

**ARIZONA'S
COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY:
2005-2015**



Arizona Game and Fish Department
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FOREWORD

Duane L. Shroufe, Director
Arizona Game and Fish Department

March 31, 2005

Arizona's Comprehensive Wildlife Conservation Strategy is the opportunity of a lifetime that many people and organizations have worked for decades to create.

Wildlife management in the 20th century was influenced by the 1937 Pittman-Robertson and 1954 Dingell-Johnson acts. The former brought funding and stability to game management programs in state wildlife agencies. The latter accomplished the same thing for sport fish management. Both programs rely on user fees (excise taxes) to generate funds to ensure, through state programs, that many wildlife resources would thrive and continue to provide enjoyment for future generations.

Nongame wildlife and endangered species programs were provided for, and mandated, by the 1973 Endangered Species Act and 1980 Forsythe-Chafee Act. However, no dedicated funding for state programs was provided.

Fortunately, the picture began to change in 1994 with a national grassroots effort to establish permanent funding for nongame wildlife. Although that initiative, Teaming With Wildlife, has yet to generate dedicated funds comparable in amount and stability to those provided by Pittman-Robertson and Dingell-Johnson, it led to enactment of the Wildlife Conservation and Restoration Program in 2001 and its 2002 successor, State Wildlife Grants. With these programs, Congress began to provide much-needed funds, for conservation of the full array of wildlife with emphasis on species that were not adequately funded or that were imperiled and in need of conservation attention.

Congress intended that these 2 programs provide enough funding to stem the rising tide of federally-listed endangered and threatened species. Congress required each state accepting funding to produce a Comprehensive Wildlife Conservation Strategy before October 2005, to describe how over the next 10 years it would meet the challenges of managing wildlife in the 21st Century.

Congress also required that states build their Comprehensive Wildlife Conservation Strategies through collaboration with stakeholders and interested parties, whether private, public, or tribal. This broad public participation must be well documented. Perhaps even more important, partnerships and new partnership opportunities must be evident throughout the implementation strategies. Strategies across the Nation are expected to collectively articulate a vision of public engagement in planning and delivering a comprehensive wildlife conservation program. Imagine 50 states, 5 territories, and the District of Columbia working toward the same goal: wildlife conservation, with a clear commitment to inform and educate the public about wildlife resources, conservation needs, and opportunities to enjoy wildlife through wildlife watching, sustainable use, or the pursuits of an armchair enthusiast.

Little more than a decade ago, as the Teaming With Wildlife initiative was born, the leaders of our state wildlife agencies and countless collaborators set in motion a change that will have a profound impact on our agencies, on our staffs, and on our constituents.

Are we ready? On behalf of the Arizona Game and Fish Commission and Department, I invite you to join us in proving that we are all ready. Together we can make this Strategy a living, working, evolving partnership for effective stewardship of our diverse and abundant living wildlife legacy.

Duane L. Shroufe
Director, Arizona Game and Fish Department

The Department's mission:

To conserve, enhance, and restore Arizona's diverse wildlife resources and habitats through aggressive protection and management programs, and to provide wildlife resources and safe watercraft and off-highway vehicle recreation for the enjoyment, appreciation, and use by present and future generations.

ARIZONA'S COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY: 2005-2015

INTRODUCTION

The Arizona Game and Fish Commission (Commission) and Department (Department) serve the people of Arizona as stewards of the State's wildlife. These resources are a public trust, managed for the benefit of present and future generations. Under Arizona Revised Statutes Title 17, the Commission and Department are vested with the authority to manage the State's wildlife.

Wildlife management is influenced by many factors. Some factors, such as drought, wildfire, and changes in human population demographics are beyond the Department's authority. In addition, many or most of the resources upon which wildlife depend—primarily habitat—reside on lands not owned by the Department. Therefore the Department relies on the cooperation of multiple partners (private, state, federal, and tribal) with whom they share stewardship responsibility for conserving wildlife resources.

WILDLIFE CONSERVATION IN ARIZONA

Arizona has a rich biological diversity of wildlife and wildlife habitats—Arizona ranks third in the nation for the number of native bird species, second for reptiles, fifth for mammals, and eighth for overall vertebrate animal diversity (Stein and others 2000). Efforts to conserve these invaluable resources have been robust and productive over the last 75 years. The Commission and Department were created in 1929 by a citizen initiative to protect and enhance the State's wildlife, primarily game species and later sport fish. In the late-1960s, Arizona became the first state in the country to dedicate a full-time employee (Richard Todd) to nongame wildlife conservation. The State of Arizona has a long record of commitment and achievement in wildlife conservation.

Through the 1980s and 1990s, the Department became widely acknowledged by its peers as being among the Nation's preeminent state wildlife agencies. Numerous national and regional awards affirmed the Department's achievements and leadership roles. Many factors contributed to this recognition, among them: the significance of state wildlife and habitat issues, the depth and breadth of its programs, the expertise and accomplishments of its staff, and the strength and effectiveness of its partnerships and public support. Game management, sport fish management, and nongame and endangered wildlife management were and continue to be the foundation for Arizona's wildlife legacy.

As the significance of wildlife and habitat issues grew, the need for change and even greater accomplishment became clear. Programs that had historically been relatively independent, and often single-species based, needed to become more integrated and holistic. A focus on landscape-level conservation to achieve greater efficiency and effectiveness was needed as pressures on wildlife and wildlife habitat grew along with an ever-increasing human population. Also, the agency's role as the management authority of Arizona's wildlife resources began to evolve toward facilitator and enabler, with more emphasis on collaborative, voluntary

conservation partnerships to complement and sometimes replace more traditional regulatory approaches.

As the state and national economies changed, the need for even greater fiscal responsibility to achieve the most value for the dollar became clear. Wildlife management followed the example of successful private businesses, where best business practices dictated that priorities needed to be set and progress toward goals and objectives needed to be measurable, reported, and carefully evaluated so constant improvement could be achieved.

The Comprehensive Wildlife Conservation Strategy is designed to address these needs and requirements. It focuses partnership efforts on conservation at the landscape level, to address stressors that constrain wildlife conservation and wildlife-related recreation opportunities. In addition to limiting the quality of human life in wildlife-rich Arizona, these stressors often limit wildlife-related contributions to our economy. Wildlife is an important and growing component of numerous local economies (Silberman 2001, Southwick Associates 2003).

This Strategy provides a 10-year vision for achievement, subject to adaptive management and improvement along the way under the watchful eye of the Commission and its partners. The Strategy covers the entire State, from low desert to alpine tundra. In any given area, it provides the Department and its partners a clear sense of what needs to be done, and opens the door to a variety of ways to get it done. It also provides opportunities for many partners to take leadership roles in getting it done. Collaboration and synergy will be key to shared success, and shared success will be key to continued Congressional support for the programs that help fund the partnerships.

The plan that follows necessarily uses specialized language and is simplified by the use of acronyms to refer to programs, agencies. See Appendices A and B, respectively, for clarification of terms and acronyms.

CWCS AND THE STATE WILDLIFE GRANT PROGRAM

As a funding requirement of the State Wildlife Grants program (TWW 2003a), Congress charged each of the 56 States and Territories (hereafter referred to as 'States') with developing a statewide "Comprehensive Wildlife Conservation Strategy" (CWCS). These strategies will provide an essential foundation for the future of wildlife conservation and a stimulus to engage the States, federal agencies, and other conservation partners to strategically think about their individual and coordinated roles in prioritizing conservation efforts. State fish and wildlife agencies are leading the strategy development process with the aim to create a strategic vision for conserving the States' wildlife. While each strategy will reflect a different set of issues, management needs, and priorities, the States are working together to ensure nationwide consistency and a common focus on targeting resources to prevent wildlife from declining to the point of endangerment. These efforts are being coordinated through the Teaming With Wildlife Committee (a standing committee of the International Association of Fish and Wildlife Agencies) at a national level. To remain eligible for State Wildlife Grant funding, State strategies need to be submitted to the National Advisory Acceptance Team by October 1, 2005, for

evaluation and approval. In addition to the aforementioned requirements, these plans must be reviewed at least every decade (TWW 2003b).

EIGHT REQUIRED ELEMENTS OF THE CWCS

Congress identified 8 required elements to be addressed in each State's wildlife conservation strategy (TWW 2003c). Congress also directed that the strategies must identify and be focused on the "species in greatest need of conservation," yet address the "full array of wildlife" and wildlife-related issues. The strategies must provide and make use of these 8 elements:

- (1) Information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife; and,
- (2) Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1); and,
- (3) Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats; and,
- (4) Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions; and,
- (5) Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions; and,
- (6) Descriptions of procedures to review the strategy at intervals not to exceed 10 years; and,
- (7) Plans for coordinating the development, implementation, review, and revision of the plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.
- (8) Congress also affirmed through this legislation that broad public participation is an essential element of developing and implementing these plans, the projects that are carried out while these plans are developed, and the Species in Greatest Need of Conservation that Congress has indicated such programs and projects are intended to emphasize.

Arizona CWCS Element Guide (Road Map)

This guide is provided for the National Advisory Acceptance Team for the purpose of evaluating Arizona's Comprehensive Wildlife Conservation Strategy (CWCS or Strategy) in addressing the

8 required elements. Section titles may be abbreviated. Only the beginning page number is given.

Element 1: Information on the distribution and abundance of species of wildlife, including low and declining populations as the state deems appropriate, that are indicative of the diversity and health of the state's wildlife:		
NAAT Guidance	Section	Page
A. The Strategy indicates sources of information (for example, literature, data bases, agencies, individuals) on wildlife abundance and distribution consulted during the planning process.	Identifying Species of Greatest Conservation Need (Element 1)	32
B. The Strategy includes information about both abundance and distribution for species in all major groups to the extent that data are available. There are plans for acquiring information about species for which adequate abundance and/or distribution information is unavailable.	Describing Species Distributions Using Ecoregions and Habitat Types (Element 1)	30
	Appendix F. Master Species List for the Apache Highlands North Ecoregion	575
	Appendix G. Master Species List for the Apache Highlands South Ecoregion	594
	Appendix H. Master species list for the Arizona-New Mexico Mountains Ecoregion	617
	Appendix I. Master species list for the Colorado Plateau Ecoregion	632
	Appendix J. Master species list for the Mohave Desert Ecoregion	654
	Appendix K. Master species list for the Sonoran Desert Ecoregion	679
C. The Strategy identifies low and declining populations to the extent data are available.	Identifying Species of Unknown Status (Element 1)	32
	Unknown Status Species and Monitoring Needs	528
	Table 16. Tier 1a and 1b SGCN associated with each habitat type in Apache Highlands North.	91
	Table 17. Tier 1a and 1b SGCN associated with each habitat type in Apache Highlands South.	111
	Table 18. Tier 1a and 1b SGCN associated with each habitat type in the Arizona-New Mexico Mountain Ecoregion.	134
	Table 19. Tier 1a and 1b SGCN associated with each habitat type in the Colorado Plateau Ecoregion.	153
	Table 20. Tier 1a and 1b SGCN associated with each habitat type in the Mohave Desert Ecoregion.	172
	Table 21. Tier 1a and Tier 1b SGCN associated with each habitat type in the Sonoran Desert Ecoregion.	189
Appendix M. All SGCN in Arizona	716	

Element 1: Information on the distribution and abundance of species of wildlife, including low and declining populations as the state deems appropriate, that are indicative of the diversity and health of the state's wildlife:		
NAAT Guidance	Section	Page
D. All major groups of wildlife have been considered or an explanation is provided as to why they were not. The State may indicate whether these groups are to be included in a future Strategy revision.	Compilation of a Comprehensive List of Wildlife in Arizona (Element 1)	29
E. The Strategy describes the process used to select the species in greatest need of conservation. The quantity of information in the Strategy is determined by the State with input from its partners, based on what is available to the State.	Soliciting Broad Public Participation in Development of the CWCS (Element 8)	23
	Identifying Species of Greatest Conservation Need (Element 1)	32
	Appendix L. Criteria for Scoring Arizona Wildlife under 4 Conservation Categories	707

Element 2: Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1):		
NAAT Guidance	Section	Page
A. The Strategy provides a reasonable explanation for the level of detail provided; if insufficient, the Strategy identifies the types of future actions that will be taken to obtain the information.	Developing Arizona's CWCS at the Habitat and Species Scales	25
	Identifying Habitats of Greatest Conservation Need (Element 2)	33
B. Key habitats and their relative conditions are described in enough detail such that the State can determine where (in which regions, watersheds, or landscapes within the State) and what conservation actions need to take place.	Arizona's Wildlife and Habitats (Element 2)	46
	Statewide Condition of Arizona's Terrestrial and Riparian/Aquatic Habitat Types (Element 2)	75
	Ecoregion-Specific Habitat Conditions (Element 2)	85
	Areas of Conservation Priority within each Habitat Type	207

Element 3: Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats:		
NAAT Guidance	Section	Page
A. The Strategy indicates sources of information (for example, literature, databases, agencies, or individuals) used to determine the problems or threats.	Assessing Stressors/Threats to Arizona's Wildlife and Wildlife Habitats (Element 3)	35
	Appendix O. Magnitude and urgency scores used to determine stressors with significant impacts in each of the major habitat type in each ecoregion	727
B. The threats/problems are described in sufficient detail to develop focused conservation actions.	Stressors that Impact Wildlife and Wildlife Habitats (Element 3)	50

Element 3: Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats:

NAAT Guidance	Section	Page
C. The Strategy considers threats/problems, regardless of their origins (local, State, regional, national and international), where relevant to the State's species and habitats.	Stressors that Impact Wildlife and Wildlife Habitats (Element 3)	50
	Major Stressors Affecting Habitat (Element 3) - AHN	95
	Major Stressors Affecting Habitat (Element 3) - AHS	118
	Major Stressors Affecting Habitat (Element 3) - AZNM	138
	Major Stressors Affecting Habitat (Element 3) - CP	157
	Major Stressors Affecting Habitat (Element 3) - MD	175
	Major Stressors Affecting Habitat (Element 3) - SD	195
	Conservation Actions to Address Stressors to SGCN (Elements 3, 4)	234
D. If available information is insufficient to describe threats/problems, research and survey efforts are identified to obtain needed information.	Developing Conservation Strategies and Identifying Information Needs (Element 4)	40
	Actions to Address Information Needs Related to Stressors	504
E. The priority research and survey needs, and resulting products, are described sufficiently to allow for the development of research and survey projects after the Strategy is approved.	Actions to Address Information Needs Related to Stressors	504

Element 4: Descriptions of conservation actions determined to be necessary to conserve the identified species and habitats and priorities for implementing such actions:		
NAAT Guidance	Section	Pages
A. The Strategy identifies how conservation actions address identified threats to species of greatest conservation need and their habitats.	Developing Conservation Strategies and Identifying Information Needs (Element 4)	40
B. The Strategy describes conservation actions sufficiently to guide implementation of those actions through the development and execution of specific projects and programs.	Conservation Actions to Address Stressors to Habitats (Element 4)	213
	Conservation Actions to Address Stressors to SGCN (Elements 3, 4)	234
C. The Strategy links conservation actions to objectives and indicators that will facilitate monitoring and performance measurement of those conservation actions (outlined in Element #5).	Identifying Species for Monitoring Habitat Condition (Element 5)	33
	Tracking Progress	529
D. The Strategy describes conservation actions (where relevant to the State's species and habitats) that could be addressed by Federal agencies or regional, national or international partners and shared with other States.	Conservation Actions to Address Stressors to Habitats (Element 4)	213
	Conservation Actions to Address Stressors to SGCN (Elements 3, 4)	234
	Appendix P. Conservation and planning documents directing activities by the Department and its cooperators	759
E. If available information is insufficient to describe needed conservation actions, the Strategy identifies research or survey needs for obtaining information to develop specific conservation actions.	Actions to Address Information Needs Related to Stressors	504
	Unknown Status Species and Monitoring Needs	528
F. The Strategy identifies the relative priority of conservation actions.	Conservation Actions to Address Stressors to Habitats (Element 4)	213
	Conservation Actions to Address Stressors to SGCN (Elements 3, 4)	234

Element 5: Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions:		
NAAT Guidance	Section	Page
A. The Strategy describes plans for monitoring species identified in Element #1, and their habitats.	Monitoring and Adaptive Management (Element 5)	44
	Monitoring and Adaptive Management (Element 5)	521
	Table 22. Summary of ongoing and planned SGCN and habitat condition monitoring efforts currently carried out by Arizona Game and Fish Department and cooperators.	530
	Appendix P. Conservation and planning documents directing activities by the Department and its cooperators	759
B. The Strategy describes how the outcomes of the conservation actions will be monitored.	CWCS Relational Database	42
	Tracking Progress	529

Element 5: Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions:		
NAAT Guidance	Section	Page
C. If monitoring is not identified for a species or species group, the Strategy explains why it is not appropriate, necessary or possible.	Monitoring and Adaptive Management (Element 5)	521
D. Monitoring is to be accomplished at one of several levels including individual species, guilds, or natural communities.	Monitoring and Adaptive Management (Element 5)	521
E. The monitoring utilizes or builds on existing monitoring and survey systems or explains how information will be obtained to determine the effectiveness of conservation actions.	Tracking Progress	529
	Table 22. Summary of ongoing and planned SGCN and habitat condition monitoring efforts currently carried out by Arizona Game and Fish Department and cooperators.	530
	Appendix P. Conservation and planning documents directing activities by the Department and its cooperators	759
F. The monitoring considers the appropriate geographic scale to evaluate the status of species or species groups and the effectiveness of conservation actions.	Table 22. Summary of ongoing and planned SGCN and habitat condition monitoring efforts currently carried out by Arizona Game and Fish Department and cooperators.	530
	Appendix P. Conservation and planning documents directing activities by the Department and its cooperators	759
G. The Strategy is adaptive in that it allows for evaluating conservation actions and implementing new actions accordingly.	CWCS Relational Database	42
	Tracking Progress	529

Element 6: Descriptions of procedures to review the Strategy at intervals not to exceed 10 years:		
NAAT Guidance	Section	Page
A. The State describes the process that will be used to review the Strategy within the next 10 years.	Revisions to the CWCS within a 10-yr Timeframe (Element 6)	46

Element 7: Plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the Strategy with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats:		
NAAT Guidance	Section	Page
A. The State describes the extent of its coordination with and efforts to involve Federal, State and local agencies, and Indian Tribes in the development of its Strategy.	Coordination with Land Management Partners (Element 7)	22
	Table 5. Department partners and interested parties that assisted in developing the CWCS.	22

Element 7: Plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the Strategy with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats:

NAAT Guidance	Section	Page
B. The State describes its continued coordination with these agencies and tribes in the implementation, review and revision of its Strategy.	Table 5. Department partners and interested parties that assisted in developing the CWCS.	22
	Implementation of Conservation Actions, Surveys, and Research	41
	Revisions to the CWCS within a 10-yr Timeframe (Element 6)	46

Element 8: Provisions to ensure public participation in the development, revision, and implementation of projects and programs. Congress has affirmed that broad public participation is an essential element of this process:

NAAT Guidance	Section	Pages
A. The State describes the extent of its efforts to involve the public in the development of its Strategy.	Table 5. Department partners and interested parties that assisted in developing the CWCS.	22
	Soliciting Broad Public Participation in Development of the CWCS (Element 8)	23
B. The State describes its continued public involvement in the implementation and revision of its Strategy.	Revisions to the CWCS within a 10-yr Timeframe (Element 6)	46

HOW THE CWCS WILL BE USED

Currently, the Department operates under separate strategic plans for its Wildlife, Watercraft, and Off-Highway Vehicle programs. Each program's strategies drive operational plans and implementation plans at the work unit level. As these 3 programs and the Business Administration program are brought together in the Department's next-generation strategic plan, *Wildlife 2012*, the CWCS will provide an essential link between the broader wildlife elements of the strategic plan and the details of the operational and implementation plans. Thus, strategies from the CWCS are delineated in each of the 4 programs for 6 designated focal areas: Conservation, Recreation, Information and Education, Laws and Law Enforcement, Research, and Administration (AGFD 2004a).

For Department cooperators, the CWCS provides guidance to partner agencies, tribes, local governments, private landowners, business/industry affiliations, universities, and non-government organizations by identifying wildlife and habitat conservation goals and information needs at a strategic level. These conservation strategies and information needs apply to various spatial scales—statewide, regional, and site specific—and can be integrated into revisions of land management plans (for example: U.S. Forest Service forest plans, Bureau of Land Management habitat management plans, Department of Defense natural resource management plans, U.S. Fish and Wildlife Service Refuge System management plans, and local government/private landowner participation in Safe Harbor Agreements or Habitat Conservation Plans). The CWCS

is one nexus for potential funding and improved coordination of partner-based conservation activities.

Arizona's CWCS is not designed to replace or duplicate the Department's existing wildlife management strategic plan, *Wildlife 2006* (AGFD 2001). Both plans serve different needs and reporting objectives—*Wildlife 2006* meets the Department's responsibilities for managing Arizona's wildlife under Title 17 obligations to the State, while the CWCS meets the Department's eligibility to receive State Wildlife Grant funding. The objectives and approaches defined by Arizona's CWCS will be used to prioritize federal "wildlife diversity" funds, matched with support from other sources, to ensure the implementation of conservation activities.

EXECUTIVE SUMMARY

ARIZONA'S APPROACHES FOR CONSERVATION

Arizona's CWCS is a document that plans for the conservation of species and their habitats. Working at large and small landscape scales, the plan first develops conservation actions to address stressors to habitats. This approach is meant to benefit all wildlife, including both vulnerable and common species, by managing for the habitat and resources upon which they depend. An example of this type of conservation action would be to identify important wildlife movement corridors and protecting them to minimize habitat fragmentation. To facilitate conservation of many species acting at different scales, Arizona's CWCS uses a multi-scale approach to classifying habitat types within Arizona. Specifically, there are 4 levels of classification:

1. **Statewide:** Coarse scale to address issues that are ubiquitous throughout Arizona.
2. **Statewide habitat types:** Based on the 14 vegetation communities identified by Brown and Lowe (1974), and 3 riparian/aquatic systems. This level addresses issues to wildlife that live in similar habitats or communities throughout Arizona.
3. **Ecoregion-level habitat types:** Ecoregions encompass regional collections of species and the resources upon which they depend. By describing each habitat type within specific ecoregions, this scale brings in regional issues. Ecoregions provide the appropriate scale for cooperation with neighboring states and sovereign nations on broad conservation efforts. There are 6 identified ecoregions for Arizona's CWCS:
 - Apache Highlands North
 - Apache Highlands South
 - Sonoran Desert
 - Mohave Desert
 - Colorado Plateau
 - Arizona-New Mexico Mountains
4. **Site Specific:** Fine scale for the conservation of specific habitat features (such as snags, nesting cavities, or caves) that are necessary for the well being of many species.

The species-level approach to conservation planning consists of continuing and expanding species-specific activities that address the needs of species of high conservation priority. These species require immediate and specific attention in order to halt or reverse the conditions contributing to their vulnerability. Whereas the habitat-level approach addresses resource needs of all species in that landscape, the species-focused approach aggressively manages conditions for those species which are already vulnerable.

DEVELOPING ARIZONA'S CWCS WITH INPUT FROM AGENCY PARTNERS (ELEMENT 7) AND THE PUBLIC (ELEMENT 8)

Various administrative and technical teams, stakeholder meetings, public input, responsive management surveys, and databases contributed to developing Arizona's CWCS:

- Oversight Group (Department divisional and work unit chiefs)
- Ecoregion Workgroup (Department technical staff and cooperating federal, state, and tribal resource managers and technical staff)
- Scientific Review Team (species experts, academics, and agency/non-government organization professionals)
- Stakeholder committees and councils (for various taxon-related or habitat conservation projects)
- Databases with new and existing management plans and agreements for conserving species and habitats
- Public opinion surveys on various wildlife-related and outdoor recreation topics
- Wildlife Summit workshops and open forum public meetings
- Department website (with comment field and background information on the CWCS)

In the development of the CWCS, the Department used extensive outreach to inform and encourage participation from the public and potential partners: 20 staff presentations; 28 presentations to external agencies, stakeholder councils, and non-government organizations; 4 media press releases (that generated at least 6 newspaper articles statewide); and email subscriber announcements to over 16,000 interested individuals and organizations. Coordination meetings between Department staff and federal agency representatives from local district offices provided another opportunity to engage partners in the CWCS development.

Among the 4 Wildlife Summit workshops held in October 2004 (2 in Phoenix and 1 each in Flagstaff and Tucson), 54 participating constituents provided initial input into developing major components of the CWCS. Summit participants provided 119 individual comments during group discussions of Department general challenges, funding allocations among challenges, ranking important stressors to wildlife and wildlife habitat, and proposing criteria for identifying Wildlife of Greatest Conservation Need (Gunn 2005a). An additional 418 constituents participated in an online Wildlife Summit survey, conducted between November 15 and December 6, 2004 (note: 256 of these participants completed the entire survey). Online survey participants provided 183 comments on the CWCS and related wildlife issues in Arizona (Gunn 2005b).

Forty-two constituents participated in a series of 8 public meetings on the CWCS draft plan, held statewide in late April and early May 2005. These participants provided 110 comments on the CWCS. An additional 52 CWCS-related comments were received through the Department's website between July 2004 and May 2005. Twelve comments were also received through correspondence with the Department's CWCS Planner or at Department-hosted events during this same timeframe.

SPECIES OF CONSERVATION PRIORITY (ELEMENT 1)

The Department rated all managed taxa in Arizona based on need for specific conservation attention (Element 1; "Vulnerable Species") and for lack of information about their vulnerability status (Element 1; "Unknown Status Species"). The Department simultaneously rated all taxa for value as an ecosystem engineer or indicator ("Community Focal Species") and relative importance of Arizona as a management entity for this taxon ("Responsibility Species"). Both of these latter categories were used to identify species suitable for monitoring habitat condition (Element 5).

"Processes to Develop Arizona's CWCS" describes the process used to evaluate the State's wildlife under these categories. Specific criteria were adapted from input of the Teaming With Wildlife Committee (TWW 2003d), stakeholder input through Arizona's Wildlife Summit workshops (Gunn 2005a), an online summit survey (Gunn 2005b), Department staff, external land management and natural resource regulatory agencies, and tribes.

Table 1 provides a count of wildlife taxa that were identified as 10-year priorities for conservation in Arizona. The lists of all wildlife in each ecoregion of Arizona are in Appendices F through K, with their ranking under each category; wildlife of immediate (2-3 year) conservation priority is listed under habitat types in each ecoregion.

	Total in Arizona ^A	Tier 1a ^B	Tier 1b ^B	Tier 1c ^B	Responsible	Community Focal	Unknown Status
Amphibians	32	3	9	6	7	9	1
Birds	297	9	40	52	7	199	36
Fish	72	24	9	2	21	33	0
Crustaceans & Mollusks ^C	86	7	21	2	25	26	44
Mammals	164	10	25	32	41	37	54
Reptiles	145	4	22	33	15	7	25
Total	796	57	126	127	116	311	160

^A: The Master Taxon List includes only those species that can be effectively managed in Arizona. For instance, transient, casual, and rare birds that occur unpredictably are not included.

^B: Tier 1a, 1b, and 1c represent all vulnerable species or the species of greatest conservation need.

^C: Other macroinvertebrates not evaluated at this time due to insufficient data.

The Department manages species at the species, subspecies, or population level, depending on legal requirements and protections, interagency coordination, stakeholder concerns, funding eligibility, national or international reporting conventions, and/or taxonomic determinations through scientific documentation. Counts of wildlife for Arizona's CWCS may therefore not correspond exactly to counts on other Department species lists or narratives.

Species on the Master List that rated high under the Vulnerability category have the highest priority for directed conservation management. Vulnerable species require conservation actions aimed at improving conditions for those species through intervention at the population or habitat

level. Over 300 species were identified as Vulnerable; however, a subset of these requires most immediate attention. Species that rated high for Vulnerability were further separated into 3 tiers of priority (1a, 1b, and 1c). For the current effort, stressors with high and moderate impacts to species in Tier 1a and Tier 1b were identified, and specific actions were outlined to address these stressors.

HABITATS OF GREATEST CONSERVATION NEED (ELEMENT 2)

For the purposes of Arizona's CWCS, habitat was defined in terms of 17 vegetation types distributed among 6 ecoregions. Of those vegetation types, 4 fall under the general category of desertscrub and represent the 3 deserts in the state (Chihuahuan, Mohave, and Sonoran); 3 represent the state's grassland; 5 are forests and woodlands ; 3 represent aquatic systems and associated riparian areas; 1 is tundra and 1 is human-dominated systems. Because the premise of Arizona's CWCS is that conservation of habitats will benefit whole communities of wildlife, all vegetation types/aquatic systems were treated as habitats in need of conservation. To customize conservation planning within each habitat, the Ecoregion Workgroup assessed important stressors within each habitat type within ecoregions ("Assessing Stressors/Threats to Arizona's Wildlife and Wildlife Habitats (Element 3)") and developed actions to address those stressors to benefit the majority of wildlife within each habitat ("Conservation Actions to Address Stressors to Habitats (Element 4)").

Habitat type	Apache Highlands South	Apache Highlands North	Arizona – New Mexico Mtns	Colorado Plateau	Mohave Desert	Sonoran Desert
Lower Colorado Sonoran Desertscrub					X	X
Upland Sonoran Desertscrub	X	X			X	X
Chihuahuan Desertscrub	X	X				X
Mohave Desertscrub		X		X	X	X
Semidesert Grassland	X	X			X	X
Plains & Great Basin Grassland	X	X	X	X	X	
Subalpine Grassland			X	X		
Chaparral	X	X	X	X	X	X
Madrean Evergreen Forest	X	X	X			X
Great Basin Conifer Forest	X	X	X	X	X	X
Montane Conifer Forest	X	X	X	X	X	
Subalpine Conifer Forest		X	X	X		
Alpine Tundra			X			
Human-dominated landscapes	X	X	X	X	X	X
Wetlands/Springs	X	X	X	X	X	X
Streams/Rivers	X	X	X	X	X	X
Lakes/Reservoirs	X	X	X	X	X	X

Where should Arizona focus attention within each habitat? The statewide habitat analysis that will comprehensively address this question has not yet been initiated. This task will need to be

completed in the near future as new data on Arizona's wildlife resources is compiled. As an initial step in this process, Department staff started by focusing on the fine grain analysis, linking all wildlife in Arizona to the habitat it occupies, and then prioritizing species for conservation attention. Location of these species is the finest scale of analysis for habitats in greatest need of conservation. Appendices F through K list all vertebrate, crustacean, and mollusk taxa in each habitat type separately for each ecoregion. Table 2 summarizes which habitat types are found in each ecoregion.

STRESSORS/THREATS TO ARIZONA'S WILDLIFE AND WILDLIFE HABITATS (ELEMENT 3)

Over the past 500 years the landscapes of Arizona have changed dramatically. Anyone traveling across Arizona today will not come across any habitat that has not been affected by humans. Dams have been placed on rivers, developed urban and rural areas have increased in size, roads and fences were built throughout the state, and plant communities have been drastically altered. All of these changes have impacted wildlife. The Ecoregion Workgroup threat assessment addressed stressors that are important because they impact whole communities of wildlife (landscape focus) or because they impact species that are priorities for conservation right now (species focus).

At the landscape scale, stressors were evaluated for the magnitude and immediacy of their impacts to the structure and function of each habitat type in each ecoregion. This assessment identified stressors that impact larger communities of wildlife. At the species level, significant stressors to SGCN in Tier 1a and 1b were identified. A description of both processes can be found under "Assessing Stressors/Threats to Arizona's Wildlife and Wildlife Habitats (Element 3)."

All together, the Department and cooperators identified 70 separate stressors that have serious impacts to at least one habitat type in Arizona. An additional 4 stressors act at the species but not landscape scale. Many of these stressors are related to 4 current themes: a rapidly increasing human population, changes to water storage and delivery systems in the Southwest, alteration of communities by invasive nonnative species, and the ongoing drought and warming trend. Although many traditional land use activities continue to have large impacts on wildlife, many of these activities have changed in nature and magnitude in recent decades. The Department anticipates that the subset of stressors related to population pressures and water use will grow in importance for their impact on biodiversity in Arizona.

INFORMATION NEEDS FOR ARIZONA'S CWCS (ELEMENT 3)

The Ecoregion Workgroup identified potential barriers to effectively addressing important stressors to wildlife and wildlife habitats. Many of these barriers were compiled as "information needs" (Table 3).

Emphasis	Information Needs
Determine status and distribution	Determine distribution and population status of priority and nuisance species.
	Determine habitat requirements for species of conservation priority and develop models of their habitat use.
	Map the distribution of habitat features including: barriers to wildlife movement; areas of high human disturbance; high fuel load areas; important wildlife corridors; migration pathways; structures, sites and activities causing soil erosion; other structures; baseline vegetation; and vegetation changes.
Compile data, programs and information	Compile wildlife-related data, programs, and information such as: the Arizona Department of Transportation database of roadside invasive plants, pertinent wildlife studies, Florida's wildlife-friendly road crossing designs.
Research species biology	Develop genetic analyses on species of taxonomic uncertainty.
	Investigate features of species' biology that are of conservation concern. For example, understand characteristics that make particular species more invasive, other species important keystone species, or other species more sensitive to stressors such as long-term drought.
Research ecosystem conditions	Generate projections of future conditions and model past conditions related to land conversion, water usage, species re/introductions, dam removal, road building, management actions, etc.
	Develop GIS models to assess the impacts on wildlife and wildlife habitat from the presence of human activities and structures.
	Investigate functional mechanisms and conditions that affect shifts in ecosystem states. These mechanisms and conditions may be related to priority species and/or identified stressors.
	Implement adaptive management principles for large-scale projects. Treat these projects as experiments in order to extract the most information and conservation benefit.
Research stressors	Determine threats to vulnerable species.
	Research impacts of specific threats and activities on wildlife resources.
	Model, monitor, and research factors related to wildlife and wildlife diseases.
	Characterize non-point sources of identified stressors.
Develop conservation, research, and monitoring tools	Develop a process or processes to identify and prioritize significant habitats for short- and long-term conservation planning.
	Work with cooperators to develop research standards and methods to assess or address impacts from particular stressors.
	Investigate and develop alternatives for non-conservation projects and activities such as dam releases, road construction, and utility towers, so that these projects have less impact on wildlife and wildlife habitats.
	Establish monitoring programs and develop best monitoring techniques.
	Rank alternative conservation tools, identifying best and worst alternatives. Encourage development and use of wildlife friendly techniques.

CONSERVATION ACTIONS FOR ARIZONA'S CWCS (ELEMENT 4)

Conservation actions were developed to address important stressors identified at the coarse (landscape) scale and specifically to address stressors impacting SGCN. This comprehensive set of conservation actions will be implemented where feasible and appropriate, and includes many opportunities for implementation by cooperators. Implementation of management actions is subject to necessary environmental compliance review (where required), and in cooperation with key land managers. Large-scale conservation efforts should be coordinated through interagency workgroups and formal agreements where applicable.

Due to the comprehensive nature of the CWCS, many of the proposed actions are included for the benefit of the Department's external partners and land managers, who will be the likely leads for implementing conservation activities. In many proposed actions, the Department may participate in an advisory and technical capacity in assisting land managers; in other cases, the Department may be the lead for those activities over which it has direct authority.

Table 4. Conservation strategies for Arizona's CWCS.	
Implementation of specific actions is considered where appropriate and feasible, for the benefit of wildlife and wildlife habitat. Strategies are not presented in order of priority.	
Emphasis	Conservation Strategy
Conserving wildlife habitat	Promote the restoration and protection of aquifers, springs, streams, rivers, lakes, and riparian systems. Support regulations ensuring minimum instream flow and water rights for wildlife resources.
	Perform landscape classification analyses to identify sensitive habitats, core wildlife areas, and important wildlife corridors.
	Acquire ecologically important lands, access agreements, conservation easements, and/or water rights.
	Support State planning efforts to address drought issues as they relate to wildlife resources.
Maintaining and re-establishing habitat and habitat connectivity	Promote maintenance and restoration of habitat connectivity by removing or modifying barriers, protecting corridors and riparian areas, and using wildlife-friendly roadway crossing structures.
	Promote maintenance and restoration of habitat connectivity by removing unneeded fences, by using wildlife-friendly barriers in future projects and when replacing old fences.
	Develop standards for new road, utility and power lines construction, and modification of existing structures and corridors to reduce impacts to wildlife.
Wildlife management	Promote implementation of recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources. Develop plans to conserve priority conservation species (Focal Community; Responsibility, and Vulnerability categories) that are not sufficiently addressed under existing plans.
	Manage so as to sustain or enhance sport fish and native fish populations.
	Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
	Maintain and construct new wildlife water developments. Encourage conversion of livestock waters so they are also continuously usable by wildlife.
	Collaborate with partners to evaluate sampling techniques, reduce duplication of effort, and develop pathogen decontamination protocols to limit impacts to wildlife.
	Collaborate with partners on disease/pathogen/parasite issues to wildlife including: development of action plans to manage existing sources, identify and respond to new threats, and to educate the public.
	Evaluate, update, and enforce existing Department regulations to address evolving concerns about hybridization, nuisance animals, illegal stocking, and spread of animals used for bait.
	Reduce/eliminate the effects of feral animal populations in sensitive habitats or near wildlife populations of concern.
Public education and law enforcement to benefit wildlife and wildlife habitat	Educate the public about the impacts of free-ranging or feral animals, release of nonnative species, and illegal stocking of fish and live bait on wildlife resources. Increase enforcement of existing laws and promote more stringent laws prohibiting the release of domestic or nonnative animals into the wild.
	Utilize education and enforcement to promote human behavior that does not encourage wildlife to become a nuisance (for example: feeding wildlife, securing waste containers, and storage of food). Increase awareness of effects of feeding and litter on wildlife.
	Increase public awareness of how water conservation and ensuring instream flow can benefit wildlife.

Table 4. Conservation strategies for Arizona's CWCS.	
Implementation of specific actions is considered where appropriate and feasible, for the benefit of wildlife and wildlife habitat. Strategies are not presented in order of priority.	
Emphasis	Conservation Strategy
Public education and law enforcement to benefit wildlife and wildlife habitat	Encourage the use of low water-use native plants in landscaping.
	Educate the public regarding identification of contaminants, release prevention, and impacts to wildlife and habitats. Promote alternatives that reduce release of contaminants.
	Encourage cooperative clean up efforts of wildlife habitats.
	Increase public awareness of the potential effects of various types of recreation on wildlife resources. Encourage responsible outdoor recreation through education (for example: "Stay on the Trails," "Leave No Trace," "Be Bear Aware," "Stop Aquatic Hitchhikers"), enforce existing laws, and encourage development of new legislation.
	Inform the public and land management agencies on the effects of illegal harvest of wildlife. Cooperate with land management agencies to increase enforcement of existing laws.
	Support prevention and suppression of accidental or arson-caused wildfire through information and education and enforcement of appropriate regulations.
	Educate the public on the importance of community focal species (including predators, prey, wide-ranging species, keystone species, etc.) for ecosystem health.
Representing wildlife values in multiple-use planning	Provide recommendations to state and federal partners on the development of new land management plans or revising existing plans as they relate to wildlife resources.
	Cooperate with state, federal, tribal, and local government partners to develop and implement watershed management plans that incorporate wildlife and habitat values.
	Prevent loss and degradation of sensitive habitats through involvement of planning efforts with local governments, private landowners, and agency/tribal land managers.
	Promote restoration of natural fire regimes for improving grassland and forest health.
	Promote adoption of sustainable forage management standards and guidelines for livestock and wildlife.
	Promote conservation of sensitive areas and habitats for wildlife.
	Encourage development and implementation of standards and guidelines for mining and landfill operations that consider the needs of wildlife resources.
Representing wildlife values in other processes	Encourage land management agencies to manage road and trail networks to ensure sustainable wildlife resources in balance with recreational opportunities, economic pursuits, and rural development.
	Coordinate with land managers, counties, municipalities and private sector partners to promote ecologically sensitive design of recreational facilities such as campgrounds, parks, golf courses, ski resorts, etc.
	Coordinate to reduce impacts to wildlife along the US-Mexico border.
	Encourage the operation of dams, canals, and diversions for improving or maintaining wildlife resources. Promote wildlife values in building new, renovating existing, or removing old water retaining structures.
	Promote programs for eliminating or limiting the spread of invasive plants and animals, and the recovery or reintroduction of native populations.
	Limit the spread of invasive plants and promote the restoration of native vegetation in disturbed areas.
	Support land management and regulatory agencies in enforcing Best Management Practices to prevent the introduction of toxins into ecosystems.
Promote the use of engineered wetlands, discharge basins, and augmented riparian vegetation to pre-treat water prior to release into riparian systems. Promote the use of treated effluent to create wildlife habitat.	
Cooperate with land management agencies and municipalities on revising waste management plans to minimize impacts to wildlife resources.	

MONITORING AND THE CWCS (ELEMENT 5)

Arizona's CWCS outlines existing and planned monitoring of species. At this time, efforts by federal land management entities are only starting to develop regional habitat monitoring plans, so coordination in these efforts is not yet part of CWCS. Building on existing strengths of the Department to monitor species, Arizona's CWCS outlines existing and planned monitoring of species both to identify trends in individual species and, by using Responsibility and Community/Focal species described under Element 1, to describe trends in habitat condition. The Department has moved over the past 6 or so years to develop multi-species plans for the conservation and monitoring of groups of species, and this effort will serve as the basis for monitoring beyond the traditional single-species focus.

Status of the 310 SGCN species will eventually be monitored. The CWCS begins implementation of this monitoring by focusing on the 183 species in Tiers 1a and 1b. Monitoring to determine the status of the 160 Unknown Status Species will also be initiated under the CWCS. All multi-species taxon plans currently under development will specifically address monitoring for both SGCN and Unknown Status species. The first planning effort where these CWCS priorities are being incorporated is the All Birds Monitoring initiative currently led by the Department.

ADAPTIVE MANAGEMENT AND THE CWCS (ELEMENT 5)

The CWCS also requires monitoring to describe effectiveness of conservation actions, followed by adaptive evaluation of conservation actions and implementation of new actions as indicated. Adaptive management provides an experimental platform upon which to incorporate existing knowledge of the system into management activities while allowing enough flexibility to implement alternative management strategies (Walters 1997, Brown and Ford 2002). Feedback loops between monitoring and management actions can correct for the uncertainty that is inherent in managing complex systems (Stromberg 2001, Clark 2002, Williams 2003). These feedback loops between management activities and monitoring allow researchers and land managers to adjust for changing circumstances (environmental, political, economic, etc) thereby ensuring success in achieving conservation goals.

Adaptive management contains an inherent flexibility allowing for multiple conservation actions to be developed, weighed and exercised. Monitoring the effectiveness of those actions relies on a number of mechanisms. These mechanisms may include:

- 1) Coordination and cooperation with all involved parties (that is: stakeholders, sponsors, agencies, academia, media, and general public);
- 2) Knowledge of pertinent information gaps and uncertainties relevant to specific conservation actions;
- 3) Formulation of alternate conservation action endpoints to assist in project organization, efficiency, and budgeting;
- 4) Monitoring at all scales necessary to determine level of success or failure for those conservation actions implemented;

- 5) Flexibility to switch to alternate actions if thresholds are not met;
- 6) Publication of results of conservation actions in highly accessible form (preferably on-line in Adobe PDF format); and
- 7) Self-revising as feedback loops between monitoring and actions frequently update information.

Arizona's CWCS is not meant to be a fixed set of conservation goals and strategies. Rather, the CWCS is a series of processes that can be used to identify Department and partner priorities and appropriate monitoring efforts for wildlife and wildlife habitat on various spatial scales (statewide, statewide within habitat types, habitat types within ecoregions, or site specific).

REVISIONS TO THE CWCS WITHIN A 10-YR TIMEFRAME (ELEMENT 6)

Arizona's CWCS is scheduled to be reviewed and revised on a series of 2-yr and 4-yr cycles during its 10-yr timeframe. This review process will be synchronized with the Department's 2-year budget planning cycle that is approved by the State's Executive and Legislative branches. The Department will use its existing annual performance reports for Federal Aid projects and State Wildlife Grant funds to document progress on CWCS-related activities.

The Department will conduct an internal review of the CWCS prior to each 2-yr budget process to address changing priorities, variations in habitat and environmental conditions, and to adaptively manage based on wildlife and habitat responses to conservation actions or treatments (see "Processes to Develop Arizona's CWCS, Revisions to the CWCS within a 10-yr Timeframe (Element 6)"). Every 4 years, a detailed evaluation of CWCS will be done to assess progress on conservation strategies, species status, important stressors, and to solicit partner and public input. Critical partners and key stakeholders will be asked to participate in the 4-yr reviews with the Department's internal staff. These evaluations allow "mid-course" corrections within the anticipated 10-year timeframe of the CWCS.

Every 4 years, the Department will conduct a detailed evaluation of CWCS progress on conservation strategies, species status, important stressors, and solicit partner and public input. Critical partners and key stakeholders will be asked to participate in the 4-yr reviews with the Department's CWCS Implementation Team. Constituent input will be solicited using a series of Wildlife Summit workshops, online surveys, and/or open forum meetings. The 4-yr evaluation and revision are intended to allow 2 "mid-course" corrections within the anticipated 10-year timeframe of the CWCS.

PROCESSES TO DEVELOP ARIZONA'S CWCS

DEVELOPMENT AND COORDINATION OF CWCS

This section describes the various workgroups, teams, and stakeholder meetings that helped develop Arizona's CWCS.

Oversight Group

The Department's Wildlife Management Division and Field Operations Division Assistant Directors, Branch Chiefs in the Wildlife Management Division, Information and Education Division, Development Branch, Law Enforcement Branch, and Funds Planning Section Manager and game and fish resource planners participated in this committee. The Oversight Group (or their alternates) met approximately on a monthly basis to provide direction and vision on development of CWCS (March 2004 through May 2005).

Specific tasks for the Oversight Group:

- Identify potential partners and interested parties (Appendix C);
- Promote internal and external outreach of CWCS efforts;
- As "process owners," ensure their staff support CWCS development efforts and meet requested deadlines for deliverables;
- Define the format and intent of Wildlife Summits, including survey questions;
- Test and evaluate draft threat matrices for the "Ecoregion Workgroup;"
- Provide guidance in structuring criteria for species of greatest conservation need, wildlife conservation strategies, plan revision process, and review of written drafts;
- Assist the CWCS Planner in specific information needs, evaluation efforts, facilitating development processes, and preparation for Commission updates.

Ecoregion Workgroups

The Department's CWCS development team included 6 regional leads (1 from each of the 6 regional offices; a Habitat or Wildlife Program Manager or Nongame Specialist), 5 Nongame Program Managers (representing taxonomic groups for native birds, mammals, reptiles/amphibians, fish, and crustaceans/mollusks) or their alternates, the Nongame Statistician, Nongame Senior GIS Analyst, the Heritage Database Management System (HDMS) Manager, CWCS Planner, a contracted planner from The Nature Conservancy (TNC), and game and fisheries specialists. The regional leads, statistician, GIS analyst, and planners were the primary authors of the CWCS plan. Other work unit staff, including representatives in the Oversight Group, assisted in writing various portions of the plan. The CWCS development team met monthly (July 2004 through February 2005). At meetings in August 2004, October 2004, and February 2005, the internal development team was augmented with representatives from state, federal, and tribal land management and regulatory agencies to produce major components of the CWCS. Participation in these meetings is documented in Appendix D.

Specific tasks for the Ecoregion Workgroups:

- Select a landscape classification system to use in Arizona's CWCS;
- Complete a threat assessment for Arizona's wildlife and wildlife habitat;
- Identify information needs and existing (or planned) operational plans, formal agreements, interagency workgroups, and recovery teams;
- Propose and define criteria for wildlife of greatest conservation need;
- Define spatially-relevant conservation goals, strategies (metrics), and monitoring efforts;
- Promote internal and external outreach of CWCS efforts;

- Assist the CWCS Planner in specific information needs, evaluation efforts, facilitating development processes, and preparation for Commission updates

Scientific Reviewers

External, recognized experts (university academics, agency professionals, independent scientists, and non-governmental organization specialists) assisted the Department by reviewing draft components of the CWCS: threat assessment, priority species criteria, and conservation strategies. This effort served as an informal peer-review process of Arizona's CWCS. These individuals on the team were involved in the CWCS review process in April and May 2005 (Appendix E).

Coordination with Land Management Partners (Element 7)

The Department regularly communicates and coordinates with numerous federal, state, tribal, and local governments, as well as private landowners, as partners in wildlife conservation planning and implementation. The Department has numerous formal partnerships through Memorandums of Understanding, conservation agreements, recovery plans, Habitat Conservation Plans, Safe Harbor Agreements, and various agreements with external agencies, tribes, local governments, and non-government organizations. Specifically for development of the CWCS, the Department invited all federal, state, and tribal land management and natural resource regulatory offices to participate in the Ecoregion Workgroup meetings and Wildlife Summit workshops. Table 5 lists external partners in both the Ecoregion Workgroup and with Wildlife Summits that helped assist in developing Arizona's CWCS.

Table 5. Department partners and interested parties that assisted in developing the CWCS.			
Federal Land Management/Regulatory Agencies:		State/Tribal Land Management/Regulatory Entities:	
USFWS	US Fish and Wildlife Service	ADHS	Arizona Dept of Health Services
USFS	US Forest Service	ADA	Arizona Dept of Agriculture
BLM	Bureau of Land Management	ASLD	Arizona State Land Dept (GIS section)
NPS	National Park Service	ASP	Arizona State Parks
NRCS	Natural Resource Conservation Service	ADEQ	Arizona Dept of Environmental Quality
FHA	Federal Highways Administration	ADOT	Arizona Dept of Transportation
USDA-WS	US Dept of Agriculture-Wildlife Services	AZ-DEMA	Arizona National Guard-Dept of Emergency and Military Affairs
USBR	US Bureau of Reclamation	ADWR	Arizona Dept of Water Resources
DOD	Dept of Defense		Hualapai Tribe
DHS	Dept of Homeland Security-Border Patrol		Hopi Tribe
Non-Governmental Organizations, Local Governments, and Various Stakeholder Workgroups:			
The Nature Conservancy	Defenders of Wildlife, SW Center	Habitat Partnership Committees	
Wildlife Conservation Council	Arizona Quail Alliance	Habitat Connectivity Committee	
Arizona Audubon Council	Wildlands Project	All Birds Conservation Initiative	
Desert Flycasters	Arizona Wildlife Federation	Intermountain West Joint Venture	
Arizona ATV Riders	Arizona-Sonoran Desert Museum	Sonoran Joint Venture	
Desert Foothills Land Trust	Sky Islands Alliance	Partners In Flight	
Coconino Natural Resources Conservation District	Southeastern Arizona Bird Observatory	Partners in Amphibian and Reptile Conservation	

Grand Canyon Wildlands Council	Animal Defense League of Arizona	White Mt Crayfish Working Group
Mohave Sportsman Club	Tucson Herpetological Association	Native Fish Conservation Team
Coconino Sportsmen	Sierra Club, Grand Canyon Chapter	National Fish Habitat Initiative
Arizona Heritage Alliance	Maricopa County Parks and Rec	Mohave County
Center for Biological Diversity	Pima Association of Governments	Town of Superior
Arizona Native Plant Society	The Phoenix Zoo	Town of Wickenburg

Soliciting Broad Public Participation in Development of the CWCS (Element 8)

Wildlife Summits: Representatives of state and federal land management and regulatory agencies, tribal, municipal, and county governments, universities, special interest groups, agriculture and livestock affiliations, private landowner/rancher representatives, power and water utilities, sportsman groups, environmental-conservation groups, outdoor recreational groups, and land trusts were invited to participate in a series of CWCS workshops. These “Wildlife Summit” workshops were designed to address values, perceptions, and priorities for Arizona’s wildlife and natural resources among a wide diversity of the Department’s constituencies.

Four summits were held in October 2004. Two summits were in Phoenix (an agency/tribal summit on October 15 and a constituency summit on October 16) and 1 each in Flagstaff (October 23) and Tucson (October 30). For constituents, agency/tribal representatives, and the general public that were unable to attend the workshops, an online summit survey was available November 15–December 6, 2004.

Each summit was designed to accommodate up to 100 invited/registered participants (from the CWCS contact list of potential partners) to provide directed feedback on 3 topics: 1) the Department’s 12 general challenges (policies and statutory roles); 2) identify and rank important stressors affecting wildlife and natural habitats statewide; and 3) identify and rank important criteria for determining species of greatest conservation need. Each summit participant used a CoNexus® wireless keypad to respond to a prepared set of survey questions (dual-pair comparisons were used in each of the 3 topics).

The online survey, hosted on an external website (subcontracted vendor: Idea Sciences), also used the CoNexus® software to process user input. Gunn Communications, Inc. (a contracted vendor) facilitated the workshops, provided and operated the electronic response system, and compiled results for the Department. Constituency summits were held on Saturdays (as directed by the Commission), and the agency/tribal summit was held on a workday. The Wildlife Summit surveys documented stakeholder and public perceptions of wildlife and habitat issues specific to components of Arizona’s CWCS. Results from the workshops and the online survey are found in supporting documents to Arizona’s CWCS (Gunn 2005a, 2005b).

Responsive management surveys: To better establish a foundation for the CWCS, the Department also relied on perspectives from a series of public opinion survey (reports from telephone interviews and sponsored workshops) on various wildlife and outdoor recreation topics. These surveys were conducted between 2001 and 2004:

- Report of the Flagstaff and Phoenix Mountain Lion Workshops - August 2004. (AGFD 2004b).
- Fishing and Hunting 1991-2001: Avid, Casual, and Intermediate Participation Trends. Addendum to the 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (Aiken 2004)
- Comprehensive Wildlife Conservation Strategy Survey—Arizona: January 2004 (Behavior Research Center 2004)
- Arizona Residents' Opinions on the Arizona Game and Fish Department and its Activities – 2004 (Responsive Management 2004)
- Economic Impact Analysis of Nonconsumptive Wildlife-Related Recreation in Arizona - May 2003 (Southwick Associates 2003)
- Arizona Residents' Opinions on the Arizona Game and Fish Department and its Activities - March 2003 (Responsive Management 2003a)
- Arizona Residents' Attitudes Toward Nongame Wildlife - February 2003 (Responsive Management 2003b)
- The Economic Importance of Off-Highway Vehicle Recreation for the State of Arizona (Silberman 2002). Jonathan Silberman, School of Management, Arizona State University.
- The Economic Importance of Fishing and Hunting for the State of Arizona (Silberman 2001). Jonathan Silberman, School of Management, Arizona State University.

A CWCS webpage on the Department's website (http://www.azgfd.com/w_c/cwcs.shtml) was launched in July 2004, concurrent with a press release that reached approximately 16,000 email subscribers, media, and partner groups. Press releases, postal mailings, phone calls, and email notifications were made to the 400+ groups/agencies/individuals on the CWCS contact list (Appendix C) in 2004 and early 2005. The CWCS webpage had a comment field for soliciting input from the public and partners on issues and concerns with developing the Arizona plan. Fifty-two CWCS-related comments were received from the Department's CWCS webpage between July 2004 and May 2005. Twelve additional comments on the CWCS effort were received through correspondence with the CWCS Planner or at Department-hosted events.

In late April and early May 2005, the Department hosted a series of open forum public meetings statewide at the start of the 30-day public review of the draft CWCS plan. These meetings were held on weeknights after the business day, and were hosted at each of the Department's regional offices at least once and the headquarters office twice. Background presentations on the CWCS and the draft plan were coupled with a question/answer session and opportunities for individuals to provide comments. Forty-two constituents and members of the general public participated in these meetings, and provided 110 comments.

All relevant comments received were considered in developing Arizona's CWCS. The Wildlife Summit and online survey reports are available to the public as Adobe PDF files through the Department's website (http://www.azgfd.gov/w_c/cwcs.shtml). Department managers and the Commission reviewed all CWCS-related comments during the development phase of the CWCS in late 2004 and early 2005.

DEVELOPING ARIZONA'S CWCS AT THE HABITAT AND SPECIES SCALES

One traditional focus of conservation efforts has been on protecting populations of rare, threatened, or endangered species (White and others 1999). More recently efforts have moved towards identifying and protecting parcels of land believed to contain highly diverse assemblages of various species. These approaches, albeit for different reasons, fall short of providing a comprehensive framework for the Department to allocate its financial and personnel resources. The initial approach conserves species that have reached the brink of extinction, but suffers because the cost and effort involved in rescuing a few species can quickly grow out of proportion to the contribution of those species to overall biodiversity; this is clearly not an efficient or effective use of limited resources. In addition, this approach removes the focus from other, more common species which are also under Department stewardship.

The second approach, focusing conservation on areas with high biodiversity, better addresses the needs of many species by conserving the underlying resources upon which they depend. However, the focus on land management puts the Department at a disadvantage because it is not a major land management agency; Department land holdings (Wildlife Areas, hatcheries, office complexes, and the Ben Avery Shooting Facility) represent only about 0.05% of the total area in the State. Instead, the Department must rely on cooperation with its conservation partners to influence their management decisions to include the needs of wildlife and wildlife habitat. In addition, many of the species under Department stewardship, from large ungulates to migratory birds, range over large areas with little regard for management boundaries. In this regard, management must be done at various spatial scales to address the needs of a diverse wildlife population across a state that is both topographically complex and heavily influenced by human activities.

Both of these approaches traditionally suffer from their focus on dynamic ecosystems without attention to the dynamic human nexus in which they operate. As the human population of Arizona continues to grow at an increasing rate (US Census Bureau 2005), the effects of human activity will put more stress on wildlife. Urban and rural growth in conjunction with increased recreation pressures often result in habitat fragmentation, deterioration, or complete habitat loss which The World Conservation Union (IUCN) has found to be the greatest threat to species worldwide (Baillie and others 2004). Therefore, stress due to human activities is expected to further impact wildlife in the future. Effective conservation planning must take into account not only the needs of the species, but also the needs of the human population and the effects of human activities on those species and their habitats. What is needed is a multi-scale conservation approach aimed at recovering species that are already at risk while simultaneously preventing further imperilment through habitat conservation. Such an approach requires knowing which species are vulnerable and which human activities threaten them (Pulliam and Babbitt 1997).

To prevent further impacts to wildlife and to more effectively use available conservation resources, the Department has adopted a two-pronged approach to conservation planning (Fig. 1). The first prong, the left hand side of Figure 1, takes a landscape level approach, developing conservation actions to address stressors at the habitat level. This approach is meant to benefit all wildlife, both vulnerable and common species, by managing for the resources upon which they

depend. An example of this type of conservation action would be to identify important wildlife movement corridors that can be protected to minimize habitat fragmentation. It is important to recognize that not all stressors act on the same scale, nor do different species react to stressors or to landscapes at the same scale. For example, raptors experience the landscape at a much larger scale than do most mammals. For raptors and many other birds, roads do not represent significant barriers to movement but for many mammals roads are a primary cause of habitat fragmentation. Arizona's CWCS uses a multi-scale approach to classifying landscapes within Arizona in order to further facilitate conservation of many species acting at different scales. Specifically, there are 4 levels of landscape classification:

1. **Statewide** - Coarse scale to address issues that are ubiquitous throughout Arizona.
2. **Ecoregion** - Wide, regional collections of species and the resources upon which they depend. The ecoregions are modified from those used by TNC in their ecoregional assessments. TNC's ecoregions are based on and closely follow the US Forest Service ECOMAP framework (Bailey 1994, 1995, 1998). Table 6 delineates the close association between TNC's ecoregions and Bailey's provinces. TNC treated all of Apache Highlands as one ecoregion; for the CWCS, the northern (and western) area is treated separately from the southern (and eastern) area. Cooperation with neighboring states and sovereign nations is also addressed at this level. This classification was adopted because the coverage extends past Arizona's borders into Mexico, tribal lands, and other States—which is anticipated to help facilitate conservation partnerships with those entities. There are 6 identified ecoregions for Arizona's CWCS:

<i>Apache Highlands North (AHN)</i>	<i>Apache Highlands South (AHS)</i>
<i>Sonoran Desert (SD)</i>	<i>Mohave Desert (MD)</i>
<i>Colorado Plateau (CP)</i>	<i>Arizona-New Mexico Mountains (AZNM)</i>

Table 6. Landscape classification schemes in Arizona: a crosswalk of TNC's Ecoregions and Bailey's Sections.	
TNC's Ecoregions	Bailey's Sections
Apache Highlands (North and West)	Tonto Transition
Apache Highlands (South and East)	Basin and Range
Arizona-New Mexico Mountains	White Mountain – San Francisco Peaks
Colorado Plateau	Grand Canyon Lands, Navajo Canyon Lands, Painted Desert
Mohave Desert	Mojave Desert
Sonoran Desert	Sonoran Colorado

3. **Habitat Types** - This level uses the 14 vegetation communities delineated by Brown and Lowe (1974) and 3 riparian/aquatic systems as proxies for wildlife habitat with the understanding that true habitat occurs at multiple scales. This level addresses stressors to wildlife that live in similar habitats or communities.

4. **Site Specific** - Fine scale for the conservation of wildlife populations with very specific habitat needs. This level also captures specific habitat features, such as: snags, nesting cavities, and caves—which are necessary for the well being of many species.

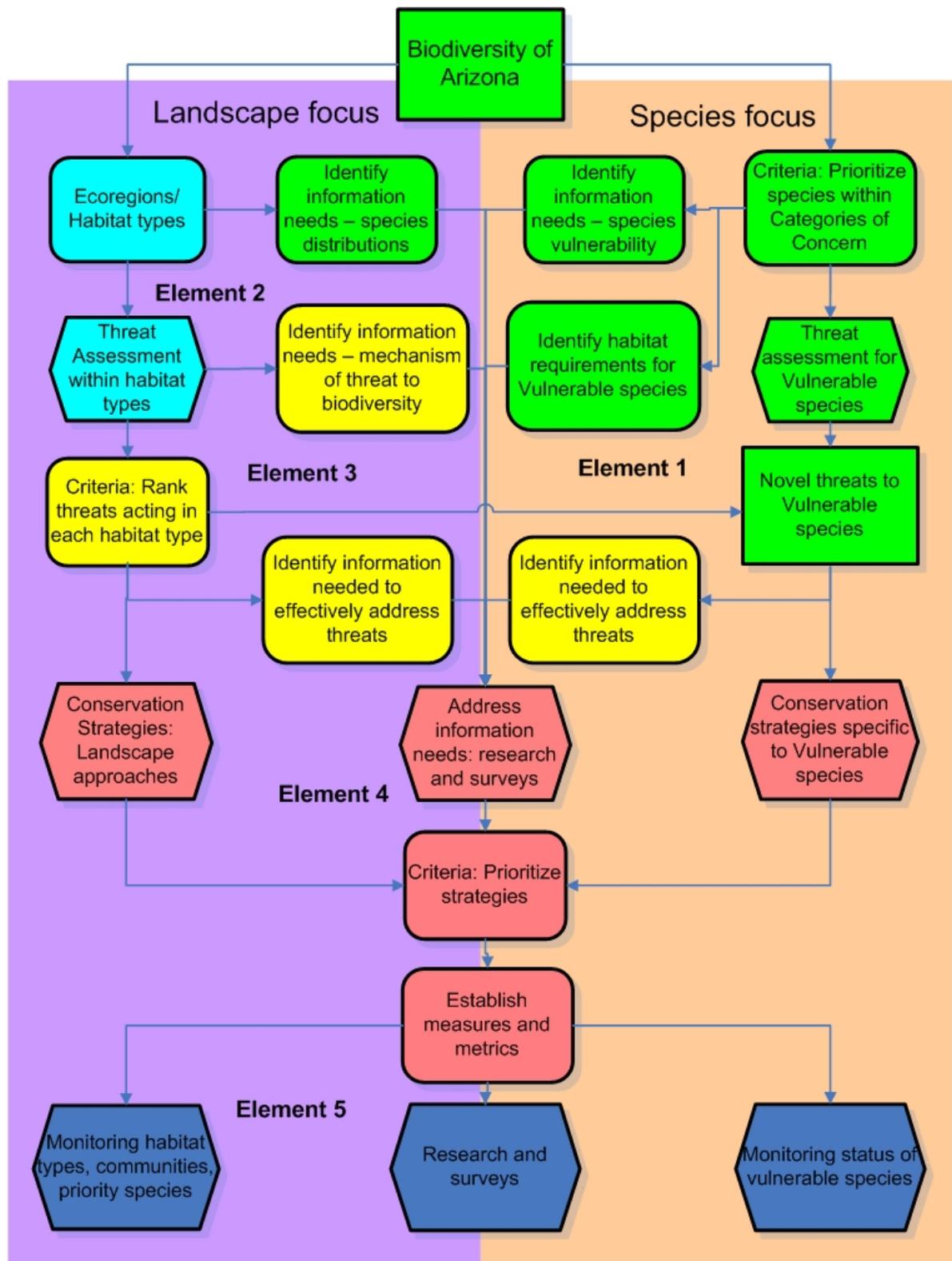


Figure 1. Two-pronged approach to wildlife conservation planning in Arizona's CWCS.

The second prong, parallel to the landscape level approach, consists of continuing and expanding species-specific activities that address the needs of species of greatest conservation need. These species require immediate and specific attention in order to halt or reverse the conditions contributing to their vulnerability.

The goals of this two-pronged approach are to proactively prevent further endangerment of all wildlife by managing the habitat on which they depend while simultaneously and aggressively managing conditions for those species which are already vulnerable. In order to accomplish those goals, a number of processes were designed to determine the status and level of threat to habitats as well as species, and then to develop conservation actions for stressors at both the habitat type and species levels. These processes are explained more fully below.

IDENTIFYING SPECIES OF GREATEST CONSERVATION NEED OR UNKNOWN STATUS (ELEMENT 1) AND FOR MONITORING HABITAT CONDITION (ELEMENT 5)

Compilation of a Comprehensive List of Wildlife in Arizona (Element 1)

For Element 1 of Arizona's CWCS, the Department is required to identify wildlife of conservation priority—described nationally as “Wildlife of Greatest Conservation Need” (WGCN). The Department previously drafted a related list under the same name. To avoid confusion, Arizona's CWCS will instead refer to “Species of Greatest Conservation Need” (SGCN). Arizona's Title 17 language describes “wildlife” as all vertebrate species plus crustaceans and mollusks; these are the species for which the Department has statutory management responsibility. The SWG Program (developed in cooperation with the TWW Committee and mandated by the US Congress) has a broader definition of “wildlife” to encompass all species of vertebrates and macroinvertebrates, including insects and arachnids. While many state wildlife agencies (including the Department) do not have legal responsibility for insects and arachnids, some of their CWCS partners—federal, tribal, and other State agencies do have jurisdiction for these species. For the CWCS to be truly comprehensive in managing Arizona's wildlife, the Department must address the full array of wildlife in the state—game species, nongame species, sport fish, natives, nonnatives, and all macroinvertebrates.

Arizona's comprehensive list of wildlife was built on previous efforts. The Department's Heritage Data Management System (HDMS) maintains a list of all species reported to exist in Arizona. The HDMS list was checked against other species lists compiled by taxon-based programs (game species, sport fish, nongame mammals, birds, reptiles, amphibians, native fish, crustaceans, and mollusks) in the Department's Wildlife Management Division. The Department uses several Commission-approved species lists for funding eligibility among various sources: Arizona's Heritage Fund Program (a portion of Arizona Lottery revenues), and federal appropriations under the ESA Section 6 Grants, Sport Fish Restoration Act (Dingell-Johnson and Wallop-Breaux Acts), Wildlife Restoration Act (Pittman-Robertson Act), and Landowner Incentive Program.

Much of the previous work on nongame species focused on their legal protective status (ESA-listed threatened or endangered, candidates, or of State special concern). The 1988 *Threatened Native Wildlife in Arizona* (AGFD 1988) list of species is used for Department rules governing

scientific collection permits and wildlife holding permits. The March 16, 1996 version of *Wildlife of Special Concern of Arizona* (WSCA; AGFD 1996) identifies wildlife in Arizona that are regarded from a state perspective as extinct, extirpated, endangered, or threatened. The WSCA list is used by Department cooperators and outside contractors for projects developed and reviewed under environmental compliance with the National Environmental Policy Act, ESA, and other federal laws. The CWCS list of wildlife includes all taxa from these lists.

The complete list of wildlife in Arizona's CWCS includes wildlife identified from the previously mentioned lists as well as compilations of resident and migratory species developed by external partners. The master list was refined by Department taxon experts to ensure that wildlife were identified at the level they are managed. For some species, management is at the level of individual populations (for example desert tortoise), while other species are managed at the specific or sub-specific level. For clarity, the comprehensive list of wildlife is referred to in this plan as the "Master Species List" (see Appendices F through K).

The Department only considered those species whose survival depends on the quality of habitat in Arizona. Accidental and casual bird migrants were not included on the list of Arizona wildlife, nor were those species with anecdotal or unconfirmed sightings. Feral mammals and most nonnative or pet trade species that reside in Arizona were not included on the species list, but are addressed in the threat assessment under the "Nuisance animals" category. Nonnative species that are actively managed (most sport fish fall into this category) were included on the Master Species List. As a result, counts of wildlife for Arizona's CWCS may therefore not correspond exactly to counts on other Department species lists or narratives. The extensive list of insects and arachnids was not included due to insufficient data to adequately assess their management needs. In the interim, habitat types may be used as a proxy for managing these species as part of the community where they occur.

Describing Species Distributions Using Ecoregions and Habitat Types (Element 1)

Using the ecoregions and habitat types established for Arizona's CWCS, Department taxon experts used published literature and external species occurrence resources to document ecoregions and habitat types used in any life history stage by each crustacean, mollusk, and vertebrate species. Habitat types previously occupied by extirpated species were also identified. This information is compiled in a relational database and GIS layer. Other macroinvertebrates will be assessed in a later iteration of the CWCS, when more information on their occurrence and status is available.

Describing Species Status Related to Habitat- and Species-level Conservation (Element 1)

All species on the Master Species List were evaluated under the criteria outlined below. Arizona's CWCS uses 4 categories (Table 7) that reflect separate, independent ways to describe a species' conservation status. The 4 categories reflect 15 specific criteria used to evaluate each wildlife species in Arizona (Appendix L). These criteria were adapted from a list of SGCN concepts to consider by the TWW Committee (TWW 2003b), stakeholder input through Arizona's Wildlife Summit workshops (Gunn 2005a) and an online summit survey (Gunn 2005b), Department staff, and external land management and natural resource regulatory

agencies and tribes (Appendix D). These categories were designed to capture the diversity and health of Arizona’s wildlife.

Many of the 15 criteria overlap previous evaluative efforts (ESA listings or candidate reviews, WSCA, interagency sensitive species lists, and Heritage/IUCN assessments). Department taxon experts also solicited input from agency staff and outside experts to generate ratings of species for the other criteria.

Table 7. Categories for describing conservation status of wildlife in Arizona.	
Species were rated using the associated criteria under each category (see Appendix L for details).	
Status Category	Criteria
Community Focal	Keystone and strongly interactive species
	Home range size
	Habitat quality indicators
Responsibility	Responsibility status
	Administrative protection status on tribal lands in Arizona
	Administrative protection status in Mexico
Vulnerability	Federal or state legal status (ESA and WSCA)
	Extirpated status
	Imperiled status (Heritage global rank)
	Declining status
	Disjunct status
	Demographic status
	Concentration status
	Element occurrence (includes endemics)
Fragmentation status	
Unknown Status	All criteria used to score “Vulnerability” category—priority species are those for which there is not sufficient information to rate this species for ‘Vulnerability’

Wildlife Summit participants provided input on criteria to determine whether individual species should be prioritized for conservation management (Gunn 2005a, 2005b). These criteria overlapped completely with the criteria used in the CWCS, except in one aspect. Wildlife Summit participants suggested inclusion of “future threats to wildlife and natural habitats” and “potential for recovery and conservation success” as considerations for identifying species of greatest conservation need. Both of those concepts are used to prioritize CWCS conservation actions for species instead of prioritizing the species themselves. These considerations also are part of developing annual operational plans for species and habitat management, and part of the decision-making processes used by the Department and its partners for funding of wildlife-related projects.

Identifying Species of Greatest Conservation Need (Element 1)

Species on the Master List that rated "1" for any criteria under the Vulnerability category (Table 7; Appendix L) are SGCN and were designated to have the highest priority for directed conservation management. Vulnerable species require conservation actions aimed at improving conditions for those species through intervention at the population or habitat level. Over 300 species were identified as SGCN (Appendix M); however, a subset of these requires most immediate attention. Species that rated "1" for Vulnerability were further separated into 3 tiers of priorities (1a, 1b, and 1c). The criteria defined below are based on current Department stakeholder commitments, legal obligations, and species of special concern lists both within and outside of the agency. Species in Tier 1a and 1b are in most immediate need of conservation, and will be addressed as part of the initial implementation of Arizona's CWCS.

Tier 1a: Scored "1" for Vulnerability and match at least one of the following:

- Federally listed species
- Candidate species
- Existence of a signed conservation agreement
- Require monitoring following delisting

Tier 1b: Scored "1" for Vulnerability, do not match the above criteria, but do match at least one of the following:

- Is petitioned for listing
- Is high priority in the Arizona Partners in Flight Bird Conservation Plan or occurs on any of the following species of special concerns lists:
 - BLM Sensitive Species
 - USFS Sensitive Species
 - NPS Sensitive Species
 - Pima County Priority Vulnerable Species
 - Trilateral Committee Species of Common Concern
 - Federal Species of Concern
 - WSCA

Tier 1c: Scored "1" for Vulnerability, but match none of the above criteria.

Identifying Species of Unknown Status (Element 1)

For some species, insufficient information currently exists to assess the Vulnerability status of the species. Information may be lacking about population size or dynamics, or available habitat size, condition, or fragmentation. Of the 225 species that met this criterion, taxon experts identified a subset that warrants more immediate attention in the next few years. This subset included species that taxon or other scientific experts suspect might be declining, but for which definitive information was unavailable. Appropriate surveys and monitoring will be developed to determine the status of any species considered as an immediate priority. Appendix N assigns species that warrant immediate attention to ecoregions where they occur; specific information on the habitats they use is given under the respective ecoregion heading in "Ecoregion-Specific Habitat Conditions (Element 2)."

Identifying Species for Monitoring Habitat Condition (Element 5)

Species on the Master Species List that rated "1" for any criteria under the Responsibility or Community/Focal categories (Table 7; Appendix L) were designated as species that could be monitored to describe the condition of Arizona habitats. Criteria under the Responsibility category rank species higher if their global status is largely a function of their status in Arizona, if they contribute to the unique character of wildlife in Arizona compared to other parts of the United States, or if they have unique value to sovereign nations that interact with Arizona to conserve wildlife. The 'Responsibility' category was designed to give importance to species that are uniquely represented in the United States by their Arizona populations. Community/Focal species criteria indicate important ties between the species and the larger ecosystem. Ratings for all species in each ecoregion for these 2 criteria are provided in Appendices F through K.

IDENTIFYING HABITATS OF GREATEST CONSERVATION NEED (ELEMENT 2)

Habitats of Value to Communities of Wildlife

The Department is required to define and identify habitats of greatest conservation need. The classic definition of habitat is the environment in which an animal of a certain species can survive and reproduce or, more simply, any place where the species occurs (Odum 1971). Since many animals are closely associated with specific vegetation types, these are often used as proxies for habitat. However, this oversimplified definition fails to capture the spatial dimensions inherent in habitat. In reality, habitat must be defined at a scale appropriate to the organism of interest. For example, a remnant patch of desert vegetation in an urban environment might be more than sufficient to support a population of Gambel's quail, but would be seriously inadequate for a population of pronghorn antelope. Furthermore, simply protecting large natural areas from degradation is not enough to insure healthy ecosystems and habitats. One must also consider the dynamic and varied nature of ecosystems (Sanderson and others 2002).

Landscapes are not consistent in physical structure or vegetation types, but are composed of a number of different elements or patches dispersed throughout, which are in a state of constant change (Pickett and Cadenasso 1995, Koehler 2000). Landscape heterogeneity, or variation across space, is created and maintained by underlying geomorphological features such as soil and topography; disturbance processes such as fire or human activities (Pickett and White 1985, Barton 1994); climate and microclimate effects (Allen and Breshears 1998); environmental gradients (Allen and Peet 1990, Barton 1994); and sometimes the organisms themselves, like beavers (Wright and others 2002) and humans. This variability in structure and vegetation results in a non-random dispersion of wildlife and humans across the landscape. Most wildlife and humans tend to concentrate their activities in those areas that are best suited to their needs.

At some scale, many organisms rely on landscape variability for survival. A good example of this is an amphibian that spends a large part of its life in a terrestrial habitat but must return to an aquatic habitat to reproduce. Many other organisms also use multiple habitats (for example to breed, hide, or feed), rely on temporary or permanent concentrations of resources, and move around the landscape in non-random ways according to the distribution of resources (Gardner and others 1989, Szacki and Liro 1991, Etzenhouser 1998, McIntyre and Wiens 1999, Semlitsch and Bodie 2003). Questions that might be asked include: does the species depend on large,

contiguous areas of habitat or can it tolerate (or even require) some level of non-contiguous or fragmented habitat? If the species uses different habitat types, how must those types be interspersed and connected in a landscape? In other words, not only the spatial extent, but the spatial distribution of habitat patches on the landscape is important. Furthermore, movement between patches must be assured through the presence of appropriate corridors.

Arizona is a large, topographically complex state with a wide variety of land uses ranging from highly protected areas such as federal wildernesses to highly developed urban areas. Wildlife exist and use every habitat type in the state and often rely on variability within and between habitat types to survive. The Department has therefore identified all habitat types as inherently valuable to the natural heritage of Arizona and worthy of conservation actions. Using a multi-scale approach, Arizona's CWCS describes statewide, habitat-level, and regional habitat issues.

In future iterations of Arizona's CWCS, the Department hopes to further refine the landscape classification to include finer scale habitat needs. This would require a comprehensive GIS based habitat analysis, that due to time and data restraints, was not feasible at this time. Instead, the Department chose to expend effort on identifying relative stressors, species of greatest conservation need, and information gaps. During this process, the Department has identified specific data gaps that need to be addressed prior to performing a comprehensive statewide landscape analysis. These gaps include but are not limited to species distributions, species habitat needs, location of relevant structures such as right of way fencing, culverts, utility towers, location of wildlife corridors, migration pathways, locations of sensitive habitats, and direction of future growth. Many data gaps can be filled through cooperation with the Department's partners to consolidate existing or collect new information, and others will require GIS-based modeling to fill.

Concentrating on the other aspects of the plan first enabled the Department to better plan the landscape analysis necessary to identify the location and relative conditions of key habitats and communities as required in Element 2, in regards to species of greatest conservation need. Specifically, this analysis needs to identify and/or locate:

- 1) Sensitive habitats
- 2) Key wildlife corridors and migration pathways
- 3) Core habitat areas
- 4) Threatened habitat (from development)
- 5) Key conservation areas
- 6) Species richness distributions
- 7) Native-dominated riparian areas
- 8) Vegetation communities
- 9) Land uses

Habitats of Value to Species of Greatest Conservation Need

Department taxon experts described the distributions of all species in Arizona by identifying occupied habitat types within each ecoregion (Appendices F through K). Distributions of SGCN requiring immediate attention are also listed in "Ecoregion-Specific Habitat Conditions (Element 2)" under each ecoregion (Table 16 through Table 21).

ASSESSING STRESSORS/THREATS TO ARIZONA'S WILDLIFE AND WILDLIFE HABITATS (ELEMENT 3)

Arizona's biodiversity—the number and types of species and genetic resources—is the result of the climate, geography, and biological history of this region. The biological resources of Arizona are not a random assemblage, but a co-evolved one. The ability to conserve these resources now and into the future depends on the ability to integrate human activities into the landscapes in a way that least disturbs Arizona's ecosystems. Not all human activities are equally disruptive of the natural processes in this State, so the most effective conservation will address stressors that have the largest impact, and those that are emerging in the next decade.

Generating a Comprehensive List of Stressors in Arizona

To develop a list of potential stressors to wildlife and natural habitats in Arizona, Department staff adapted national conventions for describing categories and classes of threats (CMP 2004a). This framework was used by many other States in their CWCS plans as a standard for naming and defining threats, and will aid in addressing and working on multi-state conservation issues. (Table 8). State, federal, and tribal partners assisted the Department in conducting a detailed threat assessment for the CWCS that identified important stressors specific to wildlife resources in Arizona. Many identified stressors in Arizona's threat assessment are based on legal and accepted recreational or economic pursuits, national security actions, or for public safety/use.

Table 8. National convention of threat categories and classes used in Arizona's CWCS threat assessment.

Threat Category	Threat Class
<p><i>Habitat Conversion</i> - Intentional conversion of natural habitat that is detrimental to wildlife use and survival; causes loss or degradation of wildlife habitat and available forage.</p>	Housing and urban development
	Agricultural operations
	Recreation areas
	Destructive resource harvesting
	Management of nature to improve human welfare
Military activities	
<p><i>Transportation and Infrastructure</i> - Development of corridors/passages for transportation use, movement of resources, and relaying communications; increases wildlife mortality and fragmentation of wildlife habitat.</p>	Roads
	Railroads
	Overhead utility lines and towers
	Shipping Lanes
<p><i>Abiotic Resource Use</i> - Extraction or use of rock, minerals, metals, fuels, and water; causes direct or indirect impacts to wildlife habitat.</p>	Drilling
	Mining
	Water use
<p><i>Consumptive Use of Biological Resources</i> - Harvest or use of plant and animal populations that impacts wildlife distribution and fitness, or ecosystem processes.</p>	Hunting, trapping, and fishing
	Gathering
	Forest and woodland management
	Grazing

Table 8. National convention of threat categories and classes used in Arizona's CWCS threat assessment.

Threat Category	Threat Class
<i>Non-consumptive Resource Use</i> - Activities that have an incidental but negative impact to wildlife or their habitats.	Motor-powered recreation
	Non-motorized recreation
	Military activities
	Scientific research
<i>Pollution</i> - Introduction and spread of unwanted matter and energy into ecosystems from point and non-point sources; causes increased mortality of wildlife and degradation of their habitats and available forage.	Chemicals and toxins
	Nutrient loads
	Solid waste
	Waste or residual materials
	Noise from low-level flights
	Light pollution
<i>Invasive Species</i> - Introduction and/or spread of unwanted nonnative and native organisms into ecosystems; increases wildlife predation, competition, and reduced fitness or loss of wildlife habitat and available forage.	Invasive plants
	Invasive animals
	Pathogens
	Introduced genetic material
<i>Climate Change</i> - Long-term changes linked to global warming and ozone depletion; causes increased mortality of wildlife and degradation of their habitats and available forage.	Habitat shifting and alteration
	Climate variability
<i>Changes in Ecological Processes</i> - Alteration of ecological processes outside of the natural range of variation, to the detriment of wildlife and their habitats.	Habitat-wide processes
	Species-linked processes

Under the classes, stressors are listed and described so that their relevance is in a statewide context. For instance, the threat category 'Habitat Conversion' is universally understood to mean loss or destruction of natural habitat; change in land use may further habitat fragmentation and/or degradation. Under the category of 'Habitat Conversion,' all States using this convention will include a class for 'Recreational sites and facilities,' but only some States will highlight 'ski resorts' as a specific stressor.

A detailed threat assessment was conducted to identify and evaluate a list of stressors to wildlife and natural habitats in Arizona. During these threat assessments, Ecoregion Workgroup participants (Appendix O) identified stressors that were unique or of greater influence to borderland areas in both the Sonoran Desert and Apache Highlands South ecoregions. "International Border Issues" include direct or indirect impacts to wildlife and wildlife habitat from illegal immigration or smuggling traffic and enforcement efforts. These same stressors were addressed differently in each state with border issues; the Department opted to create a new category for this issue, since existing stressor classes for military activities, for instance, do not encompass behaviors of illegal border traffic, nor do they highlight the barrier created to wildlife movement by all of these activities along a linear border.

Arizona's original CWCS included a Core Plan that corresponds to the current Executive Summary, and was approved by the Commission. The following table of threat categories and classes encompass the stressors identified during the Ecoregion Workgroup's threat assessment and deemed feasible for conservation action in the initial implementation of Arizona's CWCS (Table 9).

Table 9. Threat categories and classes originally addressed by conservation actions in Arizona's CWCS.	
Threat Category	Threat Class
Habitat Conversion - Intentional conversion of natural habitat that is detrimental to wildlife. Wildlife use of the area or survival are jeopardized due to degradation of wildlife habitat and available forage.	Housing and urban development
	Agricultural operations
	Recreation areas
	Destructive resource harvesting
	Management of nature to improve human welfare
Transportation and Infrastructure - Development of corridors/passages for transportation use, movement of resources, and relaying communications that increases wildlife mortality or fragmentation of wildlife habitat.	Roads
	Railroads
	Overhead utility lines and towers
Abiotic Resource Use – Extraction or use of rock, minerals, metals, fuels, and water that causes direct or indirect negative impacts to wildlife habitats.	Drilling
	Mining
	Water use
Consumptive Use of Biological Resources – Harvest or use of plant and animal populations in a manner that negatively impacts wildlife distribution and fitness, or ecosystem processes.	Gathering
	Forest and woodland management
	Grazing
Non-consumptive Resource Use – Activities that have an incidental, but negative impact to wildlife or their habitats.	Motor-powered recreation
	Non-motorized recreation
Pollution - Introduction and spread of unwanted matter and energy into ecosystems from point and non-point sources that causes increased mortality of wildlife or degradation of their habitats and available forage.	Chemicals and toxins
	Nutrient loads
	Solid waste
	Waste or residual materials
	Noise from low-level flights
Invasive Species - Introduction and/or spread of unwanted nonnative and native organisms into ecosystems outside their natural range that increases wildlife	Invasive plants
	Invasive animals
	Pathogens
	Introduced genetic material

Table 9. Threat categories and classes originally addressed by conservation actions in Arizona's CWCS.

Threat Category	Threat Class
predation, competition, and reduced fitness or loss of wildlife habitat and available forage.	
Changes in Ecological Processes - Alteration of ecological processes outside of the natural range of variation, to the detriment of wildlife and their habitats.	Habitat-wide processes
	Species-linked processes

Identifying Stressors in each Habitat Type

Representatives from State and federal land management agencies, natural resource regulatory authorities, and Native American tribes were invited to participate in a threat assessment for Arizona's CWCS. Two Ecoregion Workgroup meetings were held in August 2004, one in Phoenix for the southern half of the State and one in Flagstaff for the northern half. Participants worked in break-out groups representing each ecoregion (Appendix D) where they provided local expertise in evaluating stressors. To ensure the comprehensiveness of this assessment, teams of at least 10 people who had expertise in ecosystems and particular species or taxonomic groups were formed for each ecoregion (Appendix D).

Table 10. Rating criteria for components used to estimate the importance of each stressor in the Arizona CWCS threat assessment.

Component: Magnitude			
Rating:	Area Affected:	Or % Targets Affected:	Or Degree of Impact:
Extreme (4)	Throughout (>50%)	Most or all (>50%)	Severe damage or loss
High (3)	Widespread (15-50%)	Many (25-50%)	Significant damage
Medium (2)	Scattered (5-15%)	Some (5-20%)	Moderate damage
Low (1)	Local or none (<5%)	Few or none (>5%)	Little or no damage
Component: Urgency			
Rating:	Time that impacts start:	Likelihood of threat in next 10 yrs:	
Extreme (4)	Current (<1 yr)	Existing (100%)	
High (3)	Imminent (1-3 yrs)	High probability (50-99%)	
Medium (2)	Near-term (3-10 yrs)	Moderate probability (10-49%)	
Low (1)	Long-term (>10 yrs)	Low probability or None (0-9%)	
Conventions adapted from Salafsky and others (2003)			

Each group was asked to evaluate impacts from each stressor in terms of the individual components of Magnitude and Urgency, using the ratings low, medium, high, or extreme (Table 10). Participants were asked to score these 2 components for each vegetation community or riparian/aquatic system within in each ecoregion to: 1) describe the extent to which each stressor is an issue now or is expected to become an issue in the near future; and 2) describe the extent of

impacts from each stressor on ecosystem processes by affecting species diversity, resilience, and primary productivity.

Once individual stressors were scored, the importance of each stressor per landscape was rated as low, medium, high, or extreme based on the Magnitude and Urgency components. The ratings were translated into scores of 1, 2, 3, or 4, respectively. Next, values for the 2 components were multiplied together, and their square-root taken to get an overall importance value that also ranged from 1 to 4. Stressors evaluated to have a high (3) to extreme (4) level of impact to landscape structures or processes were flagged for developing a list of conservation strategies and actions/opportunities. Important stressors to wildlife and wildlife habitat are described under "Major Stressors Affecting Habitat" under each habitat type in "Ecoregion-Specific Habitat Conditions (Element 2)."

Identifying Stressors to SGCN

Stressors may have a different impact on a single species than they have on the community; indeed stressors that do not significantly impact entire communities may nonetheless have considerable impact on individual species. Stressors that impact SGCN in Tier 1a and Tier 1b were identified by Department taxon experts. Stressors were considered if they have high or medium impacts to each species. For this exercise, the stressor categories provided by CMP (2004a) were further expanded to include "Species-level stressors" that encompasses stressors that impact species but not landscapes.

Trade-Offs to Make a Comprehensive Threat Assessment Less Complex

In these assessments, there are some trade-offs related to the Department's attempts to make the threats open to evaluation by wildlife and habitat experts. One trade-off is that each stressor is identified in the fashion it is most easily understood. For example, the impacts of recreational facilities are many and diffuse, but are traditionally and most effectively addressed at the point source, so resource managers tend to consider these impacts (from habitat conversion, pesticide and fertilizer use, water consumption) under one heading. Other stressors arise from non-point sources, and are addressed by managers where they have impacts. Thus, "soil erosion" arises from many sources, but managers are aware of it by its impacts. In order for stressors to be described as they are perceived by resource managers, there should be no expectation that individual stressors are mutually exclusive.

Since different stressors may measure the same activity, there is no way to effectively add together the impact of all stressors in a given habitat type. For example, roads are constructed in the service of livestock and agriculture operations, public utility maintenance, woodland and forest management, and off-highway vehicle recreation. All of these activities are treated separately as potential stressors, as is road building itself. It would therefore not be reasonable to add together the magnitude of all these threats in a habitat type.

Interactions between potential stressors were not considered, due to the magnitude of such a task. There are essentially an infinite number of ways to consider interactions among a list of approximately 70 individual potential stressors. It is clear that some of the individual stressors that were evaluated are also interrelated in ways that have significant impacts on wildlife and

natural habitats. For example, “nonnative plant invasion,” “road building,” and “altered fire regimes” present risks to wildlife that could be addressed collectively.

DEVELOPING CONSERVATION STRATEGIES AND IDENTIFYING INFORMATION NEEDS (ELEMENT 4)

Active management to benefit species may be targeted at individual species or at the habitats they use. One set of priority conservation actions was developed assuming that restoration of ecosystem structure, processes, and functions would provide the most benefit to the most species. Some species, however, are already in compromised status, and warrant attention to impacts that may have only local effects. In the parallel process for species-level conservation planning, conservation actions were prioritized based on their ability to address stressors impacting SGCN.

Prioritizing Conservation Actions Based on Impact to Habitat Types

Through the threat assessment exercise (see “Identifying Stressors in each Habitat Type”), stressors with the largest magnitude and immediacy were identified for each habitat type in each ecoregion. For each stressor, a comprehensive list of actions was compiled that could be taken to reduce major impacts. Any action addressing significant stressors in a habitat type has priority under Arizona’s CWCS. The stressors are compiled by ecoregion and habitat type in “Ecoregion-Specific Habitat Conditions (Element 2),” whereas the comprehensive list of appropriate actions for each of these stressors is under “Conservation Actions to Address Stressors to Habitats (Element 4).”

For each stressor that was identified as important in at least one habitat type within Arizona, Ecoregion Workgroup participants developed comprehensive lists of actions or opportunities that would reduce the effect of each stressor. At the same time, the groups identified some barriers to effectively addressing these threats; these barriers were compiled as “information needs.” Information needs were identified at each stage in the CWCS planning process. These information needs and the conservation actions were rolled up into less operational “strategies” that are reported in Table 3 and Table 4.

Each conservation action will be considered for operational planning as appropriate. The Department uses a 3-tiered planning approach with implementation plans developed to address specific operational plan elements, each of which must tier to specific strategic plan elements (“Implementation of Conservation Actions, Surveys, and Research,” below). Conservation actions will be implemented where feasible and appropriate, subject to applicable environmental compliance review, and in cooperation with key land managers. CWCS actions are comprehensive in scope—many are outside of the Department’s authority and direct control, but identify goals to be developed and implemented by other key stakeholders (Appendix P). Note that Appendix P recommends key partners for implementing each strategy, but does not imply commitment of any specific entity to those tasks.

Prioritizing Conservation Actions Based on Impact to SGCN

For each of the stressors identified for each SGCN in Tier 1a or Tier 1b, Department taxon experts identified conservation actions that would have the most impact to benefit the species. These conservation actions were selected from the comprehensive list of actions developed for

these stressors having impacts at the habitat-level, or novel actions were developed to address species-specific needs. The list of Tier 1a and Tier 1b species, high and medium impact stressors, and species-specific conservation actions are in "Conservation Actions to Address Stressors to SGCN (Elements 3, 4)."

Information Needs for Species of Greatest Conservation Need

Presently, the Department does not have detailed habitat requirements for all SGCN. Information on the status and distribution of Arizona's wildlife is documented in hundreds of existing technical reports developed by the Department's Research Branch and Nongame and Endangered Wildlife Program, as well as game management surveys by the Department's regional offices and Game Branch. Arizona's Heritage Data Management System (HDMS) abstracts for Arizona wildlife are available through the Department website (http://azgfd.gov/w_c/edits/species_concern.shtml). Presently, the Department has not compiled detailed habitat requirements for all SGCN. Most research and baseline information from the above sources lacks information on habitat needs (or thresholds), and instead documents suitable or preferred habitats.

In order for the Department to develop conservation planning integrating all SGCN at appropriate habitat scales, gaps in the understanding of habitat requirements for some species will have to be addressed. Arizona's current CWCS plan addressed this uncertainty by using the same habitat types to classify all SGCN. These habitat types are closely related to the distribution reporting in Appendices F through K. Questions about the distributions of some species remain. Using the scoring system in Table 11, Department taxon experts evaluated their confidence in the distribution used to report each species. These scores are given in the Master species lists in Appendices F through K.

These uncertainties regarding species distributions and habitat requirements are addressed under the first 2 information needs in Table 3.

Rating	Confidence level
1	Completely confident
2	Somewhat confident
3	Information from possibly outdated sources
4	Not confident

Implementation of Conservation Actions, Surveys, and Research

Over the past 6 years, the Department has directed its Nongame and Endangered Wildlife Program to develop multispecies conservation plans that address management needs at larger, landscape levels. These multispecies plans represent the future direction of the Department to address species with and without specific legal protection status. This CWCS highlights those multi-species and -agency plans that have already been developed and implemented, and describes similar plans that are in development. Like the existing multispecies and habitat-oriented Arizona Bat Conservation Strategic Plan and the Arizona Bird Conservation Initiative,

planning efforts that are underway will include identification of conservation needs. Conservation actions from Arizona's CWCS will be directly incorporated in future plans and will result in interagency cooperation towards these ends.

For its specific implementation commitments, the Department uses a 3-tiered planning process that includes Strategic, Operational, and Implementation planning. The CWCS is unique in that it identifies stressors, threats, and actions that are pertinent to all 3 planning levels. The Department's Strategic plans are developed for each of the 4 Department programs: Wildlife Management, Watercraft, Off-Highway Vehicle, and Business Administration. However, an effort is currently underway to develop one Strategic Plan for the Department that covers all programs. Before strategic planning is finalized, it undergoes review and approval by the Arizona Game and Fish Commission. Once adopted, strategies are used for operational planning; the second tier of the Department's planning process (AGFD 2004a). The 4 Department programs pass approved strategies to the following 6 focal areas within each program: Conservation, Recreation, Information and Education, Laws and Law Enforcement, Research, and Administration. In the third tier of planning, individual work units develop annual Implementation Plans. Actions identified in the plan provide focal areas for both Operational and Implementation plans.

Concurrent to the development of any of those plans, priorities of CWCS will need to be assessed and integrated into the plans. CWCS strategies and actions built in to plans represent partnership opportunities or may be completed solely by the Department. CWCS strategies and actions not included in Department plans provide opportunities for external partner conservation actions.

CWCS RELATIONAL DATABASE

All data collected and generated during the CWCS processes are stored in one centralized relational database (CWCS database). The CWCS database is meant to be "living" in that any changes or edits to numerous components of the CWCS can be made in real time and instantly compiled, linked, and applied to all other relevant areas. For example, a change to a single stressor would automatically be reported at the habitat type and species levels, and in applicable planning documents. In addition, the centralized location of all data facilitates sharing of information and planning across work units and among cooperators. The structure of the CWCS database is complex but can be conceptualized as consisting of four main areas: Species, Stressors, Habitat types and Documents. Each of these areas consists of multiple tables which are interrelated and will be explained in more detail below. Figure 2 shows the simplified structure of the CWCS database. The main areas of the CWCS database are shown in the large boxes. Arrows connecting those boxes, indicate relationships between different areas. The direction of the arrow indicates the type of relationship. For example, the double headed arrow between "Stressors" and "Habitat types" indicates that all Stressors are linked to one or more "Habitat types" and all "Habitat types" are linked to one or more "Stressors". The single headed arrow between "Species" and "Documents" indicates that while all "Documents" are linked to one or more "Species", the converse is not necessarily true. Not all "Species" are linked to specific "Documents".

The species section of the database contains the Master Species List of all wildlife that are managed in Arizona. Species information may be retrieved grouped by taxon or by the individual species scientific or common name. Each species is linked to specific information including but not limited to: scores for all criteria used to determine species status (Table 7), conservation priority level (Appendix L), the habitat types used by the species (Table 16 – Table 21), species specific stressors, and actions to address those stressors (see “Conservation Actions to Address Stressors to SGCN (Elements 3, 4)”). This allows any species or group of species to be retrieved based on geographic distribution, vulnerability status, and/or threat level.

The stressors section contains all data collected during the threat assessment exercise (Appendix O). The main table for this section contains a comprehensive list of habitat type and species level stressors, their definitions, and the stress categories to which they belong. Stressors are linked to habitat types and the scores for magnitude and urgency (Table 10) within each of the habitat types. In addition, as indicated in Figure 2, each stressor is associated with specific conservation actions (See “Conservation Actions to Address Stressors to Habitats (Element 4)”) which may be applied at either the habitat or species level.

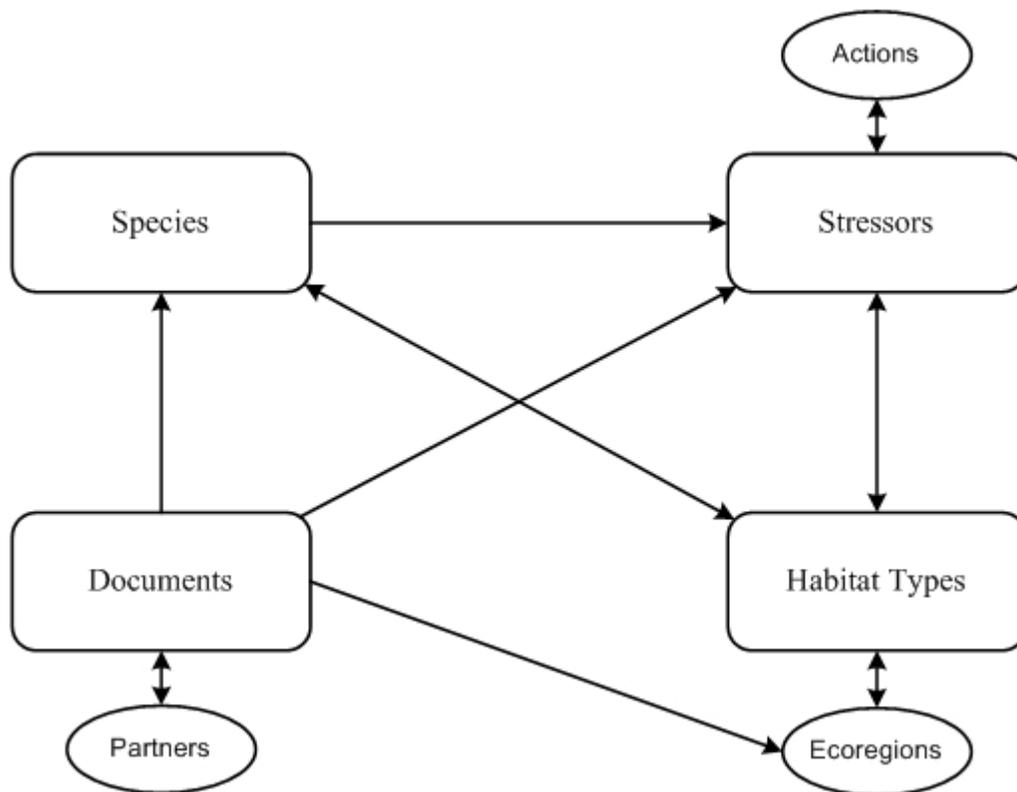


Figure 2. Structure of the CWCS Relational Database

The habitat types section of the database contains a comprehensive list of all habitat types in Arizona. The habitat types are linked to ecoregions, species, and stressors. This section also links

the CWCS database to a geographical information system (GIS) allowing species and stressors to be placed in a spatial context.

The documents portion of the database contains references to planning documents and conservation agreements, both signed and draft, that the Agency is involved with. Each document is linked to the ecoregions, species, and stressors that it applies to (Appendix P). In addition, documents are linked to a separate table containing the partners involved in each plan. This section also provides a document tracking mechanism which facilitates cooperation between work units and among cooperators. The Department plans to expand this section of the CWCS database to include habitat types and conservation actions specific to each document. These additions will allow the CWCS database to be linked to the Field Operations Division database in order to track the implementation of conservation actions. At the current time most documents in the CWCS database are conservation agreements and planning documents. In the future, the Department will also be adding MOU's and other pertinent conservation documents to the CWCS database.

MONITORING AND ADAPTIVE MANAGEMENT (ELEMENT 5)

To develop the Monitoring and Adaptive Management sections for the State's CWCS, existing Department processes were first assessed and then additional components were identified in order to better align implementation and monitoring with Arizona's CWCS.

Monitoring

Current monitoring programs are established depending upon the Department's commitments, resources and funding priorities. By necessity, the 183 SGCN species in Tier 1a and 1b comprise the majority of monitoring efforts and were designed to fulfill requirements of various conservation agreements, recovery plans, safe harbor agreements, and others. The Department has established and participates in other monitoring programs with a variety of intended goals and histories of development, as illustrated in the following partial list. Habitat and species monitoring are integral to management of a number of properties owned by the Department (for example, Sipe native fish monitoring). Through the Department's Heritage Fund IIAPM program, various "windows" (eligible species, habitats or conservation needs) are identified for which proposals are solicited for research and monitoring. The Department has benefited greatly from this program which has resulted in current and planned monitoring (for example, narrow-headed gartersnake surveys and monitoring). Habitat management plans have been developed with other agencies (for example, San Pedro Habitat Management Plan). In addition, the Department participates in ongoing cooperative efforts with nongovernmental organizations and the private sector (for example, Audubon Society IBA's and Christmas Bird Counts).

Despite the Department's active involvement in large-scale monitoring activities, clearly there remain many gaps in our understanding of management and conservation needs of Arizona's wildlife. Arizona's CWCS plan addresses conservation needs for species that do not necessarily qualify under other existing funding "windows." For instance, of the 183 Tier 1a and tier 1b species 144 are not identified as threatened or endangered under the ESA. Lack of monitoring for these species will be remedied under CWCS. The Department is continually engaged in the

development of monitoring efforts, and over the past 6 years has directed its Nongame and Endangered Wildlife Program to develop multispecies conservation plans that address management needs at larger, landscape levels. These multispecies plans represent the future direction of the Department to address species without specific legal protection status, and will complement existing monitoring priority given to Tier 1a and 1b species and those for which funding is available. This CWCS highlights those multi-species and –agency plans that have already been developed and implemented, and describes similar plans that are in development. Like the existing multispecies and habitat-oriented Arizona Bat Conservation Strategic Plan and the Arizona Bird Conservation Initiative, planning efforts that are underway will include identification of monitoring and conservation needs.

This new type of planning that is underway is also notable in that, where possible, it tiers from national and/or regional conservation planning efforts. This has enabled the state plans to implement standards that are understood and applied in other projects in Arizona and throughout North America. This sort of standardization of monitoring measures and metrics is an active area of work in wildlife conservation, and much of it is still in development (for example, Gibbs and others 1998, Dinsmore and others 2002, MacKenzie and others 2003, Schoonmaker and Luscombe 2005).

Although several land management agencies plan to develop regional habitat monitoring guidelines/plans, none are yet in process in that apply to Arizona. Instead, during this transition period at least, the Department will build on its existing strengths by utilizing existing and proposed monitoring of individual and multispecies groups to capture the conditions of habitats where they occur. To this end, the Department has identified 116 Responsibility species and 311 Community/Focal species that are resources for describing habitat conditions.

Adaptive Management

Additional CWCS Ecoregion Workgroup meetings will need to be convened with Department partners and other stakeholders to define quantifiable performance measures and identify partner priorities among the list of conservation actions and information needs. The Department's Nongame and Endangered Wildlife Program is in the process of developing taxon-based management plans, similar to the efforts already completed for bird species with the Arizona Partners In Flight Conservation Plan (Latta and others 1999) and for bats in the Arizona Bat Conservation Strategic Plan (Hinman and Snow 2003). These taxon-based plans are envisioned as implementation plans, bridging the strategic goals of the CWCS with the operational activities and stakeholder responsibilities identified in numerous recovery plans, conservation agreements, and other partnership-designed initiatives and agreements.

Because implementation plans must tier to existing strategic goals and operational approaches, reporting on these plans can be used to report on accomplishments under CWCS. A Field Operations Division (FOD) database for prioritizing and tracking work activities is currently in use. The database allows for the activities to be linked to specific reporting criteria such as CWCS stressors, and can be modified to link the updates to any reporting mechanism entered into the program. These work unit activity databases, along with associated narrative, become

their annual Implementation Plans. Further incorporation of CWCS reporting will be accomplished by linking the FOD database to the CWCS database.

REVISIONS TO THE CWCS WITHIN A 10-YR TIMEFRAME (ELEMENT 6)

The Oversight Group developed a schedule for review and revising Arizona's CWCS (Table 12). This review process will be synchronized with the Department's 2-year budget planning cycle that is approved by the State's Executive and Legislative branches. Arizona's CWCS will be evaluated internally prior to the start of each 2-yr budget process to allow the Department opportunities to amend the CWCS to address changing priorities, variations in habitat and environmental conditions, and to adaptively manage based on wildlife and habitat responses to conservation actions or treatments. A "CWCS Implementation Team," likely comprised of Department representatives from the Oversight Group and Ecoregion Workgroup, will conduct the 2-yr cycle internal reviews.

Table 12. Schedule for CWCS review and revision aligned with the Department's budget cycle.											
FY05		FY06		FY07		FY08		FY09		FY10	
July-1-2004 to June-30-2005		July-1-2005 to June-30-2006		July-1-2006 to June-30-2007		July-1-2007 to June-30-2008		July-1-2008 to June-30-2009		July-1-2009 to June-30-2010	
Develop initial CWCS plan		Submit CWCS for approval in July 2005				Internal review - amend CWCS by Apr 2008				4-yr review partners / public in Feb 2010	
Budget process		2-yr budget process			2-yr budget process			2-yr budget process			Budget process
CWCS 10-yr timeframe		Year 1		Year 2		Year 3		Year 4		Year 5	
FY11		FY12		FY13		FY14		FY15		FY16	
July-1-2010 to June-30-2011		July-1-2011 to June-30-2012		July-1-2012 to June-30-2013		July-1-2013 to June-30-2014		July-1-2014 to June-30-2015		July-1-2015 to June-30-2016	
		Internal review - amend CWCS by Apr 2012				4-yr review partners / public in Feb 2014				Internal review - amend CWCS by Apr 2016	
Budget process		2-yr budget process			2-yr budget process			2-yr budget process			Budget process
Year 5	Year 6	Year 7		Year 8		Year 9		Year 10		Year 1	
Note: State fiscal year (FY) is not aligned with the Federal fiscal year (October 1 to September 30 of the following year). Each 2-yr budget cycle process starts in Spring of the second half of the fiscal year, with the proposed budget to the Commission in June, the State's Office of Strategic Planning and Budget review in August, and to the State Legislature in January of the next fiscal year.											

ARIZONA'S WILDLIFE AND HABITATS (ELEMENT 2)

The State of Arizona contains approximately 73 million acres with a large range of topographic and geologic diversity. Elevations in Arizona range from about 75 ft above sea level (near

Yuma) up to 12,643 feet at its highest point (San Francisco Peaks near Flagstaff). Generally, elevation increases moving from west to east and from south to north. Precipitation ranges from less than 3 inches to over 30 inches per year depending on elevation and location. Most precipitation in Arizona comes from summer monsoons and winter storms carrying moisture from the Pacific Ocean. The Sonoran Desert in the southwest corner of the State typically receives near equal amounts of summer and winter rain. Winter rain or snow dominates more in northern portions of the State, while summer rain dominates more in the southern portion.

Variability in climates, elevations, landforms, vegetative communities, watercourses, and soil types create many different environments throughout Arizona. These environments range through all 6 of Merriam's life-zones (Betancourt 1990, Brown 1994)—from the hot, dry deserts of southern Arizona through grasslands and woodlands in mid-elevations, to the cold, moist, montane and alpine forest environments in the higher elevations. In addition, isolated mountains throughout Arizona, known as "sky islands" (Marshall 1957), create steep elevation gradients assuring rapid environmental changes over very short distances.

Throughout Arizona, aquatic systems and associated riparian areas play a major role in maintaining biodiversity. Riparian communities along the aquatic habitat provide migratory birds and pollinating insects and bats with vital travel corridors for their migrations between North and South America. The State is home to a number of large rivers. The Colorado River runs through the Grand Canyon and forms the western boundary of Arizona. The Gila, Salt, and Verde rivers drain the northern-central portion of Arizona, and carry water to reservoirs supporting the cities in central and southern Arizona. Many smaller creeks and tributaries have perennial or intermittent flow. Springs, cienegas (marshes), and stock tanks provide valuable aquatic and riparian habitat and water for wildlife use. The complexity of the Arizona landscape gives rise to a diversity of habitats that support diverse wildlife communities.

Arizona ranks third in the nation for the number of native bird species, second for reptiles, fifth for mammals, and eighth for overall vertebrate animal diversity (Stein and others 2000). Wildlife that reside in or regularly migrate through Arizona include: 32 species of amphibians, 297 species of birds (not including accidental and casual migrants), 72 species of fish, 164 species of mammals, 145 species of reptiles, and over 20,000 species of macro-invertebrates (note: the Department has management authority over all vertebrate species and 86 known species of crustaceans and mollusks). Each of these species has associated habitat needs—shelter from the elements and predators, food and water, and materials and locations for nesting or raising young. Some species require very specific conditions that exist in only a few localized sites. For example, springsnails as a group exhibit narrow tolerances for spring water quality and substrates to forage on. Other species are habitat generalists, existing in or ranging across a variety of habitats. For example, coyotes are found statewide. Some wildlife, like migratory birds and bats, change their habitat requirements depending on season or life history stages. Arizona's wildlife depends on many resources at different scales in both space and time.

While Arizona supports a tremendous diversity of wildlife, it faces a variety of unique challenges and opportunities for wildlife conservation. Humans have the greatest impact on wildlife through their use of the same areas occupied by wildlife. Conservation opportunities are at this interface

of land and resource use, yet as the agency responsible for wildlife management, the Department only has direct control over land use on lands it owns, only 0.05% of the total area of the State (Table 13). These areas comprise various Commission-owned Wildlife Areas, state fish hatcheries, the Ben Avery Shooting Facility, and administrative offices. The Department manages wildlife through its own actions as well as by interaction with major landowners and other resource management agencies. The US Forest Service (USFS), Bureau of Land Management (BLM), National Park Service (NPS), US Fish and Wildlife Service (USFWS), and Department of Defense (DOD) manage the largest portion (42%) of lands in Arizona. Most of these federal lands are unlikely to be subdivided and developed for commercial or residential uses. Most areas within USFS and BLM jurisdiction allow 'multiple-use' activities associated with recreational and economic pursuits. Federal agencies work under a variety of laws and policies in which conservation of wildlife is mandated. The Department works with these federal partners on land and water management projects on lands that they administer.

Tribal governments manage an additional 28% of land in Arizona. Each tribe is a sovereign nation, not subject to State jurisdictions. Most tribes maintain their own wildlife management departments. The Department continues to develop working relationships with the individual tribes to facilitate conservation of wildlife across the habitat types in Arizona.

The Arizona State Land Department (ASLD) manages 13% of the lands in Arizona. Under state law, these 'State Trust' lands are managed, leased, sold, and traded to provide revenue to support education in Arizona. These lands are primarily leased for commercial purposes or occasionally sold for private development.

Private lands make up 18% of Arizona's total area with concentrations near river corridors, watersheds, and other locations with important resources for wildlife. Because aquatic and riparian habitats are critical to many of Arizona's wildlife, private landowners have a large role in helping conserve wildlife populations.

Population growth in Arizona is among the highest in the nation. The population of Arizona grew 40% from 3.6 to 5.1 million from 1990 – 2000 (US Census Bureau 2000). Current estimates indicate an additional 13% growth in population from 2000 to 2004 (U.S. Census Bureau 2005). In particular, the desert urban centers, Phoenix and Tucson, are growing rapidly, but rural development is occurring throughout the State. Increases in human population impact wildlife through many processes, including but not limited to: conversion of habitat through urban and rural development; increased habitat fragmentation due to the proliferation of roads; dewatering of the State's habitat types through groundwater pumping and diversion of surface waters for municipal, industrial, and agricultural use; and increased pollution. All of these stressors (and more) will need to be managed proactively to insure that primary wildlife habitat and corridors connecting habitat patches are incorporated into planning.

Combined with the State's growing population, Arizona's mild winter climate and open spaces favor increased outdoor recreational pressures. As a result, many forms of recreation will require creative and proactive management to reduce stress to wildlife and natural habitats while insuring quality outdoor recreation opportunities for people. Changes in land status on State and

federal lands and access restrictions on to and across private lands also add to the challenge of sustaining viable populations of wildlife, conserving natural habitats, and accommodating increased outdoor recreation, economic prosperity, and urban/rural growth across Arizona. Compounding this situation is the demographic trend of Arizona's residents shifting from primarily rural populations that are often more aware of local environmental issues, to an urbanized population less informed about the needs of wildlife and wildlife habitat.

Table 13. Land ownership in 2005 by ecoregion in Arizona.								
		Percentage in each Ecoregion*						
Land Owner		AHN	AHS	AZNM	CP	MD	SD	Total
Federal	Bureau of Land Management	1.338	1.288	0.036	3.556	2.395	8.021	16.63%
	Bureau of Reclamation	0	0	0	0	0.017	0.148	0.17%
	National Forests	5.968	2.247	4.709	1.179	0	1.191	15.29%
	National Parks and Monuments	0.001	0.097	0.033	2.180	0.715	0.496	3.52%
	Military	0.000	0.147	0.036	0	0	3.739	3.92%
	Wildlife Refuges	0	0.159	0	0	0.046	2.138	2.34%
Total Federal Lands		7.31%	3.94%	4.81%	6.92%	3.17%	15.73%	41.87%
State of Arizona	AZ Game and Fish Dept	0.002	0.006	0.012	0.012	0.002	0.014	0.05
	State Trust	2.639	3.741	0.726	1.538	0.161	3.950	12.75
Total State Lands		2.640	3.750	0.740	1.550	0.170	4.150	13.00
Tribal Governments		3.569	0.376	1.726	16.489	0.032	5.380	27.57
Counties and Municipalities		0.005	0.001	0.001	0.002	0.005	0.201	0.22
Private		3.980	3.361	0.976	2.929	0.966	5.317	17.53%
Total		17.50	11.42	8.26	27.88	4.34	30.60	100%
*Percentages based on ASLD GIS data								

Arizona shares over 350 miles of border with Mexico. Many wildlife populations have annual migrations or movement patterns that cross these borderlands. The Department works closely with Mexican authorities and other partners through various committees, teams, and workgroups to assure the continued conservation of many borderland species. Illegal immigration traffic through the borderlands as well as homeland security border activities impact habitability of the border area and permeability of the border to wildlife migration. Conservation near the border will require politically astute strategies to address the needs of many stakeholders and affected wildlife.

Finally, drought has had a large negative impact on the habitats and wildlife of Arizona. Although the winter of 2004-05 provided a break in an overall 10-year pattern of drought, the effects of that year's precipitation are difficult to observe on the current landscape. Recent surveys of game species show little response in terms of reproduction (fawn:doe ratios) resulting from last year's rainfall, and total counts are down to historic low levels for many surveyed species. Habitat monitoring data is less readily available, but visual observations indicate severe loss of rangeland biomass, many springs and cattle tanks without water, and high levels of

impact to vegetation and soils due to livestock that is yet to be removed from rangelands. In winter 2005-06, Arizona has returned to an intensive period of little or no precipitation in the middle of a projected long-term drought. There has been little germination of winter annual vegetation and perennial vegetation is dramatically reduced in vigor. Much of the riparian, grassland, and desert scrub vegetation is considered severely over utilized, in places due to wildlife use, but more extensively as a result of livestock grazing. Forests are continuing their path through severe water stress, threat from insect infestation, and risk of catastrophic wildfire.

STRESSORS THAT IMPACT WILDLIFE AND WILDLIFE HABITATS (ELEMENT 3)

Arizona's wildlife and wildlife habitats have been affected by numerous land management actions and human activities throughout the state's history. Prior to Spanish occupation in the 1500s, the landscapes and ecosystems of Arizona were influenced by human activities. Aboriginal cultures used wildlife resources as forage, cultivated crops, diverted water, extracted timber, and may have used fire as a hunting tool (Turner and others 2003). Spanish settlers brought more agriculture to Arizona along with horses, sheep, and cattle. However, it wasn't until the 1880s when railroads linked the Arizona Territory with other states that Arizona's natural resources were effectively exploited and shipped elsewhere. Over the next few decades, mining, agriculture, timber harvest, and livestock production dominated the State's economy (Sheridan 1995). Over time these pioneering industries eventually gave way to emerging service and technological fields, but they still remain integral to Arizona's current economy and operate at varying levels of intensity throughout the State (Arizona Department of Commerce 2002). The impacts from historic high levels of these activities still persist in many of the state's landscapes and recovery of those areas to pre-settlement conditions is slow (Cooper 1960, Cooke and Reeves 1976, Turner and others 2003).

By the early twentieth century, new constituencies began to influence Arizona's economy. With the establishment of national forests, parks, and monuments by the federal government, tourism took hold in Arizona (Sheridan 1995). Over time, regulated hunting and fishing overshadowed subsistence harvesting of wildlife. Other outdoor recreational pursuits increased as well, especially after World War II, when Arizona's population growth accelerated.

Many current stressors to wildlife are related to the legacy of earlier use and stewardship of Arizona's landscapes. However, the most significant threats to Arizona's wildlife today stem from the state's explosive rate of population growth, ever-increasing demands on above- and below-ground water, modifications to ecosystems and communities from invasive species of plants and animals, and the current multi-year drought. Impacts from these sources are growing at a faster rate than from other sources, and the scale of these impacts cover enormous areas.

The intent of the Department's planning effort is to evaluate landscapes as they exist today and develop strategies on how best to make meaningful improvements to benefit species of greatest conservation need. This comprehensive effort will also address the many stressors that are based on legal and accepted practices. The Department recognizes that the manner in which a human activity or practice is conducted determines the degree of any negative or positive effects on wildlife and habitat.

Important stressors to Arizona's wildlife and wildlife habitat were identified as part of the CWCS process (Appendix O). Information gaps and research, survey, and monitoring needs related to these stressors limit the ability to make informed conservation decisions. These are some of the information needs identified in Table 3.

The following discussion of individual stressors is organized by stressor categories adopted from Salafsky and others (2003). This section does not address the relative importance or the magnitude of each stressor; it only describes the types of impacts associated with these stressors where they occur. Lists of stressors with significant impacts to ecosystem function and/or SGCN in each habitat in each ecoregion are found under "Ecoregion-Specific Habitat Conditions (Element 2)."

HABITAT CONVERSION CATEGORY

Habitat conversion through human-caused degradation and alteration is one of the most serious factors adversely affecting wildlife and plants worldwide. There are many causes of habitat conversion, including urban, residential, commercial, or recreational development; agricultural and livestock production; drainage of wetlands; altered hydroperiods; and development of dams and channels that regulate water flows. These factors affect habitats on a statewide basis.

These activities may ultimately cause habitat fragmentation and loss through landscape conversion, land clearing, road development, and increased vehicular traffic. The negative ecological impacts of fragmentation on natural systems have led many ecologists to identify habitat fragmentation as one of the greatest threats to biodiversity (Harris 1984, Wilcox and Murphy 1985, Noss and Cooperrider 1994). Adverse effects of habitat fragmentation on wildlife species and populations are numerous. Habitat fragmentation increases isolation of populations or species, which leads to decreased genetic diversity and increased potential for extirpation of localized populations or even extinction. Habitat fragmentation also alters vegetative composition and cover and the type and quality of the food base. Further, habitat fragmentation changes microclimates by altering temperature and moisture regimes, changes nutrient and energy flows, and increases opportunities for predation and exploitation by humans.

Urban growth

Rural development

Currently, population growth in Arizona is among the highest in the nation, growing 40% from 3.6 to 5.1 million between 1990 and 2000 (US Census Bureau 2000). Current estimates indicate an additional 13% growth in population from 2000 to 2004, and Arizona is projected to have the second largest proportional increase in population (108%) of any state in the nation between 2000 and 2030 (US Census Bureau 2005). While Phoenix and Tucson continue to grow as desert urban centers, rural development is increasing rapidly throughout the State. This growth presents a number of challenges to wildlife conservation including but not limited to: habitat loss due to development; habitat fragmentation and degradation from networks of roads and utility lines; introduction of nonnative plants and animals that may be invasive and nuisance species; and increased demand for already limited water resources. Pima County was quick to recognize these

threats and developed the Sonoran Desert Conservation Plan that integrates natural, cultural, and historical resource protection with urban growth (Ewing and others 2005).

Human resource use has led to a condition in which large areas of formerly continuous landscapes have become increasingly fragmented and isolated (Finch 2004). Urban, residential, commercial, and recreational development, agriculture and other such activities have accelerated over the past century, subdividing landscapes into disjunctive remnants of native ecosystems embedded in a matrix of anthropogenic land uses (Saunders and others 1991). Urban and commercial development contributes greatly to loss of native vegetation, increased water use, ground water depletion, and increased erosion through soil compaction and runoff concentration.

Growth of human population centers results not only in direct losses of habitat but is associated with other indirect pressures on wildlife and wildlife habitats. Even away from urban and agricultural areas, many valleys are dissected by major highways, railroads, canals, and utility corridors, occupied by power generating stations, feedlot operations, prisons, landfills, and military facilities, or inundated by reservoirs. All of these elements increase the spread of invasive plants. There is an ever-increasing demand for recreational opportunities in an ever-shrinking amount of open land.

Agricultural conversion

Livestock management

Agriculture operations include conversion of ecosystems to agricultural fields. This activity has dropped sharply with urbanization of the state. Livestock operations, however, continue to constitute the agricultural activity with the greatest potential to alter landscapes and impact wildlife.

Major changes in vegetation composition in Arizona and the Southwest have been linked to improper livestock grazing that occurred in the late 1800s when livestock numbers peaked (Leopold 1924, Cottam and Stewart 1940, Cooper 1960, Buffington and Herbel 1965, Humphrey 1987, Grover and Musick 1990, Archer 1994, Fleischner 1994, Pieper 1994). Preferred forage plants such as cool-season grasses declined, while weedy and unpalatable plants (prickly pear) and shrubs (for example mesquite and juniper) increased (Bohrer 1975, Bahre and Shelton 1993). Encroachment by junipers and ponderosa pine into riparian areas has also been significant and resulted in the loss of valuable vegetation components from the landscape.

These vegetation changes led to further landscape degradation. Historically, vegetation in well-functioning watersheds slowed the impact of falling precipitation, reducing erosion. Organic material at the soil surface also slowed runoff, allowing more recharge of soil moisture and subsurface aquifers. Improper grazing practices triggered significant levels of soil erosion, flooding, and arroyo cutting in the Southwest (Cottam and Stewart 1940, Smith 1953, Hastings and Turner 1965, Cooke and Reeves 1976, Branson 1985, Humphrey 1987, Bahre 1991, Webb and Betancourt 1992, Felger and Wilson 1995). By the 1930's, Congress recognized that western rangelands were being degraded, and approved the Taylor Grazing Act of 1934. This act used permits to regulate the occupancy and use of the public land. The Federal Land Policy and Management Act of 1976 and the Public Rangelands Improvement Act of 1978 further guide the

management of livestock grazing on public lands and are meant to speed restoration of public rangelands.

Unrestored landscapes compromise watershed condition. Watershed rangeland damaged from soil loss and altered plant communities affects the nature of runoff events into streams, rivers and lakes, and also groundwater recharge. Stream flow patterns have become more prone to high runoff events characterized by high velocities and silt loading, followed with dramatic reduction in flow. Currently many watercourses have been reduced from perennial meandering small streams and wetlands to gullies with ephemeral flows of high velocity and short duration. Gullies lower the effective wet zone below the reach of many riparian plant types, limiting banks to upland vegetation only.

The degree of impact of livestock grazing on wildlife habitat is largely dependent on the grazing management practices used (Holechek and others 2004). Grazing management variables that affect wildlife habitat include stocking rates, stocking density, the age and physiological condition of cattle, grazing season, forage selection, and cattle distribution. In addition, factors such as range condition, soil type, temperature, and precipitation also greatly influence the relationships between grazing and habitat quality for rangeland wildlife (Holechek and others 2004).

More informed grazing practices have been implemented on many private and public land tracts in recent years (Wilson and MacLeod 1991), but recovery of vegetation may take many years and is not possible on some sites (Fleischner 1994). For instance, many former grassland areas are now thin-soiled and vegetated by annual forbs and grasses, desertscrub brushland, or juniper woodland rather than their former deep-soiled perennial grass communities. Grazed upland forested areas in the Southwest have reduced understory grasses, with resulting dense tree recruitment and reduced fire frequency (Belsky and Blumenthal 1997). Many riparian areas have been impacted by grazing practices (Armour and others 1994; Belsky and others 1999). Riparian areas have been badly incised due to flashy runoff conditions resulting from the denuded uplands. This directly removes deep sediments from the alluvial zone, leaving steep and rocky slopes in place of riparian floodplains. It also lowers water tables, drying up soils lateral to the channel, changing the plant communities to more xeric types, and dries up springs and seeps where wildlife may water. The preference of livestock to feed on riparian plants along with the cooler nature of the riparian zone and the presence of drinking water also leads to direct impacts to riparian zones by cattle. The ecological impacts of grazing are magnified in riparian systems, where livestock tend to congregate (Fleischner 1994; Belsky and others 1999). The widespread nature of livestock operations continues to superimpose current practices on impacts from earlier times or from other stressors.

Recreational sites/facilities

Pressure from the state's growing population to build new recreational sites and facilities and maintain existing ones may result in habitat loss and fragmentation. Ski resorts, marinas, golf courses, campgrounds, RV parks, race tracks, designated OHV use areas, and shooting ranges are interconnected by a series of roads that bisect the landscape, thus increasing the difficulty for wildlife to disperse or access necessary resources.

Forest and woodland management – habitat conversion

Forest management practices that consume habitat are discussed elsewhere. However, some harvesting practices result in conversion from one type of habitat to another, leading to changes in ecosystem composition and dynamics. For example, selective logging of juniper in Great Basin Conifer (pinyon-juniper) may promote the growth of monotypic stands composed primarily of pinyon. (Samuels and Betancourt 1982). When this occurs, there may be increases in susceptibility to disease and changes in fire regimes. The alteration in canopy cover can also negatively impact understory plant communities. Wildlife species may experience loss of desirable forage, cover, and nesting trees.

Dams/Reservoirs/Impoundments

Many aquatic and riparian habitats in Arizona have been altered and fragmented by dams and water diversions. Dams modify natural flows and alter water quality. Loss of flood pulses due to upstream regulation reduces the extent and frequency of floodplain processes such as leaching of salts, deposition of sediments and nutrients, rearrangement of structures and zones along rivers, and establishment of seedbeds for riparian plants. Reservoirs act as sediment traps and disrupt or alter the sediment budgets of downstream reaches. Decreases in sediment inputs alter the natural dynamics of mesohabitat creation and maintenance. Dams also fragment species ranges, preventing up and downstream movement of fishes and other aquatic and riparian species. Altered hydroperiods of seasonally astatic pools may reduce hydrologic connection to other wetlands, or other waters, reducing the quality of these habitats.

Landfills/dumps

The increasing influx of new residents to Arizona results in generation of large quantities of waste material which is then disposed of in landfills or dumps. These structures may harm SGCN and their habitat. Landfills and dumps are often large (sometimes more than 1 mile² in size), thus resulting in habitat loss, and are often associated with contamination and pollution in the surrounding environment. Densities of predators, such as scavenging dogs and corvids, may increase around disposal sites and result in harm to native species (Kristan and Boarman 2002). Additionally, increased heavy truck traffic on rural roads leading to the sites may negatively impact wildlife and wildlife habitat through collisions or by fragmenting the landscape.

Military bases

The Department of Defense (DoD) manages 3.9% of the land in Arizona. The Barry M. Goldwater Air Force Range is the largest DoD installation, covering approximately 1.7 million ac (0.7 million ha). It operates primarily for the support of research, development, testing, and evaluation of weapon and space systems, subsystems, and components. Other DoD installations in Arizona contain sites for live bombing, air defense missile firing, mechanized brigade training exercises, battalion-size or smaller training exercises, ballistic missile testing, aircraft takeoff, landings and training courses, maintenance of fighter wing capabilities, and general military training exercises. While restricted access to many military lands provide substantial benefit to wildlife, military land uses also may destroy or fragment existing habitats.

TRANSPORTATION AND INFRASTRUCTURE CATEGORY

Roads for motorized vehicles

Trails for foot, bike, or equine use

Right-of-way fencing along roadways

Unauthorized roads and trails

Road and highway corridors have fragment habitats and landscapes (Saunders and others 1991, Reed and others 1996) dividing large landscapes into smaller patches and converting interior habitat into edge habitat. Studies in other states have demonstrated negative correlations between increasing road densities and wildlife populations (Lee and others 1997, Wisdom and others 2000). A 16 foot-wide road removes approximately two acres of habitat per mile of road. Accident report data compiled by the University of New Mexico documented an annual average of 828 large game animal/vehicle collisions has occurred since 1998 (Forman and others 2003). In a 10 year period the Department has documented 456 elk/vehicle collisions over a 30km stretch of Arizona State Route 260 (Dodd and others 2005). In addition to collisions with vehicles, roads facilitate legal and illegal killing and collection of many species, including big game as well as sensitive reptiles and birds. In the US Forest Service's Southwestern Region, 57% of threatened, endangered and proposed species under the federal Endangered Species Act, and 54% of US Forest Service's Sensitive Species are dependent on habitat within or affected by Inventoried Roadless Areas (USFS 2000).

Roads and similar structures influence stream characteristics, such as channel and floodplain configuration, substrate embeddedness, riparian condition, amount of woody debris, stream flow, and temperature regime (Furniss and others 1991). Timing of water runoff can change as roads and related drainage structures intercept, collect, and divert water. These factors can accelerate water delivery, resulting in an increase in the potential for greater magnitude of runoff peaks than in watersheds without roads (Wemple and others 1996). Road, trail and highway corridors serve as a means of dispersal for many nonnative and invasive plant species. Ground disturbance associated with the creation and maintenance of authorized roadways and trails provides additional opportunities for establishment of nonnative species (Parendes and Jones 2000, Gelbard and Belnap 2003). The creation of unauthorized roadways has many of the same influences on sensitive habitats with the added detriment of allowing access to those users who will, by their their demonstrated willingness to ignore regulation, ignore other regulations which their unauthorized access facilitates (that is vandalism, poaching, illegal camping and fire building). Proliferation of unauthorized roads forces the resources of land management agencies, law enforcement agencies and public safety providers to be spread over more and more area, forcing increased expenditure of funds which were formerly devoted to wildlife and habitat management.

The impacts of roads on ecosystem services and directly on wildlife have drawn increasing attention in recent years. This has become an active field of research, engineering, and collaboration (FDOT 1999, Clevenger and others 2003, Forman and others 2003).

Power lines/wind-harnessing turbines

Telephone lines/cellphone towers

Wind energy facilities are not yet widespread in Arizona. However, as alternative sources of energy become more important to the state and nation and related technology improves there is potential for more wind-energy sites to be developed. Wind-generated electrical energy is environmentally friendly on the surface. It does not create air-polluting and climate-modifying emissions. Nevertheless, wind turbines, particularly in large arrays, can adversely affect wildlife and wildlife habitats. Wind turbine towers in particular have been associated with direct killing of bats and birds (particularly raptors) that strike moving blades (James and Baden 2004).

Lighted wind turbine, communications and transmission towers, which attract a variety of insect species, have the same potential to attract and kill night-flying migratory birds and bats (Rich and Longcore 2005). Lighting of towers in both urban and rural settings increases the density of birds at the hazard (glass barriers or lethal guy wires). Bird kills at lighted towers have been documented for at least 50 years (Rich and Longcore 2005). In the early 1960s, a 1,000-foot TV tower with guy wires was erected in Eau Claire, Wisconsin, with 11,000 bird mortalities documented in the first major collision.

Effects of utility corridors, including wind turbine farm access routes, include habitat fragmentation and disturbance from authorized and unauthorized use of access roads and pads; the increased incidence of direct illegal take, and the introduction of nonnative plant species due to the disturbance of soil and native vegetation during construction and maintenance (Parendes and Jones 2000).

Canals/pipelines

The arterial network of canals and pipelines designed to move water and fuel throughout Arizona may negatively impact wildlife and wildlife habitat. These structures are closely associated with development of utility roads as well as other maintenance activities. The resulting negative impacts may include, but are not limited to, habitat fragmentation, habitat loss and/or degradation, changes in community composition, water diversion, stream bank alteration or channelization, and providing a mechanism for facilitating movement of contaminants.

Dredging

Water sources are valuable for agriculture as well as recreational activities in Arizona. To ensure their persistence, water storage tanks may occasionally be dredged in order to remove excess sediment and vegetation. Reservoirs may also be dredged in order to facilitate watercraft access. These activities stir up the water column, potentially reducing water quality, and displace aquatic species. Machinery used for dredging may trample surrounding riparian vegetation or wildlife species.

Air traffic corridors/overflights

Air traffic can affect wildlife in a number of ways. Noise from low-level flights has been shown to cause startle responses in a number of mammal and bird species which may result in altered behavior and loss of reproductive fitness (Manci and others 1988). In addition, the Federal Aviation Administration maintains a database in which over 1100 civilian aircraft/wildlife

collisions have been recorded in Arizona over the last 15 years. The vast majority of these are birds but some mammals have also been involved (The FAA National Wildlife Strike Database http://wildlife-mitigation.tc.faa.gov/public_html/index.html). Due to the voluntary nature of reporting, an estimated 80% of wildlife strikes are not reported and the actual impact may be much larger (DeFusco and others 2005).

ABIOTIC RESOURCE USE CATEGORY

Habitat disturbances from abiotic resource uses such as mining, oil and gas development, ground water depletion, and hydropower occur throughout Arizona, although they typically have localized impacts. Fuel drilling and development concerns are greatest in the Colorado Plateau and Arizona-New Mexico Mountain regions. Mining is a major operation in the Apache Highlands South Ecoregion in particular.

Drilling for fuels

Mining

Extractive resource uses such as mining and oil and gas development occur throughout Arizona and can influence ecosystem function, resilience and sustainability. On federal lands these activities are conducted under standards established by the Bureau of Land Management and are subject to further regulation by the Arizona Energy, Minerals and Natural Resources Department, Oil Conservation Division. Extractive resource uses may result in habitat fragmentation and loss through associated land clearing, road building, and disturbance from traffic, hauling and maintenance activities. Associated point-source pollution causes heavy metal and highly acidic water pollution (Drabkowski 1993, Starnes and Gasper 1996, Reece 1995), groundwater pollution (Miller and others 1996), air pollution, noise, and habitat conversion (Dinerstein and others 2000). Any of these activities and their adverse outcomes may ultimately lead to the reduction of wildlife populations.

Ground water depletion/springhead use

Groundwater levels in Arizona have dropped considerably due to pumping for agricultural and urban needs. Proposals and plans exist for additional desalination plants in Arizona. The surface water loss resulting from the water withdrawal and dewatering necessary to support anthropocentric water needs, exacerbated by drought conditions, will continue to influence habitats in Arizona. Lowered water tables affect all of Arizona's habitats, but can have considerable effects on small cienegas, springs, seeps and marshes and their associated SGCN. Spring "improvement," that is, capturing spring output in collection structures and either exporting the water or making it available to human determined uses, has significantly affected a large proportion of the springs around Arizona. This limits the extent of the wetted zone around the spring, the associated riparian plant community, and the associated wildlife community.

Water diversion/water catchments

Agriculture and urban areas increasingly depend on diversion and catchments to meet their water needs. Use of these tools may alter ecosystem hydrology by channeling water away from its natural flow regime. As a result, landscapes may experience severe erosion and decreased groundwater recharge which, in turn, may lead to changes in habitat.

CONSUMPTIVE USE OF BIOLOGICAL RESOURCES CATEGORY

Consumptive biological uses such as improper grazing practices, logging, fuel wood collection, and deforestation have the potential to affect SGCN and their habitats throughout Arizona. In areas where multiple consumptive biological uses occur (for instance in national forests), concerns persist about their ability to remain in a condition, connectivity, and quantity necessary to sustain viable and resilient populations of resident SGCN.

Harvesting/collecting animals

Hunting, trapping and fishing are some of the methods by which wildlife species are harvested and collected in Arizona. Over harvesting may occur when more animals are legally (or illegally) collected from specific areas or during timeframes than is sustainable for the affected species. The often unique qualities of species residing in this state enhance their desirability as targets of both legal and illegal harvest/collection for national and international trade. The impacts to SGCN resulting from these activities may include, but are not limited to, changes in community composition, range contraction or eventual eradication/extinction, and decreased fecundity and recruitment caused by disease, pathogens, parasites, and hybridization. Because the Department manages wildlife resources in the state in a manner consistent with the North American Model for Wildlife Management, regulated consumptive uses has not had any negative impact on those species.

Harvesting/collecting plants

Harvest and collection of native plant species pose severe risks to vegetation communities across Arizona. Species such as saguaro cacti are illegally collected for use in landscaping. Overharvest of slow growing or reproducing species can lead to local or widespread extirpations. Not only do these activities degrade habitat quality, they may also cause changes in native fauna community composition. The remaining disturbed habitat may favor encroachment by nonnative species.

Forest and woodland management – consumptive use

Extraction of timber products is an important economic pursuit, but can have adverse effects on wildlife if not implemented wisely and responsibly. Over the last century, species composition and structure of Arizona's forests have been altered by the combined effects of commercial logging, fire suppression, and improper grazing practices (US Forest Service 1993, Covington and Moore 1994). Logging practices in Arizona and the Southwest have gone through differing management phases. In the late 1800s and early 1900s relatively indiscriminate cutting practices occurred (deBuys 1985), followed by selective logging in the mid-1900s, and evenaged timber stand management during the 1960s through 1980s (Bogan and others 1998). Extensive road networks were developed within the forests to allow easy timber removal (Allen 1989). Earlier logging practices tended to remove larger, older trees. More recently, logging techniques have moved toward more selective, uneven-aged silvicultural practices. Timber harvests from public forests have declined in recent years (Bogan and others 1998). Some emphasis has been placed on federal endangered species habitat and ecosystem management. This has come about primarily through legal actions advanced under the Endangered Species Act, National Forest Management Act, and National Environmental Policy Act. Relatively recent Forest Service Region 3 directives require the maintenance of at least some old-growth forests for SGCN, such

as the northern goshawk (*Accipiter gentilis*) and Mexican spotted owl (*Strix occidentalis lucida*). Fuel reduction is a focus of current forest management efforts, with millions of dollars directed at thinning small diameter trees and the reintroduction of prescribed fires to reduce the potential for widespread catastrophic wildfires (Bogan and others 1998). Indications are that 50% of the allocated monies will be expended on protecting human structures and neighborhoods in the wildland/urban interface areas.

In addition to the removal of overstory vegetation, the main impact of timber harvest has been the significant transportation system established to affect the removal of the product. Most of this road system is open to public use on a year-round basis except at the highest elevations in Arizona. This increased access for vehicular traffic has greatly increased the disturbance to resident wildlife, and is very detrimental to wildlife (in particular many bird species), which occupy high elevation forests during nesting and brood rearing periods. Off-highway vehicle traffic is also increased by developed roadways into otherwise inaccessible areas, and growing impacts from OHV use are a concern on many public lands.

Harvesting strategies over this period have shifted the condition from a patchwork of stands of variable age and composition to one that is in a modified, even-aged, second-growth condition. Previous harvesting strategies resulted in large areas that were cut and allowed to regenerate as even-aged stands of primarily ponderosa pine. These areas are significantly different in composition and probably in value to wildlife than the pre-settlement forests of the same area. The high stem density of these regenerating forests renders them more vulnerable to hot, destructive fire and disease. Forests of homogenous structure support a smaller number of communities and correspondingly less biodiversity than do forests with more structural diversity. Traditional practices of wildfire suppression also contribute to these trends in forest structure and composition. In recent years, timber harvest has been much reduced and fire suppression strategies have been changed with the expectation that this will begin a trend towards more diverse forests.

Grazing by ungulates

Unrestricted grazing by domestic livestock as well as wildlife in grasslands and along riparian areas has resulted in the reduction of long-term plant and animal productivity. Entire plant communities have been altered, which then results in decreased biomass and cover and increased impacts from precipitation. Rapid runoff from watersheds stripped of plant biomass and detritus increases stream velocities, leading to erosive downcutting and lateral destabilization. Downcut channels leave banks above the wetted zone, eliminating their suitability for riparian obligate vegetation and the associated enriched wildlife communities. Soil erosion from runoff increases sedimentation in streams and other aquatic systems. The change towards more weedy, unpalatable plant species decreases the availability of forage for animals as well. The preference of livestock and other grazers to feed on riparian plants along with the cooler nature of the riparian zone and the presence of drinking water also leads to direct impacts to riparian zones. The ecological impacts of grazing are magnified in riparian systems, where livestock tend to congregate (Fleischner 1994).

NON-CONSUMPTIVE BIOLOGICAL USE CATEGORY

Recreational pressures on Arizona's landscapes are increasing due to the growing population, mild winter climate, and many open spaces. Popular outdoor activities include hiking, camping, hunting, fishing, sightseeing, wildlife-watching, watercraft and off-highway vehicle use, and other recreational and wildlife-oriented pursuits. The Department is committed to supporting a multiple-use policy (AGFC 1991) that assures quality wildlands are available to the public now and in the future. Under this policy, the Department's goal is to reduce stress to wildlife and wildlife habitats while insuring quality outdoor recreation opportunities for people. Changes in land status on State and federal lands and access restrictions onto and across private lands also add to the difficulty of sustaining viable populations of wildlife, conserving natural habitats, and accommodating increased outdoor recreation, economic prosperity, and urban/rural growth across Arizona. Habitat disturbances related to off-road vehicle use, military activities, and recreational use are a concern in large areas of Arizona.

Motorized recreation off-trail

Recreational off-road vehicle use can be found across the entire state. There are several organized events held each year. The specific effects of off-road vehicle use on Arizona habitats are incompletely understood. Off-road vehicle travel can cause damage to soils and vegetation (Holechek and others 1998) and impact wildlife by destroying and fragmenting habitat, causing direct mortality of wildlife, or altered behavior through stress and disturbance (Busack and Bury 1974, Brattstrom and Bondello 1983, Brooks and Lair 2005). The Forest Service has published in the Federal Register two proposed rules pertaining to offroad vehicle use. The first designates routes and areas for motor vehicle use and the second petitions states for inventoried roadless areas. Both of these proposed rules would impact future ATV use on Forest Service lands in Arizona. Other regulatory initiatives seek to improve ATV safety requirements and increase registration fees, with revenues targeted for the development of designated ATV trails and facilities. In areas where OHV use is popular, the increasing number of unauthorized roads will also have to be addressed.

The increasing population and dwindling amount of open land have increased the amount of recreational pressure on the areas that remain undeveloped. Balancing demands for hunting, hiking, wilderness preservation, birdwatching, and OHV recreation with wildlife conservation presents an ever-increasing challenge to resource managers.

Watercraft operation

Arizona waterways provide recreational enthusiasts with opportunities to operate motorized watercraft. Enhanced public access to previously inaccessible areas results in loss of undisturbed habitat for SGCN. Oily exhaust and fuel discharged from motorized watercraft decreases water quality and alters water chemistry. Wake and prop disturbance may alter habitat structure or physical characteristics to the detriment of SGCN. Noise and air pollution resulting from use of watercraft may also negatively impact fauna in surrounding ecosystem. Wildlife may be forced to change behavioral patterns.

Non-motorized recreation off-trail

Dispersed camping

Off-range recreational shooting

Skiing, hiking, hunting, fishing, mountain biking, rock climbing, camping, sightseeing, bird watching, and picnicking are popular recreational pursuits in Arizona (Conner and others 1990). Impacts to individual species has been document (for example, Swarthout and Steidl 2003), but the overall impact of these activities is not fully understood, nor is there a full understanding of how much recreational use can be tolerated before there is an adverse effect on wildlife or wildlife habitat. However, recreational activities are increasing and their potential effects on habitats and species should be considered in conservation planning (Conner and others 1990, McClaran and others 1992).

The increasing population and dwindling amount of open land have increased the amount of recreational pressure on the areas that remain undeveloped. Balancing demands for hunting, hiking, wilderness preservation, birdwatching, and OHV recreation with wildlife conservation presents an ever-increasing challenge to resource managers.

Battles, maneuvers, war games, military camps (Military activities)

Arizona is home to several military installations. With its diverse landscape and climate, the state offers exceptional locations to conduct training exercises. These activities may include ground maneuvers (on foot or in heavy, motorized vehicles) or flight operations (helicopters and jets). Noise from motorized vehicles or aircraft may disturb SGCN by causing them to alter their behavior. Foot or vehicle traffic tramples native vegetation and wildlife species, compacts soil, disturbs wildlife, and fragments habitat. Land clearing for military camps and target areas results in habitat loss. Wildfires caused by military training have destroyed vast areas of desert habitat, including on adjacent national wildlife refuges (for example, 5,000 acres on Cabeza Prieta and 26,000 acres on Kofa in 2005). Direct injury or mortality from munitions testing is also possible.

Scientific research and collection

Scientific research is often necessary in order to gain a better understanding of wildlife behavior and their associated habitat needs. It offers important information to wildlife managers as well. However, scientific research and collection may negatively impact SGCN and their habitat. High levels of habitat disturbance may result from frequent visits to study sites. Frequent or inappropriate handling of wildlife may induce stress or inadvertently spread disease. Consumptive sampling techniques have the potential to negatively impact communities by altering reproductive and mortality rates.

POLLUTION CATEGORY

Concerns about pollution sources influencing Arizona's habitats are primarily focused on aquatic habitats. Pollution factors such as agricultural chemicals, livestock and dairy groundwater contamination, and solid waste can negatively affect the long-term persistence of SGCN in affected habitats. Runoff from urban road surfaces introduces nutrients and numerous contaminants to aquatic habitats. Mercury and petrochemicals have been identified in many of Arizona's reservoirs. Typically, pollution sources are regulated by various federal and state agencies, such as the Arizona Department of Environmental Quality, which monitors water

quality in Arizona's reservoirs. However, more information on the extent and sources of pollution in Arizona will aid conservation decisions.

Lead shot/fishing line

Lead is a heavy metal known to be highly toxic to humans and wildlife. Exposure to lead has increased substantially since the Industrial Revolution (Pain 1996). Due to human activities, lead has become ubiquitous in soil, air, and water at unnaturally high levels (Pain and others 1994). Lead poisoning in birds and mammals has been linked to several sources, including ingestion of spent lead gunshot (Pain and others 1994, Ma 1996), consumption of lead sinkers (Sears 1988), secondary consumption of lead contaminated prey (DeMent and others 1986, Frenzel and Anthony 1989), mining and smelting activities (Beyer and others 1997, Henny and others 2000), and firearms training facilities (Lewis and others 2001).

Discarded or lost fishing line and tackle represent a threat to wildlife in Arizona. Most wildlife/monofilament encounters derive from riparian birds collecting it for nest material (Hunt and others 1992, Beatty and others 1998), or specifically, bald eagles and osprey catching dead fish with fishing material attached. However there are other ways: animals can become entangled while visiting a lakes shoreline, they can ingest the material while feeding on a dead fish, and anglers can snag submerged riparian vegetation leaving the material exposed to wildlife when water levels recede.

Heavy metals/mine tailings

Heavy metals and mine tailings are toxic to humans and wildlife. Sources for these materials include, but are not limited to, mining operations (Rösner 1998), military ordnance, and leaded gasoline. They may also enter aquatic systems through urban and agricultural runoff. SGCN that ingest, are exposed to, or bioaccumulate these toxic materials may experience decreased fecundity through reproductive effects or increased mortality rates. Accumulation of these materials in the environment may alter water chemistry, decrease water quality, increase siltation, alter or reduce forage for insects and prey species, or decrease habitat complexity.

Pesticides/herbicides

Pesticide and herbicide use may influence ecosystem function, resilience and sustainability. The application of these materials for agriculture, landscaping (including golf courses) and vector control (for example mosquitoes) may result in decreased water quality, altered water chemistry, and reduction in forage for prey species (for example insects, aquatic species). Wildlife species may gain exposure to the contaminants through ingestion or transmission across the skin (for example amphibians have highly permeable skin). Bioaccumulation of pesticides and herbicides may increase susceptibility to pathogens and parasites and reduce fitness due to reproductive effects (Relyea 2005).

Nutrients/algal blooms

Sources leading to eutrophication (in other words, nutrient enrichment) of aquatic ecosystems include runoff from application of fertilizers for landscaping and agriculture, atmospheric deposition of nutrients, leakage from sewage and septic systems, and livestock waste. Algal blooms supported by nutrient rich waters will decrease water quality, alter water chemistry, and

deplete available oxygen. Shifts in available nutrients may also lead to changes in vegetation structure over time to the detriment of SGCN.

Illegal dumping/littering

The induction of non-biodegradable and other harmful materials through illegal dumping and littering may negatively impact SGCN and their habitat. Such materials may include, but are not limited to monofilament, hooks, lead shot, shotgun casings and boxes, heavy metals, hydrocarbons, broken glass, clay targets, and balloons. Wildlife may alter their foraging behavior or experience mortality as the result of ingesting the disposed materials.

Contaminants from waste water/runoff

Aquatic systems are inundated by contaminants in waste water with sources including, but not limited by, water treatment plant releases, roadways, gas stations, storm drains, septic tanks, industrial runoff, and feedlots. Wildlife may be affected through ingestion, exposure (for example amphibians have highly permeable skin through which materials may readily flow), and bioaccumulation. Contaminants decrease water quality and alter water chemistry, which may increase stress or mortality of SGCN. They may also increase the susceptibility of species to disease, pathogens or parasites. Ultimately, accumulation of contaminants may lead to severe habitat loss or degradation and eventually changes in community composition.

Sediment/ash flows

The institution of fire suppression during the early 1900s and land use practices (for example grazing) have led to unnatural fire regimes and higher than normal fuel loads across Arizona. Altered river and stream flows carry and deposit sediment in ways that can harm SGCN and alter the habitat. In the past, more frequent, low-intensity fires provided occasional sediment deposition required by some wildlife species. However, increased fire intensity and occurrence during different times of the year may produce more ash which may then inundate aquatic systems during periods of high runoff. Accumulation of sediment alters habitat and may reduce water quality.

Highway/roadway de-icing

Even though most of Arizona experiences relatively mild winters, some areas (for example, White Mountains, Mogollon Rim) experience significant snowfalls on average. In order to reduce vehicle collisions and accidents, Arizona Department of Transportation de-ices roadways and highways soon after snowfalls. The salt that builds up along the edges of roads attracts wildlife species, such as deer and elk, and increases the likelihood for wildlife/vehicle collisions. Accumulated de-icing material (for example salt) changes soil composition and chemistry so that it becomes less hospitable for native plant species. Additionally, spring runoff containing de-icing matter (including chloride) pollutes water sources and may cause decreased fecundity or increased mortality rates of wildlife species inhabiting those aquatic systems (Kaushal and others 2005).

Noise pollution

Both aquatic and terrestrial ecosystems may experience noise pollution resulting from vehicle traffic along roads, ATVs and off-road driving, construction activities, dams, military training,

shooting ranges, city and urban activities, and motorized watercraft (for example, boats and jet skis). Noise disturbances may lead to altered behavioral patterns in wildlife, affecting their overall fitness (Weisenberger and others 1996).

Light pollution

The impact from light pollution varies from species to species, but has been shown to alter behavior of mammals, birds, reptiles, amphibians, fish, and insects (Longcore and Rich 2004, Rich and Longcore 2005). Within cities and urban areas, street lamps and construction zones provide continuous ambient light which may attract insects and thus those species that prey on them. Light from vehicle headlights may temporarily blind wildlife foraging along roadsides and thus increase the chances for wildlife/vehicle collisions. Bird kills at lighted towers have been documented for at least 50 years. In the early 1960s, a 1,000-foot tower with guy wires was erected at an Eau Claire, Wisconsin TV tower, with 11,000 bird mortalities documented in the first major collision. Lighting of towers in both urban and rural settings increases the density of birds at the hazard (glass barriers or lethal guy wires). In urban settings, the density of buildings generally increases the mortality rate for the same amount of artificial light.

INVASIVE SPECIES CATEGORY

Many ecologists have acknowledged the problems caused by invasion of nonnative species into communities or ecosystems and the associated negative effects on global patterns of biodiversity (Stohlgren and others 1999). Once established, invasive species have the ability to displace native plant and animal species (including threatened and endangered species), disrupt nutrient and fire cycles, and alter the character of the community by enhancing additional invasions (Cox 1999, DeLoach and others 2000, Zavaleta and others 2001, Osborn and others 2002). As of 1998, nonnative species have been implicated in the decline of 42% of species federally listed under the Endangered Species Act (Center for Wildlife Law 1999). At the federal level, the need for a coordinated effort to manage invasive species was recognized and The National Invasive Species Council was established in 1999 by Executive Order 13112 (Federal Register 1999). In 2005, the Governor of Arizona established an Invasive Species Advisory Council that is co-chaired by the Director of the Arizona Game and Fish Department and the Director of the Arizona Department of Agriculture.

Invasive nonnative species in Arizona have a variety of impacts on native biodiversity, and can affect native species through competition, predation, introduction of disease and parasites, hybridization, and others (Tellman 2002).

Nuisance plants

Among the most serious nuisance plants in southern Arizona are African bufflegass (*Pennisetum ciliare*), red brome (*Bromus rubens*) and Saharan mustard (*Brassica tournefortii*), and a great deal of information is provided in various websites, including the Invaders webpage at the Arizona-Sonora Desert Museum (<http://www.desertmuseum.org/invaders/>). All of these plants, and several others, tend to grow in high densities and to carry wildfires in desert habitats, resulting in wholesale changes in the vegetative communities (McAuliffe 1995, Esque and Schwalbe 2002). The Arizona-Sonora Desert Museum refers to Saharan mustard as "the worst

invasive plant in the Sonoran Desert," primarily because of its competitive effects on other plants or its ability to carry fire (http://www.desertmuseum.org/invaders/invaders_saharamustard.htm). Structural differences that occur in desert habitats have unknown effects on reptiles, birds and small mammals, and the Department is initiating monitoring programs to examine some of those effects on desert lizards.

Riparian and aquatic exotic plants also negatively impact biodiversity. Tamarisk (*Tamarix* spp.) alter riparian communities, including bird, mammal and fish diversity (Kennedy and others 2005). Giant salvinia (*Salvinia molesta*) is becoming increasingly difficult to manage in the lower Colorado River.

The Southwest Exotic Plant Information Clearinghouse, a cooperative effort among USGS, NPS and Northern Arizona University, has organized comprehensive information on nonnative plant species in the southwest on one web location (<http://www.usgs.nau.edu/SWEPIC/index.asp>).

Nuisance animals

Nonnative aquatic species have considerable effects on all aquatic fauna in Arizona's aquatic habitats. Nuisance aquatic species include, but are not limited to, bullfrogs, crayfish, and nonnative fishes (Rosen and Schwalbe 1995, Fernandez and Rosen 1996, Rosen and Schwalbe 1997, Kiesecker and others 2001, Light 2003). Fernandez and Rosen (1996) documented wholesale alteration of a stream community in the White Mountains of Arizona. In terrestrial habitats near urban areas, landfills, recreational areas, and other areas modified by human activities, starlings, cowbirds, and ravens may displace native bird species (Kristan and Boarman 2002). Nonnative bees are also replacing native pollinators and potentially impacting vegetative communities (Schaffer and others 1983).

Feral animals

Escaped or abandoned domesticated pets, farm stock, and equines are severely impacting wildlife and wildlife habitats. Horses, burros, goats, domestic sheep, and hogs may overgraze or trample native plant species, thus increasing erosion, compacting soil through frequent trail usage, and polluting aquatic systems through waste accumulation. Feral cats are responsible for the death of thousands of birds across the U.S. each year (<http://www.audubon.org/local/cn/98march/cats.html>).

Bait-bucket dumping/illegal stocking

Aquatic systems and riparian species in Arizona are negatively affected by nonnative invasive species which have been released (legally and illegally) into the environment. Crayfish and other baitfish were introduced via recreational fishing activities and now compromise the persistence of many aquatic-obligate species (Fernandez and Rosen 1996). Release of non-native tiger salamanders for use in the bait trade threatens native populations (see below).

Diseases/pathogens/parasites

Many of the avian and mammalian SGCN are affected by diseases such as West Nile virus, rabies, hantavirus, pasteuria pneumonia, and Sylvatic plague. The growing wild land-urban interface exposes wildlife to potentially infected domestic and feral pets and may contribute to

the spread of these diseases. Whirling disease in rainbow trout (*Oncorhynchus mykiss*) has led to adoption in Arizona of a "no tolerance" policy that bans the stocking or importation of fish infected with whirling disease, although the potential for accidental introduction still exists. Native frog populations have been decimated by the introduction of the fungal disease, chytridiomycosis, whose ultimate origin still remains unknown. Introduced species such as bullfrogs, African clawed frogs and tiger salamanders (introduced for the bait trade) are known to harbor chytridiomycosis, yet they experience few symptoms of the disease (see for example, Bradley and others 2002).

Around the world, recent disease outbreaks of West Nile virus, HIV/AIDS, hantavirus, avian flu, Lyme disease, and mad-cow disease started in other species but spread to humans. The spread of the disease illuminated the links between human neighbors and human health. Just as clearly, these diseases illustrate the large-scale disease threats that face wildlife populations even when they do not immediately spread to humans. All of the diseases listed above became outbreaks in association with human alteration of ecosystems.

Hybridization

Hybridization severely threatens the genetic integrity of native species, particularly those inhabiting aquatic ecosystems, through interbreeding with nonnative related species. For example, native fishes, such as Apache trout and Gila trout are threatened with hybridization (Carmichael and others 1993). Hybridization with non-native tiger salamanders, often imported for use in the bait trade, has been identified as a threat to endangered Sonoran tiger salamanders (Collins and others 1988).

CLIMATE CHANGE CATEGORY

Long-term changes in temperature and precipitation can have region-wide impacts. In the arid Southwest many ecosystem processes and the distribution and plant communities may be controlled primarily by soil moisture gradients (Griffin 1977, Pigott and Pigott 1993, Klopatek and others 1997). Drought and climate change can potentially have a substantial effect on Arizona's habitats. In coming decades, such changes are expected to produce major shifts in vegetation distributions at unprecedented rates (IPCC 1998). Recent research has shown that considerable vegetation changes have occurred in the past and can be expected in Arizona's future (Betancourt 1990, Brown and others 1997, Allen and Breshears 1998, Sprigg and others 2000). Often, these changes were a result of widespread mortality due to secondary effects such as insect infestations and fire.

Increased fire hazards, drought, and climate change present unique challenges for wildlife management planning because predicting their occurrences is uncertain. However, the effects of these processes are well known and need to be incorporated into management and policy plans (Clark and Cobb 2003).

Shift to warmer climate

The Southwest has been subject to a slight warming trend over the last 100 years that is expected to continue into the next century. According to climate prediction models, temperatures are expected to rise 4-5 °F by 2030 and 7-12 °F by 2090 (Sprigg and others 2000). Climate change

may occur in the Southwest from increased atmospheric concentrations of CO₂ and other "greenhouse" gases. Effects may include increased surface temperatures, changes in the amount, seasonality, and distribution of precipitation, more frequent climatic extremes, and a greater variability in climate patterns. Such changes may affect vegetation at the individual, population, or community level and precipitate changes in ecosystem function and structure (Weltzin and McPherson 1995). They will likely affect competitive interactions between plant and animal species currently coexisting under equilibrium conditions (Ehleringer and others 1991). Plants respond differently to changes in atmospheric gases, temperature and soil moisture, in part based on their C₃ or C₄ photosynthetic pathways (Bazzaz and Carlson 1984, Patterson and Flint 1990, Johnson and others 1993). For example, increases in winter precipitation favor tree establishment and growth at the expense of grasses. Increases in temperature and summer precipitation favor grasslands expanding into woodlands (Bolin and others 1986). Increased winter precipitation has also been shown to favor shrub expansion in southeastern Arizona (Brown and others 1997). These same authors documented major changes in population dynamics and community composition of animals on the study site including local extinctions (including one keystone species) and decreases in formerly abundant species while other species increased in numbers. This indicates that any long term shift in climate could have potentially serious impacts on Arizona's wildlife.

Drought

Drought (an extended period of abnormally dry weather) is one of the principal factors limiting seedling establishment and productivity (Schulze and others 1987, Osmond and others 1987). Soil moisture gradients are directly altered by drought conditions. The distribution and vigor of some plant communities may be controlled primarily by soil moisture gradients (Griffin 1977, Pigott and Pigott 1993, Klopatek and others 1997). Periodic drought is a normal component of the climate system in the Southwest (Clark and Cobb 2003). Drought affects wildlife and wildlife habitat through various means: it places additional stress on species for limited water resources (Sprigg and others 2000); increases susceptibility of forests to insect outbreaks and pathogens (Dale and others 2001); favors the spread of unwanted introduced species (Allen and Breshears 1998); alters ecosystem function (Franklin and others 1992, Dale and others 2000); and increases the possibility of large-scale wildfires (Sprigg and others 2000). In addition, recurrent drought may now be superimposed on climate change (see above). Drought and climate change can potentially have a substantial effect on Arizona's habitats.

CHANGES IN ECOLOGICAL PROCESSES CATEGORY

Changes in natural processes and ecological drivers (for example, unnatural fire regimes, habitat degradation, loss of keystone species) have influenced all habitats in Arizona and the Southwest. However, some habitats are more resilient or resistant to these modifications.

Habitat fragmentation/barriers

In the rapidly growing urban landscape throughout Arizona, both terrestrial and aquatic/riparian habitats are being fragmented and degraded. Within terrestrial systems, agricultural conversion reduces habitat availability. Off-road vehicles, roads, phone and utility lines, and fencing bisect the landscape with an interconnected network of barriers that may restrict wildlife movement (for example, migration), increase mortality, alter fire regimes, degrade available habitat or

resources, and alter community composition. Within aquatic systems, dams or streambank alterations may decrease water quality, change community composition, or restrict movement of species (in other words, restrict gene flow).

Habitat degradation/shrub invasions

Gori and Enquist (2003) documented a substantial decline in the area of grasslands throughout the Apache Highlands. Approximately 37% of historical grasslands have undergone a cover-type conversion to shrublands including juniper, mesquite, and catclaw, and an additional 32% will likely be converted to shrubland in the near future due to current land management practices. Conservation of grasslands is needed to maintain many grassland species, particularly wide-ranging species such as pronghorn. Ponderosa pines are also moving further into dewatered riparian areas, thus transforming entire communities. Habitat degradation and shrub invasions may cause habitat specialists to be extirpated or even to go extinct. Other SGCN may be forced to move and seek necessary resources in different locations.

Unnatural fire regimes

For thousands of years, wildfires have been an integral process in Arizona and southwestern forest and grassland ecosystems. Prior to 1900, naturally occurring wildfires were widespread in all western forests at all elevations (Swetnam 1990). From an ecological perspective, fire may be the most important disturbance process for many western forests (Hessburg and Agee 2003). Ecosystem processes and patterns are influenced and shaped by fire. These include soil productivity and nutrient cycling, seedling germination and establishment, plant growth patterns, vegetative plant community composition and structure, and plant mortality rates (Beschta and others 2004). Tree-ring and fire-scar data for the Southwest indicate that past fires were frequent and widespread (with an elevation range of variability) at least since AD 1700 (Swetnam and Baisan 1996). Within ponderosa pine and lower mixed-conifer forests and woodlands in Arizona, naturally-occurring wildfires were frequently of low-intensity and helped maintain stands of older trees with an open, park-like structure (Moir and Dieterich 1988). Higher elevation, mixed conifer and spruce-fir forests (wetter forest types) exhibited less frequent fire return intervals and fires were generally stand-replacing fires of higher intensity, (Pyne 1984, Walstad and others 1990, Agee 1993). The extent to which fire occurred in southwestern grasslands varied geographically and is related to climatic variables such as seasonal and annual rainfall and physiographic variables such as elevation, slope and aspect (Archer 1994). Fire may have been rare in desert grasslands and limited in extent due to low biomass and a lack of continuity in fine fuels (Hastings and Turner 1965, York and Dick-Peddie 1969). In more mesic grassland and savanna systems where fire was a prevalent and recurring force, pre-historic frequency and intensity appear to have been regionally synchronized by climatic conditions (Swetnam and Betancourt 1990).

The frequency, size, intensity, seasonality, and type of fires have changed throughout the Southwest (Dale and others 2001). The elimination of high-frequency, low-intensity wildfires across Arizona and the Southwest coincided with the reduction and/or elimination of fine herbaceous fuels caused by improper grazing practices (Savage and Swetnam 1990, Swetnam 1990, Swetnam and Baisan 1996). These grazing practices further reduced grass competition, thereby increasing tree and shrub establishment (Archer 1994, Gottfried and others 1995, Belsky

and Blumenthal 1997), which further altered natural fire cycles. Since the early 1900s, systematic fire suppression efforts have further curtailed the natural fire regimes that historically kept ponderosa pine, mixed conifer and spruce-fir stand densities and fuel loads relatively low. Fire suppression allowed the development of ladder fuels and the accumulation of heavy fuel loads. The frequency of large-scale, high intensity fires is increasing throughout the region (Sprigg and others 2000, Dale and others 2001). Catastrophic, stand replacing crown fires are now the standard, rather than the exception as a result of these changes (Covington and Moore 1994). Traditional practices of wildfire suppression have also contributed to these trends in forest structure and composition (Collier and Webb 2002). Land management practices and fire suppression have had adverse effects on many Arizona habitats through fragmenting, simplifying, or destroying habitats, and greatly modifying disturbance regimes (McIntosh and others 1994, Hessburg and Agee 2003). These human-caused changes have created conditions that are outside of the evolutionary and ecological tolerance limits of native species (Beschta and others 2004). Cumulatively, these practices have altered ecosystems to the point where local and regional extirpation of sensitive species is increasingly common (Rieman and others 1997, Thurow and others 1997). As a result, the integrity of many terrestrial and aquatic ecosystems has been severely degraded at the population, community, and species levels of biological organization (Nehlsen and others 1991, Frissell 1993).

Altered river flow regimes

River flow regimes may experience severe alterations from upstream dams, reservoirs, and impoundments. Altered flows change the physical parameters of rivers and streams such as temperature, salinity, nutrient loading, and sediment transport, which often then favor nonnative rather than native aquatic or riparian species. Reduced scouring frequency or intensity may allow increased sedimentation and accumulation of salts in the soils lateral to the channel, thus lowering water quality and riparian habitat viability for SGCN. Riparian vegetation dependent on water and nutrient availability and on reduction in salinities through soil leaching will recede, allowing further encroachment by non-riparian species. Nutrient regimes will also change within downstream aquatic and riparian communities. Unnaturally large flow events as a result of emergency discharge from reservoirs may cause flood pulses that exceed historical peaks, severely scouring channels and floodplains, causing direct mortality of plant and animal community elements, and sometimes resetting the successional scheme over vast extents of river and stream channels.

Soil erosion

Channelization and alteration of streambanks increases erosion through unnatural and excessive loss of soil. Hydrological changes will cause shifts in vegetative cover necessary for maintaining intact ecosystems. Erosion due to wind and water action will increase siltation, decrease water quality, and lead to loss of riparian habitat diversity and complexity.

Streambank alteration/channelization

Human presence on the Arizona landscape has always required water sources to be modified to their use. Diversion of streams for agriculture occurred at least as early as the Hohokam and other early agriculturalists. In early settlement times, many wet meadows and cienegas were drained to create farms and pastures, or to use the water elsewhere. Reduction to risk from

flooding has likewise been a concern, causing the human community to seek methods to restrict watercourses to pre-determined paths. Both of these trends have continued to modern times, sometimes being implemented on truly landscape scales, such as along the Colorado River in western Arizona. Historic flood-control efforts have reduced some once vital riparian systems to concrete-lined ditches without significant biotic components. Humans have thus changed the natural flow regimes of rivers and runoff. The results of these changes include loss of riparian habitat, drying of natural springs and seeps, modification of springheads, and depletion of groundwater supplies. Both wildlife and plant species experience severe habitat degradation and loss and may be unable to reproduce or persist. These altered ecosystems may promote nonnative species invasions or encroachment by non-riparian species. More recently, some softer approaches incorporate a desire to preserve biotic resource values, but often the constraints imposed to control flooding inherently limit the outcomes to levels of quality and quantity far below the historic values.

Loss of keystone species

Keystone species, such as beavers (*Castor canadensis*), bison (*Bison bison*), and prairie dogs (*Cynomys* sp.), are species that have a large overall effect, disproportionate to their abundance, on the structure or function of habitat types or ecosystems (for example, Wilmers and Getz 2005). Many keystone species in Arizona are pollinators, where desert plants rely heavily on insect, bird, and bat pollination. Pollinators rely in turn on a minimum level of pollen resources, so they can be affected by habitat loss or degradation (Kremen and others 2004). If a keystone species is extirpated from a system, other species that are closely associated with the keystone species will also be affected and perhaps disappear. In Arizona, several keystone species have either been completely removed or have experienced significant population reductions in their historic range. With their removal or reduction in population levels, other species population levels variously decline or benefit.

Insect infestations

Phytophagous (plant-eating) insect outbreaks cause tree mortality and reduced growth in Arizona's forests and woodlands (citations). Bark beetles and inner bark borers are primary tree killers (Haack and Byler 1993). Phytophagous insects have traditionally been considered detrimental to forest health and commercial timber harvest (Schowalter 1994). However, most phytophagous insects that affect forest trees in Arizona are native organisms (Wilson and Tkacz 1994) and, from an ecosystem perspective, perform functions that are instrumental in sustaining forest health and function through succession, decomposition, nutrient cycling and soil fertility (Haack and Byler 1993). Altered forest conditions have likely increased the frequency, intensity, and extent of insect outbreaks and diseases (Haack and Byler 1993, Wilson and Tkacz 1994). Changes in forest tree age, size, density, species composition, and vertical stratification across temporal and spatial scales influence patterns of forest insect herbivory at the ecosystem and landscape levels (Schowalter and others 1986). Environmental stresses such as drought, late spring frosts, wind throw, and air pollution can encourage insect outbreaks (Haack and Byler 1993). Although insect outbreaks in forest ecosystems occur naturally, they can cause shifts in vegetative species composition and structure (Haack and Byler 1993). Further, certain phytophagous insects are attracted to fire-damaged or fire-killed trees and their build-up in weakened host trees can threaten adjacent, unburned stands (USFS 2003, 2004b, 2005). The

magnitude of disturbance from an outbreak depends upon the particular insect or pathogen, and on the condition of the forest ecosystem affected (Wilson and Tkacz 1994). Closely spaced host trees are likely to trigger outbreaks of phytophagous insects and pathogens. In compositionally and structurally diverse forests, however, potential host trees can be harder for insects to locate among non-host trees, and vulnerable host trees may be relatively resistant to small numbers of insects that find their way through the surrounding non-host vegetation (Hunter and Aarssen 1988, Waring and Pitman 1983). Outbreaks are typically worse in single-species, monocultural tree stands especially during vulnerable periods such as drought (Mattson and Haack 1987, Schowalter and Turchin 1993, Waring and Pitman 1983). Populations of most foliar and sap-feeding insects peak during particular stages of host-tree development (Schowalter and others 1986), which make monoculture stands of single-aged trees more susceptible to outbreaks. Drought provides a more favorable environment for phytophagous insect growth, survival, and reproduction, and may reduce the effectiveness of the biochemical defense system that some plant species have evolved (Mattson and Haack 1987).

Domestication of wildlife/game farming

Wildlife maintained within game farms pose risks to native wildlife species should they escape or intentionally released. They may hybridize with native species, thus reducing genetic integrity. They may also introduce harmful disease, pathogens, or parasites to wildlife.

Management for game animals and sport fish

Game animals and sportfishes are actively managed through stocking, development of water sources, and permits for harvest and collection. Animals and fishes typically managed in this manner include, but are not limited to, elk, mule deer, waterfowl, rainbow, brook, and brown trout, and largemouth bass. The techniques used promote persistence of nonnative species that displace, compete with, or prey on native species. They may also influence species assemblages and populations through additional habitat modifications. Some management practices can also be beneficial to SGCN. For instance, wildlife water developments built for large ungulates are used by many other species.

INTERNATIONAL BORDER ISSUES CATEGORY

The volume of illegal immigration and drug smuggling across the border has increased dramatically in recent years, resulting in severe impacts to habitats. Border security measures are being stepped up throughout the Arizona/Mexico borderlands region to address this activity (US Department of Justice, Immigration and Naturalization Service 2000). Associated road and barrier construction and enforcement patrols and pursuits in the borderlands region causes additional habitat loss and fragmentation, reduces effective (usable) habitat for wildlife populations, increases road kill, poaching, illegal collecting of wildlife and general habitat destruction (Forman and others 2003). Some stressors listed below stem from illegal immigration and smuggling, others from law enforcement along the border, and still others from movement of animals across international borders.

Dispersed camping along the border

Unauthorized roads and trails created by illegal immigrants and smugglers

Undocumented aliens camp in undesignated areas along the Arizona/Mexico border and sometimes along heavily used routes many miles from the border. Camps and routes tend to be in areas that offer concealment and so are often located in sensitive riparian areas. Heavy foot traffic tramples vegetation and increases soil compaction, which degrades wildlife habitat. Wildfires from campfires that may burn vast expanses of the landscape are becoming increasingly common, and the amount of waste deposited along riparian areas and within streams is increasing, resulting in decreased water quality. SGCN inhabiting these areas will be most affected by alterations within their habitat, however direct disturbance, collecting, and killing by people is also possible. Related to the issue of camping is habitat destruction caused by smuggler foot and vehicle traffic. Border areas are experiencing a rapid proliferation of foot trails, some of which approach the width of one-lane roads. Vehicle drive-throughs across the open desert are also increasingly common. In areas of the most intense activity, landscapes are lined with a multitude of parallel foot and vehicle routes. Impacts to habitat include destruction of vegetation, soil compaction, and erosion. The disturbance caused by the presence of humans in remote backcountry areas can cause direct harm to wildlife. An example of this is disturbance of Sonoran pronghorn during fawning. Legal visitation in Sonoran pronghorn habitat is restricted during this critical time, but illegal travel from across the border is rampant.

Illegal dumping/littering along the border

Dumping and littering along the border and along smuggling routes to the north by illegal aliens introduces non-biodegradable and other harmful materials to wildlife habitats. Vehicles are commonly left abandoned in desert areas when they break down, become stuck, or are pursued by enforcement officials. All of these materials degrade habitat quality and have the potential to attract invasive or feral animals that carry transmissible diseases or will out-compete or prey on native wildlife species.

Water use/contamination by illegal immigrants and drug smugglers

Water along the Arizona-Mexico border is subject to overuse and contamination by illegal aliens, which may negatively impact native species. SGCN may avoid aquatic habitats that are degraded by vandalism and litter. This may result in the loss of necessary resources for survival. Water sources may dry completely when border crossers leave valves open or vandalize water developments to obtain water, and aquatic species may then be extirpated from a site. Terrestrial species will be forced to search for alternative water sources, which are sparse across an arid, desert landscape.

Altered fire regime as a result of border activities

Illegal aliens crossing the border from Mexico to Arizona build fires for warming or cooking as well as to create smoke diversions for avoiding detection. Because the camps are typically in areas of heavy, concealing vegetation and the fires are commonly left unattended, the risks of them developing into larger wildfires are considerable. The increased frequency and intensity of wildfires leads to habitat loss and degradation, increased soil erosion, reduced cover for SGCN, altered hydrology, and increased ash flow and sedimentation. Fires may also increase species mortality rates or susceptibility to disease, pathogens, and parasites.

Disease along the border

Dense populations of people residing in Mexico along the border with Arizona increase the threat of disease to wildlife in this state. Pet or feral dogs and cats may transmit rabies, distemper, or other diseases to SGCN, and livestock may transmit diseases to native ungulates, particularly bighorn sheep. If actions are not undertaken to minimize stagnant water sources, West Nile Virus may continue to threaten the persistence of avian SGCN (particularly corvids) living or migrating through the borderlands area.

Enforcement activities along the border

Not only do activities by illegal aliens impact wildlife and their habitat along the border, so do borderlands enforcement activities. Enforcement agencies may fragment or degrade habitat or harm wildlife by creating and maintaining roads, fencing, and barriers, using four-wheel drive vehicles and ATVs offroad, and conducting overflights and rescue operations with helicopters. With the increase of illegal alien activity in recent years, and national security concerns resulting from September 11, the Department of Homeland Security is greatly expanding its prevention and apprehension efforts. Noteworthy among these are the ongoing construction of vehicle barriers along the border across Organ Pipe Cactus National Monument and the Yuma Desert (and planned for Cabeza Prieta National Wildlife Refuge), construction of many miles of patrol and access roads, and installation of stadium-style lighting in some areas, including along part of the Colorado River. In addition to the direct impacts to wildlife and habitat, the increased level of activities at the border may promote nuisance plant invasions, altered fire regimes, soil erosion, and pollution of waterways. The effects of these activities on SGCN may include, but are not limited to, behavioral changes, decreased fitness, and mortality.

Roads and trails created for law enforcement along the border

Law enforcement agencies construct roads and trails for patrolling and to gain access to areas where illegal aliens are crossing the border. These vary from unintentional creation of "2-tracks" by repetitive driving off-road, to major construction projects. Some roads are created or widened during "dragging" activities to create smooth surfaces for track detection. Creation of roads destroys cacti and other vegetation and entire ecosystems may change to become less hospitable for native species. Once in place, public use of these roads increases and so does human disturbance to once remote and pristine regions. The roads and trails also serve as barriers for some SGCN, thus restricting ranges and impairing their abilities to obtain food or find mates. Increased traffic along these roads may augment opportunities for introduction and establishment of nonnative, invasive vegetation.

Enforcement fences along the border

Fencing and other barriers constructed along the Arizona/Mexico border to prohibit the illegal entry of immigrants, drug smugglers, and their vehicles into the U.S. also fragment and degrade wildlife habitat. These structures impede movement among habitats that provide resources necessary for survival. Fences along the border contribute to the imperilled status of the U.S. Sonoran pronghorn population by restricting their movement. In the past, these animals depended on being able to move throughout their range in order to obtain food and water. Bighorn sheep and deer may also be adversely impacted in some areas by their inability to move

across the border. Movement restrictions may reduce reproductive opportunities within small populations and result in loss of genetic integrity or decreased fitness.

Light pollution along the border

In order to better spot illegal aliens crossing the border, law enforcement agencies use large spot lights, vehicle headlights, and stadium-style lighting. Light pollutes the environment and may alter the behavior of nocturnal species such as bats, rodents, and predators. The disruption of natural light availability may even alter circadian cycles.

Enforcement overflights along the border

To discourage and search for illegal aliens, Department of Homeland Security regularly conducts flights along the border. Frequent trips during both day and night may disturb SGCN. Noise pollution from aircraft might impair hearing of wildlife, alter their behavior or induce stress, or cause them to move out of the area, if possible.

SYNERGISTIC EFFECTS OF FACTORS INFLUENCING SPECIES AND HABITATS

It is difficult, and perhaps impossible, to separate individual causal factors that influence habitats or SGCN. Multiple factors are closely linked in cause and effect relationships across spatial and temporal scales. Adverse effects from multiple ecosystem stressors can have cumulative effects that are much more significant than the additive effects alone, with one or more stressors predisposing biotic organisms to additional stressors (Paine and others 1998). For example, reduced fire frequency from a century of fire suppression is partly responsible for conditions that have allowed major outbreaks of several phytophagous insects (Peet 1988). Further, unusually dry periods and/or climate changes reduce available soil moisture causing water associated stress, reduced xylem pressure and pitch production in trees. These conditions allow insects to bore into and infect and kill trees. Affected stands with high tree mortality quickly accumulate dead standing and downed woody fuels. In turn, these conditions greatly increase the risk of catastrophic, stand-replacing wildfire and subsequent insect attack on trees injured or weakened by the fire (Gara and others 1985). To further illustrate the interactive and synergistic effects of these factors, consider historic grazing practices that reduced fine fuels and affected natural fire cycles. This condition, in combination with a century of fire suppression and multiple years of drought has created unnatural stand and fuel conditions, making forest and woodland habitat types increasingly susceptible to stand-replacing catastrophic wildfires. Add to this mix, insects and diseases linked with decreased forest health. The overall impact converts late-successional mixed conifer forests to early-successional grasslands, shrublands and recovering forests. Roads contribute to habitat fragmentation and are linked as well to other major habitat altering factors such as timber removal, fire ignition and suppression, fuel wood collection, and recreation. The effects of climate change on ecosystems and species are likely to be exacerbated in areas that have already been substantially affected by human activities such as habitat loss and fragmentation, air and water pollution, and the establishment of invasive species. Habitat fragmentation decreases the ability of plant and animal species to migrate in response to changing conditions or species requirements. Invasive species are most successful in ecosystems already disturbed by anthropogenic activities (Elton 1958). Climate change may act as a form of disturbance creating opportunities for invasive species to colonize and displace native species (Malcolm and Pitelka 2000). When suitable habitat conditions disappear or shift faster than

populations can adjust, the likelihood of species extirpation or extinction increases (Malcolm and others 1998).

Many of the factors discussed above coincide in the same geographic area. Given the synergistic effects of multiple factors, it is difficult to understand the overall impact these factors will have on Arizona landscapes, habitats, or Species of Greatest Conservation Need. In addition, it is difficult to understand which habitats may have higher risk of being altered by multiple factors. The ability to describe and address these risks only begins with the current process, under which the Department compiles information on individual stressors or individual sources.

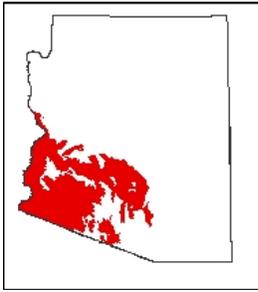
STATEWIDE CONDITION OF ARIZONA'S TERRESTRIAL AND RIPARIAN/AQUATIC HABITAT TYPES
 (ELEMENT 2)

Traditionally, the Department has managed wildlife and evaluated resources at the landscape level (habitat type) and below. Brown and Lowe (1974) vegetation communities were used to represent habitat types in the CWCS since this classification is imbedded in most of the commonly used ecoregion and province classifications for Arizona (Table 14).

Community Type	Community Description	AZ Game & Fish	Federal	Other	Private	State Trust	Tribal	Sum*
Desertscrub	Upland Sonoran	0.03	43.95	3.84	11.94	16.61	23.62	100%
	Chihuahuan	0	30.58	0.18	25.85	43.39	0	100%
	Great Basin	0.01	20.67	0	5.88	3.49	69.93	100%
	Lwr Colorado R Sonoran	0.06	45.02	10.10	22.54	10.17	12.12	100%
	Mohave	0.03	72.52	0.11	17.41	5.03	4.90	100%
Desertscrub Total		0.04	42.86	4.88	15.84	11.81	24.57	100%
Grasslands	Plains and Great Basin	0.06	11.82	0.02	28.51	15.82	43.77	100%
	Semidesert	0.05	26.31	1.60	33.67	32.68	5.70	100%
	Subalpine	0	85.50	0	0.47	0	14.03	100%
Grasslands Total		0.05	18.11	0.68	30.55	22.77	27.84	100%
Woodlands	Alpine Tundra	0	100.00	0	0	0	0	100%
	Great Basin Conifer	0.07	38.12	0	13.00	7.71	41.10	100%
	Interior Chaparral	0	66.67	0	10.13	15.36	7.84	100%
	Madrean Evergreen	0.06	71.92	0.06	10.36	8.10	9.49	100%
	Montane Conifer	0.07	64.80	0	3.82	1.30	30.01	100%
	Subalpine Conifer	0	70.70	0	0.16	0	29.14	100%
Woodlands Total		0.06	50.51	0.01	10.39	7.39	31.65	100%

* Each row represents 100% of that habitat type; columns are not additive. Percentages based on ASLD GIS data.

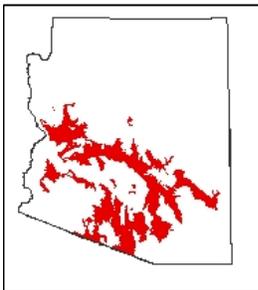
DESERTSCRUB



Lowland Sonoran: elevation 100-3000 ft

Vegetation is dominated by low, open stands of creosotebush and bursage. Smaller areas that have low, undrained and salt-affected soils commonly are dominated by saltbush, acacia, and mesquites. Has annual species, sometimes referred to as “ephemerals,” since they grow only after brief moist periods and are short-lived. Other conspicuous species include: desert broom, chuparosa, ocotillo, cholla, ironwood, palo verde, desert willow, and canyon ragweed.

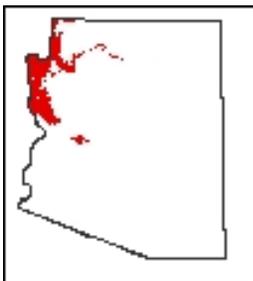
More than 21% of the area formerly occupied by lowland Sonoran desertscrub has been replaced by development or agriculture, the highest proportion of any vegetation community in the state. The remainder is rapidly shrinking and being fragmented by urban expansion, especially on private and former State Trust lands in the vicinity of Yuma and Phoenix. Habitat values on much of the undeveloped land are somewhat degraded due to livestock grazing (Hall and others 2005, Nabhan and Holdsworth 1999). However, 45% of this community is within federal lands, including National Wildlife Refuges and military lands which are ungrazed and have limited other human disturbances.



Upland Sonoran: elevation 500-3500 ft

Leguminous trees and succulents are abundant. Tree species include: foothill and blue palo verde, ironwood, mesquites, and cat-claw acacia. The giant saguaro cactus is found in this community, as are numerous other succulent species including: chollas, pincushions, barrel cacti, organpipe, ocotillo, hedgehog, and prickly-pear. Other conspicuous species include: creosotebush, jojoba, brittlebush, desert hackberry, triangle-leaf bursage, ratany, desert broom, desert willow, and chuparosa.

The area occupied by upland Sonoran desertscrub has lost about 8% due to development or agriculture. The remainder is rapidly shrinking and being fragmented by urban expansion, especially on private and former State Trust lands in the vicinity of Tucson and Phoenix. Habitat values on much of the undeveloped land are somewhat degraded due to livestock grazing (Hall and others 2005, Nabhan and Holdsworth 1999). However, 44% of this community is within federal lands, including National Park Service lands and BLM National Monuments.

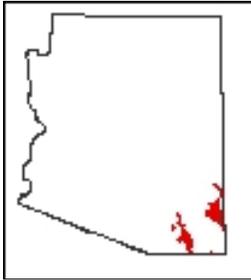


Mohave: elevation 1000-5500 ft

Landscapes are typically quite barren and desolate in appearance with low, scattered shrubs; predominately creosotebush, brittlebush, bursage, desert holly, shadscale, and blackbrush. Annuals cover the ground in wet years. Although this landscape is shrub-dominated and lacks giant cacti and many tree species, several large plants such as the Joshua tree and Mohave yucca are common, and mesquites and cat-claw acacia are present (Turner 1994a).

Mohave desertscrub has lost about 5% of its historic distribution in Arizona due to agriculture and low-density development. More than 75% of its distribution is federally managed, including

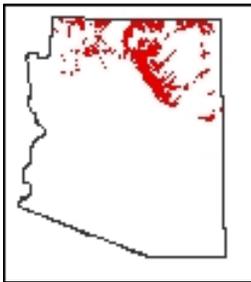
National Park Service and BLM national monument lands, and thus probably secure from those threats.



Chihuahuan: elevation 2000-5500 ft

Vegetative community consists of many species of shrubs, leaf succulents, and small cacti. Indicator species include: creosotebush, tarbush, and whitethorn acacia. Trees are rare, but numerous species of small cacti such as prickly pear, cholla, barrel, and hedgehog are present. Other conspicuous species present include: ocotillo, mesquites, desert zinnias, agaves, century plant, sandpaperbush, and a number of yuccas.

The area occupied by upland Chihuahuan desertscrub has lost about 9% due to development or agriculture. Additional losses are expected due to low-density housing development, especially along the San Pedro River valley. Livestock grazing impacts, especially in the late 1800s, caused significant changes in the soils and vegetation which may be slow to recover (Bahre and Shelton 1996, Sayre 1999).

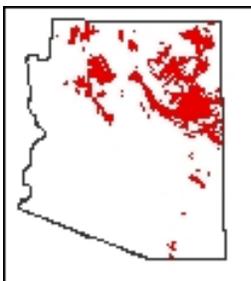


Great Basin: elevation 3000-6500 ft

Vegetation consists mostly of scattered low, small-leafed shrubs and almost no trees or succulents. Indicator species are big sagebrush and shadscale. Other conspicuous species present include: blackbrush, Mormon-tea, four-wing saltbush, greasewood, rabbitbrush, horsebrush, and winterfat (Turner 1994b).

The area occupied by Great Basin desertscrub has remained largely unchanged within historic times. Improper grazing management has caused widespread habitat degradation, especially from the late 1800s through middle 1900s (Tuhy and others 2002).

GRASSLANDS

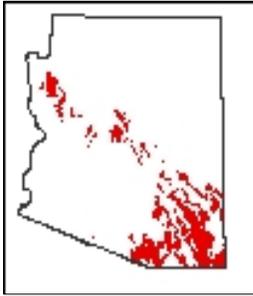


Plains and Great Basin: elevation 5000-7000 ft

Perennial grass dominated landscape usually composed of mixed or short-grass communities. Blue, black, and sideoats gramas are important. Other important grasses include: buffalo-grass, Indian rice grass, Galleta grass, prairie Junegrass, Plains lovegrass, vine mesquite grass, Texas Timothy, and alkali sacaton. Shrubs such as four-wing saltbush, sagebrush, winterfat, cholla, and rabbitbrush may be scattered throughout. Junipers have invaded large areas of all types of grasslands in the Southwest. Forbs are abundant.

The area occupied by Plains and Great Basin grasslands has remained largely unchanged within historic times. These grasslands are in good condition across about 38% of their distribution. Moderate levels of shrub invasion (10-35% cover) affect about 45%, and the remaining 16% is dominated by shrubs or nonnative grasses, or suffers from severe erosion (TNC data; Schussman

and Gori 2004). Lack of regular fires and high grazing pressure, including historic periods of overgrazing combined with drought, may have led to conversion of areas from grassland to Great Basin desertscrub or Great Basin conifer woodland (Finch 2004, ACERP 1995). Due to the attractiveness of low-lying valley bottoms for housing development, losses from this source are expected to grow with increasing population pressures in Arizona.



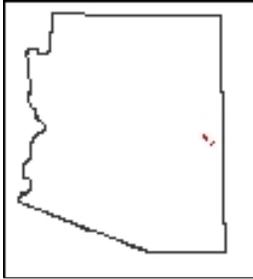
Semidesert: elevation 3500-4500 ft

Originally, the grasses were perennial bunch grasses, the bases of the clumps separated by intervening bare ground. Currently, three-awn and tobosa species together with grama grasses dominate. Some areas are essentially pure stands of grass. In other places, an open savanna with grasses beneath oaks or mesquites is common. Most areas are characterized by short-grasses interspersed with a variety of low-growing trees, shrubs, and cacti. Grass species include: black, blue, sideoats and hairy grammas, buffalo grass, Plains lovegrass, little bluestem, Plains bristlegrass, fluffgrass, burrograss, Lehmann lovegrass, and hairy tridens. Forbs and weeds are abundant. Other conspicuous species present include: acacias, prickly-pear cactus, century plant, cholla, and yuccas.

The condition of semidesert grasslands is good across about 9% of its range. Moderate levels of shrub invasion (10-35% cover) affect about 39%, and the remaining 52% is dominated by shrubs or nonnative grasses, or suffers from severe erosion (TNC data; Schussman and Gori 2004). Lack of regular fires and high grazing pressure, including historic periods of overgrazing combined with drought, may have led to conversion of large areas from grassland to Chihuahuan desertscrub. This community has also lost about 10% of its historic extent to development and agriculture. Due to the attractiveness of low-lying valley bottoms for housing development, losses are expected to continue as population pressures increase in Arizona.

There are several separate issues involved in restoration of this habitat type, and the scientific community has different opinions on potential for restoration. Some scientists believe that native grasses cannot be restored because of changes in soil characteristics and lowering of the water table. Some places have been restored with long periods of decreased grazing pressure. Grazing rest or reduction of grazing pressure is generally not occurring on most State Trust and private lands. Drought and climate change impact the ability of this vegetative community to recover. Natural fire, which historically maintained this community, no longer occurs in much of the habitat due to lack of grasses to carry the fire. A natural fire regime is not likely to be restored on most of the Semidesert Grassland because of continued grazing pressure and development of human communities within the vegetation type. There have been some successes at restoring Semidesert Grassland with herbicides to reduce shrubs and thereby promote grasses, but these efforts have been on a small scale and expensive. High human use, both because of the increasing human population and because of heavy border activity, is degrading the habitat and decreasing the value of the habitat for wildlife. In some places, introduced nonnative plants (for example, Lehmann lovegrass) have invaded the natural vegetation and caused ecosystem changes that may not be reversible. In places where nonnative grasses have become established,

an unnaturally frequent and intense fire regime is established, which furthers the spread and dominance of the nonnatives.

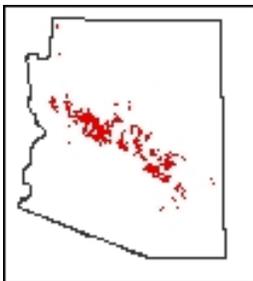


Subalpine: elevation 8500+ft

Typically a high elevation, lush grassland habitat dominated by perennial bunchgrasses and forbs. Unlike plains and desert grasslands, subalpine grasslands receive relatively high average annual precipitation.

The area covered by subalpine grasslands has remained somewhat stable through historic times, although there are areas, such as the North Kaibab plateau, which have seen conifer and aspen incursion at the expense of grasslands. The vegetation communities of subalpine grasslands have been affected by grazing or, less commonly, fire, leading to reductions in native bunchgrasses and increases in shrubs and herbaceous plants (Brown 1994).

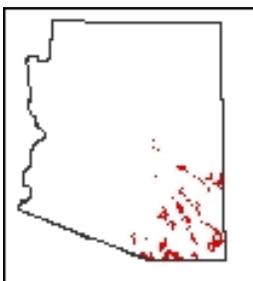
WOODLANDS / FORESTS



Chaparral: elevation 4000-6000 ft

Often comprised almost entirely of 2 species of manzanita and shrub live oak, which form a dense, nearly impenetrable thicket. Receives substantial summer rainfall. Because of the high percentage of crown cover, forbs and grasses are not abundant except in the scattered interscrub openings or after a fire event. Other conspicuous species present include: birchleaf mountain-mahogany, skunkbush sumac, silktassels, and desert ceanothus. Succulents such as prickly-pear cactus, agaves, and yuccas commonly grow alongside shrubs.

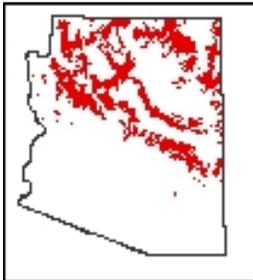
The area occupied by chaparral has remained largely unchanged within historic times. Chaparral ecosystems were subjected to treatments such as mechanical manipulation, and herbicides in the 1950's and 1960's to increase water yield and grazing potential. Because of their high accessibility and relatively gentle terrain, these ecosystems were heavily grazed by goats, especially between 1880 and 1920, and until 1940 (Pase and Brown 1994). Many of the important range grasses were eliminated from most of the sites and, as a result, have been confined to rocky protected areas (ACERP 1995).



Madrean: elevation 5000-7000 ft

Predominantly found in southeastern Arizona. Evergreen oaks dominate with junipers and sometimes pines also growing in the mix. Open savannas are common in some areas with numerous grasses growing beneath the oaks. Common tree species include: Emory oak, Mexican blue oak, Arizona oak, silverleaf oak, alligator bark juniper, one-seed juniper, and Mexican pinyon pine.

The area occupied by Madrean woodlands has remained largely unchanged within historic times. Fire suppression, both deliberate and incidentally from livestock grazing, has altered the community composition to favor trees and shrubs over grasses (McPherson 1992). Only about 6% of the Madrean woodlands have fire regimes which are severely altered from their historical range, but another 77% are moderately altered, creating a moderate risk of losing key ecosystem components (USFS data; Schmidt and others 2002). About 20% of Madrean woodland area is within areas managed with permanent protection for a primarily natural state (TNC 2004a).

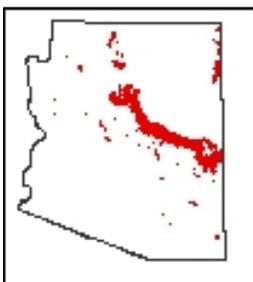


Great Basin Conifer: elevation 3400-8800 ft

Evergreen woodland dominated by juniper and pinyon-pine species. North of the Mogollon Rim, Utah and one-seed juniper are intermixed with pinyon and to the south, alligator juniper grows. Colorado Pinyon-pine is the characteristic species throughout nearly the entire zone. Singleleaf pinyon grows locally intermixed with Utah juniper, mostly in northwestern Arizona. Grassland, desertscrub, or chaparral woodland may form an understory beneath and between woodland trees, depending on the area.

Great Basin conifer woodlands have been significantly affected by changes in fire regime, livestock grazing, and mechanical or chemical treatments (Monsen and Stevens 1999, Stevens and Monson 2004). Due to increased density of tree canopies and of invasive grass species, widespread crown fires are predicted and the area of these woodlands may decline, to be replaced by shrublands or grasslands (Gruell 1999, Tausch 1999). Only about 11% of the Great Basin conifer woodlands have fire regimes which are severely altered from their historical range, but another 70% are moderately altered, creating a moderate risk of losing key ecosystem components (USFS data; Schmidt and others 2002). Pinyon pines have recently experienced widespread mortality due to drought and insects, affecting 1.2 million acres (9% of total distribution in Arizona) during 2002-2004 (Breshears and others 2005; USFS 2003, 2004b, 2005). The area occupied by Great Basin conifer woodland has remained largely unchanged within historic times. About 69% of this community is within areas managed with permanent protection for a primarily natural state (TNC 2004a).

Montane Conifer: elevation 6000-9000 ft

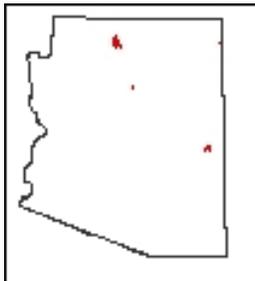


Ponderosa pine dominates, with Douglas fir and white fir growing in varying proportions. Other tree species include limber pine, southwestern white pine, Gambel oak, silverleaf oak, bigtooth maple, and quaking aspen. Many stands of ponderosa pine are relatively open or park-like, which permits the growth of grasses, forbs, shrubs, and broadleaf trees as understory. Mainly located along the southern rim of the Colorado Plateau in central Arizona as an unbroken ponderosa pine forest. In southern Arizona, the Montane Conifer Forest grows primarily on the larger mountains as "islands."

The area of forested lands in Arizona, primarily conifer forests, has been reduced by about 10% since 1630, based on historic estimates. More detailed estimates of timberland suggest a

reduction of about 2.6% for the period 1953-2002 (USFS 2003). Only about 7.6% of montane conifer area is within areas managed with permanent protection for a primarily natural state (TNC 2004a).

Changes in fire regime and forest management have changed many conifer forest stands from well-spaced groups of large trees to closed thickets of small trees, resulting in decreased diversity of grasses, forbs and shrubs. Mortality of large trees by disease, insects, or high-intensity crown fires has replaced the understory thinning action of low-intensity ground fires (Dahms and Geils 1997). Approximately 58% of the montane conifer forests have fire regimes which are severely altered from their historical range, creating a high risk of losing key ecosystem components (USFS data; Schmidt and others 2002). Recent insect outbreaks, amplified by drought and high winter temperatures, caused widespread die-off in ponderosa pines affecting 1.3 million acres (27% of total distribution in Arizona) during 2002-2004 (USFS 2003, 2004b, 2005). These dead trees will likely support additional large fires in the future.



Alpine Conifer: elevation 8000-9000 ft

A mix of many coniferous and one deciduous species characterize these spruce-alpine fir woodlands. The principal boreal conifers are: Engelmann spruce, blue spruce, corkbark fir, white fir, Douglas fir, bristlecone pine and limber pine. Quaking aspen is the dominant deciduous species; both intermixed with various coniferous species and in pure stands. Dense overstories common to these forests severely limit or prevent growth of herbaceous vegetation.

Due to their limited distribution in Arizona, the alpine conifer forests have been disproportionately affected by a small number of development projects such as ski runs, communication towers, and observatories (Patten and Stromberg 1995, Dahms and Geils 1997). They also experienced significant tree mortality due to drought and insects, affecting 77,000 acres (32% of total distribution in Arizona) during 2002-2004 (USFS 2003, 2004b, 2005). Historically, subalpine conifer forest was insulated from fire by the surrounding lower-elevation fire-resistant mixed conifer, which historically burned regularly but not catastrophically; the mixed conifer was thinned naturally by fire, and fire did not usually invade into the wetter subalpine spruce fir forest. With the current unnaturally high tree density in mixed conifer, and the resulting high fuel loads, the subalpine conifer forest is now being lost to fire and disease. Approximately 79% of the alpine conifer forests have fire regimes which are severely altered from their historical range, creating a high risk of losing key ecosystem components due to destructive crown fires (USFS data; Schmidt and others 2002).

Tundra: elevation 11,000-12,600 ft

Located on the peaks of the San Francisco Mountains in northern Arizona. Extreme cold temperatures exclude trees and succulents. Dominant plants are ground-hugging woody shrubs and perennial herbs.

This community has very limited distribution in Arizona, occurring on just two mountain peaks (Brown 1994). The only significant stressor is trampling and other disturbance by hikers, but

climate change could lead to reductions in this community due to an upward shift in treeline (Bowman and others 2002, Tuhy and others 2002).

Human-dominated landscapes:

The current status of many species in Arizona, especially birds, depends on the quality of non-traditional habitat. Some native wildlife species are attracted to pastures and irrigated agricultural lands. In particular during migration and winter, many species of birds including raptors, egrets, herons, ibis, shorebirds, waterfowl, blackbirds, and sparrows often congregate locally in exceptional numbers in these human-altered landscapes. Urban sprawl is rapidly converting adjacent agricultural lands into residential and commercial developments, much to the detriment of many species. Conversely, residential and urban ponds, lakes, and canals often attract thousands of wintering waterfowl and other waterbirds such as coots, grebes and cormorants. These permanent urban water impoundments and subsequent fish populations have also encouraged the local establishment of heron and cormorant nesting colonies.

RIPARIAN / AQUATIC SYSTEMS

Maintaining aquatic and riparian habitats is critical to maintaining the biological diversity of the ecoregion. Water resources throughout the state are currently over-allocated such that conflicts are increasing between human uses and maintenance of biological diversity. Active land and water management planning will be critical to accommodating the anticipated human population growth while maintaining biological diversity.

Riparian and aquatic systems throughout Arizona have been uniformly impacted in dramatic fashion from the pre-settlement condition. Three major sources of impact are worthy of discussion: Prevailing drought; impacts from livestock management to riparian areas and watersheds; and introduction of nonnative organisms. Other factors causing significant local impact include pollution; off-road vehicular use; changes to watercourses from diversion, impoundments and beaver removal; and fire on watersheds resulting in high siltation.

Prevailing drought conditions in Arizona are at their most extreme within recorded history. This directly results in lower input to both surface and subsurface water resources. Many springs and seeps have dried up within the last few years for the first time in living memory. This has direct severe impact on the wildlife and plant communities dependent on them. Rivers and streams have lower flow regimes and reduced seasonal peaks. This affects the life histories of riparian and aquatic organisms in multiple ways.

Emphasis on preservation of livestock grazing as a viable use of public lands has conflicted with efforts to preserve watershed condition in many areas. Many rangeland watersheds have been damaged over the years such that soils have been lost and plant communities altered. This impacts the nature of runoff events into streams, rivers and lakes, and also impacts groundwater recharge. Stream flow patterns have become more "flashy," that is, more prone to high runoff events characterized by high velocities and silt loading, followed by dramatic reduction in flow. Previously, watersheds with better plant cover allowed vegetation to slow the impact of falling precipitation, reducing erosion, and organic material at the soil surface slowed runoff, allowing

more recharge of soil moisture and subsurface aquifers. Degradation of this system by excessive removal of plant biomass and reduction in vigor is a positive feedback loop; deteriorating conditions further restrict plant vigor and moisture retention, leading to further degradation of the plant community. Currently many watercourses have been reduced from perennial meandering small streams and wetlands to gullies with ephemeral flows of high velocity and short duration. Gullies lower the effective wet zone below the reach of many riparian plant types, limiting banks to upland vegetation only. These processes are essentially irreversible at the landscape scale within human lifetimes.

Grazing by livestock and by elk (in some areas) has resulted in loss of recruitment of new individuals to the plant communities, especially among riparian trees. In many areas there is a near total lack of riparian tree recruitment during most of the last 100 years. Trends are generally positive regarding this issue, with most land managers moving toward reduction or elimination of grazing in riparian areas. Areas that have received the most extensive relief have generally shown positive, sometimes remarkable improvement.

Nonnative organisms introduced deliberately and inadvertently have greatly modified the biota of riparian and aquatic systems throughout Arizona. In the aquatic environment, nonnative fishes, crayfish, and mollusks have essentially converted many aquatic communities to a different biota. Crayfish are an emerging threat of large magnitude in these aquatic systems. Native fish in Arizona are considered the most threatened taxa among Arizona native species, largely as a result of predation and competition with these nonnative organisms.

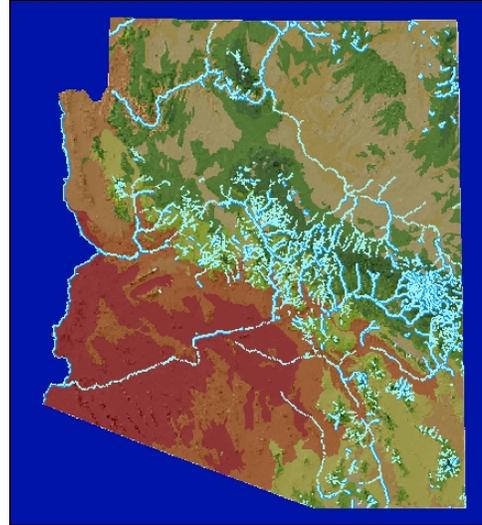
Off-road vehicle use has similarly affected localized riparian and aquatic areas throughout the state. In many areas, access by motorized vehicle is only possible by following the streamcourses. This has resulted in extensive damage by trampling banks and vegetation. This travel, and cross-channel fording adds to sediment loading of aquatic systems, reducing productivity and the integrity of systems downstream, and creating erosive actions that can lead to head-cutting upstream, with all of the associated adverse effects.

Artificial impoundments and diversion of watercourses occur throughout the state to varying degrees, dramatically changing many watercourses from the pre-settlement condition. Especially in smaller watercourses, loss of once-widespread beaver impoundments has altered aquatic habitats. Early explorers found many beaver in streams and wetlands throughout Arizona. These were profoundly reduced in the mid-1800s. Many watercourses apparently have changed as a result, with loss of more continuously connected wetland areas, increases in flow rate peaks, decreases in flow duration, and increases in both seasonal and area extent of periods of no flow. This has had profound effects on riparian and aquatic plant communities and their associated wildlife.

High intensity fires and those burning larger areas have profound affects on riparian and aquatic systems. Although direct consumption by fire can be locally destructive, the largest impacts result from impacts to the watershed, where ash and silt runoff results in erosive damage to the physical structure of watercourses. Silt and ash smother organisms, change water chemistry, destroy spawning habitat, and create turbidity that disrupts essential behaviors. Erosion resulting

from fire impacts to watersheds can cause dramatic downcutting of watercourses, with all the resulting damage to both aquatic and riparian communities as discussed regarding gullies above.

Wetlands/Springs/Seeps – Scattered throughout the state, these landscapes provide critical habitat for a number of species. Wetlands, whether perennial or intermittent, provide important habitat for migrating waterfowl. All free-flowing seeps and springs provide water for wildlife consumption, while some are host to a number of rare and endemic species. This category also includes natural cienegas (marshes), tinajas (ephemeral pools), and stock tanks. In addition, these features often support riparian vegetation which varies across the state but is often more diverse and lush than surrounding vegetation.



The statewide status of wetlands, springs, and seeps is not well documented, but most are thought to be greatly reduced from their prehistoric conditions. The distribution of cienegas has shrunk from formerly widespread to small, scattered remnants due to grazing and streambed modifications (Hendrickson and Minckley 1984). The remaining riparian areas are often subject to intensive utilization. Arizona has more than 6,400 mapped springs, but most have been diverted for human or livestock uses (Arizona State Land Department data; Stevens and Meretsky, in press). Construction of concrete “spring boxes” has resulted in many springs becoming unavailable to support riparian communities at the margins. Some of those have remnant outflow which still provides wildlife habitat (Pima County 2000). A survey of more than 220 springs in northern Arizona found 93% of springs on federal, non-National Park Service lands to be ecologically devastated or functioning at risk (Stevens and Springer 2004). Springs and cienegas are supported by locally high groundwater levels which can be drawn down by groundwater withdrawals, especially during times of drought (ADWR 1994). The current extended period of drought, combined with poor initial watershed condition, is causing many of these areas to go dry for the first time in recorded history. Approximately 11,800 acres of marsh habitat occurs within the Colorado River floodplain below Hoover Dam, including California (LCRMSCP 2004). Most researchers believe that this acreage is much higher now than historically because river dynamics prior to the construction of dams did not favor the establishment of marshes (Ohmart and others 1991). Most of this habitat is protected within federal and state wildlife refuges, but threats to the habitat and resident wildlife exist from selenium accumulation, wildfire, and vegetation accumulation and succession.

Streams/Rivers – Includes perennial and intermittent running waters and the associated riparian area. According to one data set, now somewhat outdated, Arizona has lost 35% of historically perennial river and stream flow (Brown and others 1981). Loss of natural perennial flow includes formerly perennial reaches that are now dry, mostly due to groundwater pumping and surface water diversions, and formerly perennial reaches that are now regulated, chiefly due to dam construction (ADWR 1994, Tellman and others 1997). According to a TNC analysis of Brown and others dataset, the loss of naturally flowing perennial reaches has been most profound on

Arizona's big rivers - the Colorado, Gila, Salt, and Verde rivers - where 91% of free-flowing perennial miles have been lost. On moderate-sized rivers - the San Pedro, Santa Cruz, Little Colorado, White, Black, Blue, San Francisco, and Babocomari rivers - 37% of naturally flowing perennial reaches have been lost. In the remaining creeks and streams, which consist chiefly of streams draining the White Mountains and small discontinuous perennial flow reaches in other locations, at least 9% of free flowing perennial reaches have been lost.

As of 1993, Arizona had about 267,000 acres of riparian vegetation associated with perennial waters, covering approximately 0.4% of the state (Valencia 1993). Increasing human population in the state is expected to put added demands on water (ADWR 1994) and thus reduce the water available for wildlife or degrade its value as habitat. This would likely also reduce the area of riparian vegetation available as wildlife habitat (Valencia 1993). Many streams and rivers have become highly eroded, impacted by nonnative organisms, and converted to ephemeral flows as a result of erosion and general watershed degradation. Riparian tree communities have been greatly reduced in extent due to overgrazing of seedlings necessary for recruitment and by altered flow regimes that reduce or eliminate conditions necessary for seed germination and seedling establishment. Many land managers are moving toward active acceptance of responsibility to manage these impacts from livestock on riparian areas, so the trends for condition of riparian habitat may begin to see improvement. Nonnative aquatic organisms are also having profound effects, however, and have eliminated or reduced native fish and aquatic invertebrates in many areas. Many waterways are under threat or have already been converted by crayfish to simple monocultures of crayfish and algae.

Lakes/Reservoirs – Includes small man-made lakes, backwater lakes, and large reservoirs, associated marshes and riparian vegetation throughout the state. Lakes and reservoirs were not a common or important part of the historic landscape of Arizona. Creation of reservoirs in Arizona has affected flows and introduced nonnative fish, crayfish, and mollusks in all major river systems except along the San Pedro. Currently, smaller human-created impoundments are of value to native wildlife. These smaller impoundments range from stock tanks of less than ½ acre in size up to local community/ranch ponds and small lakes. Most of these are dominated by nonnative fishes and have limited or no riparian areas associated with them. They provide locally important sources of drinking water for many wildlife species, and indeed are frequently the only sources of standing water over significant areas.

Arizona currently has about 492 square miles covered with water, mostly in artificial lakes (Tellman and others 1997). Since most of those lakes also have value for water storage and flood control, that area is not likely to decline. At least ten of Arizona's lakes have serious contamination by mercury or other toxins which affect fish, the result of mining or farming operations in their watersheds (ADEQ 2004).

ECOREGION-SPECIFIC HABITAT CONDITIONS (ELEMENT 2)

Ecoregions are defined as areas—on the scale of tens of millions of acres—that are characterized by phenomena that influence the character of specific habitat types. These large-scale phenomena include environmental conditions such as climate and landforms, as well as regional

human activities and population centers. Terrestrial habitat types are summarized by ecoregion in Table 15. Terrestrial and aquatic/riparian habitat types are depicted by ecoregion in Figs. 3 and 4, respectively.

		Percentage in each Ecoregion*					
Community Type	Landscape	AHN	AHS	AZNM	CP	MD	SD
Desertscrub	Upland Sonoran Desertscrub	0.39	0	0	0	1.33	46.68
	Chihuahuan Desertscrub	0.01	15.32	0	0	0	0
	Great Basin Desertscrub	0.34	0	0.61	27.49	0.85	0
	Lower Colorado River Sonoran Desertscrub	0	0	0	0	4.80	52.37
	Mohave Desertscrub	0.36	0	0	3.71	82.18	0.63
Desertscrub Total		1.10	15.32	0.61	31.20	89.16	99.68
Grasslands	Plains and Great Basin Grassland	13.91	1.96	13.04	34.96	0	0
	Semidesert Grassland	14.32	60.96	0	0	2.88	0.20
	Subalpine Grassland	0	0	0.88	0.04	0	0
Grassland Total		28.23	62.92	13.92	35.00	2.88	0.20
Woodlands	Alpine Tundra	0	0	0.02	0	0	0
	Great Basin Conifer Woodland	37.70	0.23	31.72	30.72	5.45	0.03
	Interior Chaparral	21.82	2.06	0.86	0.05	2.41	0.10
	Madrean Evergreen Woodland	2.93	18.13	0.18	0	0	0
	Petran Montane Conifer Forest	8.22	1.29	50.73	2.44	0.10	0
	Petran Subalpine Conifer Forest	0	0.05	1.96	0.58	0	0
Woodlands Total		70.67	21.76	85.47	33.79	7.96	0.13
*Percentages based on ASLD GIS data.							

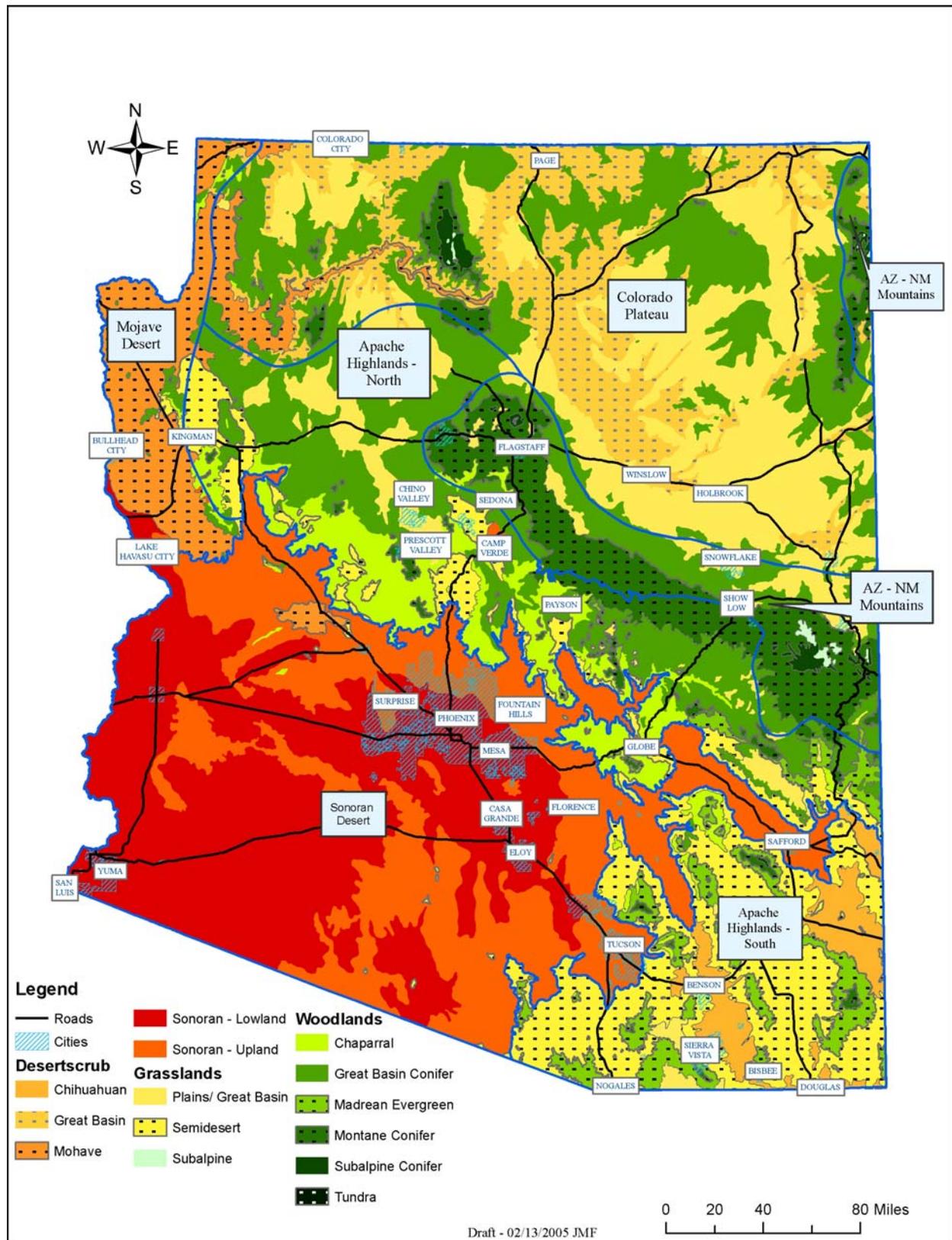


Figure 3. Habitat types and ecoregions identified in Arizona's CWCS.

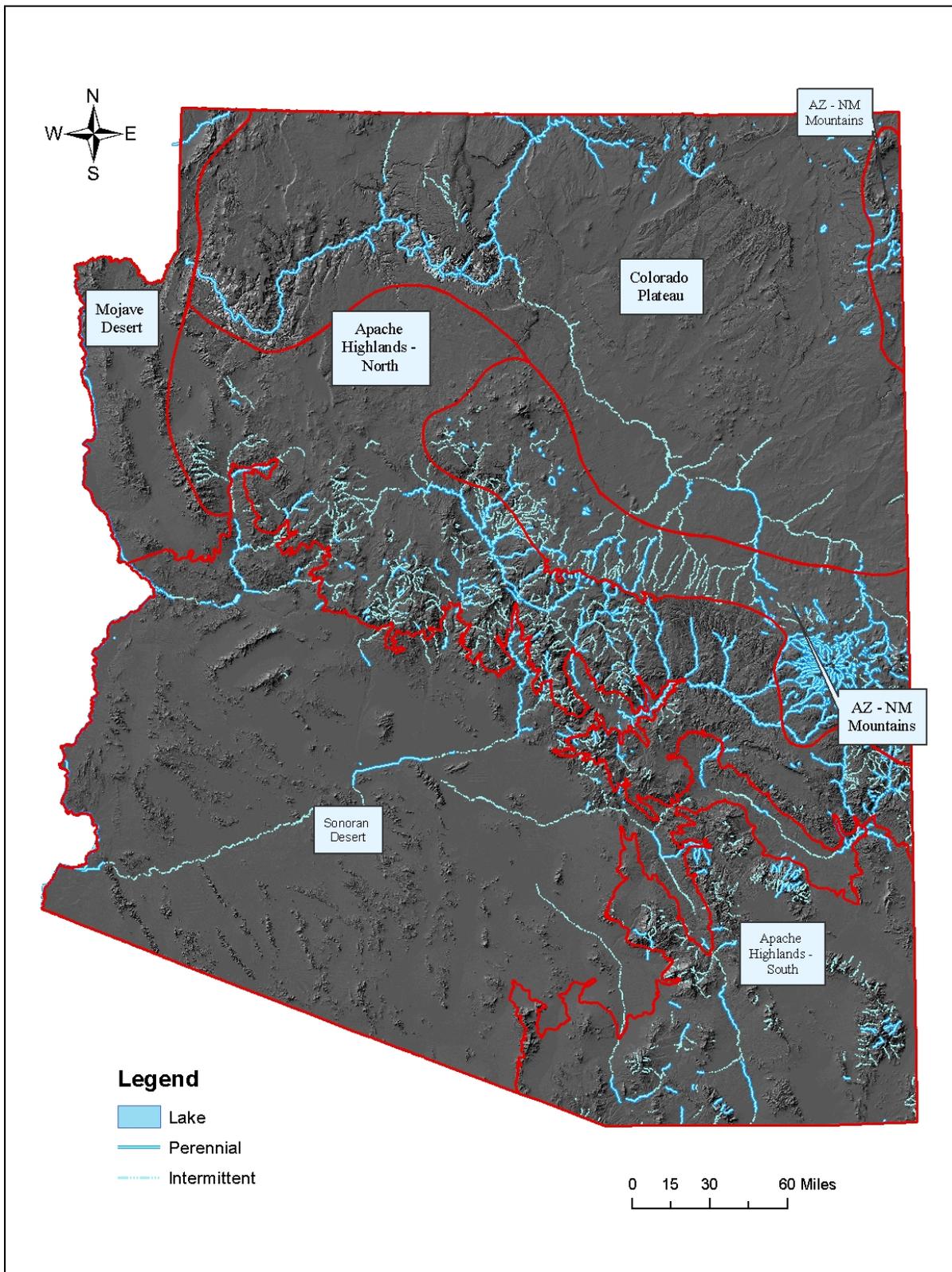


Figure 4. Riparian/aquatic habitat types and ecoregions identified in Arizona's CWCS.

APACHE HIGHLANDS NORTH

The Apache Highlands North Ecoregion spans 9.4 million acres in Arizona, largely comprised of grasslands, chaparral, and pinyon/juniper woodlands (Marshall and others 2004), but also containing significant mixed stands of Madrean evergreen oak woodlands and ponderosa pine/mixed conifer forests at higher elevations. Elevation ranges from about 2100 to 8800 feet, averaging about 4950 feet. Precipitation ranges from 10 to 18 inches in this ecoregion, with approximately equal portions falling in winter and summer. It contains a variety of landforms, including broad flat valleys, rolling hills, and steep mountains, including the isolated heights of the Hualapai Mountains, a "sky-island" landform similar to those of the Apache Highlands South. Precipitation in the "sky-island" areas to the south varies from 11 to 30 inches per year, with more precipitation at higher elevations and with slightly more falling in summer than winter.

The dominant characteristic of the Apache Highlands North is the highly dissected nature of the landform. With the Mogollon Rim defining the northern boundary of the eastern part of this ecoregion, the landforms consist in large part of canyons, valleys and the intervening small mountain ranges, ridges and plateaus. Relatively flatter and more extensive plateaus at somewhat higher elevation than the remainder of the ecoregion dominate the northwestern part of this ecoregion. This plateau country breaks into similarly highly dissected drainages and small mountain ranges towards the south.

The Apache Highlands North is transitional in nature throughout its extent. Dramatic local differences in elevation, slope and aspect may result in striking variety in habitat type and associated wildlife. Within a single square mile in this ecoregion it would not be unusual to encounter Great Basin Coniferous Woodland, Montane Coniferous Woodland, Chaparral, and Semidesert Grassland, as well as associated riparian and aquatic habitats.

The Apache Highlands North is a relatively well-watered portion of the State. Higher elevations to the north receive some of the most significant precipitation in the State, and much of that runoff flows through this ecoregion. The Salt River forms a portion of the southern boundary of this ecoregion and the Verde River bisects it. Other significant drainages include upper portions of the Big Sandy and Santa Maria rivers; the Agua Fria, and New River drainages; the Verde tributaries Sycamore Creek, Oak Creek, Beaver Creek, West Clear Creek, and the East Verde River; the Salt tributaries Tonto Creek, Cherry Creek, Canyon Creek, Cibique Creek, Carrizo Creek, and the White and Black rivers; and the upper Gila River tributaries Bonita Creek, Eagle Creek and the San Francisco River. Many of the smaller tributaries of these named systems have perennial or intermittent flow, providing aquatic habitat, support for riparian communities and water for wildlife consumption. Additionally, private landowners and livestock operations have constructed numerous water impoundments across the breadth of this ecoregion that are of value to wildlife. The western third of the ecoregion is less well-watered. Moderately large portions of this western zone are covered by sagebrush and other Great Basin desertscrub species with Great Basin conifer forest occurring in the somewhat higher elevations with thinner soils and broken, rocky terrain. Significant canyon systems drain much of the north-central portion into the

Colorado River through Cataract Canyon, with the north-western zone draining south and west to the Verde River through Big Chino and its tributaries.

Land management responsibility in the Apache Highlands North is predominantly tribal or federal in the eastern two-thirds of the ecoregion. The White Mountain Apache and San Carlos Apache Indian reservations lie at the eastern-most portion of the ecoregion. West of these, the USFS (Apache-Sitgreaves, Coconino, Tonto and Prescott national forests) is the principal land manager. Only small areas of private land are found within these zones, although the private lands are often some of the most well-watered and ecologically significant. Farther west in the ecoregion large areas of Arizona State Trust lands are present, often interspersed with private land in a checkerboard pattern. These offer a challenge to management since access and control are often limited. The BLM also manages a significant portion of lands in the western part of the ecoregion, and many BLM areas are similarly checkerboarded with State Trust and private land.

Due to the highly dissected nature of its topography, the more rugged areas of the Apache Highlands North are relatively less influenced by human population centers. Major communities in the ecoregion include Payson, Camp Verde, Cottonwood, Prescott, Prescott Valley, Kingman, Chino Valley, and Globe. Show Low and Pinetop-Lakeside straddle the border of this ecoregion and the Arizona-New Mexico Mountains. Because many of these communities are located in the large valleys of the ecoregion, where the topography is gentle and the soils are deeper, they have had a disproportionate influence on the condition of Plains and Great Basin Grassland landscapes, especially around Prescott, Prescott Valley, Kingman, and Chino Valley.

Mining, livestock grazing, and timber harvesting have been the dominant human economic activities throughout the Apache Highlands North Ecoregion since European settlement. Both activities have been a source of significant impacts on the biotic environment. Agriculture is present in the Verde Valley near Camp Verde and in other small valleys in the ecoregion, but is not of great significance anywhere.

Mining has led to establishment of human communities in the ecoregion, such as Globe and Clifton/Morenci, and has exerted lesser impacts in other localities. Many hills and canyons are dotted with working or abandoned small mines and claims. Some of these remain as blighted areas with negative impacts to wildlife and scenic value, while some mining structures provide habitat for bats and other wildlife with special habitat requirements.

Today, the Apache Highlands North is facing pressure from an increasing human population that finds the area's elevations and forests to be a highly desirable location to recreate. Indeed, this recreational use has an increasingly dominant impact on the landscape in this ecoregion. Many parts of this ecoregion get heavy recreational use from residents of the Phoenix metropolitan area. This and burgeoning retirement communities associated with the mild climate of the area create a population that is able to afford the time and expense to recreate in the outdoors. Human presence on the landscape is significant in all but the most inaccessible areas. Vehicular traffic on roads, tracks and trails creates disturbance to natural wildlife behaviors and movements. Lakeshores and streamsides have high levels of human presence during day use and overnight camping. Off-road travel by four-wheel drive vehicles, quads and dirt bikes has caused habitat

damage to plants and soils and high levels of disturbance to wildlife. The trend for all these types of disturbances continues to be on the increase.

Drought is a large source of negative impact on the habitats and wildlife of the Apache Highlands North. In winter 2005-06 Arizona find itself in an extensive period of severe drought, with little germination of winter annual vegetation and perennial vegetation dramatically reduced in vigor. Much of the existing vegetation has been severely over-utilized, in places due to wildlife use, but more extensively as a result of livestock grazing. Although the winter of 2004-05 provided a break in an overall 10-year pattern of drought, the effects of that year's precipitation are difficult to observe on the current landscape. Recent surveys of game species show little response in terms of reproduction (fawn:doe ratios) resulting from last year's rainfall, and total counts are down to historically low levels for many surveyed species. Habitat monitoring data is less readily available, but visual observations indicate severe loss of rangeland biomass, many springs and cattle tanks without water, and high levels of impact to vegetation and soils due to livestock that remain on rangelands.

Stressors described under each habitat type below reflect historical and continuing changes in ecological process as well as growth of human population centers in this ecoregion. Human developments have associated transportation and infrastructure requirements. For an expanded description of each habitat type and characterization of statewide threats to each, see "Statewide Condition of Arizona's Terrestrial and Riparian/Aquatic Habitat Types (Element 2)." See Appendix O for scoring of all stressors in each habitat type. The nature of these stressors in Arizona is presented more fully under "Stressors that Impact Wildlife and Wildlife Habitats (Element 3)." Finally, the descriptions provided do not attempt to depict conditions on sovereign tribal lands.

Species of Greatest Conservation Need (Element 1)

For more information on these species, see "Conservation Actions to Address Stressors to SGCN (Elements 3, 4)." A complete list of species, including those of lower conservation priority and of undetermined vulnerability status can be found in Appendix F. For some species in Table 16, this part of their distribution may not represent a key area for conservation actions.

Table 16. Tier 1a and 1b SGCN associated with each habitat type in Apache Highlands North.

Scientific name	Common name	Desert-scrub		Grass-lands	Woodlands/Forests				Human-dominated landscapes*	Aquatic & Riparian		
		Upland Sonoran	Mohave	Semidesert Plains & Great Basin	Interior Chaparral	Madrean Evergreen	Great Basin Conifer	Petrain Montane Conifer		Streams/Rivers	Wetlands/Springs	Lakes/Reservoirs
Amphibians												
<i>Bufo microscaphus</i>	Arizona Toad	X	X	X	X	X	X	X		X	X	
<i>Eleutherodactylus augusti cactorum</i>	Western Barking Frog			X	X	X						

Scientific name	Common name	Desert- scrub		Grass- lands		Woodlands/Forests				Human-dominated landscapes*	Aquatic & Riparian		
		Upland Sonoran	Mohave	Basin & Great Plains	Semidesert	Interior Chaparral	Madrean Evergreen	Great Basin Conifer	Petran Montane Conifer		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Rana chiricahuensis</i>	Chiricahua Leopard Frog			X	X	X	X	X	X		X	X	X
<i>Rana pipiens</i>	Northern Leopard Frog			X	X		X		X		X	X	X
<i>Rana yavapaiensis</i>	Lowland Leopard Frog	X		X	X	X	X	X	X		X	X	X
Birds													
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk					X	X	X	X		X	X	X
<i>Aechmophorus clarkii</i>	Clark's Grebe									X	X	X	X
<i>Ammodramus bairdii</i>	Baird's Sparrow			X	X								
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow			X	X					X			
<i>Anthus spragueii</i>	Sprague's Pipit			X	X								
<i>Ardea alba</i>	Great Egret									X	X	X	X
<i>Botaurus lentiginosus</i>	American Bittern									X	X	X	X
<i>Buteo regalis</i>	Ferruginous Hawk			X	X			X		X			
<i>Buteogallus anthracinus</i>	Common Black-Hawk					X	X		X		X	X	X
<i>Catharus ustulatus</i>	Swainson's Thrush					X	X	X	X	X	X	X	
<i>Ceryle alcyon</i>	Belted Kingfisher									X	X	X	X
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover									X			X
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo	X					X	X		X	X	X	X
<i>Contopus cooperi</i>	Olive-sided Flycatcher	X	X	X	X	X	X	X	X	X	X	X	X
<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck									X			X
<i>Dumetella carolinensis</i>	Gray Catbird									X	X	X	X
<i>Egretta thula</i>	Snowy Egret									X	X	X	X
<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher	X	X			X				X	X	X	X
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	X	X	X	X	X	X	X	X	X	X	X	X
<i>Haliaeetus leucocephalus</i>	Bald Eagle							X	X	X	X	X	X
<i>Ictinia mississippiensis</i>	Mississippi Kite									X	X	X	

Scientific name	Common name	Desert- scrub		Grass- lands		Woodlands/Forests				Human-dominated landscapes*	Aquatic & Riparian		
		Upland Sonoran	Mohave	Basin & Great Plains	Semidesert	Interior Chaparral	Madrean Evergreen	Great Basin Conifer	Petrified Conifer		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Oreoscoptes montanus</i>	Sage Thrasher	X	X	X	X	X		X		X			
<i>Pandion haliaetus</i>	Osprey									X	X	X	X
<i>Picoides dorsalis</i>	American Three-toed Woodpecker												
<i>Pinicola enucleator</i>	Pine Grosbeak								X				
<i>Progne subis arboricola</i>	Western Purple Martin			X	X		X	X	X	X	X		X
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker	X	X			X	X	X	X	X	X	X	X
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl					X	X	X	X		X	X	
Fish													
<i>Agosia chrysogaster</i>	Longfin Dace										X		
<i>Catostomus clarki</i>	Desert Sucker										X		
<i>Catostomus insignis</i>	Sonora Sucker										X		
<i>Catostomus latipinnis</i>	Flannelmouth Sucker										X		
<i>Cyprinodon macularius</i>	Desert Pupfish										X	X	
<i>Gila elegans</i>	Bonytail										X		
<i>Gila intermedia</i>	Gila Chub										X	X	
<i>Gila nigra</i>	Headwater Chub										X		
<i>Gila robusta</i>	Roundtail Chub										X		
<i>Meda fulgida</i>	Spikedace										X		
<i>Oncorhynchus gilae apache</i>	Apache (Arizona) Trout										X		X
<i>Oncorhynchus gilae gilae</i>	Gila Trout										X		
<i>Plagopterus argentissimus</i>	Woundfin										X		
<i>Poeciliopsis occidentalis occidentalis</i>	Gila Topminnow										X	X	
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow										X		
<i>Rhinichthys osculus</i>	Speckled Dace										X		
<i>Tiaroga cobitis</i>	Loach Minnow										X		
<i>Xyrauchen texanus</i>	Razorback Sucker										X		
Crustaceans and Mollusks													
<i>Anodonta</i>	California Floater										X	X	X

Scientific name	Common name	Desert- scrub		Grass- lands		Woodlands/Forests				Human-dominated landscapes*	Aquatic & Riparian		
		Upland Sonoran	Mohave	Basin & Great Plains	Semidesert	Interior Chaparral	Madrean Evergreen	Great Basin Conifer	Petrone Montane Conifer		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>californiensis</i>													
<i>Oreohelix yavapai cummingi</i>	(blank)			X				X					
<i>Pyrgulopsis glandulosa</i>	Verde Rim Springsnail											X	
<i>Pyrgulopsis montezumensis</i>	Montezuma Well Springsnail											X	
<i>Pyrgulopsis morrisoni</i>	Page Springsnail											X	
<i>Pyrgulopsis simplex</i>	Fossil Springsnail											X	
<i>Pyrgulopsis sola</i>	Brown Springsnail											X	
Mammals													
<i>Cynomys gunnisoni</i>	Gunnison's Prairie Dog			X	X	X		X	X				
<i>Euderma maculatum</i>	Spotted Bat			X	X	X	X	X	X		X	X	X
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat		X	X	X	X		X	X				X
<i>Lasiurus blossevillii</i>	Western Red Bat	X				X		X	X		X	X	
<i>Lasiurus xanthinus</i>	Western Yellow Bat			X	X	X	X	X			X	X	
<i>Macrotus californicus</i>	California Leaf-nosed Bat		X		X	X	X	X			X	X	
<i>Microtus mexicanus hualpaiensis</i>	Hualapai Mexican Vole					X		X	X				
<i>Mustela nigripes</i>	Black-footed Ferret			X									
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat					X	X	X	X		X	X	X
<i>Ovis canadensis mexicana</i>	Desert Bighorn Sheep	X	X	X	X						X	X	
<i>Panthera onca</i>	Jaguar	X	X	X	X	X	X	X	X				
<i>Perognathus flavus goodpasteri</i>	Springerville Pocket Mouse			X									
<i>Sigmodon arizonae jacksoni</i>	Yavapai Arizona Cotton Rat			X									
<i>Sorex arizonae</i>	Arizona Shrew						X	X	X		X	X	
<i>Zapus hudsonius luteus</i>	New Mexican Jumping Mouse										X	X	
Reptiles													
<i>Gopherus agassizii (Sonoran Population)</i>	Sonoran Desert Tortoise	X	X		X	X		X					
<i>Thamnophis eques</i>	Northern Mexican										X	X	X

Table 16. Tier 1a and 1b SGCN associated with each habitat type in Apache Highlands North.

Scientific name	Common name	Desert-scrub		Grass-lands	Woodlands/Forests				Human-dominated landscapes*	Aquatic & Riparian	
		Upland Sonoran	Mohave	Plains & Great Basin Semidesert	Interior Chaparral	Madrean Evergreen	Great Basin Conifer	Petrain Montane Conifer		Streams/ Rivers	Wetlands/ Springs
<i>megalops</i>	Gartersnake										
<i>Thamnophis rufipunctatus</i>	Narrow-headed Gartersnake								X		

*Human-dominated landscapes here refer to agricultural areas and urban lakes. These habitat types are discussed under "Statewide Condition of Arizona's Terrestrial and Aquatic/Riparian Habitat Types," and in "Stressors to Arizona's Wildlife and Wildlife Habitat" under the stressor "Urban/rural development."

Habitat types below are arranged in order of prevalence in this ecoregion. Where patches of uncharacteristic habitat types (not described in this section) occur in this ecoregion, conservation should reflect stressors and species identified in neighboring ecoregions.

Great Basin Conifer Woodland

(37.7% of acreage)

Habitat Condition (Element 2)

This habitat type, characterized by alligator and one-seed juniper, exists throughout middle elevations of the ecoregion. This landscape and Interior Chaparral are the dominant vegetation types of this ecoregion. The condition of Great Basin Coniferous Woodland is that it is increasing in extent within this ecoregion at the expense of Semidesert Grassland and riparian habitats. This reflects the combined impacts of altered fire regimes and intensive domestic livestock use over the past 100 years. Over the last 10 years, portions of this habitat type have been treated by various means to reduce overstory vegetation and to restore grassland. The resulting vegetative communities vary in composition, stability and productivity depending on restoration techniques employed and subsequent management practices. Presence of undesirable invasive plants has resulted in much of the treated acreage failing to be properly restored to the intended grasslands.

The important stressors listed below reflect impacts of these historical land uses as well as increasing human population and pressure for outdoor recreational opportunities for people living within the ecoregion and in neighboring metropolitan Phoenix.

Major Stressors Affecting Habitat (Element 3)

- Stressor Category:* Abiotic resource use
 - Groundwater depletion and springhead use
- Stressor Category:* Changes in Ecological Processes

- Insect Infestation
- Habitat fragmentation/barriers
- Loss of keystone species
- Unnatural fire regimes
- Stressor Category: Climate Change
 - Shift to warmer climate
 - Drought
- Stressor Category: Consumptive use of biological resources
 - Grazing by ungulates
- Stressor Category: Habitat conversion
 - Rural development
 - Livestock management
- Stressor Category: Invasive species
 - Nuisance plants
 - Nuisance animals
- Stressor Category: Non-consumptive resource use
 - Non-motorized recreation off-trail
 - Motorized recreation off-trail
- Stressor Category: Pollution
 - Contaminants from waste water and runoff
- Stressor Category: Transportation and infrastructure
 - Power lines/wind-harnessing turbines
 - Telephone lines/cellphone towers
 - Roads for motorized vehicles
 - Unauthorized roads & trails

Interior Chaparral

(21.8% of acreage)

Habitat Condition (Element 2)

This habitat type is co-dominant in this ecoregion with Great Basin Coniferous Woodland. Characterized by shrub live oak, manzanita, various *Ceanothus* and other shrubs, it forms nearly impenetrable thickets on many slopes in the area. Although this habitat has high value for wildlife, the current condition of much of the chaparral is decadent from decades of fire suppression. As a fire-adapted community, much of its value to wildlife occurs in the early seral stages. It is expected that this landscape is on course to experience a return to wildfires. This change in fire regime is expected due to climate and land management shifts. The ongoing drought and higher temperatures should increase the likelihood of fire. Recent changes in land management agency policies treat fire as a natural element in this landscape, leading to active use of fire as a management tool. Otherwise, historical land uses are largely limited to livestock grazing, with a small amount of recreation (hunting, fishing, hiking, off-highway vehicle use, etc.). These pressures will not change dramatically in the near term, although livestock grazing may start to decrease.

Water for wildlife in this landscape is often available only along major drainages and from springs and seeps in canyons and drainages. The current drought has eliminated available water from many of these sources, forcing wildlife to re-locate or perish and adversely affecting riparian plant communities. Large destructive fires have also had adverse effects by removing plant biomass protection to soils, resulting in erosive run-off.

Major Stressors Affecting Habitat (Element 3)

- Stressor Category: Abiotic resource use
 - Groundwater depletion and springhead use
- Stressor Category: Changes in Ecological Processes
 - Loss of keystone species
 - Unnatural fire regimes
 - Habitat fragmentation/barriers
 - Soil erosion
- Stressor Category: Climate Change
 - Shift to warmer climate
 - Drought
- Stressor Category: Consumptive use of biological resources
 - Grazing by ungulates
- Stressor Category: Habitat conversion
 - Rural development
- Stressor Category: Invasive species
 - Nuisance animals
 - Nuisance plants
- Stressor Category: Pollution
 - Contaminants from waste water and runoff
- Stressor Category: Transportation and infrastructure
 - Power lines/wind-harnessing turbines
 - Roads for motorized vehicles
 - Telephone lines/cellphone towers

Semidesert Grassland

(14.3% of acreage)

Habitat Condition (Element 2)

This habitat type is most extensive in southerly portions of this ecoregion and at its lowest elevations. There are scattered patches of this habitat type in the northwest, with the largest blocks on the western edge. This is the habitat type in this ecoregion that has probably diverged most significantly from its native condition. This landscape was historically dominated by perennial bunch grasses such as three-awn, tobosa and grama species interspersed with low shrubs and bare ground. Because it is characterized by lower precipitation than other grasslands, its condition has been very susceptible to changes associated with human activities such as intensive livestock grazing, fire suppression, and growing human settlements. Bunch grasses have consequently been replaced in most areas with scrubby trees and shrubs and by annual

grasses and forbs. The current condition of this habitat type is that it has been degraded throughout the ecoregion, followed by invasion of Great Basin Conifer and/or Upland Sonoran Desertscrub communities in degraded areas. Current drought, and expectation that it may continue for a significant period into the future, creates a mixed prognosis for this habitat. Increases in fire on this landscape offer an opportunity for the perennial grass community to reestablish a favorable equilibrium with the invading shrubs communities. However, without normal or near normal precipitation, grasses are unlikely to thrive. In addition, nonnative grasses and forbs are mostly annual species which react quickly to favorable conditions, sequester nutrients, and out-compete the native perennial grasses, at least in the short-term.

The stressors listed below reflect historical land uses, plus impacts from increasing human populations and recreational pressure. In its degraded state, it is more susceptible to invasion by nonnative herbs as well as native shrubs, both of which change the community composition and affect the success of restoration techniques.

Major Stressors Affecting Habitat (Element 3)

- Stressor Category:* Abiotic resource use
 - Groundwater depletion and springhead use
- Stressor Category:* Changes in Ecological Processes
 - Habitat degradation/shrub invasions
 - Unnatural fire regimes
 - Soil erosion
 - Habitat fragmentation/barriers
- Stressor Category:* Climate Change
 - Drought
 - Shift to warmer climate
- Stressor Category:* Consumptive use of biological resources
 - Grazing by ungulates
- Stressor Category:* Habitat conversion
 - Urban growth
 - Rural development
 - Livestock management
- Stressor Category:* Invasive species
 - Nuisance animals
 - Nuisance plants
- Stressor Category:* Non-consumptive resource use
 - Non-motorized recreation off-trail
 - Motorized recreation off-trail
- Stressor Category:* Pollution
 - Contaminants from waste water and runoff
- Stressor Category:* Transportation and infrastructure
 - Roads for motorized vehicles
 - Unauthorized roads & trails
 - Power lines/wind-harnessing turbines

Telephone lines/cellphone towers

Plains and Great Basin Grassland

(13.9% of acreage)

Habitat Condition (Element 2)

These grasslands are situated on high plains, in valleys, and on adjacent low hillsides, ridges and mesas. Landscapes are dominated by perennial grasses and are usually composed of mixed or short grass communities. Once forming large uninterrupted expanses of continuous grassland, its current condition is characterized by large-scale shrub encroachment and loss of plant diversity. Many changes in structure and composition started over a century ago with the rise of livestock operations and subsequent loss of fire from the system. More recently, urban and rural development has encroached on this landscape. The condition of this habitat type is moderately to severely degraded with little prospect of reversal due to soil losses and invasion by nonnative grasses and woody species. Management is needed to reduce forage utilization by livestock and other ungulates to levels below rates of annual production. Allocation of this annual production demands continued and increased inter-agency coordination. Much of this coordination is not effective at present due to budgetary constraints on forage monitoring efforts.

Stressors described below reflect resulting changes in ecological process as well as impacts related to a trend toward a warmer climate, increased human population growth in this ecoregion and in neighboring metropolitan Phoenix.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers

Unnatural fire regimes

Soil erosion

Habitat degradation/shrub invasions

Stressor Category: Climate Change

Shift to warmer climate

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management

Urban growth

Rural development

Stressor Category: Invasive species

Nuisance animals

Nuisance plants

Stressor Category: Non-consumptive resource use

Non-motorized recreation off-trail
Motorized recreation off-trail
Stressor Category: Pollution
Contaminants from waste water and runoff
Stressor Category: Transportation and infrastructure
Telephone lines/cellphone towers
Power lines/wind-harnessing turbines
Roads for motorized vehicles
Unauthorized roads & trails

Montane Conifer Forest

(8.2% of acreage)

Habitat Condition (Element 2)

This habitat type, characterized by ponderosa pine and Gambel oak, exists as a band in the northeastern portion of the ecoregion and at the highest elevations within the rest of the ecoregion. A large zone of this habitat type occurs below the Mogollon Rim from about Pine/Strawberry eastward to Pinetop-Lakeside. Much of this forest has been logged for timber, especially in the last century. Harvesting strategies over this period have shifted the condition from a patchwork of stands of variable age and composition to one that is in a modified, second-growth condition. Previous harvesting strategies resulted in even-aged, high stem density stands of primarily ponderosa pine. The modified structure of these forests renders them more vulnerable to hot, destructive fire and disease. In recent years, timber harvest has been much reduced and fire suppression strategies have been changed with the expectation that this will begin a trend towards more diverse forests. Extensive loss of trees and in some cases whole stands has occurred during the current drought period due to fire and to stress-related infestation by bark beetles and other insects. Stressors described below reflect resulting changes in ecological process as well as impacts related to human population growth in this ecoregion and in neighboring metropolitan Phoenix.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use
Groundwater depletion and springhead use
Stressor Category: Changes in Ecological Processes
Soil erosion
Habitat fragmentation/barriers
Loss of keystone species
Habitat degradation/shrub invasions
Insect Infestation
Unnatural fire regimes
Stressor Category: Climate Change
Shift to warmer climate
Drought
Stressor Category: Consumptive use of biological resources

Grazing by ungulates
Stressor Category: Habitat conversion
Forest and woodland management - habitat conversion
Rural development
Stressor Category: Invasive species
Nuisance plants
Disease/pathogens/parasites
Stressor Category: Transportation and infrastructure
Telephone lines/cellphone towers
Power lines/wind-harnessing turbines
Roads for motorized vehicles

Madrean Evergreen Woodland

(2.9% of acreage)

Habitat Condition (Element 2)

This habitat type is present primarily in small portions of the eastern part of the ecoregion, although floral and faunal influences occur west along the base of the Mogollon Rim and to the Prescott area as well. The largest extent in this ecoregion is on the San Carlos Indian Reservation, and a second area occurs in the vicinity of Eagle Creek and the San Francisco River.

This habitat type is found primarily in Apache Highlands South, with some representation at its northern limit in this ecoregion. The following major stressors were assessed for this habitat type in Apache Highlands South.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use
Mining
Stressor Category: Changes in Ecological Processes
Insect Infestation
Habitat fragmentation/barriers
Soil erosion
Unnatural fire regimes
Habitat degradation/shrub invasions
Stressor Category: Climate Change
Shift to warmer climate
Drought
Stressor Category: Consumptive use of biological resources
Grazing by ungulates
Harvesting/collecting animals
Stressor Category: Habitat conversion
Livestock management
Rural development

Stressor Category: Invasive species

- Feral animals
- Nuisance plants
- Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

- Motorized recreation off-trail
- Off-range recreational shooting
- Non-motorized recreation off-trail

Stressor Category: Transportation and infrastructure

- Roads for motorized vehicles
- Trails for foot, bike, or equine use
- Unauthorized roads & trails
- Right-of-way fencing along roadways

Upland Sonoran Desertscrub

(0.4% of acreage)

Habitat Condition (Element 2)

This habitat type is found primarily in the Sonoran Desert ecoregion; its largest extent in Apache Highlands North is in the Beaver Creek watershed. The condition of this landscape was well developed Sonoran Desertscrub habitat with very interspersed Semi-Desert Grassland prior to the settlement of the Verde Valley in the mid 1800s and is currently being heavily impacted by human development, dispersed recreation and water diversion. Important land use activities over this time frame have been livestock grazing, mining and limited agricultural development. Shifts in these activities, including reduced mining activities and rural development encroaching on the limited agricultural activities of the valley, have served to reduce the viability of this Sonoran desertscrub as wildlife habitat. Loss of springs and riparian zones have resulted from de-watering of most of the watershed for municipal and residential subdivision uses. The condition of the landscape is expected to decline further in the future with continued urbanization of the area, development of the remaining wildlands for activities such as golf resorts, recreation sites and the like. The stressors listed below reflect the pressures described above as well as changes to natural processes resulting from climate change and a resulting trend toward warmer conditions. Significant impacts from invasive species proliferation and introduction of nonnative plant and animal species will serve to continue the deterioration of this habitat type.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

- Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

- Unnatural fire regimes
- Soil erosion
- Habitat fragmentation/barriers

Stressor Category: Climate Change

- Drought

- Shift to warmer climate
- Stressor Category:* Consumptive use of biological resources
 - Grazing by ungulates
- Stressor Category:* Invasive species
 - Disease/pathogens/parasites
 - Nuisance animals
 - Nuisance plants
- Stressor Category:* Non-consumptive resource use
 - Off-range recreational shooting
 - Motorized recreation off-trail
- Stressor Category:* Pollution
 - Illegal dumping/littering
- Stressor Category:* Transportation and infrastructure
 - Unauthorized roads & trails
 - Roads for motorized vehicles

Riparian and aquatic systems in Apache Highlands North

General Conditions and Trends in Riparian and Aquatic Systems

Riparian and aquatic systems in the Apache Highlands North have been uniformly impacted in dramatic fashion from the pre-settlement condition. Three major sources of impact account for most of the change in Apache Highlands North as well as across the state: prevailing drought, livestock management and the resulting impacts to riparian areas and watersheds, and introduction of nonnative organisms. Other factors causing significant local impact in this ecoregion include runoff from mining waste and road-building activities; off-road vehicular traffic along and across stream courses; changes to watercourses from diversion, impoundments, and beaver removal; and fire on watersheds resulting in high siltation.

Wetlands/Springs/Seeps

Habitat Condition (Element 2)

Wetlands, springs and seeps in the Apache Highlands North have been affected by drought, human modification, and over utilization of the riparian vegetation. Construction of concrete "spring boxes" has resulted in many springs becoming unavailable to support riparian communities at the margins. Long-term drought, combined with poor watershed condition, is causing many of these areas to go dry for the first time in recorded history.

Major Stressors Affecting Habitat (Element 3)

- Stressor Category:* Abiotic resource use
 - Groundwater depletion and springhead use
 - Mining
- Stressor Category:* Changes in Ecological Processes
 - Habitat degradation/shrub invasions
- Stressor Category:* Climate Change

- Drought
- Shift to warmer climate
- Stressor Category:* Consumptive use of biological resources
 - Grazing by ungulates
- Stressor Category:* Habitat conversion
 - Livestock management
 - Urban growth
 - Dams/reservoirs/impoundments
 - Rural development
 - Agricultural conversion
- Stressor Category:* Invasive species
 - Nuisance animals
 - Nuisance plants
 - Disease/pathogens/parasites
- Stressor Category:* Non-consumptive resource use
 - Motorized recreation off-trail
 - Scientific research and collection
- Stressor Category:* Pollution
 - Nutrients/algal blooms
 - Sediment/ash flows
 - Contaminants from waste water and runoff
 - Pesticides/herbicides
 - Heavy metals/mine tailings
- Stressor Category:* Transportation and infrastructure
 - Canals/pipelines
 - Trails for foot, bike, or equine use
 - Roads for motorized vehicles
 - Unauthorized roads & trails

Streams/Rivers

Habitat Condition (Element 2)

Degraded conditions and trends in this ecoregion mirror those for the state as a whole. Many streams and rivers have become highly eroded, impacted by nonnative organisms, and converted to ephemeral flows as a result of erosion and general watershed degradation. Riparian tree communities have been greatly reduced in extent due to overgrazing of seedlings necessary for recruitment and by altered flow regimes that reduce or eliminate conditions necessary for seed germination and seedling establishment. Many land managers are moving toward active acceptance of responsibility to manage these impacts from livestock on riparian areas, so the trends for condition of riparian habitat may begin to see improvement. Nonnative aquatic organisms are having profound effects, however, and have eliminated or reduced native fish and aquatic invertebrates in many areas. Most waterways are under threat or have already been converted by crayfish to simple monocultures of crayfish and algae.

While impoundments and diversion of watercourses in the Apache Highlands North are not on the dramatic scale of the Sonoran Desert, the many small diversions and impoundments have served to dramatically change many watercourses from pre-settlement condition. Perhaps the most dramatic change has resulted from the removal of beaver from many systems. Early explorers found many beaver in the streams and wetlands of much of Arizona. These were profoundly reduced in the mid-1800s. Many watercourses apparently have changed as a result, with loss of more continuously connected wetland areas, increases in flow rate peaks, decreases in flow duration, and increases in both seasonal and area extent of periods of no flow. This has had profound effects on riparian and aquatic plant communities and their associated wildlife. A perhaps direct result of this reduction in beaver modified habitat is the reduction in leopard frog populations throughout the state and region. Leopard frogs appear to be vulnerable to local extinctions. During periods of high wetland connectivity, frog metapopulations could survive with local extinctions being corrected by immigration of frogs from adjacent habitats. As watercourses became increasingly disconnected, local extinctions are less likely to be followed by recolonization.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Mining

Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Management for game animals and sport fish

Habitat fragmentation/barriers

Altered river flow regimes

Habitat degradation/shrub invasions

Streambank alteration/channelization

Stressor Category: Climate Change

Shift to warmer climate

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Recreational sites/facilities

Rural development

Agricultural conversion

Dams/reservoirs/impoundments

Landfills/dumps

Urban growth

Livestock management

Stressor Category: Invasive species

Nuisance plants

Bait-bucket dumping/illegal stocking

Disease/pathogens/parasites

Nuisance animals

Stressor Category: Non-consumptive resource use
Scientific research and collection
Motorized recreation off-trail

Stressor Category: Pollution
Sediment/ash flows
Pesticides/herbicides
Contaminants from waste water and runoff
Nutrients/algal blooms
Heavy metals/mine tailings

Stressor Category: Transportation and infrastructure
Unauthorized roads & trails
Roads for motorized vehicles
Trails for foot, bike, or equine use
Canals/pipelines

Lakes/Reservoirs

Habitat Condition (Element 2)

Lakes and reservoirs are not an important habitat type for wildlife in the Apache Highlands North, except for smaller human-created impoundments. These range from stock tanks of less than ½ acre in size up to local community/ranch ponds and small lakes. Most are dominated by nonnative fishes and have limited or no riparian areas associated with them. They do provide locally important sources of drinking water for many wildlife species, and indeed are frequently the only sources of standing water over significant areas.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use
Groundwater depletion and springhead use
Mining

Stressor Category: Changes in Ecological Processes
Management for game animals and sport fish
Habitat degradation/shrub invasions

Stressor Category: Climate Change
Shift to warmer climate
Drought

Stressor Category: Consumptive use of biological resources
Grazing by ungulates

Stressor Category: Habitat conversion
Agricultural conversion
Rural development
Livestock management
Urban growth
Landfills/dumps
Recreational sites/facilities

- Dams/reservoirs/impoundments
- Stressor Category: Invasive species
 - Disease/pathogens/parasites
 - Nuisance plants
 - Nuisance animals
 - Bait-bucket dumping/illegal stocking
- Stressor Category: Non-consumptive resource use
 - Motorized recreation off-trail
 - Scientific research and collection
 - Watercraft operation
- Stressor Category: Pollution
 - Pesticides/herbicides
 - Nutrients/algal blooms
 - Sediment/ash flows
 - Contaminants from waste water and runoff
 - Heavy metals/mine tailings
- Stressor Category: Transportation and infrastructure
 - Trails for foot, bike, or equine use
 - Canals/pipelines
 - Unauthorized roads & trails
 - Roads for motorized vehicles

Stressors that act in this ecoregion at the species-but not habitat-scale (Element 3)

In some cases, a stressor may have significant impacts to individual SGCN, but impacts are not felt throughout the habitat. Regardless of the extent of ecosystem-wide impacts, in any habitat type where these stressors act on SGCN, the appropriate conservation actions apply (see “Conservation Actions to Address Stressors to SGCN (Elements 3, 4)”). The following stressors have significant ecosystem-level impacts in some habitat types in this ecoregion, but not in all habitat types where the SGCN occur. Note that for wide-ranging species, impacts from some stressors may be quite significant, but may not act on the species throughout its range.

Stressors that rated high for SGCN in Apache Highlands North, but not for the habitat type in which they occur.			
Stressor category	Stressor	Scientific name	Common name
Habitat conversion			
	Forest & woodland management - habitat conversion		
		Accipiter gentilis atricapillus	Northern Goshawk
		Catharus ustulatus	Swainson's Thrush
		Contopus cooperi	Olive-sided Flycatcher

Stressors that rated high for SGCN in Apache Highlands North, but not for the habitat type in which they occur.			
Stressor category	Stressor	Scientific name	Common name
		Picoides dorsalis	American Three-toed Woodpecker
	Livestock management		
		Buteogallus anthracinus	Common Black-Hawk
		Catharus ustulatus	Swainson's Thrush
		Haliaeetus leucocephalus	Bald Eagle
		Cynomys gunnisoni	Gunnison's Prairie Dog
		Panthera onca	Jaguar
	Recreational sites/facilities		
		Haliaeetus leucocephalus	Bald Eagle
		Microtus mexicanus hualpaiensis	Hualapai Mexican Vole
	Urban growth		
		Cynomys gunnisoni	Gunnison's Prairie Dog
Non-consumptive resource use			
	Dispersed camping		
		Buteogallus anthracinus	Common Black-Hawk
		Haliaeetus leucocephalus	Bald Eagle
	Off-range recreational shooting		
		Haliaeetus leucocephalus	Bald Eagle
Pollution			
	Lead shot/fishing line		
		Haliaeetus leucocephalus	Bald Eagle
	Pesticides/herbicides		
		Eumops perotis californicus	Greater Western Mastiff Bat
	Sediment/ash flows		
		Catharus ustulatus	Swainson's Thrush
		Haliaeetus leucocephalus	Bald Eagle
Changes in Ecological Processes			
	Altered river flow regimes		
		Eumops perotis californicus	Greater Western Mastiff Bat
Consumptive use of biological resources			
	Harvesting/collecting animals		
		Haliaeetus leucocephalus	Bald Eagle
		Panthera onca	Jaguar

APACHE HIGHLANDS SOUTH

The Apache Highlands South Ecoregion, including 8.5 million acres in Arizona, is best known among the scientific community for its “sky islands.” Over 20 mountain ranges cloaked in pine-oak woodland and mixed conifer forests rise abruptly from surrounding basins comprised of grassland and desert scrub to form forested islands among a “desert sea” (Marshall 1957; Marshall and others 2004; Warshall 1995). These have also been called the “Madrean archipelago” for their resemblance to a chain of islands extending off the “continent” of the Sierra Madre (DeBano and others 1995). The elevation ranges from about 2200 to 10,717 feet, averaging about 4340 feet. Precipitation varies from about 10 to 30 inches per year according to elevation, with slightly more falling in summer than winter.

Because of the variation in elevations as well as the location between the Sierra Madre to the south (Neotropic influence) and the Rocky Mountains to the north (Nearctic influence), an unusually rich fauna and flora exist here (Marshall and others 2004; Warshall 1995). At least 468 bird species (including accidental and casual migrants) have been verified in southeastern Arizona during the past 50 years, along with more than 240 butterfly species (Bailowitz and Brock 1991; Edison and others 1995).

Historically, land use in the Apache Highlands South Ecoregion consisted mainly of cattle ranching, with small areas of agriculture where water was available. Most of the private lands were homesteaded, and almost all of the public and state trust lands were leased to ranchers for grazing.

Ranching continues to be a dominant land use, even as human population growth in the ecoregion climbs. The major urban area of southeastern Arizona is Tucson, in the Sonoran Desert Ecoregion, but its growth is encroaching into the adjacent Apache Highlands South Ecoregion. Other communities in the ecoregion are also growing, including Nogales, Douglas, Sierra Vista, Benson, Willcox, Bisbee, Tombstone, Patagonia, Sonoita, Arivaca, Rio Rico, and Oracle. As people find new ways to telecommute, and as the number of retired people in the state increases, there is increased demand for rural housing. These changing human pressures across the ecoregion have resulted in habitat fragmentation due to roads and new urban and rural development. Concomitantly, as more people come to the area, there is an increased demand for recreational opportunity on public lands in the ecoregion, leading to high use on lands that were previously lightly impacted by man. These pressures will continue to pose a problem for maintaining biodiversity.

Land uses and conservation opportunities vary across the region, reflecting the pattern of land ownership. Many of the major mountain ranges in the ecoregion are federal lands, with a large majority managed by the Coronado National Forest; thus, many of the mountain habitats are at lowered risk of permanent development. Nevertheless, federal lands are threatened by increased recreational use, habitat fragmentation by roads and other human activities, unauthorized roads and trails, mining, invasive species, historic overgrazing, insect infestations, and unnatural fire regimes.

The situation is different in the lowland basins between the mountains, which include many private and State Trust lands. These valleys are topographically suitable for urban and rural development, and they provide climate suitable for human habitation. In addition to the effects of continuing widespread development, the lowlands continue to be impacted by the same issues as mountain communities, including increased recreational use, historic overgrazing, and unnatural fire regimes. Degraded grasslands continue to be susceptible to shrub encroachment.

Aquatic systems, including rivers, streams, creeks, cienegas, and wetlands, and their associated riparian habitats, support a disproportionately high number of wildlife species. The San Pedro River is the most important perennial river in the ecoregion, with considerable value to wildlife. The ecoregion also includes a portion of the upper Gila River from the border with New Mexico to the mouth of the San Francisco River, an effluent-supported portion of the Santa Cruz River north from the Mexican Border, and numerous important riparian streams such as Sonoita Creek and Cienega Creek. Willcox Playa and Whitewater Draw, both ephemeral wetlands, are important for many species of wildlife, particularly sandhill cranes and waterfowl. Healthy riparian habitat associated with these aquatic systems in Apache Highlands South provides migratory birds and pollinating insects and bats with critical trans-hemispheric travel corridors.

The Apache Highlands South also has significant pressure from uses related to the border with Mexico. Large numbers of illegal immigrants pass through the Apache Highlands South seeking work opportunities in the United States. Illegal drugs are smuggled across the Mexico border. Because interdiction is most effective in the urban border areas, the illegal traffic has been funneled into the wildlands, and this traffic is having significant impacts on wildlife and wildlife habitat. Law enforcement efforts to track, apprehend, and deter illegal traffic are having their own adverse impacts on natural habitats. In many instances, border activities have destroyed habitat and provided a barrier along the wildlands of our border. The impact to wildlife due to borderland activities is significant.

Pressures from historical and current land use, human population increases, and border issues have put communities in Apache Highlands South under considerable threat. Note that the descriptions provided do not attempt to depict conditions on sovereign tribal lands. For an expanded description of each habitat type and characterization of statewide threats to each, see "Statewide Condition of Arizona's Terrestrial and Riparian/Aquatic Habitat Types (Element 2)." See Appendix O for scoring of all stressors in each habitat type. The descriptions provided do not attempt to depict conditions on sovereign tribal lands. The nature of these stressors in Arizona is presented more fully under "Stressors that Impact Wildlife and Wildlife Habitats (Element 3)." These communities represent an important natural resource for Arizona, with an extremely high level of biodiversity due to Madrean and Petran influences. Maintaining the full variety of biotic communities in Apache Highlands South will be a challenge in the face of increasing threats.

Species of Greatest Conservation Need (Element 1)

For more information on these species, see "Conservation Actions to Address Stressors to SGCN (Elements 3, 4)." A complete list of species, including those of lower conservation priority and

of undetermined vulnerability status can be found in Appendix G. For some species in Table 17, this part of their distribution may not represent a key area for conservation actions.

Table 17. Tier 1a and 1b SGCN associated with each habitat type in Apache Highlands South.														
ScientificName	Common	Desert- scrub	Grassland		Woodlands/ Forests					Human-dominated landscapes*	Aquatic & Riparian			
			Chihuahuan	Semidesert	Plains & Great Basin	Interior Chaparral	Madrean Evergreen	Great Basin Conifer	Petrán Montane Conifer		Petrán Subalpine Conifer	Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
Amphibians														
<i>Ambystoma tigrinum stebbinsi</i>	Sonoran Tiger Salamander			X		X						X	X	
<i>Eleutherodactylus augusti cactorum</i>	Western Barking Frog		X			X		X						
<i>Gastrophryne olivacea</i>	Great Plains Narrow-mouthed Toad		X			X						X	X	
<i>Pternohyla fodiens</i>	Lowland Burrowing Treefrog		X									X	X	
<i>Rana blairi</i>	Plains Leopard Frog		X			X							X	
<i>Rana chiricahuensis</i>	Chiricahua Leopard Frog	X	X	X		X		X				X	X	
<i>Rana subaquavocalis</i>	Ramsey Canyon Leopard Frog		X			X						X	X	
<i>Rana tarahumarae</i>	Tarahumara Frog					X						X	X	
<i>Rana yavapaiensis</i>	Lowland Leopard Frog	X	X	X	X	X		X				X	X	
Birds														
<i>Accipiter gentilis apache</i>	Apache Northern Goshawk				X	X	X	X	X			X	X	X
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk				X	X	X	X	X			X	X	X
<i>Aechmophorus clarkii</i>	Clark's Grebe									X		X	X	X
<i>Aimophila botterii</i>	Botteri's Sparrow		X	X						X				
<i>Amazilia violiceps</i>	Violet-crowned Hummingbird					X				X		X	X	
<i>Ammodramus bairdii</i>	Baird's Sparrow		X	X						X				

ScientificName	Common	Desert- scrub	Grassland		Woodlands/ Forests					Human- dominated landscapes*	Aquatic & Riparian		
		Chihuahuan	Semidesert	Plains & Great Basin	Interior Chaparral	Madrean Evergreen	Great Basin Conifer	Petrain Montane Conifer	Petrain Subalpine Conifer		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Ammodramus savannarum ammolegus</i>	Arizona Grasshopper Sparrow		X	X						X			
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow		X	X						X		X	
<i>Anthus spragueii</i>	Sprague's Pipit		X	X						X			
<i>Ardea alba</i>	Great Egret									X	X	X	X
<i>Asturina nitida maxima</i>	Northern Gray Hawk									X	X	X	X
<i>Botaurus lentiginosus</i>	American Bittern									X	X	X	X
<i>Buteo regalis</i>	Ferruginous Hawk	X	X	X						X			
<i>Buteogallus anthracinus</i>	Common Black-Hawk				X	X				X	X	X	X
<i>Caracara cheriway</i>	Crested Caracara		X							X			
<i>Catharus ustulatus</i>	Swainson's Thrush	X			X	X	X	X	X	X	X	X	
<i>Ceryle alcyon</i>	Belted Kingfisher									X	X	X	X
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover									X	X		X
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo					X	X			X	X	X	X
<i>Colinus virginianus ridgwayi</i>	Masked Bobwhite		X							X			
<i>Contopus cooperi</i>	Olive-sided Flycatcher	X	X	X	X	X	X	X	X	X	X	X	X
<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck									X	X	X	X
<i>Dumetella carolinensis</i>	Gray Catbird									X	X	X	X
<i>Egretta thula</i>	Snowy Egret									X	X	X	X

Table 17. Tier 1a and 1b SGCN associated with each habitat type in Apache Highlands South.

ScientificName	Common	Desert-scrub	Grassland		Woodlands/ Forests					Human-dominated landscapes*	Aquatic & Riparian		
		Chihuahuan	Semidesert	Plains & Great Basin	Interior Chaparral	Madrean Evergreen	Great Basin Conifer	Petran Montane Conifer	Petran Subalpine Conifer		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Empidonax fulvifrons pygmaeus</i>	Northern Buff-breasted Flycatcher						X	X	X		X	X	
<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher	X				X				X	X	X	X
<i>Falco femoralis septentrionalis</i>	Northern Aplomado Falcon		X								X	X	X
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	X	X	X	X	X	X	X	X	X	X	X	X
<i>Glaucidium brasilianum cactorum</i>	Cactus Ferruginous Pygmy-Owl		X							X	X	X	X
<i>Haliaeetus leucocephalus</i>	Bald Eagle		X	X						X	X	X	X
<i>Ictinia mississippiensis</i>	Mississippi Kite		X							X	X	X	
<i>Oreoscoptes montanus</i>	Sage Thrasher	X	X	X				X		X			
<i>Pachyrhamphus aglaiae</i>	Rose-throated Becard					X					X		X
<i>Pandion haliaetus</i>	Osprey									X	X	X	X
<i>Pinicola enucleator</i>	Pine Grosbeak							X	X				
<i>Polioptila nigriceps</i>	Black-capped Gnatcatcher		X								X		
<i>Progne subis arboricola</i>	Western Purple Martin									X	X		X
<i>Rhynchopsitta pachyrhyncha</i>	Thick-billed Parrot					X		X					
<i>Sialia sialis fulva</i>	Azure Bluebird			X		X	X	X		X	X	X	X
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker				X	X	X	X	X	X	X	X	X
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl				X	X	X	X	X		X	X	
<i>Trogon elegans</i>	Elegant Trogon					X	X	X	X		X	X	

Table 17. Tier 1a and 1b SGCN associated with each habitat type in Apache Highlands South.													
ScientificName	Common	Desert- scrub	Grassland		Woodlands/ Forests					Human- dominated landscapes*	Aquatic & Riparian		
		Chihuahuan	Semidesert	Plains & Great Basin	Interior Chaparral	Madrean Evergreen	Great Basin Conifer	Petran Montane Conifer	Petran Subalpine Conifer		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Tyrannus crassirostris</i>	Thick-billed Kingbird										X	X	X
<i>Tyrannus melancholicus</i>	Tropical Kingbird		X							X	X	X	X
Fish													
<i>Agosia chrysogaster</i>	Longfin Dace										X	X	
<i>Campostoma ornatum</i>	Mexican Stoneroller										X		
<i>Catostomus bernardini</i>	Yaqui Sucker										X		
<i>Catostomus clarki</i>	Desert Sucker										X		
<i>Catostomus insignis</i>	Sonora Sucker										X		
<i>Catostomus latipinnis</i>	Flannelmouth Sucker										X		
<i>Cyprinella formosa</i>	Beautiful Shiner										X		X
<i>Cyprinodon macularius</i>	Desert Pupfish										X	X	
<i>Gila ditaenia</i>	Sonora Chub										X		
<i>Gila intermedia</i>	Gila Chub										X	X	
<i>Gila purpurea</i>	Yaqui Chub										X	X	X
<i>Gila robusta</i>	Roundtail Chub										X		
<i>Ictalurus pricei</i>	Yaqui Catfish										X		X
<i>Meda fulgida</i>	Spikedace										X		
<i>Oncorhynchus gilae apache</i>	Apache (Arizona) Trout										X		
<i>Poeciliopsis occidentalis occidentalis</i>	Gila Topminnow										X	X	
<i>Poeciliopsis occidentalis sonoriensis</i>	Yaqui Topminnow										X	X	

Table 17. Tier 1a and 1b SGCN associated with each habitat type in Apache Highlands South.														
ScientificName	Common	Desert- scrub	Grassland		Woodlands/ Forests					Human- dominated landscapes*	Aquatic & Riparian			
		Chihuahuan	Semidesert	Plains & Great Basin	Interior Chaparral	Madrean Evergreen	Great Basin Conifer	Petrain Montane Conifer	Petrain Subalpine Conifer		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs	
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow										X			
<i>Rhinichthys osculus</i>	Speckled Dace										X			
<i>Tiaroga cobitis</i>	Loach Minnow										X			
<i>Xyrauchen texanus</i>	Razorback Sucker										X			
Crustaceans and Mollusks														
<i>Anodonta californiensis</i>	California Floater										X	X	X	
<i>Oreohelix grahamensis</i>	Pinaleno Mountainsnail							X	X					
<i>Pyrgulopsis arizonae</i>	Bylas Springsnail											X		
<i>Pyrgulopsis bernardina</i>	San Bernardino Springsnail											X		
<i>Pyrgulopsis thompsoni</i>	Huachuca Springsnail											X		
<i>Sonorella christenseni</i>	Clark Peak Talussnail							X	X					
<i>Sonorella grahamensis</i>	Pinaleno Talussnail							X	X					
<i>Sonorella imitator</i>	Mimic Talussnail							X	X					
<i>Sonorella macrophallus</i>	Wet Canyon Talussnail							X	X					
<i>Stygobromus arizonensis</i>	Arizona Cave Amphipod											X		
<i>Tryonia gilae</i>	Gila Tryonia											X		
Mammals														
<i>Choeronycteris mexicana</i>	Mexican Long-tongued Bat	X	X	X	X	X	X	X	X			X	X	X
<i>Cynomys ludovicianus</i>	Black-tailed Prairie Dog	X	X	X										
<i>Euderma maculatum</i>	Spotted Bat					X	X	X	X			X	X	X
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat	X	X	X	X	X	X	X	X					X

Table 17. Tier 1a and 1b SGCN associated with each habitat type in Apache Highlands South.													
ScientificName	Common	Desert- scrub	Grassland		Woodlands/ Forests					Human-dominated landscapes*	Aquatic & Riparian		
		Chihuahuan	Semidesert	Plains & Great Basin	Interior Chaparral	Madrean Evergreen	Great Basin Conifer	Petrain Montane Conifer	Petrain Subalpine Conifer		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Aspidoscelis stictogrammus</i>	Giant Spotted Whiptail				X						X		
<i>Aspidoscelis xanthonota</i>	Red-back Whiptail		X										
<i>Crotalus pricei pricei</i>	Western Twin-spotted Rattlesnake							X	X				
<i>Crotalus willardi obscurus</i>	New Mexico Ridge-nosed Rattlesnake					X							
<i>Crotalus willardi willardi</i>	Arizona Ridge-nosed Rattlesnake		X	X		X		X					
<i>Gopherus agassizii</i> (Sonoran Population)	Sonoran Desert Tortoise	X	X		X	X							
<i>Gyalopion quadrangulare</i>	Thornscrub Hook-nosed Snake		X			X							
<i>Kinosternon arizonense</i>	Arizona Mud Turtle		X			X					X	X	X
<i>Kinosternon flavescens</i>	Yellow Mud Turtle	X	X			X					X	X	
<i>Lampropeltis triangulum celaenops</i>	New Mexico Milksnake		X										
<i>Oxybelis aeneus</i>	Brown Vinesnake		X			X							
<i>Sceloporus slevini</i>	Slevin's Bunchgrass Lizard		X	X		X		X	X				
<i>Sistrurus catenatus edwardsii</i>	Desert Massasauga		X	X									
<i>Terrapene ornata luteola</i>	Desert Box Turtle	X	X	X									
<i>Thamnophis eques megalops</i>	Northern Mexican Gartersnake										X	X	X

*Human-dominated landscapes here refer to agricultural areas and urban lakes. These habitat types are discussed under "Statewide Condition of Arizona's Terrestrial and Aquatic/Riparian Habitat Types," and in "Stressors to Arizona's Wildlife and Wildlife Habitat" under the stressor "Urban/rural development."

Habitat types below are arranged in order of prevalence in this ecoregion. Where patches of uncharacteristic habitat types (not described in this section) occur in this ecoregion, conservation should reflect stressors and species identified in neighboring ecoregions.

Semidesert Grassland
(61.0% of acreage)

Habitat Condition (Element 2)

This is the most common habitat in the ecoregion and covers most of the lowlands. The majority of the Semidesert Grassland is State Trust Lands and private lands. Most of these lands have a long history of intensive cattle grazing. The condition of this vegetation community is generally poor due to loss of grass species and an increase in the shrub component. There are several separate issues involved in restoration of this habitat type, and the scientific community has different opinions on potential for restoration. Some scientists believe that native grasses cannot be restored because of changes in soil characteristics and lowering of the water table. Some places have been restored with long periods of decreased grazing pressure; however, grazing rest or reduction is generally not occurring on most State Trust and private lands. Drought and climate change impact the ability of this vegetative community to recover. Natural fire, which historically maintained this community, no longer occurs in much of the habitat due to lack of grasses to carry the fire. A natural fire regime is not likely to be restored on most of the Semidesert Grassland because of continued grazing pressure and development of human communities within the habitat type. There have been some successes at restoring Semidesert Grassland with herbicides to reduce shrubs and thereby promote grasses, but these efforts have been on a small scale and expensive. High human use, both because of the increasing human population and because of heavy border activity, is degrading the habitat and decreasing the value of the habitat for wildlife. In some places, introduced nonnative plants (for example, Lehmann lovegrass) have invaded the natural vegetation and caused ecosystem changes that may not be reversible. In places where nonnative grasses have become established, unnaturally *high* fire regime is established, which furthers the spread and dominance of the nonnatives. Most of the Semidesert Grassland in Arizona exists in the Apache Highlands South Ecoregion, so the responsibility for conservation of this community lies within this ecoregion. In the long term, it is unlikely that the majority of Semidesert Grassland will be maintained for wildlife values. Instead, conservation goals should focus on protection of some of the Semidesert Grassland from development and restoration of these lands to ecological function.

Major Stressors Affecting Habitat (Element 3)

Stressor Category:* **Abiotic resource use*

 Mining

Stressor Category:* **Border issues*

 Enforcement fences along the border

 Enforcement activities along the border

 Unauthorized roads & trails created by illegal immigrants and smugglers

 Altered fire regime as a result of border activities

Light pollution along the border
Illegal dumping/littering along the border
Dispersed camping along the border

Stressor Category: Changes in Ecological Processes

Unnatural fire regimes
Streambank alteration/channelization
Habitat degradation/shrub invasions
Soil erosion
Habitat fragmentation/barriers
Loss of keystone species

Stressor Category: Climate Change

Drought
Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Harvesting/collecting animals
Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management
Rural development

Stressor Category: Invasive species

Nuisance plants
Disease/pathogens/parasites
Feral animals

Stressor Category: Non-consumptive resource use

Off-range recreational shooting
Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Unauthorized roads & trails
Roads for motorized vehicles
Right-of-way fencing along roadways

Madrean Evergreen Woodland
(18.1% of acreage)

Habitat Condition (Element 2)

This vegetative community covers the bulk of the mountainous habitats in Apache Highlands South. This ecoregion contains the majority of the Madrean Woodlands in Arizona, so responsibility for conservation of this habitat lies in this ecoregion. Historically, this community was characterized by open oak woodland, interspersed with native grasses. Due to lack of a natural fire regime, this community is currently denser than natural, and species that are not adapted to natural fire (for example, juniper) have increased. Historic overgrazing reduced grasses, which resulted in the lack of fire. Federal land managers are reducing grazing pressure and restoring natural fire, but it will take many years to restore natural conditions at a landscape level. Most of this habitat is public land managed by the Coronado National Forest, but some portions of the community are private, State Trust, BLM, San Carlos Apache Nation, and NPS

lands. Conservation of this habitat should focus on managing grazing at a sustainable level and restoration of a natural fire regime, which will restore grasses and decrease shrub density. High human use, both because of the increasing human population and because of heavy border activity, is degrading the habitat and decreasing the value of the habitat for wildlife.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Mining

Stressor Category: Border issues

Enforcement activities along the border

Enforcement fences along the border

Dispersed camping along the border

Unauthorized roads & trails created by illegal immigrants and smugglers

Illegal dumping/littering along the border

Altered fire regime as a result of border activities

Stressor Category: Changes in Ecological Processes

Insect Infestation

Soil erosion

Habitat fragmentation/barriers

Unnatural fire regimes

Habitat degradation/shrub invasions

Stressor Category: Climate Change

Shift to warmer climate

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Harvesting/collecting animals

Stressor Category: Habitat conversion

Livestock management

Rural development

Stressor Category: Invasive species

Feral animals

Disease/pathogens/parasites

Nuisance plants

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Non-motorized recreation off-trail

Off-range recreational shooting

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Trails for foot, bike, or equine use

Unauthorized roads & trails

Right-of-way fencing along roadways

Chihuahuan Desertscrub
(15.3% of acreage)

Habitat Condition (Element 2)

This community also fills some of the valleys in the Apache Highland South, but is not as extensive as the Semidesert Grassland. Land ownership is State Trust Land, BLM, and private. Like Semidesert Grassland, most of these lands have been historically overgrazed and degraded by human uses. Historically, this community had more of a grass component than currently and more variety in the shrub community. In places, this community has degraded to a monoculture of tarbush (*Flourensia cernua*) or a combination of a few unpalatable shrubby species (for example, *Prosopis*, *Larrea*, *Gutierrezia*, *Happlopappus*) that is very resistant to change. Restoration of this community will be difficult if not impossible, due to low rainfall and poor soils. Drought and climate change impact the ability of Chihuahuan desertscrub to recover. In a few small places, restoration has been accomplished by use of herbicide to kill shrubs and encourage grasses. Rural development and border activities are having impacts on wildlife habitat. A reasonable conservation goal is to protect some of the Chihuahuan Desertscrub from development and to restore these lands to ecological function.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Border issues

- Disease along the border
- Dispersed camping along the border
- Enforcement activities along the border
- Enforcement fences along the border
- Light pollution along the border
- Altered fire regime as a result of border activities
- Unauthorized roads & trails created by illegal immigrants and smugglers
- Illegal dumping/littering along the border
- Water use/contamination from illegal immigrants and drug smugglers

Stressor Category: Changes in Ecological Processes

- Habitat fragmentation/barriers
- Habitat degradation/shrub invasions
- Streambank alteration/channelization
- Soil erosion

Stressor Category: Climate Change

- Drought
- Shift to warmer climate

Stressor Category: Consumptive use of biological resources

- Harvesting/collecting animals
- Grazing by ungulates

Stressor Category: Habitat conversion

- Rural development
- Livestock management

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Unauthorized roads & trails

Right-of-way fencing along roadways

Interior Chaparral

(2.1% of acreage)

Habitat Condition (Element 2)

This habitat is found in a few isolated pockets in the Apache Highlands South, primarily on the western edge of some mountains, and additionally as the major vegetative component of the Santa Teresa Mountains. Current condition of most of this habitat is probably poor, due to lack of low-growing plants and lack of litter. This habitat requires periodic fire to maintain biodiversity, and lack of fire has resulted in increased shrub density. In this shrub-dominated degraded stage, livestock grazing further represses restoration of grasses. There are many landowners in the Chaparral habitat; a large portion is part of the San Carlos Apache Nation, and another large piece is federal land managed by the Coronado National Forest. Other chaparral communities are private, State Trust Land, and federal lands managed by NPS (Saguaro National Park) and BLM. Currently, some natural fires are allowed to burn in Chaparral habitat, which should help to restore the community, but landscape changes will require time.

Major Stressors Affecting Habitat Type (Element 3)

Stressor Category: Changes in Ecological Processes

Habitat degradation/shrub invasions

Soil erosion

Unnatural fire regimes

Domestication of wildlife/game farming

Loss of keystone species

Habitat fragmentation/barriers

Stressor Category: Climate Change

Drought

Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Invasive species

Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Off-range recreational shooting

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Plains and Great Basin Grassland
(2% of acreage)

Habitat Condition (Element 2)

This community is found in a few isolated locations in the Apache Highlands South Ecoregion, but the value of this habitat to grassland species of wildlife is significant, particularly for pronghorn and grassland birds. Historically, this grassland was characterized by an open grassland structure with little shrub component. Although these lands have been grazed historically and are grazed currently, most are in relatively good ecological condition and still provide significant wildlife functions and values. Restoration of a natural fire regime is important to maintaining the function of these grasslands and to reducing shrub invasion. Land ownership in Plains and Great Basin Grassland is a combination of USFS, BLM, State Trust Lands, and private. The most threatened Plains and Great Basin Grassland in this ecoregion is the area around Sonoita, which is mainly private- and State-owned. Rural development here is usually ranchette-type development, where homes are scattered widely throughout the grassland. This type of development threatens wildlife habitat because of fragmentation, roads, fencing, intensive grazing on small parcels, and inability to maintain natural fire frequency. Human activities related to illegal border traffic, enforcement and recreation are impacting the wildlife habitat.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Border issues

- Enforcement activities along the border
- Dispersed camping along the border
- Enforcement fences along the border
- Illegal dumping/littering along the border
- Light pollution along the border
- Unauthorized roads & trails created by illegal immigrants and smugglers
- Altered fire regime as a result of border activities

Stressor Category: Changes in Ecological Processes

- Soil erosion
- Habitat degradation/shrub invasions
- Habitat fragmentation/barriers
- Unnatural fire regimes
- Loss of keystone species

Stressor Category: Climate Change

- Drought

Stressor Category: Consumptive use of biological resources

- Grazing by ungulates
- Harvesting/collecting animals

Stressor Category: Habitat conversion

- Rural development
- Urban growth
- Livestock management

Stressor Category: Invasive species

Disease/pathogens/parasites
Nuisance plants

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles
Unauthorized roads & trails
Right-of-way fencing along roadways

Montane Conifer Forest
(1.3% of acreage)

Habitat Condition (Element 2)

This habitat exists on the tops of the following mountains in the ecoregion: Santa Teresa, Pinaleño, Galiuro, Winchester, Chiricahua, Huachuca, Santa Rita, Rincon, and Santa Catalina. This is an important habitat type for the ecoregion because of the isolated sky island communities. Virtually all of these habitats are on public land managed by the Coronado National Forest, with the exceptions of habitat in the Huachuca Mountains managed by Fort Huachuca, in the Santa Teresas within the San Carlos Apache Nation, and in the Rincon Mountains managed by Saguaro National Park. Historically, the Montane Conifer Forest was characterized by a more open forest community. Its condition is currently considered degraded due to the lack of fire and the related high density of trees. The fire regime in this habitat type has been considerably altered by forest fire suppression and long-term livestock grazing that largely eliminated fine fuels. The unnaturally high density of trees has caused catastrophic fires and forest pest outbreaks, which have further degraded the forest. Currently, grazing pressures are being reduced by land managers, and federal agencies are starting to manage fire for resource conservation, allowing natural fire to return. However, it is expected to take many years to improve the condition of the forests, and in the interim these forest are at continued risk of catastrophic fire and disease.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Border issues

Dispersed camping along the border
Unauthorized roads & trails created by illegal immigrants and smugglers
Illegal dumping/littering along the border
Altered fire regime as a result of border activities

Stressor Category: Changes in Ecological Processes

Soil erosion
Unnatural fire regimes
Insect Infestation

Stressor Category: Climate Change

Shift to warmer climate
Drought

Stressor Category: Invasive species
Disease/pathogens/parasites

Great Basin Conifer Woodland
(0.2% of acreage)

Habitat Condition (Element 2)

Small pockets of this habitat exist in the Apache Highlands South near Aravaipa and Klondyke, between the Santa Teresa and northern Galiuro Mountains. Larger portions of this habitat exist in other ecoregions of the state. The condition of Great Basin Coniferous Woodland throughout Arizona is that it is increasing in extent at the expense of grassland and riparian habitats. This reflects the combined impacts of altered fire regimes and intensive domestic livestock use over the past 100 years. In this ecoregion, management of this habitat type would be most successful for wildlife if developed as part of the adjacent grasslands and woodlands.

This habitat type is found primarily in Apache Highlands North and Colorado Plateau, with some representation in this ecoregion. The following major stressors were assessed for this habitat type in Apache Highlands North. The important stressors listed below reflect impacts of historical land uses as well as increasing human population and pressure for outdoor recreational opportunities for people living within the ecoregion and in neighboring metropolitan Phoenix.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers
Unnatural fire regimes
Loss of keystone species
Domestication of wildlife/game farming
Habitat degradation/shrub invasions
Soil erosion

Stressor Category: Climate Change

Shift to warmer climate
Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Invasive species

Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail
Off-range recreational shooting

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Subalpine Conifer Forest
(0.05% of acreage)

Habitat Condition (Element 2)

Two small pockets of this community exist in the Apache Highlands South: a significant mountaintop in the Pinaleño Mountains and a small area in the Chiricahua Mountains. Both habitats are managed entirely by the Coronado National Forest. Because of the rarity and isolation of these mountaintops in the Apache Highlands South, these habitats are critical for conservation and for listed and sensitive species. Historically, this forest was characterized by large old fire-sensitive trees in a generally even-aged stand. The subalpine forest was insulated from fire by the surrounding lower-elevation fire-resistant mixed conifer, which historically burned regularly but not catastrophically; the mixed conifer was thinned naturally by fire, and fire did not usually invade into the wetter subalpine spruce fir forest. With the current unnaturally high tree density in mixed conifer, and the resulting high fuel loads, the subalpine conifer forest is now being lost to fire and disease. This community is critically in danger in Apache Highlands South. Natural resource agencies are working together to accomplish restoration by protecting this community from further fire and disease, but threats are still significant

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

Unnatural fire regimes
Soil erosion
Insect Infestation

Stressor Category: Climate Change

Drought
Shift to warmer climate

Stressor Category: Invasive species

Disease/pathogens/parasites

Riparian and aquatic systems in Apache Highlands South include:

Wetlands/Springs/Seeps

Habitat Condition (Element 2)

Wetlands, springs, and seeps are rare in the Apache Highlands South, and all are critical to maintain. Important wetland habitats are the San Bernardino National Wildlife Refuge, Arivaca Cienega, Whitewater Draw, and Willcox Playa. Historically, wetlands were more numerous in Apache Highlands South than today; these communities have been lost to water diversion, lowered water tables, grazing and agricultural use, dams and reservoirs, and numerous other human uses. Many natural springs have been tapped for livestock or domestic use. Those few wetlands, springs and seeps that exist today are impacted by the same historical uses and also by heavy recreational and border activities. Today the value of these wetlands is more fully

appreciated, and conservation efforts focus on wetlands. Nevertheless, functions and values are difficult to restore in places where hydrology has changed and the water table has lowered. Nonnative species have invaded and replaced native species in many wetlands. In spite of conservation efforts, restoration of wetlands, springs and seeps in Apache Highlands South will continue to be a challenge; demands for precious water resources continue to grow.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

- Groundwater depletion and springhead use
- Water diversion/water catchments
- Mining

Stressor Category: Border issues

- Disease along the border
- Altered fire regime as a result of border activities
- Dispersed camping along the border
- Enforcement activities along the border
- Illegal dumping/littering along the border
- Unauthorized roads & trails created by illegal immigrants and smugglers
- Water use/contamination from illegal immigrants and drug smugglers

Stressor Category: Changes in Ecological Processes

- Streambank alteration/channelization
- Soil erosion
- Habitat degradation/shrub invasions
- Unnatural fire regimes
- Habitat fragmentation/barriers
- Loss of keystone species
- Management for game animals and sport fish
- Altered river flow regimes

Stressor Category: Climate Change

- Shift to warmer climate
- Drought

Stressor Category: Consumptive use of biological resources

- Grazing by ungulates

Stressor Category: Habitat conversion

- Urban growth
- Dams/reservoirs/impoundments
- Livestock management
- Rural development
- Recreational sites/facilities
- Military bases, defoliation, munitions testing

Stressor Category: Invasive species

- Bait-bucket dumping/illegal stocking
- Nuisance plants
- Disease/pathogens/parasites

Hybridization

Nuisance animals

Stressor Category: Non-consumptive resource use

Battles, maneuvers, war games, military camps, guerilla insurgencies

Dispersed camping

Scientific research and collection

Motorized recreation off-trail

Stressor Category: Pollution

Heavy metals/mine tailings

Sediment/ash flows

Pesticides/herbicides

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Canals/pipelines

Unauthorized roads & trails

Streams/Rivers

Habitat Condition (Element 2)

Rivers in Apache Highlands South include the San Pedro River, a portion of the Gila River from the New Mexico border to the mouth of the San Francisco, the Babocomari River, and the Santa Cruz River from the headwater in the San Rafael Valley and in the effluent-supported perennial stretch north of Nogales. All streams are important to wildlife conservation, and include Cienega Creek, Sonoita Creek, Red Rock Canyon, Sycamore Canyon in the Pajarito Mountains, O'Donnell Creek, Leslie Canyon, and numerous mountain streams in the Pinaleños, Chiricahuas, Huachucas, Santa Catalinas, and Galiuros. Historically, rivers and streams had more water for longer periods, had higher water tables, and had greater vegetation. Water was less channelized, and flowed through slower, maintaining the water table. Historic accounts document rivers as wide valleys with grass up to the belly of a horse and water seeping and weaving through the grass. Today, many rivers are dry, downcut riverbeds, carrying water only during flood events. Water tables are far lower today than historically; perennial water and riparian vegetation cannot be supported. In spite of interagency planning efforts, Apache Highlands South continues to lose streams and rivers. July 2005 was the first time on record that zero water flow was recorded in the San Pedro River at the Charleston gaging station. It is feared that the San Pedro could dry, chiefly as a result of groundwater pumping, much as the Santa Cruz River dried in the Tucson basin. Because of the increasing human demand for water, it will be difficult to maintain existing streams and rivers or to restore historic sites.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Mining

Groundwater depletion and springhead use

Water diversion/water catchments

Stressor Category: Border issues

Altered fire regime as a result of border activities
Illegal dumping/littering along the border
Water use/contamination from illegal immigrants and drug smugglers
Unauthorized roads & trails created by illegal immigrants and smugglers
Enforcement activities along the border
Disease along the border
Dispersed camping along the border

Stressor Category: Changes in Ecological Processes

Loss of keystone species
Streambank alteration/channelization
Altered river flow regimes
Soil erosion
Management for game animals and sport fish
Unnatural fire regimes
Habitat fragmentation/barriers
Habitat degradation/shrub invasions

Stressor Category: Climate Change

Drought
Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Rural development
Livestock management
Military bases, defoliation, munitions testing
Dams/reservoirs/impoundments
Urban growth
Recreational sites/facilities

Stressor Category: Invasive species

Bait-bucket dumping/illegal stocking
Nuisance plants
Nuisance animals
Hybridization
Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Battles, maneuvers, war games, military camps, guerilla insurgencies
Scientific research and collection
Motorized recreation off-trail
Dispersed camping

Stressor Category: Pollution

Lead shot/fishing line
Nutrients/algal blooms
Heavy metals/mine tailings
Sediment/ash flows
Pesticides/herbicides

***Stressor Category:* Transportation and infrastructure**

Canals/pipelines
Unauthorized roads & trails
Roads for motorized vehicles

Lakes/Reservoirs

Habitat Condition (Element 2)

Small man-made lakes exist in the ecoregion: Patagonia Lake, Parker Canyon Lake, Peña Blanca Lake, Arivaca Lake, Riggs Lake, Frye Mesa Reservoir and Rose Canyon Lake. None of these lakes existed historically in Apache Highlands South. The lakes were created by manmade dams as water reservoirs and for sportfish recreation. Nonnative fish are managed in these lakes for sportfish recreation, and the wetland habitat is used by a variety of native wildlife species. Some nonnative species introductions have caused problems with wildlife and fish management (for example, crayfish, pike introduction into Parker Canyon Lake, bullfrog impacts to native amphibians). During drought some of these lakes have been greatly lowered.

Major Stressors Affecting Habitat (Element 3)

***Stressor Category:* Abiotic resource use**

Mining
Groundwater depletion and springhead use
Water diversion/water catchments

***Stressor Category:* Border issues**

Illegal dumping/littering along the border
Water use/contamination from illegal immigrants and drug smugglers
Unauthorized roads & trails created by illegal immigrants and smugglers
Disease along the border
Altered fire regime as a result of border activities
Enforcement activities along the border

***Stressor Category:* Changes in Ecological Processes**

Altered river flow regimes
Unnatural fire regimes
Loss of keystone species
Management for game animals and sport fish
Habitat degradation/shrub invasions
Soil erosion
Habitat fragmentation/barriers
Streambank alteration/channelization

***Stressor Category:* Climate Change**

Drought
Shift to warmer climate

***Stressor Category:* Consumptive use of biological resources**

Grazing by ungulates

***Stressor Category:* Habitat conversion**

Rural development
 Recreational sites/facilities
 Livestock management

Stressor Category: Invasive species

Disease/pathogens/parasites
 Nuisance plants
 Hybridization
 Nuisance animals
 Bait-bucket dumping/illegal stocking

Stressor Category: Non-consumptive resource use

Watercraft operation
 Motorized recreation off-trail
 Scientific research and collection

Stressor Category: Pollution

Sediment/ash flows
 Lead shot/fishing line
 Heavy metals/mine tailings
 Pesticides/herbicides

Stressor Category: Transportation and infrastructure

Dredging

Stressors that act in this ecoregion at the species- but not habitat-scale (Element 3)

In some cases, a stressor may have significant impacts to individual SGCN, but impacts are not felt throughout the habitat. Regardless of the extent of ecosystem-wide impacts, in any habitat type where these stressors act on SGCN, the appropriate conservation actions apply (see "Conservation Actions to Address Stressors to SGCN (Elements 3, 4)"). The following stressors have significant ecosystem-level impacts in some habitat types in this ecoregion, but not in all habitat types where the SGCN occur. Note that for wide-ranging species, impacts from some stressors may be quite significant, but may not act on the species throughout its range.

Stressors that rated high for these SGCN, but not in some of the habitats in Apache Highlands South in which these species occur.			
Stress Category	Stressor	Scientific Name	Common Name
Habitat conversion			
	Aquaculture		
		Kinosternon arizonense	Arizona Mud Turtle
	Wetland filling for mosquito control		
		Ardea alba	Great Egret
		Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo
		Dendrocygna autumnalis	Black-bellied Whistling-Duck
		Egretta thula	Snowy Egret
		Gastrophryne olivacea	Great Plains Narrow-mouthed Toad
		Kinosternon arizonense	Arizona Mud Turtle

Stressors that rated high for these SGCN, but not in some of the habitats in Apache Highlands South in which these species occur.			
Stress Category	Stressor	Scientific Name	Common Name
		<i>Pterohyla fodiens</i>	Lowland Burrowing Treefrog
Transportation and infrastructure			
	Railroads		
		<i>Gopherus agassizii</i> (Sonoran Population)	Sonoran Desert Tortoise
Border issues			
	Feral animals along the border		
		<i>Trogon elegans</i>	Elegant Trogon
	Poaching along the border		
		<i>Gopherus agassizii</i> (Sonoran Population)	Sonoran Desert Tortoise
		<i>Leopardus pardalis</i>	Ocelot
		<i>Panthera onca</i>	Jaguar
	Unauthorized roads & trails created for law enforcement along the border		
		<i>Gyalopion quadrangulare</i>	Thornscrub Hook-nosed Snake

ARIZONA-NEW MEXICO MOUNTAINS

As its name suggests, the Arizona-New Mexico Mountains Ecoregion includes much of the mountainous terrain in Arizona and New Mexico, as well as a small piece of Texas. It covers more than 6 million acres in Arizona and contains most of the State's conifer forests (TNC 1999). Elevation ranges from about 4000 to 12,643 feet, averaging about 7050 feet. One of the most prominent features of the ecoregion is the Mogollon Rim, an escarpment that traverses nearly 200 miles across central Arizona from just southwest of Flagstaff to the White Mountains of eastern Arizona, and which defines much of the southern edge of the ecoregion. No less dramatic are the San Francisco Peaks near Flagstaff, which may be seen from more than 100 miles away, and Mount Baldy in the White Mountains of eastern Arizona. Annual precipitation varies from 11 to 30 inches, evenly divided between summer and winter. Average temperatures vary seasonally and along elevation gradients, with all of the ecoregion receiving some snowfall.

Vegetative communities found within the Arizona-New Mexico Ecoregion range from high elevation Tundra atop the San Francisco Peaks, to the Plains and Great Basin Grassland/Desertscrub at the lowest elevations. Over half of the ecoregion is composed of Montane Conifer and Subalpine Conifer vegetative communities.

Historically, the Arizona-New Mexico Ecoregion was settled for domestic livestock ranching and small subsistence farming enterprises. Most of the private lands were homesteaded where water was available. Logging, primarily of ponderosa pine, began in the 1870s and 1880s with the harvest of railroad ties and other products primarily for construction of the transcontinental railroad. A large portion of the conifer forests are on federal lands, administered by the Coconino and Apache-Sitgreaves National Forests, as well as on lands of the White Mountain Apache Nation.

Currently, almost all of the public and State Trust lands are leased for grazing. Logging of saw timber on federal and tribal lands declined sharply in the 1990's, and has not recovered to date. Concerns over insect infestation and catastrophic wildfire events have resulted in an increased interest and planning for landscape-level removal of primarily small diameter trees to reduce fuel loads and promote forest health. Other enterprises in the area are centered on tourism and recreation.

The major urban area within the ecoregion is the City of Flagstaff in the western portion of the ecoregion, with a population of approximately 61,000. Numerous other small communities including Williams, Snowflake, Taylor, Eagar, and Springerville occur throughout the ecoregion. Show Low and Pinetop-Lakeside straddle the border between this ecoregion and Apache Highlands North. None of these communities can be considered urban although they are increasing in population as retirees, recreationists, and associated businesses move to the area.

As more people come to the area, there is an increased demand for recreational opportunity on public lands in the ecoregion. The increasing population leads to new demands on lands that were previously lightly impacted by man. Wildlands of the Arizona-New Mexico Ecoregion are used by the public for hiking, hunting, sightseeing, back-roading, birding, camping, fishing, and a whole assortment of other recreational and wildlife-oriented pursuits. Fragmentation due to roads and new urban and rural development continues to be a problem for maintaining biodiversity. Of particular concern is the increased use of off-road vehicles, which are causing increased roads and increase vehicle use in all of the wildlands of the ecoregion.

While the impacts associated with human settlement are increasing throughout the ecoregion, most of the land remains in public ownership and is expected to continue so into the foreseeable future. This factor alone will allow healthy wildlife diversity to be preserved if planning and partnering with the State, federal, and tribal landowners are maximized. Land management responsibility in the Arizona-New Mexico Ecoregion is predominantly tribal or federal with interspersed State Trust lands. The northeastern portions of the ecoregion, consisting primarily of private and State Trust lands, have a checkerboard landownership pattern that increases the challenge of planning and implementation of a cohesive land management strategy. In this portion of the ecoregion, large parcels of land are being subdivided into smaller "ranchettes," resulting in further fragmentation and loss of habitat. Preservation of wildlife habitat, particularly for grassland species and protection of critical winter range for wild ungulates through easements, land use agreements, and the acquisition of private lands should be considered as a high priority.

The Arizona-New Mexico Ecoregion contains the headwaters of the Little Colorado, Blue, Black, Gila, and Verde rivers, as well as numerous manmade impoundments. These and other aquatic systems and their associated riparian habitat support a disproportionately high number of wildlife species. Water resources are already over-allocated such that conflicts are increasing between human uses and maintenance of biological diversity. Land and water management planning will be critical to maintenance of biological diversity in the of anticipated human population growth.

For an expanded description of each habitat type and characterization of statewide threats to each, see "Statewide Condition of Arizona's Terrestrial and Riparian/Aquatic Habitat Types (Element 2)." See Appendix O for scoring of all stressors in each habitat type. The descriptions provided do not attempt to depict conditions on sovereign tribal lands. The nature of these stressors in Arizona is presented more fully under "Stressors that Impact Wildlife and Wildlife Habitats (Element 3)."

Species of Greatest Conservation Need (Element 1)

For more information on these species, see "Conservation Actions to Address Stressors to SGCN (Elements 3, 4)." A complete list of species, including those of lower conservation priority and of undetermined vulnerability status can be found in Appendix H. For some species in Table 18, this part of their distribution may not represent a key area for conservation actions.

Table 18. Tier 1a and 1b SGCN associated with each habitat type in the Arizona-New Mexico Mountain Ecoregion.

Scientific Name	Common Name	Grasslands		Woodlands/Forests						Human Dominated Landscapes*	Aquatic & Riparian				
		Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Petrans Montane Conifer Forest	Petrans Subalpine Conifer Forest	Alpine Tundra		Streams/Rivers	Wetlands/Springs	Lakes/Reservoirs		
Amphibians															
<i>Bufo microscaphus</i>	Arizona Toad	X		X	X	X	X					X	X		
<i>Rana blairi</i>	Plains Leopard Frog	X													
<i>Rana chiricahuensis</i>	Chiricahua Leopard Frog	X			X	X	X					X	X	X	
<i>Rana pipiens</i>	Northern Leopard Frog	X	X		X	X	X	X				X	X	X	
<i>Rana yavapaiensis</i>	Lowland Leopard Frog			X	X	X	X					X	X		
Birds															
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk		X	X	X	X	X	X	X	X	X	X	X	X	
<i>Aechmophorus clarkii</i>	Clark's Grebe											X	X	X	X
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow	X										X			
<i>Anthus spragueii</i>	Sprague's Pipit	X													
<i>Ardea alba</i>	Great Egret											X	X	X	X
<i>Botaurus lentiginosus</i>	American Bittern											X	X	X	X

Scientific Name	Common Name	Grasslands		Woodlands/Forests					Human Dominated landscapes*	Aquatic & Riparian			
		Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Petran Montane Conifer Forest	Petran Subalpine Conifer Forest		Alpine Tundra	Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Catostomus clarki</i>	Desert Sucker										X		
<i>Catostomus discobolus</i>	Bluehead Sucker										X		X
<i>Catostomus insignis</i>	Sonora Sucker										X		
<i>Catostomus latipinnis</i>	Flannelmouth Sucker										X		
<i>Catostomus sp.</i>	Little Colorado Sucker										X		
<i>Gila robusta</i>	Roundtail Chub										X		
<i>Lepidomeda vittata</i>	Little Colorado Spinedace										X		
<i>Oncorhynchus gilae apache</i>	Apache (Arizona) Trout										X		X
<i>Oncorhynchus gilae gilae</i>	Gila Trout										X		
<i>Rhinichthys osculus</i>	Speckled Dace										X		
<i>Tiaroga cobitis</i>	Loach Minnow										X		
Crustaceans and Mollusks													
<i>Anodonta californiensis</i>	California Floater										X	X	X
<i>Discus shimckii cockerelli</i>	Cockerell's Striate Disc (Snail)						X	X	X				
<i>Pyrgulopsis trivialis</i>	Three Forks Springsnail											X	
Mammals													
<i>Canis lupus baileyi</i>	Mexican Gray Wolf		X	X	X	X	X	X					
<i>Cynomys gunnisoni</i>	Gunnison's Prairie Dog	X	X			X	X						
<i>Euderma maculatum</i>	Spotted Bat			X			X	X			X	X	X
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat						X						
<i>Lasiurus blossevillii</i>	Western Red Bat	X	X	X	X	X	X	X			X	X	

Table 18. Tier 1a and 1b SGCN associated with each habitat type in the Arizona-New Mexico Mountain Ecoregion.

Scientific Name	Common Name	Grasslands		Woodlands/Forests						Human Dominated landscapes*	Aquatic & Riparian			
		Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Petran Montane Conifer Forest	Petran Subalpine Conifer Forest	Alpine Tundra		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs	
<i>Microtus mexicanus hualpaiensis</i>	Hualapai Mexican Vole					X	X							
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat				X	X	X				X	X	X	
<i>Ovis canadensis mexicana</i>	Desert Bighorn Sheep	X									X	X		
<i>Perognathus flavus goodpasteri</i>	Springerville Pocket Mouse	X												
<i>Sorex nanus</i>	Dwarf Shrew						X	X	X					
<i>Sorex palustris</i>	Water Shrew		X					X			X	X		
<i>Spermophilus tridecemlineatus</i>	Thirteen-lined Ground Squirrel		X						X					
<i>Zapus hudsonius luteus</i>	New Mexican Jumping Mouse										X	X		
Reptiles														
<i>Thamnophis eques megalops</i>	Northern Mexican Gartersnake										X	X	X	
<i>Thamnophis rufipunctatus</i>	Narrow-headed Gartersnake										X			

*Human-dominated landscapes here refer to agricultural areas and urban lakes. These habitat types are discussed under "Statewide Condition of Arizona's Terrestrial and Aquatic/Riparian Habitat Types," and in "Stressors to Arizona's Wildlife and Wildlife Habitat" under the stressor "Urban/rural development."

Terrestrial habitat types below are arranged in order of prevalence in this ecoregion. Where patches of uncharacteristic habitat types (not described in this section) occur in this ecoregion, conservation should reflect stressors and species identified in neighboring ecoregions.

Montane Conifer Forest
(50.7% of acreage)

Habitat Condition (Element 2)

With over 3 million acres, stretching contiguously from west of Flagstaff east to the New Mexico border, this is the largest vegetative community in the ecoregion. Ponderosa pine is the dominant

tree species, with some interspersions of Subalpine Conifer forest at higher elevations. Historically, these forests were characterized by a patchwork of stands with variable age structures, densities, and composition. Their current condition is considered degraded, largely due to homogenization of stands, dense growth, and lower species diversity. Though numerous private inholdings as well as cities and towns are interspersed throughout, most of this habitat is public land managed by the USFS, and has been subject to livestock grazing, timber harvest and the development of extensive road networks which were needed to access the timber. Catastrophic wildfire and insect infestation, exacerbated during periods of drought, are major threats to this vegetative community. Fuels reduction activities may also prove detrimental to some forest species, as tree densities and canopy closure are reduced beyond tolerance levels, or may fail to allow the return of natural fire regimes in the face of fine fuels removal by continued high levels of livestock grazing.

This habitat type is impacted by stressors from a variety of sources. Active management is currently underway to address some identified stressors as described above. However, other stressors, such as those associated with burgeoning population growth locally and in the metropolitan areas of Phoenix and Tucson will continue to increase pressure on this habitat type. Many of the restoration activities currently underway are in early stages, so it is not yet clear whether the fuels reduction activities currently being taken to address unnatural fire regimes, for example, will prove sufficient, or may themselves become stressors in the future. In this example, it is not yet known if the development of a viable industry capable of utilizing small diameter wood and offsetting the substantial cost of these treatments will come to fruition and thus make practicable the treatment of a significant portion of this habitat type. If the scale of these operations is increased as planned, economic considerations may make it difficult to protect smaller, critical habitat components.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

- Altered river flow regimes
- Unnatural fire regimes
- Streambank alteration/channelization
- Loss of keystone species
- Insect Infestation
- Management for game animals and sport fish
- Habitat degradation/shrub invasions
- Habitat fragmentation/barriers

Stressor Category: Climate Change

- Drought

Stressor Category: Consumptive use of biological resources

- Grazing by ungulates
- Forest and woodland management - consumptive use

Stressor Category: Habitat conversion

- Livestock management
- Rural development

Recreational sites/facilities

Stressor Category: Invasive species

Nuisance plants

Feral animals

Disease/pathogens/parasites

Nuisance animals

Stressor Category: Non-consumptive resource use

Dispersed camping

Motorized recreation off-trail

Stressor Category: Pollution

Highway/roadway de-icing

Illegal dumping/littering

Noise pollution

Stressor Category: Transportation and infrastructure

Power lines/wind-harnessing turbines

Roads for motorized vehicles

Unauthorized roads & trails

Great Basin Conifer Woodland

(31.7% of acreage)

Habitat Condition (Element 2)

This vegetative community is found at somewhat lower elevations than the Montane Conifer forest and typically on poorer soils at mid-elevations. Land management is primarily a mix of USFS, private and State Trust lands. This habitat type continues to degrade as tree densities continue to increase. With an increase in canopy closure, there has been a reduction in vegetative diversity including the critical browse and herbaceous vegetation components. Loss of ground cover has left many areas within this habitat type vulnerable to the effects of overland flows, and the dense canopies have become increasingly vulnerable to catastrophic fire, especially during periods of drought. This habitat type is also replacing grassland habitat types in many locales. This shift has occurred under the influences of heavy livestock grazing, unnatural fire regimes and a possible climate shift to warmer temperature. In addition, this habitat type is becoming increasingly vulnerable to fragmentation through rural development as once large tracts of land are subdivided, as wind power generation facilities are constructed, and as the network of roads continues to grow. Management of these habitats for wildlife requires balancing the needs of species dependent on the woodland type with the needs of grassland obligates in planning and prioritization of actions.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Drilling for fuels

Mining

Water diversion/water catchments

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers
Habitat degradation/shrub invasions
Management for game animals and sport fish
Soil erosion
Unnatural fire regimes
Insect Infestation
Streambank alteration/channelization

Stressor Category: Climate Change

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates
Forest and woodland management - consumptive use

Stressor Category: Habitat conversion

Livestock management
Urban growth
Rural development

Stressor Category: Invasive species

Disease/pathogens/parasites
Nuisance plants
Nuisance animals
Feral animals

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Pollution

Noise pollution
Sediment/ash flows
Illegal dumping/littering

Stressor Category: Transportation and infrastructure

Power lines/wind-harnessing turbines
Unauthorized roads & trails
Roads for motorized vehicles
Right-of-way fencing along roadways

Plains and Great Basin Grassland

(13.0% of acreage)

Habitat Condition (Element 2)

This vegetative community is found at somewhat lower elevations than Montane Conifer forest and typically on poorer soils at mid-elevations. These are the most important habitats for some of our pronghorn and other grassland species (for example, grassland birds). Land ownership is primarily a mix of USFS, private and State Trust lands. This habitat type continues to degrade in the face of impacts due to improper livestock grazing, encroachment by pinyon-juniper, and altered fire regimes. In addition, this habitat type is becoming increasingly vulnerable to fragmentation through rural development as once large tracts of land are subdivided, as wind power generation facilities are constructed, and as the network of roads continues to grow. It will

be necessary to address these threats and to restore a natural fire regime to maintain the function of these grasslands and to reduce shrub invasion.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

Soil erosion
Unnatural fire regimes
Habitat degradation/shrub invasions
Habitat fragmentation/barriers

Stressor Category: Climate Change

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles
Unauthorized roads & trails

Subalpine Conifer Forest
(2.0% of acreage)

Habitat Condition (Element 2)

The majority of this habitat type is found at higher elevations in the White Mountains and San Francisco Peaks. This community is also found in the canyons and drainages along the Mogollon Rim. It occurs interspersed with the Montane Conifer forest type at mid-elevations in canyons and on steeper, north-facing slopes of some hills where soil moisture is more abundant. These forests are currently considered degraded. Most of this habitat is public land managed by the USFS, and has been subject to fire suppression, livestock grazing, timber harvest and the development of extensive road networks, which were needed to access the timber and remain as aggravating factors. Drought-induced catastrophic wildfire and insect infestation, along with the continued loss of vegetative components such as aspen, and an increasing demand for recreational opportunities are major threats to this vegetative community.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Altered river flow regimes
Streambank alteration/channelization
Management for game animals and sport fish

- Loss of keystone species
- Insect Infestation
- Habitat fragmentation/barriers
- Stressor Category: Climate Change**
- Drought
- Stressor Category: Consumptive use of biological resources**
- Grazing by ungulates
- Stressor Category: Habitat conversion**
- Recreational sites/facilities
- Stressor Category: Invasive species**
- Nuisance plants
- Stressor Category: Non-consumptive resource use**
- Motorized recreation off-trail
- Dispersed camping
- Stressor Category: Pollution**
- Noise pollution
- Stressor Category: Transportation and infrastructure**
- Roads for motorized vehicles
- Unauthorized roads & trails

Subalpine Grasslands
(0.9% of acreage)

Habitat Condition (Element 2)

This vegetative community occurs in the White Mountains in the eastern portion of the ecoregion. Most of this habitat is public land managed by the USFS. The condition of this habitat type is considered degraded, with encroachment by woody species and some areas showing excessive utilization of herbaceous forage by grazing ungulates, low plant vigor, insufficient ground cover, and displacement of native mesic species in moist bottom areas with nonnative species such as Kentucky bluegrass. Livestock grazing has been and continues to be the dominant land use. Continued heavy grazing within areas of this habitat type is impeding recovery. Due to the open nature of the landscape, creation of unauthorized roads is also of concern along with an increasing demand for recreational opportunities.

Major Stressors Affecting Habitat (Element 3)

- Stressor Category: Abiotic resource use**
- Water diversion/water catchments
- Groundwater depletion and springhead use
- Stressor Category: Changes in Ecological Processes**
- Management for game animals and sport fish
- Habitat degradation/shrub invasions
- Loss of keystone species
- Altered river flow regimes
- Stressor Category: Climate Change**

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Rural development

Recreational sites/facilities

Livestock management

Stressor Category: Invasive species

Nuisance plants

Nuisance animals

Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Trails for foot, bike, or equine use

Unauthorized roads & trails

Interior Chaparral

(0.9% of acreage)

Habitat Condition (Element 2)

This habitat type is found primarily in Apache Highlands North, with some representation in this ecoregion. The following major stressors were assessed for this habitat type in Apache Highlands North.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers

Unnatural fire regimes

Loss of keystone species

Soil erosion

Stressor Category: Climate Change

Shift to warmer climate

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Rural development

Stressor Category: Invasive species

Nuisance animals

Nuisance plants

Stressor Category: Pollution

Contaminants from waste water and runoff

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Telephone lines/cellphone towers

Power lines/wind-harnessing turbines

Great Basin Desertscrub
(0.6% of acreage)

Habitat Condition (Element 2)

This vegetative community within the Arizona-New Mexico Mountains Ecoregion is found primarily on the sovereign nations of the Navajo and Hopi tribal lands. Elsewhere, this habitat type has established itself in areas with poorer soils and in degraded sites that were originally in the Great Basin grassland and conifer forest communities. There is a tendency for the Plains and Great Basin grassland type to convert to Desertscrub and/or Great Basin Conifer Woodlands when subjected to the combined effects of heavy livestock use, unnatural fire regimes and generalized warming of the region's climate. When the Ecoregion Workgroup evaluated stressors for the Arizona-New Mexico Mountains, the Plains and Great Basin Grassland and Great Basin Desertscrub habitat types were combined due to the interspersed nature of the two and the commonality of the threats to each.

Major Stressors Affecting Habitat (Element 3)

SEE STRESSORS UNDER "PLAINS/GREAT BASIN GRASSLAND"

Madrean Evergreen Woodland
(0.18% of acreage)

Habitat Condition (Element 2)

This vegetative community occurs in the southeast-most portion of the ecoregion, along the Blue River. This habitat is public land managed by the USFS, and has been subject to livestock grazing. Past fire suppression, exacerbated by the current drought, has contributed to a downward trend in condition and an increased risk of catastrophic fire.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

Soil erosion

Unnatural fire regimes

Stressor Category: Climate Change

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management

Alpine Tundra
(0.02% of acreage)

Habitat Condition (Element 2)

One small pocket of this vegetative community exists in Arizona, and it consists of less than 1400 acres atop the San Francisco Peaks near Flagstaff. The most important impacts on this habitat type are climate related: the shift to a warmer climate throughout the state and prevailing drought conditions. Other influences are minor but important. These include trampling by hikers, and construction of unauthorized roads and trails by summer recreational use of the Arizona Snowbowl ski lift. The trend in this habitat type is to continued loss of species and populations of rare components of the tundra. Many of these influences are being actively managed by the USFS under strict rules which lack a significant enforcement effort due to restricted funding and the remote location at which tundra is found.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Climate Change

Shift to warmer climate

Drought

Stressor Category: Non-consumptive resource use

Non-motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Unauthorized roads & trails

Riparian and aquatic habitat types in the Arizona-New Mexico Mountains include:

Wetlands/Springs/Seeps

Habitat Condition (Element 2)

Although limited within certain regions of the Arizona-New Mexico Mountains, innumerable springs and seeps occur. All are critical to maintain due to the role they play in providing key habitat components to wildlife. Although a number of these wetlands, springs, and seeps have received some protection, primarily through fencing to eliminate use by livestock and occasionally elk, others remain highly degraded and continue to be subjected to the perturbations of grazing activities, including activities within the surrounding uplands. During periods of drought, reduction in flow or complete dewatering has occurred. Stressors described below reflect resulting changes in ecological process as well as impacts related to human population growth in this ecoregion and in neighboring metropolitan Phoenix.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Water diversion/water catchments

Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Altered river flow regimes

Streambank alteration/channelization

Loss of keystone species

Unnatural fire regimes

Management for game animals and sport fish

Habitat degradation/shrub invasions

Habitat fragmentation/barriers

Stressor Category: Climate Change

Shift to warmer climate

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Harvesting/collecting animals

Stressor Category: Habitat conversion

Agricultural conversion

Rural development

Dams/reservoirs/impoundments

Livestock management

Urban growth

Stressor Category: Invasive species

Nuisance plants

Nuisance animals

Disease/pathogens/parasites

Feral animals

Stressor Category: Non-consumptive resource use

Dispersed camping

Non-motorized recreation off-trail

Motorized recreation off-trail

Stressor Category: Pollution

Nutrients/algal blooms

Sediment/ash flows

Pesticides/herbicides

Highway/roadway de-icing

Contaminants from waste water and runoff

Stressor Category: Transportation and infrastructure

Canals/pipelines

Unauthorized roads & trails

Dredging

Roads for motorized vehicles

Streams/Rivers

Habitat Condition (Element 2)

Rivers and streams in the Arizona-New Mexico Mountains include the headwaters of the Little Colorado River and most of its perennial tributaries, much of the Blue River and its tributaries, and the headwaters of the San Francisco, Black, White, and Verde rivers and their associated tributaries. All play a critical role in providing key habitat components to wildlife. Prior to European settlement of the ecoregion the rivers and streams which drained the area were largely unimpeded from their headwaters to their junction with the major rivers of which they are tributaries. Most, if not all of these streams, are now dammed or diverted throughout their course through the ecoregion. Most of this diversion has been for development of mining, municipal water supplies or agriculture. The trend in most of the ecoregion is toward more competition for the available streamflows with water rights for wildlife (including instream flows and minimum pool) and wildlife habitats considered junior to other uses (municipal supplies, agriculture, etc.).

In the remaining streams and rivers, reduced flows due to water withdrawals, lowered water tables, and drought, as well as loss of riparian vegetation and occurrence of nonnative species continue to threaten streams and rivers within this ecoregion. Although many areas remain highly degraded and continue to degrade further, recent management actions, which have included modifying grazing practices and reducing sources of sedimentation have resulted in improved habitat conditions at those locations.

The listed major stressors elucidate the complexity of the situation.

Major Stressors Affecting Habitat (Element 3)

Stressor Category:* **Abiotic resource use*

- Mining
- Groundwater depletion and springhead use
- Water diversion/water catchments

Stressor Category:* **Changes in Ecological Processes*

- Altered river flow regimes
- Habitat degradation/shrub invasions
- Loss of keystone species
- Domestication of wildlife/game farming
- Management for game animals and sport fish
- Habitat fragmentation/barriers
- Streambank alteration/channelization
- Unnatural fire regimes
- Soil erosion

Stressor Category:* **Climate Change*

- Shift to warmer climate
- Drought

Stressor Category:* **Consumptive use of biological resources*

- Grazing by ungulates

Stressor Category: Habitat conversion

- Dams/reservoirs/impoundments
- Livestock management
- Urban growth
- Rural development
- Recreational sites/facilities
- Agricultural conversion

Stressor Category: Invasive species

- Feral animals
- Bait-bucket dumping/illegal stocking
- Hybridization
- Nuisance animals
- Nuisance plants
- Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

- Motorized recreation off-trail
- Non-motorized recreation off-trail
- Dispersed camping

Stressor Category: Pollution

- Illegal dumping/littering
- Lead shot/fishing line
- Contaminants from waste water and runoff
- Highway/roadway de-icing
- Pesticides/herbicides
- Noise pollution
- Nutrients/algal blooms
- Sediment/ash flows

Stressor Category: Transportation and infrastructure

- Roads for motorized vehicles
- Unauthorized roads & trails
- Canals/pipelines
- Trails for foot, bike, or equine use

Lakes/Reservoirs

Habitat Condition (Element 2)

Numerous small man-made lakes exist in the ecoregion, including Big Lake, Crescent Lake, Lee Valley Reservoir, Nelson Reservoir, Becker Lake, River Reservoir, Tunnel Reservoir, Bunch Reservoir, Rainbow Lake, Scott Reservoir, Show Low Lake, Fool Hollow Lake, Black Canyon Lake, Willow Springs Lake, Woods Canyon Lake, Chevelon Canyon Lake, Bear Canyon Lake, Knoll Lake, Blue Ridge Reservoir, Long Lake, Tremaine Lake, Soldier Lake, Soldier Annex Lake, Kinnikinick Lake, Ashurst Lake, Mormon Lake, Upper Lake Mary and Lower Lake Mary.

The lakes and reservoirs of the ecoregion are typically augmented natural depressions or impounded streams in the associated habitat types. These augmentations have been for the

purpose of increasing domestic water supplies, providing livestock water, providing wildlife water and for recreation purposes. Many of the augmentations have been done strictly to supply water related recreation opportunity (for example, fishing and boating) and many have been constructed and maintained over the years by sportsmen's licenses and fees. The trend in condition in most of these is toward reduction in size due to concerns for dam and water control structure integrity. Competition with other uses for instream flows, water rights adjudications and other factors are limiting the number of new lakes and reservoirs being constructed in the ecoregion. Concerns for dam safety and budgetary constraints on funds for repairs/upgrades will serve to reduce the number of lakes and reservoirs in the future due to forced abandonment. Increased downstream demand for water tied to urbanization and population growth in Arizona will likely force release of impounded waters maintained by lesser water rights (in other words, for fisheries and recreation vs. city water supplies and agriculture).

Stressors described below reflect resulting changes in ecological process as well as impacts related to human population growth in this ecoregion and in neighboring metropolitan Phoenix.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use
Water diversion/water catchments

Stressor Category: Changes in Ecological Processes

Altered river flow regimes
Streambank alteration/channelization
Loss of keystone species
Habitat degradation/shrub invasions
Domestication of wildlife/game farming
Unnatural fire regimes
Management for game animals and sport fish

Stressor Category: Climate Change

Drought
Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Dams/reservoirs/impoundments
Urban growth
Agricultural conversion
Rural development
Recreational sites/facilities

Stressor Category: Invasive species

Nuisance plants
Nuisance animals
Bait-bucket dumping/illegal stocking
Disease/pathogens/parasites

Feral animals

Stressor Category: Non-consumptive resource use

- Non-motorized recreation off-trail
- Dispersed camping
- Motorized recreation off-trail
- Watercraft operation

Stressor Category: Pollution

- Highway/roadway de-icing
- Nutrients/algal blooms
- Sediment/ash flows
- Pesticides/herbicides
- Contaminants from waste water and runoff
- Heavy metals/mine tailings
- Illegal dumping/littering
- Noise pollution
- Lead shot/fishing line

Stressor Category: Transportation and infrastructure

- Dredging
- Unauthorized roads & trails
- Trails for foot, bike, or equine use
- Canals/pipelines

Stressors that do not have habitat-level impacts in this ecoregion but may have large species-level impacts on specific SGCN in this ecoregion (Element 3)

In some cases, a stressor may have significant impacts to individual SGCN, but impacts are not felt throughout the habitat. Regardless of the extent of ecosystem-wide impacts, in any habitat type where these stressors act on SGCN, the appropriate conservation actions apply (see "Conservation Actions to Address Stressors to SGCN (Elements 3, 4)"). The following stressors do not have significant ecosystem-level impacts aquatic/riparian habitats in the Arizona-New Mexico Mountains, but where they act, they will negatively affect the associated SGCN where these species occur. Note that for wide-ranging species, impacts from some stressors may be quite significant, but may not act on the species throughout its range.

Stressors that rated high for these SGCN, but not for any of the habitats in the Arizona-New Mexico Mountains in which these species occur.			
Stressor Category	Stressor	Scientific Name	Common Name
Habitat conversion			
	Wetland filling for mosquito control		
		<i>Ardea alba</i>	Great Egret
		<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo
		<i>Egretta thula</i>	Snowy Egret

COLORADO PLATEAU

The Colorado Plateau Ecoregion includes portions of Arizona, Utah, Colorado, and New Mexico. The Arizona portion covers 22.9 million acres, dominated by desertscrub and shrublands (CSE and others 2002; Tuhy and others 2002). Elevation ranges from about 1200 to 9200 feet, averaging about 5700 feet. It features extensive plains broken by sheer-walled canyons and buttes, and includes the Grand Canyon. Precipitation ranges from about 5 to 30 inches per year, with a high proportion falling in winter. Average temperatures vary seasonally and along elevation gradients, with all of the ecoregion receiving some snowfall.

Due to the high elevation of most of the ecoregion, the temperature extremes and their influence on vegetative communities can be significant. This, along with the low precipitation received in most seasons, causes very low vegetative diversity in most of the area. Many of the native grassland communities have also been converted to monotypic stands of desertscrub and woodlands. Soils are very thin and less than fertile due to lack of vegetative cover; leaching of nutrients by solar radiation, wind, and water action; and the generally low potential of sandstone substrates.

Vegetative communities at the higher elevations of the Kaibab Plateau and isolated higher elevations of the Arizona Strip consist of large conifer trees, predominantly ponderosa pine and spruce/fir forest, as well as aspen, which have been variably subjected to commercial timber harvest for the past century. Timber harvest directly removes wildlife habitat, and requires development of a significant transportation system to allow the removal of the harvest.

Historically, the Colorado Plateau Ecoregion was settled for domestic livestock ranching and small subsistence farming enterprises associated with Mormon settlement of the area. Most of the private lands were homesteaded, where water was available, by the Mormon church. Almost all of the public and state trust lands are leased for grazing.

Other enterprises in the area are centered on providing for the needs of travelers and visitors to the scenic and natural wonders that abound in the ecoregion. The ecoregion has the highest density of national parks, monuments and recreation areas of anywhere in the United States. This ecoregion contains NPS- and BLM-administered areas such as: the Grand Canyon, Lake Powell, Lake Mead, the Petrified Forest, the Wupatki ruins, Sunset Crater, Walnut Canyon, Grand Canyon-Parashant, Marble Canyon, Paria Canyon-Vermillion Cliffs. Many of these areas and additional parks, monuments, natural and wilderness areas cross state and tribal borders. Hence the NPS, BLM, and tribal governments are important partners in developing a comprehensive plan for preservation and enhancement of wildlife diversity in this ecoregion.

The Colorado Plateau Ecoregion in Arizona contains no major urban centers, but numerous rural communities. The largest population centers are Page, Fredonia, Kayenta, Window Rock, Tuba City, Winslow, and Holbrook. Neighboring communities of Kanab and St. George (Utah), Gallup (New Mexico), and Flagstaff are also exerting an influence on the ecoregion. Numerous smaller communities, mostly along the Arizona/Utah and Arizona/New Mexico state boundaries, complete the list of population centers. As human uses of the ecoregion increase, fragmentation

due to roads and new urban and rural development continues to be a problem for maintaining biodiversity. Most recent human development of the area has been restricted to the previously developed areas around existing population centers. Page, Arizona and St. George, Utah are the only examples of "urban" sprawl, with significant increases in developed area over the past 25–30 years.

As more people come to the area, there is an increased demand for recreational opportunity on public lands in the ecoregion. The increasing population leads to new demands on lands that were previously lightly impacted by man. Wildlands of the Colorado Plateau Ecoregion are used by the public for hiking, hunting, sightseeing, back-roading, birding, camping, fishing, and a whole assortment of other recreational and wildlife-oriented pursuits. Of particular concern is the increased use of off-road vehicles, which are associated with increased roads and increased vehicle use in all of the wildlands of the ecoregion.

While the impacts associated with human settlement are increasing in the ecoregion, most of the land in the Colorado Plateau Ecoregion is federally or tribally owned, and is expected to continue so into the foreseeable future. This factor will help ensure wildlife diversity in the ecoregion if planning and partnering with the federal and tribal landowners is maximized. Acquisition of lands for conservation of wildlife habitat values is less desirable or not a viable alternative in most of the ecoregion, although some limited opportunities do exist around communities in the Little Colorado River Valley.

The Colorado Plateau Ecoregion is entirely within the Colorado River watershed. Perennial tributaries to the Colorado River include the Paria and Little Colorado rivers, Tapeats, Kanab, and Havasu creeks. While the mainstem of the Colorado River is controlled by a series of dams, the tributaries are all relatively unencumbered by water control structures. Many smaller tributaries in the ecoregion are mainly intermittent. Most of the area within the ecoregion is very arid. Water for wildlife and livestock is supplemented by water developments such as guzzlers, catchments, and spring-fed tanks and troughs. Even the high elevation forests of the Kaibab Plateau, Mt Trumbull and Black Rock Mountain depend on human constructions to ensure adequate water for the needs of important wildlife species.

For an expanded description of each habitat type and characterization of statewide threats to each, see "Statewide Condition of Arizona's Terrestrial and Riparian/Aquatic Habitat Types (Element 2)." See Appendix O for scoring of all stressors in each habitat type. The descriptions provided do not attempt to depict conditions on sovereign tribal lands. The nature of these stressors in Arizona is presented more fully under "Stressors that Impact Wildlife and Wildlife Habitats (Element 3)."

Species of Greatest Conservation Need (Element 1)

For more information on these species, see "Conservation Actions to Address Stressors to SGCN (Elements 3, 4)." A complete list of species, including those of lower conservation priority and of undetermined vulnerability status can be found in Appendix I. For some species in Table 19, this part of their distribution may not represent a key area for conservation actions.

Table 19. Tier 1a and 1b SGCN associated with each habitat type in the Colorado Plateau Ecoregion.

Scientific Name	Common Name	Desert- scrub	Grasslands		Woodlands/Forests				Human Dominated*	Aquatic & Riparian		
		Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Petran Montane Conifer Forest	Petran Subalpine Conifer Forest		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
Amphibians												
<i>Bufo microscaphus</i>	Arizona Toad	X	X		X	X				X	X	
<i>Rana onca</i>	Relict Leopard Frog	X								X	X	
<i>Rana pipiens</i>	Northern Leopard Frog	X	X			X				X	X	X
Birds												
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk			X	X	X	X	X		X	X	X
<i>Aechmophorus clarkii</i>	Clark's Grebe								X	X	X	X
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow		X						X			
<i>Anthus spragueii</i>	Sprague's Pipit		X									
<i>Ardea alba</i>	Great Egret								X	X	X	X
<i>Botaurus lentiginosus</i>	American Bittern								X	X	X	X
<i>Buteo regalis</i>	Ferruginous Hawk		X	X		X			X			
<i>Catharus ustulatus</i>	Swainson's Thrush	X		X		X	X	X	X	X	X	
<i>Ceryle alcyon</i>	Belted Kingfisher								X	X	X	X
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover								X	X		X
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo					X			X	X	X	X
<i>Contopus cooperi</i>	Olive-sided Flycatcher	X	X	X	X	X	X	X	X	X	X	X
<i>Dumetella carolinensis</i>	Gray Catbird								X	X	X	X
<i>Egretta thula</i>	Snowy Egret								X	X	X	X
<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher					X			X	X	X	X

Scientific Name	Common Name	Desert- scrub	Grasslands		Woodlands/Forests				Human Dominated*	Aquatic & Riparian		
			Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Petrans Montane Conifer Forest	Petrans Subalpine Conifer Forest		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow									X		
<i>Rhinichthys osculus</i>	Speckled Dace									X		
<i>Xyrauchen texanus</i>	Razorback Sucker									X		
Crustaceans & Mollusks												
<i>Anodonta californiensis</i>	California Floater									X	X	X
<i>Oreohelix yavapai cummingsi</i>			X				X					
<i>Oxyloma haydeni haydeni</i>	Niobrara Ambersnail		X			X						
<i>Oxyloma haydeni kanabensis</i>	Kanab Ambersnail	X	X									
Mammals												
<i>Ammospermophilus leucurus tersus</i>	Prospect Valley White-tailed Antelope Squirrel	X										
<i>Choeronycteris mexicana</i>	Mexican Long- tongued Bat		X									
<i>Cynomys gunnisoni</i>	Gunnison's Prairie Dog		X			X	X					
<i>Dipodomys microps leucotis</i>	Houserock Valley Chisel- toothed Kangaroo Rat		X									
<i>Euderma maculatum</i>	Spotted Bat	X	X	X	X	X	X	X		X	X	X
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat	X	X		X	X	X	X				X
<i>Lasiurus blossevillii</i>	Western Red Bat	X	X			X	X			X	X	
<i>Macrotus californicus</i>	California Leaf- nosed Bat	X										
<i>Microtus mexicanus hualpaiensis</i>	Hualapai Mexican Vole					X	X					
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat	X	X	X	X	X	X	X		X	X	X

Table 19. Tier 1a and 1b SGCN associated with each habitat type in the Colorado Plateau Ecoregion.

Scientific Name	Common Name	Desert- scrub	Grasslands		Woodlands/Forests				Human Dominated*	Aquatic & Riparian		
			Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Petrane Montane Conifer Forest	Petrane Subalpine Conifer Forest		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Perognathus flavus goodpasteri</i>	Springerville Pocket Mouse		X									
<i>Sorex nanus</i>	Dwarf Shrew			X			X	X				
Reptiles												
<i>Gopherus agassizii</i> (Mohave Population)	Mohave Desert Tortoise	X	X									
<i>Lampropeltis triangulum taylori</i>	Utah Milksnake		X				X					

*Human-dominated landscapes here refer to agricultural areas and urban lakes. These habitat types are discussed under "Statewide Condition of Arizona's Terrestrial and Aquatic/Riparian Habitat Types," and in "Stressors to Arizona's Wildlife and Wildlife Habitat" under the stressor "Urban/rural development."

Terrestrial habitat types below are arranged in order of prevalence in this ecoregion. Where patches of uncharacteristic habitat types (not described in this section) occur in this ecoregion, conservation should reflect stressors and species identified in neighboring ecoregions.

Plains and Great Basin Grasslands
 (34.9% of acreage)

Habitat Condition (Element 2)

Prior to settlement of the region, much of this vegetative type was comprised of cool season, perennial grasses. Lightly populated by nomadic bands of the indigenous humans, the grasslands were not subject to heavy grazing by ungulates until the introduction of livestock (sheep, goats and horses) by Spanish explorers and missionaries. With the introduction of these influences, much of the native grasslands were heavily grazed to the point that conversion to shrubs and other woody species occurred (Johnson and Elson 1979, Gori and Enquist 2003, Finch 2004). There is a tendency for the Plains and Great Basin grassland type to convert to Desertscrub and/or Great Basin Conifer Woodlands when subjected to the combined effects of heavy livestock use, unnatural fire regimes and generalized warming of the region's climate (Wright Neuenschwander and Britton 1979, White 2002, Stevens and Monson 2004). Most of the middle to lower elevation basins and benchlands along major canyon systems have been converted to these two habitat types and is public land managed by the BLM and NPS. A large percentage of the ecoregion's desertscrub/grassland habitat is located on tribal lands belonging to the sovereign nations of the Navajo and Hopi tribes.

Much of the grassland type is still being heavily used by livestock and continues to degrade in vegetative diversity and coverage, with bare soil predominating in many areas of formerly productive grasslands. Major human activities associated with this change include livestock grazing, off-highway vehicle travel, rural development and urbanization of nearby population centers.

Stressors described below reflect resulting changes in ecological process as well as impacts related to a shift to a warmer climate, rural development, human population growth in this ecoregion and in metropolitan Phoenix and Tucson.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers

Habitat degradation/shrub invasions

Loss of keystone species

Unnatural fire regimes

Management for game animals and sport fish

Soil erosion

Stressor Category: Climate Change

Shift to warmer climate

Drought

Stressor Category: Consumptive use of biological resources

Harvesting/collecting animals

Grazing by ungulates

Stressor Category: Habitat conversion

Rural development

Livestock management

Stressor Category: Invasive species

Nuisance plants

Disease/pathogens/parasites

Nuisance animals

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Right-of-way fencing along roadways

Unauthorized roads & trails

Power lines/wind-harnessing turbines

Great Basin Desertscrub
(27.5% of acreage)

Habitat Condition (Element 2)

Over 50% of the ecoregion is covered by this habitat type along with Plains and Great Basin grasslands. When the Ecoregion Workgroup evaluated stressors for the Colorado Plateau, the Plains and Great Basin Grassland and Great Basin Desertscrub habitat types were combined due to the interspersed nature of the two and the commonality of the threats to each. Most of the middle to lower elevation basins and benchlands along major canyon systems are covered by these habitat types. Most of it is public land managed by the BLM and NPS, with a large percentage of the ecoregion's desertscrub/grassland habitat on the sovereign nations of the Navajo and Hopi tribes (Turner 1994b).

Much of this habitat type is present due to degradation of former Desert and Great Basin Grassland communities by heavy livestock grazing pressure over the past 150 years. Further influences include: soil loss due to wind and water erosion, invasive species effects; groundwater depletion and invasion by nonnative grass and shrub species. Mining and road development for powerlines, wind turbine farms and general off-highway vehicle use are other effects from development of the ecoregion for energy production (Stevens and Monson 2004). The condition of this habitat type is degraded and not expected to improve due to soil loss, widespread invasive species influences and a shift to a warmer climate with longer periods of drought and continued desertification of a large expanse of the ecoregion.

Stressors described below reflect resulting changes in ecological process as well as impacts related to a shift to a warmer climate, human population growth in this ecoregion and in metropolitan Phoenix and Tucson.

Major Stressors Affecting Habitat (Element 3)

See stressors under "Plains and Great Basin Grassland."

Great Basin Conifer Woodland
(30.7% of acreage)

Habitat Condition (Element 2)

Historically found only at somewhat lower elevations than the Montane Conifer forest and on poorer soils at mid-elevations, this habitat type has expanded in distribution and density predominately on public lands managed by the Kaibab National Forest, Grand Canyon National Park, Arizona State Land Department and the BLM. Significant acreage of this habitat type is also now found on Hualapai, Navajo and Hopi tribal lands as well as on neighboring privately held lands. This habitat type is replacing plains and desert grasslands vegetation in many locales. Major human activities that may be associated with the changes observed include many, if not all, of the commodity production activities in which human populations engage to ensure their continued existence. These activities include livestock grazing, timber harvest, fire suppression, introduction of nonnative species and other activities, many of which cause changes in vegetative

composition through creation of conditions which favor woody species over perennial grasses and forbs (Aro 1971, Johnson and Elson 1979, Wright and others 1979, Everett 1987, Ffolliot and Gottfried 2002, Stevens and Monson 2004). All of these are exacerbated by the influence of a shift to a warmer climate and by the current pervasive drought. Much of the vegetative diversity provided by plains and desert grasslands habitats is lost when pinyon-juniper vegetation becomes established in nearly monotypic stands. Soil erosion results from creation of bare soil under these woody species, followed by the resulting unimpeded overland flows. The effect of soil losses is conversion of the soil profile to a near permanent barren state lacking any "A" horizon, in which the bulk of plant growth takes place. Management of these habitats requires balancing the needs of species dependent on the woodland type with the needs of grassland obligates in planning and prioritization of actions.

The current trend of this habitat type is expansion in distribution and density in the face of an apparent shift to a warmer climate. Concurrently, significant portions of typical pinyon – juniper vegetation have lost the pinyon pine component to bark beetle and other insect infestations induced by drought stress. The effect has been creation of a monotypic juniper stand of reduced value to wildlife due to the loss of significant mast production (pinyon nuts). This has made the habitat type more vulnerable to treatments, and may allow conversion of these landscapes back to a grassland or shrub dominated type.

Stressors described below reflect resulting changes in ecological process as well as impacts related to human population growth in this ecoregion and in neighboring metropolitan areas.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Management for game animals and sport fish

Soil erosion

Habitat degradation/shrub invasions

Habitat fragmentation/barriers

Unnatural fire regimes

Insect Infestation

Loss of keystone species

Soil erosion

Stressor Category: Climate Change

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Harvesting/collecting animals

Stressor Category: Habitat conversion

Livestock management

Stressor Category: Invasive species

Disease/pathogens/parasites

Nuisance plants
Nuisance animals

***Stressor Category:* Non-consumptive resource use**

Motorized recreation off-trail

***Stressor Category:* Pollution**

Illegal dumping/littering

***Stressor Category:* Transportation and infrastructure**

Roads for motorized vehicles

Unauthorized roads & trails

Right-of-way fencing along roadways

Mohave Desertscrub
(3.7% of acreage)

Habitat Condition (Element 2)

This habitat type is found at the lower elevations of the far western reaches of the ecoregion in the Grand Wash and at the very bottom of the Grand Canyon in a narrow band which reaches as far east as the confluence of the Little Colorado River. It provides a diversity of habitats in the canyons which results in corresponding diversity of wildlife in the public lands managed by the NPS and BLM (Turner 1994a).

It is likely that the distribution and vegetative composition of this habitat type in this ecoregion is nearly the same as during pre-settlement times. However, the invasion of the riparian zone along the Colorado River by saltcedar and other nonnatives may be reducing the diversity of this type as native species such as blackbrush are outcompeted for water and nutrients. This conversion is likely to increase with increased fluctuation in river flow regimes leading to mortality of native species during flood stage bank scouring and removal of soil. Increased grazing pressure by nonnative herbivores, including feral horses and burros, exacerbates this effect through removal of ground cover in upland areas (Turner 1994a, Stevens and Monson 2004).

Stressors described below reflect resulting changes in ecological process as well as impacts related to a shift to a warmer climate and the effects incursions of nonnative plant and animal species.

Major Stressors Affecting Habitat (Element 3)

***Stressor Category:* Abiotic resource use**

Groundwater depletion and springhead use

Water diversion/water catchments

***Stressor Category:* Changes in Ecological Processes**

Unnatural fire regimes

Habitat fragmentation/barriers

Soil erosion

***Stressor Category:* Consumptive use of biological resources**

Grazing by ungulates

- Stressor Category: Habitat conversion**
Livestock management
- Stressor Category: Invasive species**
Nuisance plants
- Stressor Category: Non-consumptive resource use**
Motorized recreation off-trail
- Stressor Category: Pollution**
Noise pollution
- Stressor Category: Transportation and infrastructure**
Unauthorized roads & trails

Montane Conifer Forest
(2.4% of acreage)

Habitat Condition (Element 2)

The commercial forests of the ecoregion are made up of almost pure stands of ponderosa pine with some interspersions of subalpine conifer forest at higher elevations. Most of this habitat type is found on the Kaibab Plateau north and south of the Grand Canyon. This forested land is managed by the USFS and NPS. Other significant amounts are situated on the Hualapai and Navajo tribal lands. A small amount of this vegetative type is found on the tops of isolated mountains such as Mt. Trumbull, Mt. Dellenbaugh and Black Rock Mountain, managed by the Arizona Strip District of the BLM. Most of the forest type off of the Kaibab National Forest is not commercially harvested to any extent except on Mt. Trumbull, which is being managed to demonstrate the influence of various levels of forest restoration treatments through removal of varying levels of ponderosa pine overstory. The results of this experiment will help determine the direction of forest restoration treatments as a standard management practice in the Southwest pine forests. While disagreement with estimates of pre-settlement conditions exists in the academic and scientific communities, it remains obvious that the structure and makeup of the montane conifer forests is different, in many respects, from historic condition. The large, mature, "old growth" forests of the ecoregion were replaced by over-populated stands of even-age ponderosa pine due to heavy commercial logging and associated fire suppression activities. Heavy fuel loads have caused stand replacement fires in large wildfire events over the past 25 – 30 years. Due to the large scale of the area involved, efforts to combat the effects of unnatural fire regimes have been largely confined to the urban interface to protect housing and other human development. Road building, dispersed recreation and use of the forest understory for livestock grazing also has had negative influence on the species composition and distribution of vegetative communities throughout this habitat type (Pase and Brown 1994b, Friederici 2004, Stevens and Monson 2004).

The condition of this habitat type is severely degraded but with active management in place to restore condition to an indeterminate "pre-settlement" condition. The major point of departure remains achieving consensus on what this condition was.

Stressors described below reflect resulting changes in ecological process as well as impacts related to human population growth in this ecoregion and in metropolitan areas of the state.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

- Insect Infestation
- Soil erosion
- Habitat fragmentation/barriers
- Habitat degradation/shrub invasions
- Unnatural fire regimes
- Management for game animals and sport fish

Stressor Category: Climate Change

- Drought
- Shift to warmer climate

Stressor Category: Consumptive use of biological resources

- Grazing by ungulates
- Forest and woodland management - consumptive use

Stressor Category: Habitat conversion

- Forest and woodland management - habitat conversion
- Livestock management
- Rural development
- Recreational sites/facilities

Stressor Category: Invasive species

- Nuisance plants
- Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

- Dispersed camping
- Motorized recreation off-trail

Stressor Category: Pollution

- Noise pollution
- Lead shot/fishing line

Stressor Category: Transportation and infrastructure

- Roads for motorized vehicles
- Unauthorized roads & trails
- Air traffic corridors/overflights
- Right-of-way fencing along roadways

Subalpine Conifer Forest
(0.6% of acreage)

Habitat Condition (Element 2)

The majority of this habitat type is found at the higher elevations of the North Kaibab Plateau and is interspersed with the Montane Conifer forest type at mid-elevations in canyons and on north-facing slopes of some hills. Small pockets of this type also exist on isolated mountains such as Mt Trumbull, Mt. Dellenbaugh and Black Rock Mountain on the Arizona Strip. Most of this habitat is public land managed by the Kaibab National Forest, Grand Canyon National Park,

and Arizona Strip District of the BLM. Much of this type, mostly on the North Kaibab plateau, has been heavily logged. The general condition of this habitat type is currently degraded. Much of it has failed to return to former vegetative composition and function due to loss of soil moisture and temperature increases wrought by overstory removal. Significant shifts in composition of many guilds and species have occurred (Pase and Brown 1994b, Stevens and Monson 2004).

The large, mature, "old growth" mixed conifer forests of the ecoregion were replaced, in many locations, by over-populated stands of even-age ponderosa pine due to heavy commercial logging, silvicultural treatments (eg. tree planting) and associated fire suppression activities. Heavy fuel loads have caused stand replacement fires in large wildfire events over the past 25 – 30 years. Road building, dispersed recreation and use of the forest understory for livestock grazing also has had negative influence on the species composition and distribution of vegetative communities throughout this habitat type. The overall general condition of this habitat type is degraded but with active management, expected to have some effect in the foreseeable future.

Stressors described below reflect resulting changes in ecological process as well as impacts related to a shift to a warmer climate and increased dependency of an increasing human population on the area for recreation as well as commodity needs.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers
Insect Infestation
Soil erosion
Unnatural fire regimes
Management for game animals and sport fish
Soil erosion

Stressor Category: Climate Change

Shift to warmer climate
Drought

Stressor Category: Consumptive use of biological resources

Forest and woodland management - consumptive use
Grazing by ungulates

Stressor Category: Habitat conversion

Forest and woodland management - habitat conversion
Livestock management

Stressor Category: Invasive species

Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Air traffic corridors/overflights
Unauthorized roads & trails

Roads for motorized vehicles

Interior Chaparral
(0.05% of total acreage)

Habitat Condition (Element 2)

This habitat type is found in neighboring parts of the Mohave Desert Ecoregion, with some representation in this ecoregion. The following major stressors were assessed for this habitat type in the Mohave Desert Ecoregion.

Major Stressors Affecting Habitat (Element 3)

- Stressor Category: Abiotic resource use**
 - Groundwater depletion and springhead use
 - Mining
- Stressor Category: Changes in Ecological Processes**
 - Soil erosion
 - Habitat degradation/shrub invasions
 - Unnatural fire regimes
- Stressor Category: Climate Change**
 - Drought
- Stressor Category: Consumptive use of biological resources**
 - Grazing by ungulates
- Stressor Category: Habitat conversion**
 - Livestock management
 - Rural development
- Stressor Category: Invasive species**
 - Nuisance plants
- Stressor Category: Transportation and infrastructure**
 - Telephone lines/cellphone towers
 - Power lines/wind-harnessing turbines

Subalpine Grassland
(0.04% of total acreage)

Habitat Condition (Element 2)

This vegetative community occurs in this ecoregion only on the Kaibab Plateau north of the Grand Canyon. Most of this is public land managed by the USFS and NPS. The condition of this habitat type may be considered degraded due to decreased plant species diversity, large amounts of bare soil, and continued loss of topsoil to wind and water action; however, the physical geography of the North Kaibab plateau may cause these grasslands to express a more alpine character since they are situated in valleys and natural bowls at high elevation (8200 to 8800 feet). Plant communities are not diverse and tend more toward forbs and low shrub-like species than to the "tussock grasslands" described by Walter (1973; cited in Brown 1994). There is very little difference in the character of these grasslands from the previously heavily grazed National

Forest lands to the same vegetative type found on Grand Canyon National Park, an area supposedly lightly grazed in the past.

Historically very heavy livestock grazing has been the dominant land use. Continued heavy grazing by both livestock and wildlife (mule deer, elk) within areas of this habitat type may be impeding recovery. Encroachment on the Subalpine grassland by conifers, a result of heavy grazing, lowered water tables and increased average temperatures, serves to reduce the total amount of "meadow" habitat when over-story tree species proliferate (White 2002, Stevens and Monson 2002, Pase and Brown 1982).

Due to the open nature of the landscape, creation of unauthorized roads, along with the increasing demand for recreational opportunities, is also of concern due to the loss of vegetation and compaction of soil which results when the open "meadow" habitats are used for dispersed camping and off-highway vehicle "romping".

Stressors described below reflect resulting changes in ecological process as well as impacts related to a shift to a warmer climate and increased dependency of an increasing human population on the area for recreation as well as commodity needs.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

- Unnatural fire regimes
- Soil erosion
- Management for game animals and sport fish
- Habitat fragmentation/barriers

Stressor Category: Climate Change

- Shift to warmer climate

Stressor Category: Consumptive use of biological resources

- Grazing by ungulates

Stressor Category: Habitat conversion

- Livestock management

Stressor Category: Transportation and infrastructure

- Roads for motorized vehicles

Riparian and aquatic systems in the Colorado Plateau include:

Wetlands/Springs/Seeps

Habitat Condition (Element 2)

Wetlands, springs, and seeps are rare features in the Colorado Plateau, and all are critical to maintain. Few major wetlands exist in the ecoregion. There are innumerable springs and seeps associated with the major canyon systems. Many of these are habitat for distinct populations of invertebrates (for example: springsnails and ambersnails) and plants which are federally listed.

Prior to settlement of the ecoregion by contemporary civilizations the springs and wetlands of the Colorado Plateau were largely undeveloped except those that had been discovered and utilized by prehistoric indigenous peoples to support their agriculture. Most of these known waters were centers of their cultures and when they abandoned them the waters reverted largely to their original condition. Settlers found and used these waters for the same purposes as the native cultures. The water sources eventually became the centers of contemporary cultures. In this respect most were impacted by human "development" prior to European settlement of the area. Natural conditions likely included small wetlands and riparian areas in short reaches of the drainages in which the springs and seeps occurred. Many of these are centers of human development to this day. Most have been significantly degraded in species diversity and/or impacted by introduction of nonnative plant and animal species. Modern impacts to these areas are largely associated with burgeoning human development and recreation activities (White 2002, Stevens and Monson 2004).

Stressors described below reflect resulting changes in ecological process as well as impacts related to a trend toward a warmer climate, continued dependence on the waters of the ecoregion for supplying the needs of a growing human population in this ecoregion and in the metropolitan areas of Arizona.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use
Water diversion/water catchments
Mining

Stressor Category: Changes in Ecological Processes

Streambank alteration/channelization
Soil erosion
Habitat fragmentation/barriers
Habitat degradation/shrub invasions

Stressor Category: Climate Change

Drought
Shift to warmer climate

Stressor Category: Habitat conversion

Livestock management

Stressor Category: Invasive species

Nuisance animals
Disease/pathogens/parasites
Nuisance plants
Bait-bucket dumping/illegal stocking

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Pollution

Lead shot/fishing line

Stressor Category: Transportation and infrastructure

Canals/pipelines
Unauthorized roads & trails

Streams/Rivers

Habitat Condition (Element 2)

Rivers in the Colorado Plateau ecoregion include the Colorado River and its tributaries the Little Colorado River, Paria River and Kanab Creek. Other creeks and washes are mainly intermittent watercourses which run water only periodically. Prior to settlement of the ecoregion by contemporary civilizations the streams and rivers of the Colorado Plateau were largely undeveloped except those that had been discovered and utilized by the prehistoric indigenous peoples to support their agriculture. Most of these known waters were centers of their cultures and when they abandoned them the waters reverted largely to their original condition. European settlers found and used these waters for the same purposes as the native cultures. The water sources eventually became the centers of contemporary cultures. In this respect most were impacted by human "development" prior to European settlement of the area. Natural conditions likely included small riparian zones along short reaches of the drainages downstream from the sources and watersheds of higher elevations. Many of the accessible riparian zones are centers of human development to this day. Most have been significantly degraded in species diversity and/or impacted by introduction of nonnative plant and animal species. Modern impacts to these areas are largely associated with burgeoning human development and unrestricted recreation activities. The likelihood that the impacts will be mitigated in the near future is very low. However, the long range outlook for mitigation of impacts is fairly optimistic due to technological advances in hydro-electric generators, water column variable intakes, tempering valves, etc. The remainder of the streams will likely remain pretty much as they are or could possibly be improved by restoration of watershed condition of the surrounding uplands.

Stressors described below reflect resulting changes in ecological process as well as impacts related to a trend to a warmer climate and an increased dependence of the human population on resources supplied by this ecoregion.

Major Stressors Affecting Habitat (Element 3)

Stressor Category:* **Abiotic resource use*

Mining
Groundwater depletion and springhead use
Water diversion/water catchments

Stressor Category:* **Changes in Ecological Processes*

Streambank alteration/channelization
Soil erosion
Habitat degradation/shrub invasions
Habitat fragmentation/barriers
Altered river flow regimes

Stressor Category:* **Climate Change*

Drought

Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management

Dams/reservoirs/impoundments

Recreational sites/facilities

Stressor Category: Invasive species

Nuisance plants

Bait-bucket dumping/illegal stocking

Nuisance animals

Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Scientific research and collection

Motorized recreation off-trail

Watercraft operation

Stressor Category: Pollution

Heavy metals/mine tailings

Pesticides/herbicides

Sediment/ash flows

Contaminants from waste water and runoff

Lead shot/fishing line

Nutrients/algal blooms

Stressor Category: Transportation and infrastructure

Canals/pipelines

Unauthorized roads & trails

Lakes/Reservoirs

Habitat Condition (Element 2)

Portions of large man-made lakes including Lake Powell and Lake Mead exist in the ecoregion. These lakes are important for sport fishing and other water-based recreation. Additionally, these flood-control impoundments significantly influence the flows, sediment transport, water quality, and wildlife habitat characteristics of the Colorado River. All lakes and reservoirs of the ecoregion were created by impoundment of major river systems. When the waters were impounded to form these large bodies of water significant changes were wrought in the river systems impounded. Complete loss of natural flow, temperature and nutrient cycling regimes occurred with associated influences on native wildlife species. This was compounded in most instances by the introduction of nonnative fish, crustacean, and amphibian species for sport fish production. Unnatural conditions were created on the streambanks with invasive nonnative plant species such as salt cedar prevailing. The likelihood that the impacts will be mitigated in the near future is very low. However, the long range outlook for mitigation of impacts is fairly optimistic due to technological advances in hydro-electric generators, water column variable intakes, tempering valves, etc.

Stressors described below reflect resulting changes in ecological process as well as impacts related to human population growth in this ecoregion and in neighboring metropolitan Phoenix.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use
Water diversion/water catchments
Mining

Stressor Category: Changes in Ecological Processes

Soil erosion
Habitat degradation/shrub invasions
Altered river flow regimes
Soil erosion

Stressor Category: Climate Change

Drought
Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Invasive species

Bait-bucket dumping/illegal stocking
Disease/pathogens/parasites
Nuisance animals
Nuisance plants

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail
Watercraft operation

Stressor Category: Pollution

Lead shot/fishing line
Contaminants from waste water and runoff
Nutrients/algal blooms
Pesticides/herbicides
Heavy metals/mine tailings

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Stressors that do not have habitat-level impacts in this ecoregion but may have large species-level impacts on specific SGCN in this ecoregion (Element 3)

In some cases, a stressor may have significant impacts to individual SGCN, but impacts are not felt throughout the habitat. Regardless of the extent of ecosystem-wide impacts, in any habitat type where these stressors act on SGCN, the appropriate conservation actions apply (see "Conservation Actions to Address Stressors to SGCN (Elements 3, 4)"). The following stressors do not have significant ecosystem-level impacts any habitat type in this ecoregion, but where they act, they will negatively affect the associated SGCN in habitat types on the Colorado

Plateau where these species occur. Note that for wide-ranging species, impacts from some stressors may be quite significant, but may not act on the species throughout its range.

Stressor Category	Stressor	Scientific Name	Common Name
Habitat conversion			
	Wetland filling for mosquito control		
		<i>Ardea alba</i>	Great Egret
		<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo
		<i>Egretta thula</i>	Snowy Egret
Transportation and infrastructure			
	Railroads		
		<i>Gopherus agassizii</i> (Mohave Population)	Mohave Desert Tortoise

MOHAVE DESERT

The Mohave Desert Ecoregion is a transitional region situated between the higher and cooler Great Basin Desert to the north and the warmer Sonoran Desert to the south (Lowe 1985). Arizona contains only the eastern edge of the Mohave Desert Ecoregion, with the remainder in California, Nevada, and Utah. Located in the northwest corner of the State, Arizona's portion of the Mohave Desert covers 3.2 million acres and is dominated by Mohave Desertscrub. This habitat type is intermediate between the Great Basin Desertscrub and the Sonoran Desertscrub habitats. Upper and lower Sonoran habitat types are found along the southwestern border of the ecoregion. It is difficult to distinguish between the Sonoran Desertscrub and the Mohave Desertscrub, since many plant species from both habitat types are present in the southern portion of the ecoregion. Five other habitat types are found in the ecoregion, and are typically associated with mountain ranges and higher elevation basins. The primary mountain ranges of the ecoregion are the Virgin, Black, Cerbat, and Mohave.

Elevation ranges from about 450 to over 8000 feet, averaging 2770 feet. This ecoregion features Basin and Range topography, with broad valleys separated by rugged mountain ranges. Precipitation ranges from about 5 to 11 inches per year, with slightly more winter than summer precipitation.

The Colorado and Virgin rivers are the primary river systems in the ecoregion. The Colorado River has been modified over most of its length with the creation of lakes Mead, Mohave, and Havasu. Recreation activities in the form of boating, fishing, and other water-sports, is prevalent along this entire reach of the Colorado River, especially from Southern California and surrounding population centers. Recreation related impacts are increasing in these areas. Recreation sites/facilities see a tremendous amount of use by boaters and people with personal watercraft. Annual visitation to Lake Mead National Recreation Area, which includes Lake Mead and Lake Mohave, is estimated to be 9 to 10 million visitors. Recreational use is sufficiently high that recreational carrying capacities have been evaluated for these reservoirs (*Lake Mead National Recreation Area General Management Plan* (NPS 1986). Dispersed Camping is allowed along the shores of these reservoirs and provides serious threats to shoreline

habitats and species thorough disturbance and destruction of vegetation. Historically, the Colorado River and its associated wetlands, flood plains, and riparian forests, provided habitat for a diverse array of wildlife species and native fish in this otherwise dry habitat. With the exception of the Havasu National Wildlife Refuge, few of these habitats still exist. The Virgin River and the surrounding riparian zone, which bisect the extreme northwest corner of the ecoregion, are also experiencing an increase in recreational pressures from the growing population centers of St. George, Utah and Mesquite, Nevada.

Land ownership is a mixture of federal, state, and private. Private land is primarily checkerboarded with BLM land, although large blocks are present in the Sacramento Valley and on the south side of the Black Mountains. The entire length of the Colorado River north of Bullhead City is contained within the Lake Mead National Recreation Area. Havasu National Wildlife Refuge, which is administered by the USFWS, has a large section of land north of Lake Havasu City along the Colorado River. Small parcels of State Trust land are scattered throughout the ecoregion.

Mining and livestock grazing were historically the primary land uses in the area. This pattern of land use has continued through today. Rich veins of gold, silver, and copper brought many settlers into the region during the latter half of the 19th century. Although there are currently not many active mines, numerous abandoned mines and mining claims are scattered throughout all of the mountain ranges. Livestock grazing is common in the higher precipitation areas, which are typically in the foothills, higher basins and the mountain ranges. Grazing is not common in the hotter low elevation desert but may occur when there is an abundance of ephemeral vegetation following good winter rains.

Over the past few decades, the impact of these historical land uses on wildlife has receded in importance as the ecoregion has experienced explosive growth of human population centers. The attraction of this area lies in its mild winter temperatures and close proximity to recreational opportunities along the Colorado River. Major communities in the ecoregion include Lake Havasu City, Bullhead City, Fort Mohave, Golden Valley, Littlefield, and Dolan Springs. This region is also expected to see increased suburban growth from Las Vegas, Nevada when the Hoover Dam bypass is completed (scheduled for 2008) making commuter traffic viable. Over the past decade, this has been the fastest growing region in Arizona, with a growth rate that is over 3 times the national average (U.S. Census Bureau 2005). Over 160,000 homes have been proposed for construction by developers in Mohave County. If this proposed growth is realized, nearly 400,000 residents would be added to the region making this the third largest urban center in Arizona. Road building and motorized recreation, both of which are associated with increasing urban and rural growth, are causing significant impacts to wildlife and habitat in the region.

Off highway vehicle use and uncontrolled recreation traffic represent some of the greatest threats to sensitive elements of the ecoregion such as the desert tortoise and other reptile, amphibian and small mammal populations. North of the Colorado River, the Mohave population of desert tortoise is protected under a recovery plan that contains Desert Wildlife Management Areas (DWMA's) administered by the BLM Arizona Strip District. Stipulations in this plan affect livestock grazing, recreation and development throughout this area. Additional protection from

these impacts is provided by the designation of the Beaver Dam Mountains, Paiute and Grand Wash Cliffs as part of the National Wilderness Preservation System. The BLM administers these areas. Unauthorized roads and trails are a serious threat in the southern portion of the ecoregion. Offroad recreational use is increasing and many people travel from adjoining states to participate in these activities. Lowland bajadas near Lake Havasu City and Bullhead City are experiencing some of the most serious impacts.

For an expanded description of each habitat type and characterization of statewide threats to each, see "Statewide Condition of Arizona's Terrestrial and Riparian/Aquatic Habitat Types (Element 2)." See Appendix O for scoring of all stressors in each habitat type. The descriptions provided do not attempt to depict conditions on sovereign tribal lands. The nature of these stressors in Arizona is presented more fully under "Stressors that Impact Wildlife and Wildlife Habitats (Element 3)."

Species of Greatest Conservation Need (Element 1)

For more information on these species, see "Conservation Actions to Address Stressors to SGCN (Elements 3, 4)." A complete list of species, including those of lower conservation priority and of undetermined vulnerability status can be found in Appendix J. For some species in Table 20, this part of their distribution may not represent a key area for conservation actions.

Table 20. Tier 1a and 1b SGCN associated with each habitat type in the Mohave Desert Ecoregion.

Scientific Name	Common Name	Deserts scrub			Grass-land		Woodlands/Forests			Human-dominated Landscapes*	Aquatic & Riparian		
		Lower Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Petrain Montane Conifer Forest		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
Amphibians													
<i>Bufo microscaphus</i>	Arizona Toad			X				X			X	X	
<i>Rana onca</i>	Relict Leopard Frog			X							X	X	
<i>Rana yavapaiensis</i>	Lowland Leopard Frog			X									
Birds													
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk						X	X	X			X	
<i>Aechmophorus clarkii</i>	Clark's Grebe									X	X	X	
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow					X				X			
<i>Ardea alba</i>	Great Egret									X	X	X	
<i>Botaurus lentiginosus</i>	American Bittern									X	X	X	
<i>Buteo regalis</i>	Ferruginous Hawk				X	X				X			

Scientific Name	Common Name	Desertscrub			Grass-land		Woodlands/Forests			Human-dominated Landscapes*	Aquatic & Riparian		
		Lower Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Petrain Montane Conifer Forest		Streams/Rivers	Wetlands/Springs	Lakes/Reservoirs
<i>Buteogallus anthracinus</i>	Common Black-Hawk										X	X	X
<i>Catharus ustulatus</i>	Swainson's Thrush	X	X	X				X	X	X	X	X	X
<i>Ceryle alcyon</i>	Belted Kingfisher									X	X	X	X
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover									X	X		X
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo		X								X	X	X
<i>Contopus cooperi</i>	Olive-sided Flycatcher	X	X	X	X	X	X	X	X	X	X	X	X
<i>Dumetella carolinensis</i>	Gray Catbird										X	X	X
<i>Egretta thula</i>	Snowy Egret									X	X	X	X
<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher		X	X						X	X	X	X
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	X	X	X	X	X	X	X	X	X	X	X	X
<i>Haliaeetus leucocephalus</i>	Bald Eagle										X	X	X
<i>Laterallus jamaicensis coturnic</i>	California Black Rail										X	X	X
<i>Oreoscoptes montanus</i>	Sage Thrasher	X	X	X	X	X		X		X			
<i>Pandion haliaetus</i>	Osprey									X	X	X	X
<i>Progne subis arboricola</i>	Western Purple Martin										X		X
<i>Rallus longirostris yumanensis</i>	Yuma Clapper Rail										X	X	X
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker		X	X			X	X	X	X	X	X	X
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl							X	X				
Fishes													
<i>Agosia chrysogaster</i>	Longfin Dace										X		
<i>Catostomus clarki</i>	Desert Sucker										X		
<i>Catostomus latipinnis</i>	Flannelmouth Sucker										X		
<i>Cyprinodon macularius</i>	Desert Pupfish										X	X	
<i>Gila cypha</i>	Humpback Chub										X		
<i>Gila elegans</i>	Bonytail										X		X

Scientific Name	Common Name	Deserts scrub			Grass-land		Woodlands/Forests			Human-dominated Landscapes*	Aquatic & Riparian		
		Lower Colorado River Sonoran Desert scrub	Upland Sonoran Desert scrub	Mohave Desert scrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Petrain Montane Conifer Forest		Streams/Rivers	Wetlands/Springs	Lakes/Reservoirs
<i>Gila robusta</i>	Roundtail Chub										X		
<i>Gila seminuda</i>	Virgin Chub										X		
<i>Lepidomeda mollispinis mollispinis</i>	Virgin Spinedace										X		
<i>Plagopterus argentissimus</i>	Woundfin										X		
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow										X		
<i>Rhinichthys osculus</i>	Speckled Dace										X		
<i>Xyrauchen texanus</i>	Razorback Sucker										X		X
Crustaceans and Mollusks													
<i>Anodonta californiensis</i>	California Floater										X	X	X
<i>Pyrgulopsis bacchus</i>	Grand Wash Springsnail											X	
<i>Pyrgulopsis conica</i>	Kingman Springsnail											X	
<i>Pyrgulopsis deserta</i>	Desert Springsnail											X	
<i>Euderma maculatum</i>	Spotted Bat	X	X	X	X	X	X	X	X		X	X	X
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat	X	X	X		X	X	X	X				X
<i>Lasiurus blossevillii</i>	Western Red Bat			X							X	X	
<i>Macrotus californicus</i>	California Leaf-nosed Bat	X	X	X	X	X	X	X			X	X	
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat	X	X	X	X	X	X	X			X	X	X
Reptiles													
<i>Gopherus agassizii</i> (Mohave Population)	Mohave Desert Tortoise			X				X	X				
<i>Gopherus agassizii</i> (Sonoran Population)	Sonoran Desert Tortoise	X	X	X				X	X				
<i>Uma scoparia</i>	Mojave Fringe-toed Lizard	X		X									

*Human-dominated landscapes here refer to agricultural areas and urban lakes. These habitat types are discussed under "Statewide Condition of Arizona's Terrestrial and Aquatic/Riparian Habitat Types," and in "Stressors to Arizona's Wildlife and Wildlife Habitat" under the stressor "Urban/rural development."

Terrestrial habitat types below are arranged in order of prevalence in this ecoregion. Where patches of uncharacteristic habitat types (not described in this section) occur in this ecoregion, conservation should reflect stressors and species identified in neighboring ecoregions.

Mohave Desertscrub
(82.2% of acreage)

Habitat Condition (Element 2)

At the southern end of the ecoregion, Mohave Desertscrub intergrades with Sonoran Desertscrub making separation of the 2 types difficult. Along the bajadas and sandy plains, creosote bush is the dominant overstory plant. Co-dominants include white bursage, paper bag bush, buckwheat, and Mohave yucca. In hills and washes, Sonoran species such as Palo Verde, catclaw acacia, smoketree, and saguaro are present. The Mohave Desertscrub is rich in ephemeral plants. Cacti are also common within this zone. Hedgehog, beavertail, buckthorn cholla, and barrel cactus are common. In the northern part of this zone, the creosote bush dominated landscapes give way to blackbrush and Joshua tree dominance. One of the densest old growth stands of Joshua tree forest is found in the area between Dolan Springs and Meadview, Arizona. Plants associated with these areas include galleta grass, bush muhley, white burrobrush, ephedra, and banana yucca.

Drought is a major stressor to wildlife and wildlife habitat in this area. Rainfall is often unpredictable and some areas may go without measurable precipitation for long periods of time. Year-round grazing by livestock and feral animals (primarily burros) has altered plant composition in many areas. In particular, abundance and diversity of native grasses has been reduced with a subsequent increase in shrub density. Rural and urban development has had dramatic impacts in this region; most development in this ecoregion is occurring within the Mohave desertscrub habitat type. Purchase of land for development and speculation has increased dramatically in recent years. Developers have been buying up large tracts of land and are proposing construction of thousands of new homes within the region. The associated new road and highway construction is causing increased fragmentation of habitat. Recently, fire has caused major impacts within the region. Wildfires fueled by nonnative grasses and weeds have removed many native plant species from large areas of the Black Mountain range. Native plant communities do not appear to be recovering within these areas. The condition of this habitat type will continue to show a decreasing trend due to population growth in the region and associated human impacts.

Major Stressors Affecting Habitat (Element 3)

***Stressor Category:* Abiotic resource use**

Groundwater depletion and springhead use
Mining

***Stressor Category:* Changes in Ecological Processes**

Soil erosion
Unnatural fire regimes
Habitat fragmentation/barriers
Habitat degradation/shrub invasions
Insect Infestation

***Stressor Category:* Climate Change**

Drought

***Stressor Category:* Consumptive use of biological resources**

Grazing by ungulates

***Stressor Category:* Habitat conversion**

Urban growth

Livestock management

Rural development

***Stressor Category:* Invasive species**

Invasive plants

Feral animals

***Stressor Category:* Non-consumptive resource use**

Motorized recreation off-trail

***Stressor Category:* Transportation and infrastructure**

Telephone lines/cellphone towers

Unauthorized roads & trails

Roads for motorized vehicles

Power lines/wind-harnessing turbines

Great Basin Conifer Woodland
(5.45% of total acreage)

Habitat Condition (Element 2)

This habitat type does not comprise a significant element within the ecoregion. It occurs primarily in scattered pockets within the Black Mountains, in the Cerbat Mountains and in the Azure and Virgin mountains on the North side of the ecoregion. Grazing has changed the composition of understory vegetation in many areas primarily by reducing abundance and composition of native grasses. Drought has killed some juniper trees in fringe areas although some expansion may be occurring in wetter areas. Trends remain static for this habitat type.

Major Stressors Affecting Habitat (Element 3)

***Stressor Category:* Abiotic resource use**

Mining

Groundwater depletion and springhead use

***Stressor Category:* Changes in Ecological Processes**

Insect Infestation

Soil erosion

Unnatural fire regimes

Habitat degradation/shrub invasions

***Stressor Category:* Climate Change**

Drought

***Stressor Category:* Consumptive use of biological resources**

Grazing by ungulates

***Stressor Category:* Habitat conversion**

Livestock management

***Stressor Category:* Invasive species**

Nuisance plants

Stressor Category: Transportation and infrastructure

Telephone lines/cellphone towers

Power lines/wind-harnessing turbines

Lower Colorado River Sonoran Desertscrub

(4.8% of acreage)

Habitat Condition (Element 2)

This vegetative type reaches its most northern extent along the southwest border of the ecoregion. Vegetation is dominated by low, open stands of creosotebush and bursage. Ephemeral annuals are abundant following adequate winter rains. Other common species include desert broom, ocotillo, palo verde, and desert willow. This habitat type falls primarily within jurisdiction of the BLM and Havasu National Wildlife Refuge. A few scattered parcels of private land do occur here which are seeing development pressures due to the close proximity of Lake Havasu City. Recreational use is a major threat in this area, with the primary threat to wildlife and wildlife habitat coming from the associated illegal motorized recreation and wildcat roads. Large numbers of recreationists and winter visitors come to this area every year. Drought and overgrazing by burros are of major concern. The condition of this habitat type is in a downward trend due to human impacts associated with population growth in the area.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Mining

Stressor Category: Changes in Ecological Processes

Soil erosion

Stressor Category: Climate Change

Drought

Stressor Category: Habitat conversion

Livestock management

Urban growth

Stressor Category: Invasive species

Nuisance plants

Feral animals

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Power lines/wind-harnessing turbines

Unauthorized roads & trails

Telephone lines/cellphone towers

Semidesert Grassland
(3.7% of acreage)

Habitat Condition (Element 2)

This habitat type primarily occurs in the Hualapai Valley. It was historically dominated by perennial bunch grasses interspersed by low shrubs and bare ground. Characterized by lower precipitation than other grasslands, it is very susceptible to changes brought on by overgrazing and fire suppression. These factors have compromised the condition of these grasslands by reducing bunch grasses across the valley and contributing to their replacement with annual grasses, forbs, scrubby trees, and shrubs. In climax communities, three-awn and tobosa together with grama species are the dominant grasses. Galleta, bush muhley, fluffgrass, vine mesquite, and hairy tridens may also be present. Other common species in this zone include acacias, prickly pear cactus, cholla, and yucca. Precipitation ranges from 10 -11 inches in this zone with approximately equal portions falling in winter and summer. This habitat type has seen major downward trends due to drought and overgrazing. Native grass communities have been reduced or eliminated over most of the valley and nonnative grasses and weeds have become dominant. On the southern end of the valley near Kingman, much of the habitat has been lost to development. Many large developments are planned throughout the Southern Valley. Groundwater depletion is becoming a concern because of the exponential population growth and future population projections. This habitat type is showing a downward trend due to continued year-long grazing, nonnative plant encroachment, losses to urbanization and rural development, and associated human impacts.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers

Unnatural fire regimes

Soil erosion

Habitat degradation/shrub invasions

Stressor Category: Climate Change

Shift to warmer climate

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Urban growth

Livestock management

Rural development

Stressor Category: Invasive species

Nuisance animals

Nuisance plants

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail
Non-motorized recreation off-trail

Stressor Category: Pollution

Contaminants from waste water and runoff

Stressor Category: Transportation and infrastructure

Unauthorized roads & trails
Telephone lines/cellphone towers
Roads for motorized vehicles
Power lines/wind-harnessing turbines

Interior Chaparral
(2.4% of acreage)

Habitat Condition (Element 2)

This habitat type is present at mid to high elevations in the Hualapai, Cerbat, and Virgin mountain ranges. Shrub live oak is the dominant shrub over much of this area, but is usually in mixed stands with other shrubs such as birchleaf mountain mahogany, skunkbrush sumac, Wright's silktassel, and desert ceanothus. Historically, wildfire kept this zone in various stages of succession with variable shrub densities and abundant herbaceous vegetation in the younger stages. Fire suppression has resulted in much of this type being in older dense stands of shrubs. The condition of this habitat type is therefore considered degraded. Because of the typically rough topography and primary BLM ownership, this habitat type is not being impacted heavily by development. Grazing is common within this zone and year-long grazing is standard on many allotments. Trends within this zone are static. Fire is being utilized in adjacent areas by the BLM to improve habitat conditions for wildlife and livestock and to reduce the potential for catastrophic wildfire.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Mining
Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Soil erosion
Unnatural fire regimes
Habitat degradation/shrub invasions

Stressor Category: Climate Change

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management
Rural development

Stressor Category: Invasive species

Nuisance plants

Stressor Category: Transportation and infrastructure

Telephone lines/cellphone towers
Power lines/wind-harnessing turbines

Upland Sonoran Desertscrub
(1.3% of acreage)

Habitat Condition (Element 2)

The Upper Sonoran desertscrub is found only in a small patch at the southern end of the ecoregion. Palo Verde, mesquite, cat-claw acacia, and crucifixion thorn are the common tree species. Saguaro cactus and other succulents such as ocotillo, cholla, barrel cactus, and prickly-pear are well represented. Other common species include creosote bush, brittlebush, ratany, desert broom, and desert willow. This habitat type is in relatively intact condition. Primary threats are from increased motorized off-road recreation in the area. Illegal roads and off-trail travel are major threats. Drought is a major stressor because range conditions and wildlife populations are directly linked to annual precipitation. Future trends are expected to show a slight decline in condition due to increased human impacts and recreational damage.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use
Mining

Stressor Category: Changes in Ecological Processes

Soil erosion

Stressor Category: Climate Change

Drought

Stressor Category: Habitat conversion

Livestock management

Stressor Category: Invasive species

Nuisance plants

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Telephone lines/cellphone towers
Power lines/wind-harnessing turbines
Unauthorized roads & trails

Great Basin Desertscrub
(0.8% of acreage)

Habitat Condition (Element 2)

This habitat type occurs only in the northern portion of the ecoregion on the edges of the Virgin Mountains. The desert landscape consists mostly of scattered low shrubs. Sagebrush and shadscale dominate, with blackbrush, greasewood, and rabbitbrush common in some areas. This

is a minor component within the ecoregion and trends are static. Patches of this habitat type occur where it borders the same habitat type in the Colorado Plateau ecoregion. The following major stressors were assessed for this habitat type in the Colorado Plateau.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers

Management for game animals and sport fish

Unnatural fire regimes

Soil erosion

Loss of keystone species

Habitat degradation/shrub invasions

Stressor Category: Climate Change

Shift to warmer climate

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Harvesting/collecting animals

Stressor Category: Habitat conversion

Livestock management

Rural development

Stressor Category: Invasive species

Disease/pathogens/parasites

Nuisance plants

Nuisance animals

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Unauthorized roads & trails

Right-of-way fencing along roadways

Roads for motorized vehicles

Power lines/wind-harnessing turbines

Montane Conifer Forest
(0.1% of acreage)

Habitat Condition (Element 2)

This habitat type is only found in very small patches at the highest elevations of the Cerbat and Virgin mountains. Ponderosa pine is the dominant tree species, with stands that are generally open with scattered shrubs or herbaceous vegetation. These small patches are bordered by either interior chaparral or great basin conifer and share elements with each of these zones. This habitat type falls entirely on public lands and receives relatively few human impacts. Drought is a large

stressor in this habitat type because in this part of their range, ponderosa pines are already on the edge of their precipitation tolerance. Lack of low intensity fires in the understory and adjacent habitats also dramatically increases the risk of loss in this habitat type from catastrophic wildfires. Patches of this habitat type are similar to that found in the Colorado Plateau ecoregion. The following major stressors were assessed for this habitat type in the Colorado Plateau.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use
Mining

Stressor Category: Changes in Ecological Processes

Insect Infestation
Habitat degradation/shrub invasions
Unnatural fire regimes
Soil erosion

Stressor Category: Climate Change

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management

Stressor Category: Invasive species

Nuisance plants

Stressor Category: Transportation and infrastructure

Power lines/wind-harnessing turbines
Telephone lines/cellphone towers

Riparian and aquatic systems in the Mohave Desert Ecoregion include:

Wetlands/Springs/Seeps

Habitat Condition (Element 2)

Most of the riparian habitat in this ecoregion formerly occurred along the Colorado River corridor. Large backwaters and other marshes were common along the river due to annual flooding from snowmelt in the upper drainages. Dredging and impoundment of the river destroyed nearly all of the marshes and cottonwood galleries associated with the river. Springs and seeps are relatively common in the major mountain ranges. Many have been developed for livestock use and are currently grazed. This affects abundance and composition of native vegetation. Drought has a major effect on springs and seeps, so that many either disappear or flow duration and quantity are reduced. Groundwater depletion is also of concern due to increased demands from population growth in adjacent areas. Major efforts are underway to restore some wetland areas along the Colorado River for wildlife habitat. In general, trends are downward in this habitat type.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Mining
Water diversion/water catchments
Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers
Soil erosion
Habitat degradation/shrub invasions
Management for game animals and sport fish
Insect Infestation

Stressor Category: Climate Change

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Rural development
Livestock management
Dams/reservoirs/impoundments

Stressor Category: Invasive species

Nuisance animals
Nuisance plants
Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Non-motorized recreation off-trail

Stressor Category: Pollution

Contaminants from waste water and runoff
Lead shot/fishing line
Illegal dumping/littering

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles
Trails for foot, bike, or equine use
Telephone lines/cellphone towers
Power lines/wind-harnessing turbines

Streams/Rivers

Habitat Condition (Element 2)

The Colorado and Virgin are the major rivers within this ecoregion. The Colorado River has been severely impacted by formation of Lake Mead, Lake Mohave, and Lake Havasu. River flows and water quality have been severely impacted. Allocation of water in the system is divided among 6 Western states. Increased demands for power generation and water use have severely impacted the ability to manage water flows. Drought is a major contributor to this problem. These reservoirs and the river itself receive extremely high recreation use, which contributes to

problems from contaminants and littering. Lake Havasu City, Bullhead City, and Laughlin (Nevada) are also growing rapidly along the river. General trends are static to decreasing for this habitat element.

The Virgin River, a major tributary of the Colorado River which crosses the very northwest corner of the State, has been severely impacted in most of its course by over allocation of its waters for municipal, recreational and mining/industrial uses. The remaining flows are sporadic and seasonal flooding complicates management of water quality and in-stream flow issues. Much of the native aquatic species diversity of the watershed has been compromised by introduction of nonnative species. Most of the stream course north of the Arizona-Utah state line flows through a mixed federal-private-municipal ownership which has complicated efforts to effect recovery efforts. The outlook for improvement of condition of this stream in Arizona is improving with major interstate and inter-agency cooperative efforts underway to ensure the needs of sensitive aquatic species are considered in the management of the area's resources.

Stressors described below reflect resulting changes in ecological process as well as impacts related to a trend to a warmer climate and an increased dependence of the human population on resources supplied by this ecoregion.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Mining
Water diversion/water catchments
Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Soil erosion
Management for game animals and sport fish
Insect Infestation
Habitat degradation/shrub invasions
Streambank alteration/channelization
Habitat fragmentation/barriers
Altered river flow regimes

Stressor Category: Climate Change

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Dams/reservoirs/impoundments
Livestock management
Rural development

Stressor Category: Invasive species

Nuisance plants
Nuisance animals
Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Non-motorized recreation off-trail
Watercraft operation

Stressor Category: Pollution

Contaminants from waste water and runoff
Illegal dumping/littering

Stressor Category: Transportation and infrastructure

Trails for foot, bike, or equine use
Telephone lines/cellphone towers
Roads for motorized vehicles
Power lines/wind-harnessing turbines

Lakes/Reservoirs

Habitat Condition (Element 2)

Lakes Havasu, Mohave, and Mead are the primary reservoirs in the ecoregion. Lake Havasu was formed with the completion of Parker Dam in 1938 and is the smallest of the three reservoirs in this ecoregion. The reservoir is about 45 miles long and can store nearly 211 billion gallons of water. This water is used for generation of hydroelectric power, but the primary purpose of Lake Havasu is to provide reservoir storage for water to be pumped into the Colorado River and Central Arizona Project Aqueducts.

Created in 1953, Lake Mohave is the second largest reservoir in Arizona and backs up 67 miles of the Colorado River above Davis Dam. This reservoir was created primarily for flood regulation and water storage. Davis Dam is also used for hydroelectric generation.

Lake Mead is the largest reservoir in the United States, backing up 110 miles of the Colorado River behind Hoover Dam. Water capacity is about 28 million acre feet which is approximately 2 years of average Colorado River flow. The reservoir was originally created to control flooding along the Colorado River, provide water storage, and for hydroelectric generation.

All of these reservoirs are man-made and have had significant impact to the natural landscapes and wildlife in the ecoregion. These flood-control impoundments significantly influence the river's dynamics, including flows, sediment transport, water quality, and wildlife habitat characteristics of the Colorado River. Complete alteration of flow, temperature and nutrient cycling regimes occurred with associated impacts to native wildlife. These altered aquatic conditions shifted the dynamics of associated riparian systems as well, so that today invasive nonnative plant species such as salt cedar predominate. The likelihood that the impacts will be mitigated in the near future is very low. Rapidly expanding urban areas guarantee that demands on water stored in these reservoirs will continue to increase, except to the extent that they are offset by retirement of agricultural lands. However, the long range outlook for mitigation of impacts is fairly optimistic due to technological advances in hydro-electric generators, water column variable intakes, tempering valves, etc.

Currently, these lakes are important for sportfishing and other water-based recreation. Millions of visitors use these reservoirs annually. Ecosystem impacts from dam construction have been compounded by recreational use of the reservoirs. The largest recreational impact has come from introduction of nonnative fish, crustaceans, and amphibians. In addition, discharge and spills from boats and personal watercraft affect water quality. As the region continues to grow, pressures from recreational use are expected to increase.

Habitat and wildlife communities were changed dramatically with creation of these reservoirs. New habitats have been created along shorelines and are now providing some habitat for wildlife. The utility of these habitats is compromised however, as water levels fluctuate with user demands and drought. Increasing human activity is also negatively affecting habitat and wildlife through disturbance, destruction of habitat, and introduction and spread of nonnative plants and animals.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Water diversion/water catchments
Groundwater depletion and springhead use
Mining

Stressor Category: Changes in Ecological Processes

Streambank alteration/channelization
Habitat degradation/shrub invasions
Insect Infestation
Management for game animals and sport fish
Altered river flow regimes
Soil erosion

Stressor Category: Climate Change

Drought

Stressor Category: Habitat conversion

Dams/reservoirs/impoundments

Stressor Category: Invasive species

Nuisance plants
Nuisance animals

Stressor Category: Non-consumptive resource use

Watercraft operation

Stressor Category: Pollution

Contaminants from waste water and runoff

Stressor Category: Transportation and infrastructure

Telephone lines/cellphone towers
Power lines/wind-harnessing turbines

Stressors that do not have habitat-level impacts in this ecoregion but may have large species-level impacts on specific SGCN in this ecoregion (Element 3)

In some cases, a stressor may have significant impacts to individual SGCN, but impacts are not felt throughout the habitat. Regardless of the extent of ecosystem-wide impacts, in any habitat type where these stressors act on SGCN, the appropriate conservation actions apply (see “Conservation Actions to Address Stressors to SGCN (Elements 3, 4)”). The following stressors do not have significant ecosystem-level impacts any habitat type in this ecoregion, but where they act, they will negatively affect the associated SGCN in the habitat types in the Mohave Desert where these species occur. Note that for wide-ranging species, impacts from some stressors may be quite significant, but may not act on the species throughout its range.

Stressors that rated high for these SGCN, but not for any of the habitats in Mohave Desert in which these species occur.			
Stressor Category	Stressor	Scientific Name	Common Name
Habitat conversion			
	Wetland filling for mosquito control		
		<i>Ardea alba</i>	Great Egret
		<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo
		<i>Egretta thula</i>	Snowy Egret
Transportation and infrastructure			
	Railroads		
		<i>Gopherus agassizii</i> (Mohave Population)	Mohave Desert Tortoise
		<i>Gopherus agassizii</i> (Sonoran Population)	Sonoran Desert Tortoise

SONORAN DESERT

The Sonoran Desert Ecoregion in Arizona covers 22.3 million acres, and is dominated by desert scrub communities (Marshall and others 2000, Phillips and Comus 2000). Elevation ranges from about 70 to 5900 feet, averaging about 1350 feet. The ecoregion features Basin-and-Range topography, with broad valleys separated by rugged mountain ranges. Annual precipitation in the ecoregion ranges from about 3 to 17 inches, with slightly more annual rainfall within higher elevation inclusions of other vegetation types. Moving from east to west, total precipitation decreases and there is less influence from summer rains.

The most striking feature of this ecoregion is the cactus-dominated vegetation communities, with giant saguaros and chollas being the most conspicuous. Biodiversity of the Sonoran Desert is among the highest of any desert in the world (Phillips and Comus 2000) and can be manifested here in surprising ways. In one of the drier portions of the ecoregion, Rosenstock and others (2004) found over 200 species of native bees, one of the most diverse such communities in North America. In a review of several studies of breeding birds, Nabhan and Holdsworth (1999)

concluded that in terms of breeding bird diversity and productivity, the Sonoran Desert's riparian habitats are among the richest in all of North America.

Land ownership is primarily federal and is dominated by Barry M. Goldwater Air Force Range and Yuma Proving Grounds (Army), Cabeza Prieta and Kofa National Wildlife Refuges, the Tohono O'odham Nation, and Organ Pipe Cactus National Monument. The majority of intervening land is owned by BLM. Irrigable lands along the Colorado, Gila, and Salt Rivers and in the Phoenix and Tucson valleys are mostly private or tribal lands. Important areas along the Colorado River are managed by Imperial, Cibola, and Bill Williams National Wildlife Refuges and by BR and BLM. Large tracts of State Trust land occur near Wickenburg and Tucson, and smaller parcels are scattered in areas of BLM and private lands. USFS and the San Carlos Apache Nation own tracts on the northeast periphery of the ecoregion.

Major land uses within the Sonoran Desert Ecoregion have historically been agriculture, urban and rural settlement, livestock grazing, mining, and military training. Agriculture became established where water was available, but in recent decades has given way in many areas to urban growth. In some portions of the ecoregion, large tracts of desert remain, and plant and animal communities are relatively intact. In other portions of the ecoregion, urban development and rural sprawl have significantly impacted the wildlands. Despite the inherent lack of water within the region, urban growth continues unabated in significant portions of the relatively flat ecoregion. This is largely due to impoundment of the major surface water drainages in Arizona, and significant withdrawals from the associated groundwater basins.

The scenic desert settings and warm, sunny climate continue to make the Sonoran Desert a favored destination for relocation and retirement. Population of the counties that comprise the Sonoran Desert Ecoregion increased from 1.0 million in 1960 to 4.1 million in 2000 (US Census Bureau 2000). This 300% increase far outpaced the 62% increase recorded for the nation as a whole during the same period (US Census Bureau 2000). Continued increases will create additional direct and indirect stresses on the ecoregion.

Major urban areas are the Phoenix and Tucson metropolitan areas, both of which are rapidly expanding into previously undeveloped desert. Other communities in the ecoregion are also growing rapidly, most notably: Green Valley, Casa Grande, Marana, Sahuarita, Buckeye, Wickenburg, and the Colorado River communities of San Luis, Yuma, and Lake Havasu City.

The primary river systems and riparian areas in the Sonoran Desert Ecoregion include: the lower reaches of the Colorado, Bill Williams, Big Sandy, Santa Maria, Hassayampa, Agua Fria, Gila, Verde, Salt, Santa Cruz, and San Pedro rivers. The eastern edge of the ecoregion contains a number of river impoundment reservoirs: Lake Pleasant, Bartlett, Horsehoe, Saguaro, Canyon, Apache, Roosevelt, and San Carlos. Recreation activities in the form of boating, fishing, and other water-sports are prevalent along the Colorado River and the ecoregion's larger reservoirs. Extensive water diversion projects occur in this ecoregion: the Central Arizona Project canal, the Salt River Project network of canals in and around the Phoenix metropolitan area, and the Mohawk-Welton network of canals along the lower Gila River. Along with groundwater sources,

these projects divert surface water from the Colorado, Salt, and Gila rivers to support the ecoregion's municipal, industrial, and agricultural water needs.

The Sonoran Desert ecoregion has unique problems that result from its location along the border with Mexico. Borderlands traffic from illegal immigration and drug trafficking and the concomitant enforcement activities have caused further losses of habitat and reduction in terrestrial wildlife movement corridors. In many instances, border activities have completely converted, degraded, and fragmented wildlife habitat along the border. At the same time, the shared border also presents unique opportunities for collaboration with Mexican partners, which has resulted in benefits to wildlife on both sides of the border.

For an expanded description of each habitat type and characterization of statewide threats to each, see "Statewide Condition of Arizona's Terrestrial and Riparian/Aquatic Habitat Types (Element 2)." See Appendix O for scoring of all stressors in each habitat type. The descriptions provided do not attempt to depict conditions on sovereign tribal lands. The nature of these stressors in Arizona is presented more fully under "Stressors that Impact Wildlife and Wildlife Habitats (Element 3)."

Species of Greatest Conservation Need (Element 1)

For more information on these species, see "Conservation Actions to Address Stressors to SGCN (Elements 3, 4)." A complete list of species, including those of lower conservation priority and of undetermined vulnerability status can be found in Appendix K. For some species in Table 21, this part of their distribution may not represent a key area for conservation actions.

Table 21. Tier 1a and Tier 1b SGCN associated with each habitat type in the Sonoran Desert Ecoregion.											
Scientific Name	Common Name	Desertscrub			Grass-land	Woodlands/Forests		Human-dominated landscapes*	Aquatic/Riparian		
		Lower Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Great Basin Conifer Woodland		Streams/Rivers	Wetlands/Springs	Lakes/Reservoirs
Amphibians											
<i>Bufo microscaphus</i>	Arizona Toad	X	X	X	X				X	X	
<i>Gastrophryne olivacea</i>	Great Plains Narrow-mouthed Toad	X	X		X				X	X	
<i>Pternohyala fodiens</i>	Lowland Burrowing Treefrog	X	X						X	X	

Table 21. Tier 1a and Tier 1b SGCN associated with each habitat type in the Sonoran Desert Ecoregion.

Scientific Name	Common Name	Deserts/scrub			Grass-land	Woodlands/ Forests		Human-dominated landscapes*	Aquatic/ Riparian		
		Lower Colorado River Sonoran Deserts/scrub	Upland Sonoran Deserts/scrub	Mohave Deserts/scrub	Semidesert Grassland	Interior Chaparral	Great Basin Conifer Woodland		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Rana yavapaiensis</i>	Lowland Leopard Frog	X	X		X	X			X	X	
Birds											
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk					X	X				
<i>Aechmophorus clarkii</i>	Clark's Grebe							X	X	X	X
<i>Amazilia violiceps</i>	Violet-crowned Hummingbird							X			
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow				X			X	X	X	
<i>Anthus spragueii</i>	Sprague's Pipit							X			
<i>Ardea alba</i>	Great Egret							X	X	X	X
<i>Asturina nitida maxima</i>	Northern Gray Hawk		X					X	X	X	X
<i>Botaurus lentiginosus</i>	American Bittern							X	X	X	X
<i>Buteo regalis</i>	Ferruginous Hawk				X			X			
<i>Buteogallus anthracinus</i>	Common Black-Hawk								X	X	X
<i>Caracara cheriway</i>	Crested Caracara	X	X		X			X			
<i>Catharus ustulatus</i>	Swainson's Thrush	X	X	X			X	X	X	X	
<i>Ceryle alcyon</i>	Belted Kingfisher							X	X	X	X
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover							X	X		X
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo		X						X	X	X
<i>Contopus cooperi</i>	Olive-sided Flycatcher	X	X	X	X	X	X	X	X	X	X
<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck							X	X	X	X
<i>Dumetella carolinensis</i>	Gray Catbird								X	X	X

Scientific Name	Common Name	Desertscrub			Grass-land	Woodlands/ Forests		Human-dominated landscapes*	Aquatic/ Riparian		
		Lower Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Great Basin Conifer Woodland		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Gila elegans</i>	Bonytail								X		X
<i>Gila intermedia</i>	Gila Chub								X	X	
<i>Gila nigra</i>	Headwater Chub								X		
<i>Gila robusta</i>	Roundtail Chub							X	X		
<i>Meda fulgida</i>	Spikedace								X		
<i>Poeciliopsis occidentalis occidentalis</i>	Gila Topminnow								X	X	
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow								X		
<i>Rhinichthys osculus</i>	Speckled Dace								X		
<i>Tiaroga cobitis</i>	Loach Minnow								X		
<i>Xyrauchen texanus</i>	Razorback Sucker								X		X
Crustaceans and Mollusks											
<i>Anodonta californiensis</i>	California Floater								X	X	X
<i>Sonorella allynsmithi</i>	Squaw Peak Talussnail	X									
<i>Sonorella eremita</i>	San Xavier Talussnail		X								
<i>Sonorella papagorum</i>	Papago Talussnail		X								
<i>Tryonia quitobaquita</i>	Quitobaquito Tryonia		X								
Mammals											
<i>Antilocapra americana sonoriensis</i>	Sonoran Pronghorn	X	X								
<i>Choeronycteris mexicana</i>	Mexican Long-tongued Bat	X	X		X	X	X		X	X	
<i>Euderma maculatum</i>	Spotted Bat	X	X		X						
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat	X	X	X	X	X					X
<i>Eumops underwoodi</i>	Underwood's Mastiff Bat	X	X		X						X
<i>Lasiurus blossevillii</i>	Western Red Bat	X	X						X	X	

Table 21. Tier 1a and Tier 1b SGCN associated with each habitat type in the Sonoran Desert Ecoregion.

Scientific Name	Common Name	Deserts/scrub			Grass-land	Woodlands/ Forests		Human-dominated landscapes*	Aquatic/ Riparian		
		Lower Colorado River Sonoran Deserts/scrub	Upland Sonoran Deserts/scrub	Mohave Deserts/scrub	Semidesert Grassland	Interior Chaparral	Great Basin Conifer Woodland		Streams/Rivers	Wetlands/Springs	Lakes/Reservoirs
<i>Lasiurus xanthinus</i>	Western Yellow Bat	X	X						X	X	
<i>Leptonycteris curasoae yerbabuena</i>	Lesser Long-nosed Bat	X	X		X	X					
<i>Macrotus californicus</i>	California Leaf-nosed Bat	X	X	X	X	X			X	X	
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat	X	X		X		X		X	X	X
<i>Ovis canadensis mexicana</i>	Desert Bighorn Sheep	X	X	X	X	X			X	X	
<i>Peromyscus merriami</i>	Mesquite Mouse	X	X								
<i>Sigmodon hispidus eremicus</i>	Yuma Hispid Cotton Rat	X									
<i>Thomomys bottae subsimilis</i>	Harquahala Southern Pocket Gopher		X								
Reptiles											
<i>Aspidoscelis xanthonota</i>	Red-back Whiptail		X		X						
<i>Chionactis occipitalis klauberi</i>	Tucson Shovel-nosed Snake	X	X								
<i>Chionactis palarostris organica</i>	Organ Pipe Shovel-nosed Snake	X	X								
<i>Eumeces gilberti arizonensis</i>	Arizona Skink		X								
<i>Gopherus agassizii (Sonoran Population)</i>	Sonoran Desert Tortoise	X	X	X	X	X	X				
<i>Kinosternon arizonense</i>	Arizona Mud Turtle	X	X						X	X	X
<i>Kinosternon sonoriense longifemorale</i>	Sonoyta Mud Turtle		X							X	X
<i>Phrynosoma mcallii</i>	Flat-tailed Horned Lizard	X									
<i>Thamnophis eques megalops</i>	Northern Mexican Gartersnake								X	X	X

Table 21. Tier 1a and Tier 1b SGCN associated with each habitat type in the Sonoran Desert Ecoregion.

Scientific Name	Common Name	Deserts scrub			Grass-land	Woodlands/Forests		Human-dominated landscapes*	Aquatic/Riparian		
		Lower Colorado River Sonoran Deserts scrub	Upland Sonoran Deserts scrub	Mojave Deserts scrub	Semidesert Grassland	Interior Chaparral	Great Basin Conifer Woodland		Streams/Rivers	Wetlands/Springs	Lakes/Reservoirs
<i>Uma rufopunctata</i>	Yuman Desert Fringe-toed Lizard	X									
<i>Uma scoparia</i>	Mojave Fringe-toed Lizard	X									

*Human-dominated landscapes here refer to agricultural areas and urban lakes. These habitat types are discussed under "Statewide Condition of Arizona's Terrestrial and Aquatic/Riparian Habitat Types," and in "Stressors to Arizona's Wildlife and Wildlife Habitat" under the stressor "Urban/rural development."

Terrestrial habitat types below are arranged in order of prevalence in this ecoregion. Where patches of uncharacteristic habitat types (not described in this section) occur in this ecoregion, conservation should reflect stressors and species identified in neighboring ecoregions.

Lower Colorado River Sonoran Deserts scrub
(52.4% of acreage)

Habitat Condition (Element 2)

This habitat occurs widely across the lower elevations within the hottest and driest portion of the state, generally filling the center and western portion of the Sonoran Desert Ecoregion in Arizona. This vegetation includes significant areas around the Tucson and Phoenix metropolitan areas, specifically the Santa Cruz, Salt, and Gila basins. Lower Colorado River Sonoran Deserts scrub is typically a shrub-dominated community, with creosotebush and white bursage dominating in most areas (Brown 1982). Washes provide xeroriparian habitat, which is critical to many resident desert and migratory wildlife species for forage and cover.

In the western portion of this vegetative community, large tracts of federal land are managed by the Department of Defense (Barry M. Goldwater and Yuma Proving Grounds military ranges), USFWS (Cabeza Prieta, Kofa, and several Colorado River wildlife refuges), BLM, and NPS (Organ Pipe Cactus National Monument). The federal tracts are relatively protected, although there are impacts from military actions on the military ranges from grazing where it occurs on BLM lands, from roads and other human activities that fragment habitat, from invasion of nonnative plants and resulting wildfires, and from unauthorized roads and trails, especially from OHV vehicles and all-terrain vehicles. Along the border, many of these federal areas are currently threatened from activities of illegal immigrants, drug smuggling, and related

enforcement. If, at some time in the future, these federal lands lose their federal status (possibilities include BLM land exchanges or closure of military ranges), the threat of urban and rural development should not be overlooked. Because of significant losses of this vegetative community in the eastern portion of the Lower Colorado River Sonoran Desertscrub (see next paragraph), conservation of intact ecosystems should be a high priority on these federal land tracts. Significant tribal lands are also included in this vegetative community.

The eastern portion of this vegetative community is dominated by large tracts of private land and interspersed State Trust Land, and is greatly impacted and in many areas completely lost as wildlife habitat. The Phoenix metropolitan area was largely carved out of this vegetative community; areas northwest of Tucson and along the interstate corridors between Phoenix and Tucson and north and west of Phoenix will become largely developed over the next 10-20 years. The eastern portion of the Lower Colorado River Sonoran Desertscrub has been most heavily impacted by urban development, but also by rural development and agriculture. Even in the undeveloped areas, historic and current overgrazing and OHV use are causing significant impact to wildlife habitat. It is anticipated that impacts to the eastern portions of the Lower Colorado River Sonoran Desertscrub will increase as urban areas continue to expand; conservation here should focus on riparian areas, corridors, and community planning that will incorporate wildlife values.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Border issues

- Illegal dumping/littering along the border
- Unauthorized roads & trails created by illegal immigrants and smugglers
- Dispersed camping along the border
- Enforcement activities along the border

Stressor Category: Changes in Ecological Processes

- Soil erosion
- Habitat fragmentation/barriers
- Habitat degradation/shrub invasions

Stressor Category: Climate Change

- Drought
- Shift to warmer climate

Stressor Category: Consumptive use of biological resources

- Harvesting/collecting animals
- Grazing by ungulates
- Harvesting/collecting plants

Stressor Category: Habitat conversion

- Livestock management
- Urban growth
- Military bases, defoliation, munitions testing

Stressor Category: Invasive species

- Feral animals
- Nuisance plants

Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Pollution

Light pollution

Illegal dumping/littering

Noise pollution

Stressor Category: Transportation and infrastructure

Air traffic corridors/overflights

Right-of-way fencing along roadways

Unauthorized roads & trails

Roads for motorized vehicles

Upland Sonoran Desertscrub **(46.7% of acreage)**

Habitat Condition (Element 2)

This habitat occurs at the higher elevations of the Sonoran Desert Ecoregion, where slightly cooler temperatures and increased precipitation result in more verdant and diverse vegetation. This community abuts other ecoregions, and pockets are scattered within the Lower Colorado River Sonoran Desertscrub. Fingers of Upland extend the Sonoran Desert Ecoregion into other ecoregions, particularly surrounding the river drainages of the San Pedro, Gila, Salt, Verde, Agua Fria, Big Sandy, and Santa Cruz. In the Upland Sonoran Desertscrub, trees are less confined to drainages than in the Lower Colorado River Sonoran Desertscrub, giving this habitat a greater overall arboreal component and therefore a greater vertical and structural diversity. The most extensive community is paloverde-mixed cacti (Brown 1982). In recent years there has been an increased understanding of the importance of the ironwood tree in the Upland. Ironwood functions as a habitat modifying keystone species, exhibiting strong influences on the distribution and abundance of associated species.

In Upland, strips of riparian habitat exist along drainages with perennial or near-perennial flows. These riparian deciduous woodlands and marshlands were formerly much more extensive and their decline represents a significant loss to wildlife.

Land ownership in the Upland Sonoran Desertscrub community is mixed. Several areas of tribal lands are included, including large areas of the Tohono O'odham Nation and the San Carlos Apache Nation. Large sections are federal lands managed by the USFWS (Kofa and Cabeza Prieta NWRs), NPS (Organ Pipe Cactus National Monument and Saguaro National Park), USFS (Tonto National Forest), and BLM (including Sonoran Desert National Monument, Ironwood Forest National Monument, and Agua Fria National Monument). As in the Lower Colorado River Sonoran Desertscrub community, these federal lands are largely protected as long as they remain in federal ownership. Stressors to these federal lands include military activities, habitat fragmentation from roads and other human activities, unauthorized roads and trails, border issues, wildfires (largely from introduced nonnative grasses), overgrazing where it occurs, and feral animals (for example, impacts to the Silver Bell bighorn sheep population due to disease

outbreak from feral goats in 2004). Wildfire in this vegetative community is increasingly common, but was not so formerly. Many Upland native plants are not adapted to fire and where it occurs, type conversion to a community more similar to the Lower Colorado River Sonoran Desertscrub, augmented with nonnative grasses and forbs, is often the result. Increased pressure from recreational use, particularly unregulated OHV use, also is a threat in many places. The federal lands are increasingly important for conservation of the Upland, and ecosystem integrity and connectivity should be a high priority.

Upland Sonoran Desertscrub vegetation outside of the large federal land blocks are interspersed BLM, State Trust Land, and private lands. Here, threats are more diverse and immediate, including current and future urban and rural development, agricultural development, overgrazing, and increasing recreational pressure. The scenic deserts typical of Upland Sonoran Desertscrub are favored areas for urbanization and recreation. Around the urban centers of Phoenix and Tucson, immense areas of this habitat are being lost completely to human activity. Recreational impacts close to the urban areas are also increasing. Population pressures will continue to increase, with Arizona projected to have the second largest increase in population (108%) of any state in the nation during 2000-2030 (U.S. Census Bureau 2005; <http://www.census.gov/population/www/projections/projectionsagesex.html>).

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Border issues

Unauthorized roads & trails created by illegal immigrants and smugglers

Dispersed camping along the border

Illegal dumping/littering along the border

Enforcement activities along the border

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers

Habitat degradation/shrub invasions

Soil erosion

Stressor Category: Climate Change

Shift to warmer climate

Drought

Stressor Category: Consumptive use of biological resources

Harvesting/collecting animals

Harvesting/collecting plants

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management

Urban growth

Stressor Category: Invasive species

Nuisance plants

Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Battles, maneuvers, war games, military camps, guerilla insurgencies
Motorized recreation off-trail

Stressor Category: Pollution

Illegal dumping/littering
Light pollution
Noise pollution

Stressor Category: Transportation and infrastructure

Right-of-way fencing along roadways
Unauthorized roads & trails
Air traffic corridors/overflights
Roads for motorized vehicles

Mohave Desertscrub
(0.6% of acreage)

Habitat Condition (Element 2)

A small, remnant patch of this habitat occurs in the northern part of the ecoregion, isolated from the large expanses to the northwest. Dominant plants are creosotebush and Joshua tree. Land ownership is almost entirely State Trust with some BLM. Urban and agricultural development is almost nonexistent in these areas, but some impacts have resulted from livestock grazing. Overall, however, the ecological functions of this habitat remain intact and its condition is considered to be healthy. Its small area and isolation from other areas of Mohave Desertscrub make this patch vulnerable to loss or disturbance. Located on the southern extremity of Mohave Desertscrub distribution, it may be vulnerable to any increase of aridity through drought or warming.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

Soil erosion

Stressor Category: Climate Change

Drought
Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management

Stressor Category: Invasive species

Nuisance plants

Semidesert Grassland
(0.2% of acreage)

Habitat Condition (Element 2)

A dozen very small inclusions of Semidesert Grassland exist in the ecoregion, sometimes on isolated mountains, other times in lowland valleys. Some have suffered from overgrazing but most remain intact. Their small sizes and isolation make them particularly vulnerable to loss or disturbance. Grasslands located in valley bottoms will be particularly susceptible to urbanization as Arizona's population continues to grow.

Larger patches of this habitat type are found in neighboring Apache Highlands North and South ecoregions. The following major stressors were assessed for Upland Sonoran Desertscrub habitat that largely surrounds patches of Semidesert Grassland in the Sonoran Desert ecoregion.

Major Stressors Affecting Habitat (Element 3)

***Stressor Category:* Abiotic resource use**

Groundwater depletion and springhead use

***Stressor Category:* Border issues**

Illegal dumping/littering along the border

Enforcement activities along the border

Dispersed camping along the border

Unauthorized roads & trails created by illegal immigrants and smugglers

***Stressor Category:* Changes in Ecological Processes**

Soil erosion

Habitat fragmentation/barriers

Habitat degradation/shrub invasions

***Stressor Category:* Climate Change**

Drought

Shift to warmer climate

***Stressor Category:* Consumptive use of biological resources**

Harvesting/collecting plants

Harvesting/collecting animals

Grazing by ungulates

***Stressor Category:* Habitat conversion**

Urban growth

Livestock management

***Stressor Category:* Invasive species**

Nuisance plants

Disease/pathogens/parasites

***Stressor Category:* Non-consumptive resource use**

Battles, maneuvers, war games, military camps, guerilla insurgencies

Motorized recreation off-trail

***Stressor Category:* Pollution**

Noise pollution

Light pollution
Illegal dumping/littering

Stressor Category: Transportation and infrastructure

Unauthorized roads & trails
Right-of-way fencing along roadways
Air traffic corridors/overflights
Roads for motorized vehicles

Interior Chaparral

(0.1% of acreage)

Habitat Condition (Element 2)

At higher elevations, several small pockets of chaparral habitat add diversity to the ecoregion. They are afforded a large degree of protection by their location in rugged, remote areas and on lands administered by BLM and USFWS, and they remain largely intact. However, their small sizes and isolation from other areas of similar habitat make them particularly vulnerable to loss or disturbance. Located on the southern fringe of Interior Chaparral distribution, they may be vulnerable to any increase of aridity through drought or warming.

Larger patches of this habitat type are found in neighboring Apache Highlands North. The following major stressors were assessed for Upland Sonoran Desertscrub habitat that largely surrounds patches of Interior Chaparral in this ecoregion.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Border issues

Enforcement activities along the border
Unauthorized roads & trails created by illegal immigrants and smugglers
Dispersed camping along the border
Illegal dumping/littering along the border

Stressor Category: Changes in Ecological Processes

Habitat degradation/shrub invasions
Habitat fragmentation/barriers
Soil erosion

Stressor Category: Climate Change

Drought
Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Grazing by ungulates
Harvesting/collecting animals
Harvesting/collecting plants

Stressor Category: Habitat conversion

Urban growth

Livestock management

Stressor Category: Invasive species

Nuisance plants

Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Battles, maneuvers, war games, military camps, guerilla insurgencies

Motorized recreation off-trail

Stressor Category: Pollution

Noise pollution

Illegal dumping/littering

Light pollution

Stressor Category: Transportation and infrastructure

Unauthorized roads & trails

Right-of-way fencing along roadways

Roads for motorized vehicles

Air traffic corridors/overflights

Great Basin Conifer Woodland

(0.03% of acreage)

Habitat Condition (Element 2)

There is one small inclusion of this habitat type in the ecoregion in the Poachie Range north of Alamo Lake. It is afforded a large degree of protection by its location in a rugged, remote area and on lands administered by BLM, and it remains largely intact. However, its small size and isolation from other areas of similar habitat make it particularly vulnerable to loss or disturbance. Located on the southern extremity of Great Basin Conifer Woodland distribution, it may be vulnerable to any increase of aridity through drought or warming.

Larger patches of this habitat type are found in neighboring Apache Highlands North and in the Mohave Desert ecoregions. The following major stressors were assessed for Upland Sonoran Desertscrub habitat that largely surrounds this patch of Great Basin Conifer Woodland in this ecoregion.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Border issues

Dispersed camping along the border

Unauthorized roads & trails created by illegal immigrants and smugglers

Illegal dumping/littering along the border

Enforcement activities along the border

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers

Soil erosion

Habitat degradation/shrub invasions

Stressor Category: Climate Change

Drought

Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Harvesting/collecting plants

Harvesting/collecting animals

Grazing by ungulates

Stressor Category: Habitat conversion

Military bases, defoliation, munitions testing

Livestock management

Urban growth

Stressor Category: Invasive species

Nuisance plants

Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Pollution

Noise pollution

Light pollution

Illegal dumping/littering

Stressor Category: Transportation and infrastructure

Right-of-way fencing along roadways

Unauthorized roads & trails

Roads for motorized vehicles

Air traffic corridors/overflights

Riparian and aquatic systems in the Sonoran Desert include:

Wetlands/Springs/Seeps

Habitat Condition (Element 2)

Wetlands, springs, and seeps are rare in the Sonoran Desert but are critical to a number of rare species. Extensive cattail and bulrush marshes occur along the Lower Colorado River. These were thought to be much more restricted before the creation of dams and the cessation of annual flooding (Rosenberg and others 1991. Birds of the Lower Colorado River. The University of Arizona Press, Tucson, Arizona. 416 p.). They are of critical importance to many marsh species, most notably the Yuma clapper rail and California black rail. These habitats are threatened in some areas by efforts to dredge or straighten the river channel but the vast majority are protected within Bill Williams, Cibola, and Imperial National Wildlife Refuges and Mitty Lake Wildlife Area. Most springs and seeps are located in mountains or other areas of rugged terrain and remain largely intact. These areas are administered primarily by BLM, FWS Refuges, and NPS, which have afforded protection in the past and should continue to do so. Quitobaquito Spring and the associated man-made pond at Organ Pipe Cactus National Monument is a prominent site of great historical importance. Some springs and seeps in the Sonoran Desert have been degraded or

lost completely due to development or diversion for use by livestock or crops or groundwater pumping, particularly those in flatter topographies. Agua Caliente Spring in Tucson, for example, has been developed into an urban park. An increase in aridity, should it occur, would obviously have severe impacts to many springs and seeps in the Sonoran Desert.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use
Water diversion/water catchments

Stressor Category: Changes in Ecological Processes

Altered river flow regimes
Habitat degradation/shrub invasions
Soil erosion
Unnatural fire regimes

Stressor Category: Climate Change

Drought
Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management

Stressor Category: Invasive species

Nuisance animals
Nuisance plants
Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Unauthorized roads & trails

Streams/Rivers

Habitat Condition (Element 2)

The condition of aquatic and riparian systems within this ecoregion has been greatly degraded by human activities. This ecoregion includes the lower portions of major rivers, including the Colorado, Gila, Verde and Salt rivers, all of which originate at higher elevations outside this ecoregion. These rivers have all been impounded, diverted, and/or channelized. Along the Lower Colorado and the Gila rivers, associated marshes provide significant wildlife habitat. Changes in instream flow in these systems and the elimination of annual flooding cycles have reduced the capability of riparian systems to sustain themselves, especially during drought. These changes have reduced nutrient input and the leaching of salts that floods provide, and have affected reproduction of riparian plants by reducing the establishment of necessary seed beds. These same changes have favored undesirable nonnative competitors such as salt cedar. Many smaller rivers (for example: Santa Cruz, New River, and Aqua Fria) no longer flow, except during storm

events, due to groundwater pumping, downcutting, and other factors. Some perennial reaches are maintained only by effluent discharge for short stretches (the Santa Cruz, and the Gila River west of Phoenix). The Bill Williams River falls entirely within this ecoregion and provides a lingering example of the riparian woodlands that once stretched for miles across the broad floodplains of major rivers. The loss of these extensive reaches of lower Sonoran deciduous riparian and marshland habitat has been arguably the greatest detrimental effect of modern western civilization on the Sonoran Desert Ecoregion. The lower San Pedro River remains one of the few dam-free rivers in the State, but it too is impacted and further threatened by human uses, such as agricultural diversion, groundwater pumping, and overgrazing.

Streams are relatively few in the ecoregion, but include: Date Creek, New River, Aravaipa Creek, Bonita Creek, Eagle Creek, Rillito River, Sabino Creek, and the Hassayampa River. Natural functions of these systems have been seriously altered in most areas by lowering of ground water levels, by diversion and channelization, by dam building and resulting inundation and cessation of flood cycles, and by invasion of nonnative plants. Arizona is unlikely to see additional water projects on the scale of those built in the last century. However, the state's ever-increasing population and demands for water make any improvement unlikely. Extended drought such as is currently being experienced will result in continued loss of instream flows and further degradation of riparian and aquatic habitats.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

- Groundwater depletion and springhead use
- Water diversion/water catchments

Stressor Category: Border issues

- Altered fire regime as a result of border activities
- Illegal dumping/littering along the border
- Dispersed camping along the border
- Unauthorized roads & trails created by illegal immigrants and smugglers

Stressor Category: Changes in Ecological Processes

- Management for game animals and sport fish
- Streambank alteration/channelization
- Altered river flow regimes
- Soil erosion
- Habitat fragmentation/barriers
- Unnatural fire regimes
- Habitat degradation/shrub invasions

Stressor Category: Climate Change

- Shift to warmer climate
- Drought

Stressor Category: Consumptive use of biological resources

- Grazing by ungulates

Stressor Category: Habitat conversion

- Rural development

Urban growth
Dams/reservoirs/impoundments
Agricultural conversion
Livestock management
Recreational sites/facilities

Stressor Category: Invasive species

Nuisance animals
Bait-bucket dumping/illegal stocking
Disease/pathogens/parasites
Nuisance plants
Feral animals

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail
Watercraft operation

Stressor Category: Pollution

Sediment/ash flows
Noise pollution
Pesticides/herbicides
Contaminants from waste water and runoff

Stressor Category: Transportation and infrastructure

Unauthorized roads & trails
Roads for motorized vehicles

Lakes/Reservoirs

Habitat Condition (Element 2)

Significant areas of open water in the Sonoran Desert were originally confined to the Lower Colorado River. Some were inundated by Havasu and Imperial Reservoirs but backwater lakes such as Cibola, Ferguson, and Mittry remain and provide important wildlife habitat. Elsewhere, reservoirs impounded by dams constructed in the 1900s include Horseshoe and Bartlett on the Verde River; Roosevelt, Apache, Canyon, and Saguaro on the Salt River; San Carlos and Painted Rock on the Gila River; Pleasant on the Agua Fria River; and Alamo on the Bill Williams River. Most of these lakes were primarily intended for water retention or power production, but are important for sport fishing and watercraft recreation, and for their areas of marsh habitat. Roper Lake near Safford was created for sport fishing, and Picacho Reservoir was created for water retention. These both can provide important bird habitat. However, wildlife value of reservoirs is typically low, particularly away from the Colorado River, and fluctuates with water levels. Levels in the Lower Colorado River reservoirs tend to be stable, buffered by upstream reservoirs. Elsewhere, however, fluctuations can be severe and recent trends have been downward because of extended drought. Increasing demand for water by rapidly expanding urban areas guarantee that demands on water stored in these reservoirs will continue to increase, except to the extent that they are offset by retirement of agricultural lands.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

- Altered river flow regimes
- Habitat degradation/shrub invasions
- Management for game animals and sport fish
- Unnatural fire regimes

Stressor Category: Climate Change

- Shift to warmer climate
- Drought

Stressor Category: Consumptive use of biological resources

- Grazing by ungulates

Stressor Category: Habitat conversion

- Recreational sites/facilities

Stressor Category: Invasive species

- Feral animals
- Disease/pathogens/parasites
- Bait-bucket dumping/illegal stocking
- Nuisance animals
- Nuisance plants

Stressor Category: Non-consumptive resource use

- Watercraft operation
- Motorized recreation off-trail

Stressor Category: Pollution

- Heavy metals/mine tailings
- Sediment/ash flows
- Noise pollution

Stressor Category: Transportation and infrastructure

- Unauthorized roads & trails

Stressors that act in this ecoregion at the species- but not habitat-scale (Element 3)

In some cases, a stressor may have significant impacts to individual SGCN, but impacts are not felt throughout the habitat. Regardless of the extent of ecosystem-wide impacts, in any habitat type where these stressors act on SGCN, the appropriate conservation actions apply (see “Conservation Actions to Address Stressors to SGCN (Elements 3, 4)”). The following stressors have significant ecosystem-level impacts in some habitat types in this ecoregion, but not in all habitat types where the SGCN occur. Note that for wide-ranging species, impacts from some stressors may be quite significant, but may not act on the species throughout its range.

Stressor Category	Stressor	Scientific Name	Common Name
International border issues			
	Poaching along the border		
		<i>Antilocapra americana sonoriensis</i>	Sonoran Pronghorn

Stressor Category	Stressor	Scientific Name	Common Name
		<i>Gopherus agassizii</i> (Sonoran Population)	Sonoran Desert Tortoise
	Unauthorized roads & trails created for law enforcement along the border		
		<i>Phrynosoma mcallii</i>	Flat-tailed Horned Lizard
		<i>Uma rufopunctata</i>	Yuman Desert Fringe-toed Lizard
Habitat conversion			
	Aquaculture		
		<i>Kinosternon arizonense</i>	Arizona Mud Turtle
	Wetland filling for mosquito control		
		<i>Ardea alba</i>	Great Egret
		<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo
		<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck
		<i>Egretta thula</i>	Snowy Egret
		<i>Gastrophryne olivacea</i>	Great Plains Narrow-mouthed Toad
		<i>Kinosternon arizonense</i>	Arizona Mud Turtle
		<i>Pternohyla fodiens</i>	Lowland Burrowing Treefrog
Transportation and infrastructure			
	Railroads		
		<i>Gopherus agassizii</i> (Sonoran Population)	Sonoran Desert Tortoise

AREAS OF CONSERVATION PRIORITY WITHIN EACH HABITAT TYPE

As part of the CWCS process, the Department has identified habitat associated with each species of wildlife at the vegetation level. The Department recognizes that there are many areas important to conservation that occur at a finer scale than vegetation associations. Identifying these areas will require a full landscape analysis based on species distributions, current and future stressor impacts, resource distribution, current protection level, proximity to urban areas, and many other factors important to the Department and wildlife. Due to time constraints and the lack of current, spatially explicit data, the Department has decided to forego this analysis at this time with the understanding that it will be completed as soon as possible. However, the Department has recently coordinated with various partners in 3 efforts to identify areas of conservation priorities. Each of these efforts have used different criteria to identify specific areas in the state that can benefit from special conservation attention. A summary of each of these efforts is included below.

Arizona Wildlife Habitat Linkages – This important effort is being led by the Department, ADOT, multiple federal agencies, universities, and non-governmental organizations. The purpose is to identify fracture zones—defined as areas dominated by private land, State Trust land, or public infrastructure (highways, railroads, canals, fencing) that can provide for wildlife movement between habitat blocks. Habitat blocks are large areas of publicly-owned habitat, including tribal and BLM land. The Linkages Workgroup identified approximately 100 fracture zones in Arizona, with 30 of these potential linkages as high priority. Priority linkages are based

on the presence of special status species in the potential linkage, and the likelihood of decline or loss of wildlife species from one or more habitat blocks if connectivity is lost. The Linkages Workgroup has begun the process of drawing up detailed Linkage Designs for these priority zones. Each Linkage Design will identify which lands within the fracture zones need management for permeability, and recommend strategies to maintain permeability on those lands (including future structures to allow wildlife to cross highways and other infrastructure). The draft Linkages map (Fig. 5) is provides a visual tool to guide future planning, engineering, and mitigation strategies for public roadway construction and renovation and expansion of rural and urban communities.

Ecoregional Analyses - The Nature Conservancy (TNC) has completed a ecoregional analysis for each of the TNC ecoregions in Arizona. The objective of these analyses was to identify a set of conservation areas, in each ecoregion, that if managed properly, would guarantee the persistence of the ecoregion's biodiversity. These spatially explicit analyses considered diverse criteria including but not limited to: species richness, land management, conservation goals, stressors, land ownership, vegetation, and hydrography. All in all, 147 conservation priority areas were identified in Arizona (TNC 2004b, 2005). The resulting map (Fig. 6) shows areas with the greatest strategic value for protecting ecosystems and viable populations of native species of animals and plants. This effort provides insight into the location of large species assemblages and delineates areas of high conservation priority.

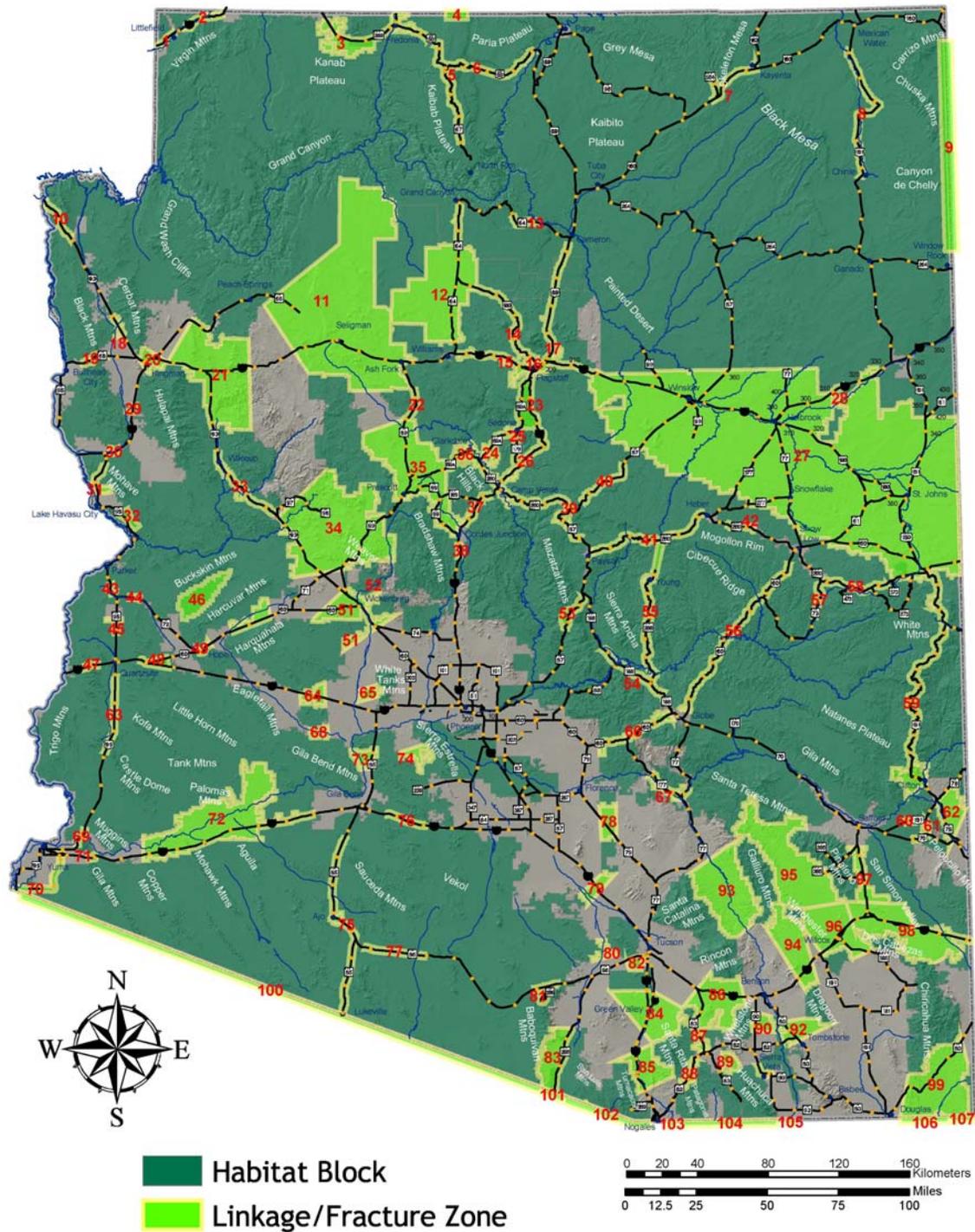


Figure 5. DRAFT Arizona Linkages map (May 16, 2005 version by S. Nordhaugen). The numbered Linkages / Fracture Zones are not in order of priority, but are identifiers associated with the map's GIS database. This product is still under revision.

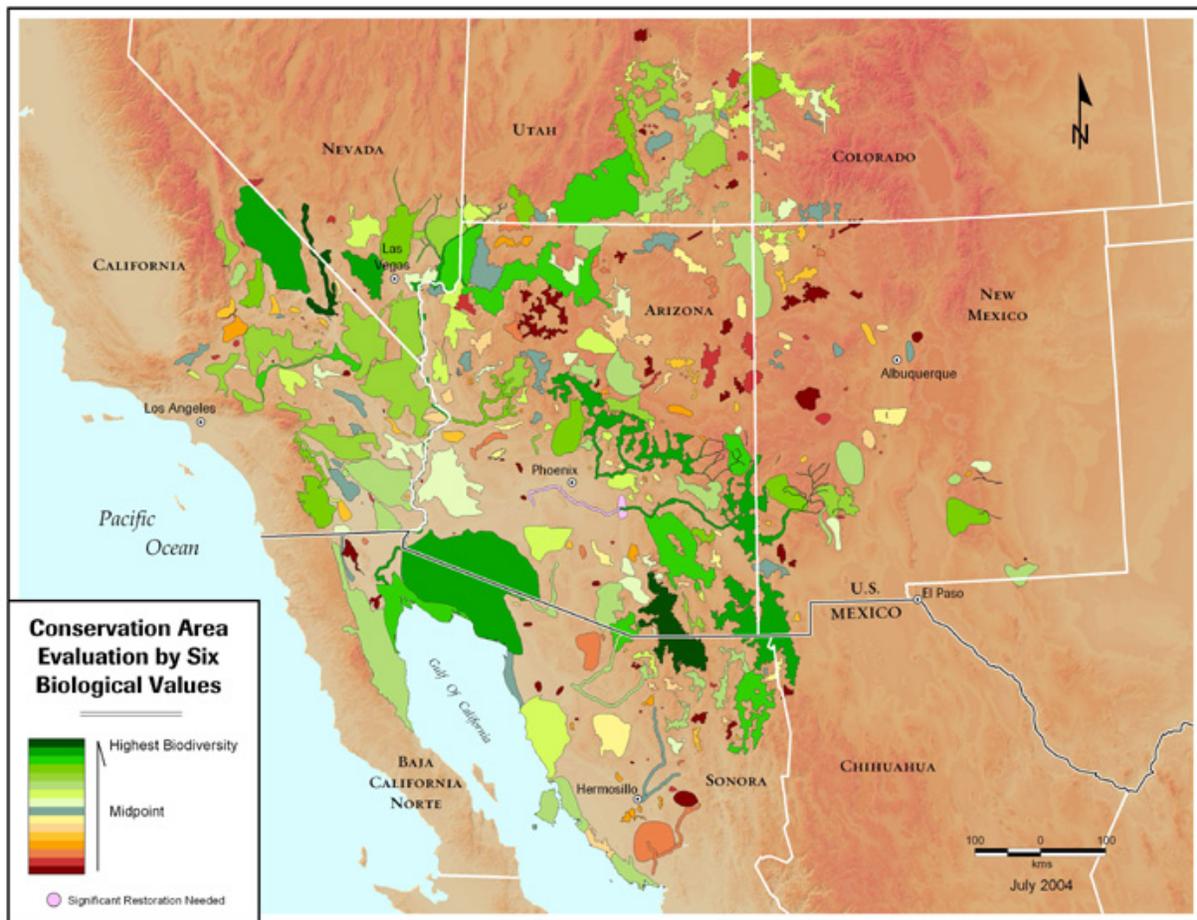


Figure 6. TNC Conservation Areas identified in Arizona and extending into neighboring states, tribes, and Mexico. Six biological values were used to identify conservation areas in this assessment: 1) plant and animal species occurring at each location; 2) species present that are globally rare (IUCN ranks of G1/G2); 3) species present that are federally listed as endangered or threatened; 4) species present that are endemic (90% of their range is found within 1 of 5 ecoregions analyzed); 5) taxonomic groups represented (birds, fish, mammals, crustaceans, mollusks, reptiles, amphibians, and plants); and 6) aquatic/riparian species present.

Arizona Important Bird Area Program – The Department has participated in a nationwide effort led by the Audubon Society to identify important bird areas (IBAs). In Arizona 4 criteria were used to identify sites. Any individual site was required to meet any one of those 4 criteria in order to qualify as an IBA. The 4 criteria are:

1. Sites important to species listed under the ESA or other special conservation status species.
2. Sites where significant numbers of birds concentrate for breeding, during migration, or in winter.
3. Sites that contain rare or unique habitat or are an exceptional representative of an ecological community type, and that hold important species or species assemblages largely restricted to that distinctive habitat or ecological community type.

4. Sites important for long-term research and/or monitoring or sites supporting educational programs in which a significant component of the program focuses on avian ecology.

Based on these criteria 26 IBAs have been identified in Arizona (Fig. 7). Each IBA represents an important conservation area for birds.

In addition to the above efforts, there are several regional habitat analyses by non-governmental organizations, contractors, and local governments that offer additional information and recommendations on land use and planning in support of wildlife resources. Recent analyses include: Sonoran Desert Conservation Plan (Pima County 2002); Sky Islands Wildlands Network (Foreman and others 2000); Wildlife Reference Document for Coconino County (Wildlife Workgroup 2003); Sonoran Desert Network Inventory and Monitoring Program (Gebow and others 2004); Mohave County General Plan (Mohave County 1995); Grand Canyon Wildlands Network (Grand Canyon Wildlands Council 2004); and the Integrated Natural Resources Management Plan and Environmental Assessment 2001-2005: U.S. Army Intelligence Center and Fort Huachuca (Trousil 2001). Each of these efforts identifies areas of high conservation priority and provides the Department with the opportunity to work with partners to insure the continuing protection of these areas.

Finally, many wildlife populations have very specific needs that are not necessarily met by landscape level conservation actions. In these cases, specific, localized actions are often needed to insure the well-being of those populations. The Department is working with numerous land managers and conservation partners on many site-specific activities to promote restoration and recovery of wildlife and wildlife habitats. Any number of circumstances can prompt site-specific conservation actions. Threatened or highly vulnerable species may require localized monitoring to insure their survival. An example would be active monitoring of bald eagle nests by Department volunteers and contractors. Small, geographically isolated populations with specific habitat needs are at risk of extirpation if those habitats are degraded or converted to other uses. Relocations and reintroductions of extirpated species may require habitat modeling, while many existing populations benefit from habitat improvements and removal of undesirable nonnative species. For example, the Fossil Creek renovation effort in 2004 involved removal of nonnative fish with the replacement of natives, following the return of natural stream flows to the creek with the decommissioning of the hydropower facility at Childs. Efforts are also underway to restore prime grassland habitat for pronghorn antelope through managing juniper encroachment, identifying and restoring important corridors, and restoring wetlands on Anderson Mesa.

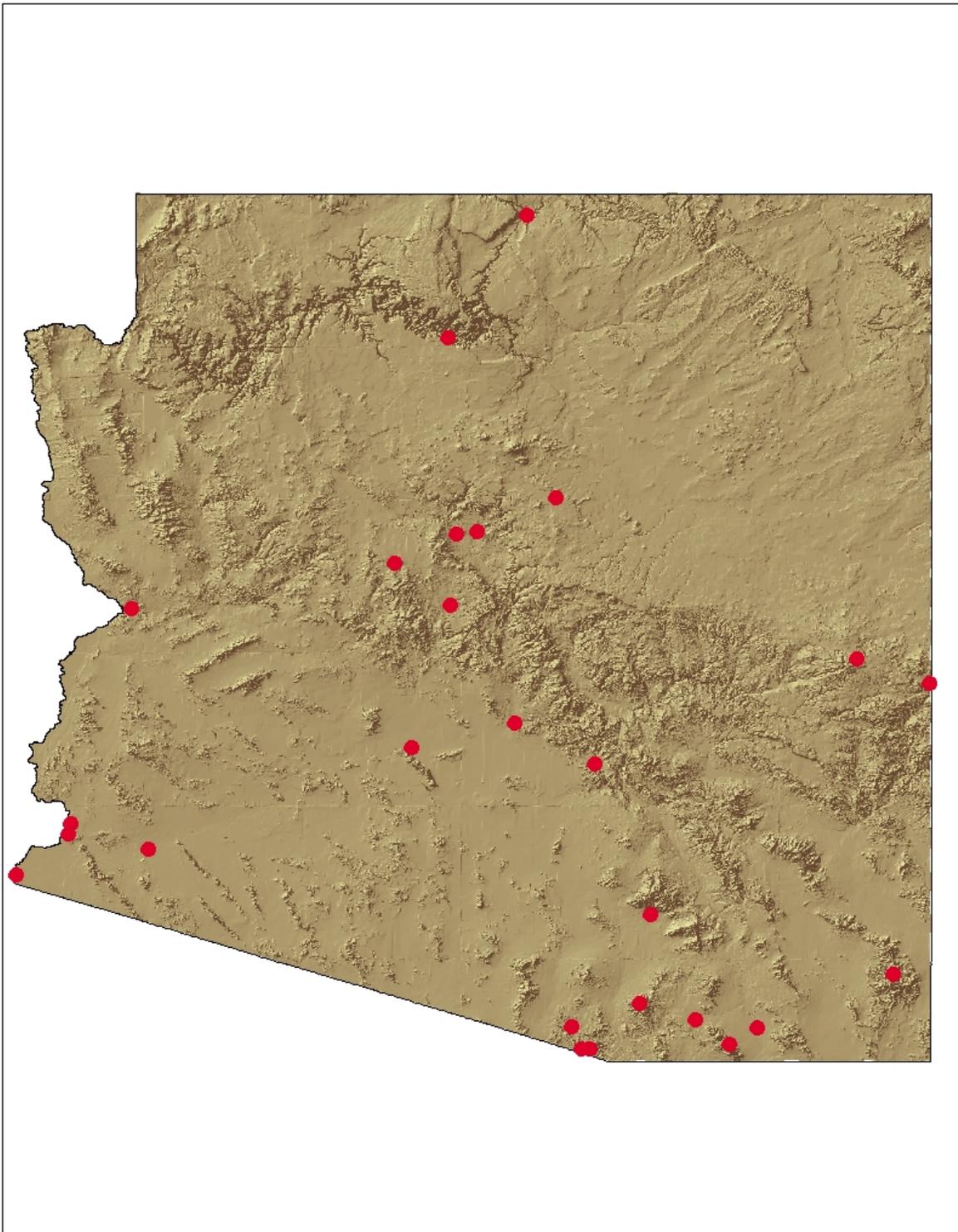


Figure 7. Center point locations of Arizona's 26 Important Bird Areas.

CONSERVATION ACTIONS TO ADDRESS STRESSORS TO HABITATS (ELEMENT 4)

Major stressors were identified for each habitat type in each ecoregion ("Ecoregion-Specific Habitat Conditions (Element 2)"). Any stressor identified as having significant impacts is listed below, along with conservation actions that would alleviate or remove the impacts to wildlife and wildlife habitats. Some of these actions can be implemented immediately or represent ongoing efforts. Other actions fall outside the scope of work for the Department, represent long-term commitments, or imply other obstacles to implementation. Nonetheless, this is a comprehensive set of actions that would bring better habitat conditions for communities of wildlife in Arizona. Stressors are listed under the appropriate stressor category; actions are grouped under the appropriate emphasis (conserving wildlife habitat, representing wildlife values in multiple-use planning, representing wildlife values in other processes, maintaining and re-establishing habitat and landscape connectivity, wildlife management, or public education and law enforcement to benefit wildlife and wildlife habitat).

HABITAT CONVERSION CATEGORY

Agricultural conversion

Conserving wildlife habitat

- Acquire land or conservation easements to protect key conservation areas.
- Protect and restore riparian areas.

Representing wildlife values in multiple-use planning

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.

Representing wildlife values in other processes

- Collaborate on public outreach, education, and incentive programs to encourage erosion control techniques on private lands.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Dams/reservoirs/impoundments

Conserving wildlife habitat

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Representing wildlife values in multiple-use planning

- Remove or modify unnecessary or inoperative dams or diversions.
- Create and maintain habitat improvement features for aquatic species.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.

Representing wildlife values in other processes

- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.

Wildlife management

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Survey for areas of suitable habitat for reestablishment of species.

Forest and woodland management - habitat conversion

Representing wildlife values in multiple-use planning

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
- Encourage design of extractive operations that minimizes disturbance to wildlife.

Representing wildlife values in other processes

- Use integrated management activities in concert to address nuisance plants.

Landfills/dumps

Representing wildlife values in multiple-use planning

- Improve public access and use of landfills to reduce illegal dumping.
- Work with manufacturing and commercial industries to modify products and packaging to reduce disposable material and need for additional landfills.
- Use old pit mines as landfills, where appropriate.
- Regulate and enforce regulations that ensure allowable materials are disposed of properly based on landfill type (industrial waste, municipal waste, hazardous materials).
- Promote recycling to reduce contamination from landfills and new mine operations.
- Locate new landfills in appropriate locations that reduce impacts to wildlife and water sources.
- Minimize wildlife access to landfills to discourage use as a source of food.

Representing wildlife values in other processes

- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.

Livestock management

Conserving wildlife habitat

- Protect and restore riparian areas.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Maintaining and re-establishing habitat and landscape connectivity

- Remove unnecessary fences and barriers to wildlife movement.
- Encourage use of wildlife-friendly fences.

Representing wildlife values in multiple-use planning

- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

Representing wildlife values in other processes

- Revegetate disturbed areas with native plants.
- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Recreational sites/facilities

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase enforcement for laws governing recreational activities.
- Support prevention of human-caused fire through enforcement of appropriate fire use regulations and education.
- Increase public awareness on ways to reduce nuisance wildlife in residential areas (that is: not leaving out pet food, proper disposal of waste, storage of food, fencing gardens or yards).
- Increase public awareness on the impacts of releasing nonnative species, pets, or livestock on wildlife.
- Encourage gray water use.
- Increase public awareness on the risks of wildlife transmitted diseases.

Representing wildlife values in multiple-use planning

- Use environmentally-friendly materials, landscaping, and structure designs for recreational sites.
- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Benchmark and evaluate successful recreational management efforts in various parks, forests, rangelands, and private lands.
- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.
- Educate the public about maintaining sensitive habitat for wildlife.

Representing wildlife values in other processes

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Conduct boat inspections at marina and boat launch ramps to detect and prevent the spread of aquatic nuisance species.

Rural development

Conserving wildlife habitat

- Renovate aquatic systems to remove undesirable species.
- Identify key conservation areas to protect from development.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Protect and restore riparian areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Acquire land or conservation easements to protect key conservation areas.

Maintaining and re-establishing habitat and landscape connectivity

- Identify and protect key wildlife corridors for landscape connectivity.
- Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase enforcement for laws governing recreational activities.
- Promote legislation to increase water conservation.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Increase enforcement of existing laws and promote more stringent laws prohibiting the release of domestic or nonnative animals into the wild.
- Encourage the utilization of low water use [and native] plants in landscaping.

Representing wildlife values in multiple-use planning

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.

Representing wildlife values in other processes

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Use environmentally-friendly materials, landscaping, and structure designs for rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Urban growth

Conserving wildlife habitat

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Acquire land or conservation easements to protect key conservation areas.
- Renovate aquatic systems to remove undesirable species.
- Identify key conservation areas to protect from development.

Maintaining and re-establishing habitat and landscape connectivity

- Identify and protect key wildlife corridors for landscape connectivity.
- Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Encourage the utilization of low water use [and native] plants in landscaping.
- Promote legislation to increase water conservation.
- Increase enforcement for laws governing recreational activities.
- Increase enforcement of existing laws and promote more stringent laws prohibiting the release of domestic or nonnative animals into the wild.
- Increase public awareness of water cycles, water tables, instream flow, proper stream

morphology, and ecosystem functions (Project WET).

Representing wildlife values in multiple-use planning

- Create and maintain habitat improvement features for aquatic species.

Representing wildlife values in other processes

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

TRANSPORTATION AND INFRASTRUCTURE CATEGORY

Air traffic corridors/overflights

Maintaining and re-establishing habitat and landscape connectivity

- Establish, where necessary, advisory distances for air traffic corridors/overflights in critical wildlife habitats.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Inform and educate the public on potential negative impacts of low level overflights to wildlife.

Canals/pipelines

Conserving wildlife habitat

- Identify wildlife core habitats and corridors to avoid when installing new pipelines and canals.

Maintaining and re-establishing habitat and landscape connectivity

- Encourage proper maintenance and functioning of current pipelines.
- Identify and protect key wildlife corridors for landscape connectivity.

Representing wildlife values in multiple-use planning

- Remove or modify unnecessary or inoperative dams or diversions.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Representing wildlife values in other processes

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Revegetate disturbed areas with native plants.
- Create barriers between susceptible native species and nonnatives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.

Wildlife management

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Advocate for and create new urban fishing opportunities.
- Manage so as to sustain or enhance native fish and sport fish populations.

Power lines/wind-harnessing turbines

Maintaining and re-establishing habitat and landscape connectivity

- Develop guidelines for location and design of new infrastructure installations to minimize effects on - Encourage use of underground power and telephone lines where feasible.
- Identify problem areas and retrofit existing problem structures to minimize affects on wildlife.

Representing wildlife values in multiple-use planning

- Limit access and use of utility maintenance roads for official use when other adequate access exists or is not desirable.

Wildlife management

- Assess and implement current recommendations for power lines/wind-harnessing turbines/telephone lines/cell phone towers/radio towers to minimize impacts to wildlife.

Right-of-way fencing along roadways

Maintaining and re-establishing habitat and landscape connectivity

- Remove unnecessary fences and barriers to wildlife movement.
- Encourage use of wildlife-friendly fences.
- Use exclusion fencing and other design features to funnel wildlife movement to existing underpasses, overpasses or culverts.
- Develop species-specific wildlife friendly fencing guidelines.

Roads for motorized vehicles

Maintaining and re-establishing habitat and landscape connectivity

- Encourage wildlife friendly design for all road building.
- Encourage increased partnering and communication with transportation officials on projects that affect wildlife and their habitat.
- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on the negative effects of feeding wildlife.
- Encourage cooperative clean up efforts of aquatic and terrestrial wildlife habitats through existing and new programs.
- Encourage cooperative clean up efforts along highways through existing and new programs.
- Support prevention of human-caused fire through enforcement of appropriate fire use regulations and education.

Representing wildlife values in multiple-use planning

- Reduce sedimentation effects from road and trail construction.

Representing wildlife values in other processes

- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
- Use seed traps along forest/woodland roads to prevent the spread of nuisance plants.
- Encourage maintenance of paved and unpaved roads in a manner that minimizes impacts on wildlife and wildlife habitats.
- Use native plants for roadway landscaping and urban/rural developed areas.
- Use certified weed-free straw or native vegetation for roadside erosion control.

Telephone lines/cellphone towers

Maintaining and re-establishing habitat and landscape connectivity

- Develop guidelines for location and design of new infrastructure installations to minimize effects on wildlife and habitats.
- Encourage use of underground power and telephone lines where feasible.

Representing wildlife values in multiple-use planning

- Prevent or minimize recreational impacts in sensitive habitats.

Wildlife management

- Assess and implement current recommendations for power lines/wind-harnessing turbines/telephone lines/cell phone towers/radio towers to minimize impacts to wildlife.

Trails for foot, bike, or equine use

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

Representing wildlife values in multiple-use planning

- Clearly mark designated roads and trails for recreational users.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Prevent or minimize recreational impacts in sensitive habitats.

Representing wildlife values in other processes

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Unauthorized roads & trails

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Increase public awareness of responsible OHV use and laws.
- Increase enforcement for laws governing recreational activities.
- Encourage responsible outdoor recreation through education (for example: "Stay on the Trails," "Leave No Trace," "Be Bear Aware," "Stop Aquatic Hitchhikers").

Representing wildlife values in multiple-use planning

- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.
- Encourage revegetation and restoration of existing unauthorized roads and trails.

Representing wildlife values in other processes

- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

ABIOTIC RESOURCE USE CATEGORY

Representing wildlife values in multiple-use planning

- Encourage design of extractive operations that minimizes disturbance to wildlife.

Groundwater depletion and springhead use

Conserving wildlife habitat

- Encourage wise management of ground water.

- Protect and restore springheads.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Encourage gray water use.
- Encourage low water use agriculture.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.

Representing wildlife values in other processes

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Mining

Representing wildlife values in multiple-use planning

- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.
- Increase public awareness of wildlife impacts and benefits of mining operations.
- Promote recycling to reduce contamination from landfills and new mine operations.
- Retain and secure old mine adits and shafts for wildlife habitat (primarily for bats).

Representing wildlife values in other processes

- Revegetate disturbed areas with native plants.

Water diversion/water catchments

Conserving wildlife habitat

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Maintaining and re-establishing habitat and landscape connectivity

- Remove artificial stream barriers where appropriate.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Representing wildlife values in multiple-use planning

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Prevent or minimize recreational impacts in sensitive habitats.
- Protect sensitive habitats from excessive grazing.

Representing wildlife values in other processes

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

CONSUMPTIVE USE OF BIOLOGICAL RESOURCES CATEGORY

Forest and woodland management - consumptive use

Representing wildlife values in multiple-use planning

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
- Encourage design of extractive operations that minimizes disturbance to wildlife.

Representing wildlife values in other processes

- Work with fire fighting services to develop fire management plans that minimize effects of fire retardants and water drawing on wildlife and wildlife habitats.

Grazing by ungulates

Representing wildlife values in multiple-use planning

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Disseminate information to partners on effects of grazing on resources.
- Protect sensitive habitats from excessive grazing.

Representing wildlife values in other processes

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Harvesting/collecting animals

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
- Increase public awareness of regulations pertaining to illegal harvest.

Wildlife management

- Develop harvest guidelines for sensitive species to minimize impacts to important life stages (breeding, raising young, etc.).

NON-CONSUMPTIVE RESOURCE USE CATEGORY

Dispersed camping

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness of responsible camping practices (low impact camping).
- Increase enforcement for laws governing recreational activities.

Wildlife management

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Motorized recreation off-trail

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible OHV use and laws.
- Encourage responsible outdoor recreation through education (for example: "Stay on the Trails," "Leave No Trace," "Be Bear Aware," "Stop Aquatic Hitchhikers").

Representing wildlife values in multiple-use planning

- Prevent or minimize recreational impacts in sensitive habitats.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Encourage revegetation and restoration of existing unauthorized roads and trails.

Representing wildlife values in other processes

- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

Non-motorized recreation off-trail

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

Representing wildlife values in multiple-use planning

- Seasonally close areas to recreational and commercial use when sensitive breeding wildlife are present.
- Prevent or minimize recreational impacts in sensitive habitats.
- Clearly mark designated roads and trails for recreational users.

Representing wildlife values in other processes

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Off-range recreational shooting

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase enforcement for laws governing recreational activities.

Representing wildlife values in multiple-use planning

- Educate users on responsible recreational shooting behavior and habitat stewardship.

Wildlife management

- Develop harvest guidelines for sensitive species to minimize impacts to important life stages (breeding, raising young, etc.).

Scientific research and collection

Wildlife management

- Collaborate with partners to evaluate effects of capture and sampling techniques on wildlife.
- Evaluate and modify Department regulations where appropriate.

Watercraft operation

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness of dumping and littering impacts to wildlife and their habitat.

- Increase enforcement for laws governing recreational activities.
- Encourage cooperative clean up efforts of aquatic and terrestrial wildlife habitats through existing and new programs.
- Increase public awareness on the impacts of watercraft and watercraft operating practices to wildlife and wildlife habitat.

Representing wildlife values in multiple-use planning

- Promote integrated aquatic plant management strategies.
- Require use of established launch ramps for watercraft put in/take out.
- Promote the "Boating Access Grant Program" to help fund development of launch ramps, information kiosks, and restrooms.
- Prevent or minimize recreational impacts in sensitive habitats.
- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.
- Install designated, concrete watercraft launch ramps to minimize shoreline habitat degradation.
- Incorporate wildlife needs in aquatic vegetation removal efforts.

Representing wildlife values in other processes

- Install washdown stations to prevent spread of aquatic nuisance species.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Conduct boat inspections at marina and boat launch ramps to detect and prevent the spread of aquatic nuisance species.
- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Promote the "Clean Vessel Act Grant Program" to develop sanitary waste pump-out and dump stations.

POLLUTION CATEGORY

Contaminants from waste water and runoff

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Representing wildlife values in other processes

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.

Heavy metals/mine tailings

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.

Representing wildlife values in multiple-use planning

- Promote recycling to reduce contamination from landfills and new mine operations.

Representing wildlife values in other processes

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Support alternative energy and recycling efforts to reduce toxic by-products and wastes from traditional fuels and mineral extraction.

Highway/roadway de-icing

Representing wildlife values in other processes

- Use inert or non-polluting materials for roadway de-icing.

Illegal dumping/littering

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness of dumping and littering impacts to wildlife and their habitat.
- Encourage cooperative clean up efforts of aquatic and terrestrial wildlife habitats through existing and new programs.

Representing wildlife values in multiple-use planning

- Promote recycling to reduce contamination from landfills and new mine operations.

Representing wildlife values in other processes

- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.

Lead shot/fishing line

Public education and law enforcement to benefit wildlife and wildlife habitat

- Encourage cooperative clean up efforts of aquatic and terrestrial wildlife habitats through existing and new programs.
- Increase public awareness on the effects of improper disposal of fishing line.
- Provide more wildlife proof waste receptacles in areas of public recreation.

Light pollution

Conserving wildlife habitat

- Identify sites where light pollution affects wildlife.

Noise pollution

Conserving wildlife habitat

- Identify sensitive wildlife areas where noise should be reduced/limited/avoided.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness of responsible OHV use and laws.
- Increase public awareness on the impacts of watercraft and watercraft operating practices to wildlife and wildlife habitat.

Representing wildlife values in other processes

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Nutrients/algal blooms

Conserving wildlife habitat

- Chemical and biological treatment of lakes (copper compounds, microbes, hay) to prevent and reduce algal blooms.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Encourage cooperative clean up efforts of aquatic and terrestrial wildlife habitats through existing and new programs.
- Encourage the utilization of low water use [and native] plants in landscaping.

Representing wildlife values in other processes

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Promote self-containing designs for high fertilizer use areas or filtration of nutrients.

Pesticides/herbicides

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.

Representing wildlife values in other processes

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
- Promote organic agriculture and gardening practices that do not rely on chemical treatments.
- Use alternative means for pest control (biocontrol, genetic control, management practices).
- Identify and use pesticides and herbicides that have limited negative impact to wildlife (a wildlife-safe label).

Sediment/ash flows

Conserving wildlife habitat

- Protect and restore riparian areas.

Representing wildlife values in multiple-use planning

- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Representing wildlife values in other processes

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Revegetate disturbed areas with native plants.
- Work with land managers to reduce or prevent high sedimentation of aquatic systems where appropriate.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Wildlife management

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

INVASIVE SPECIES CATEGORY

Bait-bucket dumping/illegal stocking

Conserving wildlife habitat

- Renovate aquatic systems to remove undesirable species.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on the impacts of releasing nonnative species, pets, or livestock on wildlife.

Representing wildlife values in other processes

- Evaluate additional regional guidelines for use of different fishing baits and risks of bait-bucket - Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

Wildlife management

- Evaluate and modify Department regulations where appropriate.

Disease/pathogens/parasites

Representing wildlife values in other processes

- Adopt national standards and efforts to reduce and control nuisance species.

Wildlife management

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.
- Pursue projects to limit spread of disease to sensitive wildlife populations.

Feral animals

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on the impacts of releasing nonnative species, pets, or livestock on wildlife.
- Increase public awareness on the need to control feral animals.

Representing wildlife values in other processes

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Wildlife management

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

- Reduce/eliminate the effects of feral animal populations in sensitive wildlife habitats or near wildlife populations of concern.

Hybridization

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness on the impacts of releasing nonnative species, pets, or livestock on wildlife.

Representing wildlife values in multiple-use planning

- Address hybridization and replication of rare populations in watershed planning efforts.

Representing wildlife values in other processes

- Regulate or prohibit movement of species with high risk of hybridization with native species.
- Create barriers between susceptible native species and nonnatives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

Wildlife management

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Evaluate and modify Department regulations where appropriate.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Nuisance animals

Conserving wildlife habitat

- Identify watersheds and other conservation areas to prioritize renovation activities.

Representing wildlife values in other processes

- Adopt national standards and efforts to reduce and control nuisance species.
- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Conduct inspections at state borders to detect and prevent the spread of nuisance plants and animals.
- Use integrated management activities in concert to address nuisance plants.
- Create barriers between susceptible native species and nonnatives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
- Support and participate in the multi-agency Governor's Invasive Species Task Force.

Wildlife management

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Manage so as to sustain or enhance native fish and sport fish populations.
- Limit recreational and commercial use of crayfish and bullfrogs as fishing bait.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Evaluate and modify Department regulations where appropriate.

- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Survey for areas of suitable habitat for reestablishment of species.

Nuisance plants

Public education and law enforcement to benefit wildlife and wildlife habitat

- Encourage the utilization of low water use [and native] plants in landscaping.

Representing wildlife values in other processes

- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Use integrated management activities in concert to address nuisance plants.
- Use certified weed-free straw or native vegetation for roadside erosion control.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Revegetate disturbed areas with native plants.
- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.
- Conduct inspections at state borders to detect and prevent the spread of nuisance plants and animals.
- Adopt national standards and efforts to reduce and control nuisance species.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

CLIMATE CHANGE CATEGORY

Drought

Conserving wildlife habitat

- Encourage development of water use plans that protect instream flow.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Promote water conservation methods in growth planning to develop sustainable water use.

Representing wildlife values in multiple-use planning

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Promote adjustment of livestock management practices during droughts to ensure sufficient

forage for wildlife.

Representing wildlife values in other processes

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Wildlife management

- Survey for areas of suitable habitat for reestablishment of species.

Shift to warmer climate

Representing wildlife values in other processes

- Support efforts to reduce emission of greenhouse gases.

Wildlife management

- Develop plans to conserve priority conservation species (Focal Community, Responsibility, and Vulnerability categories) that are not sufficiently addressed under existing plans.

CHANGES IN ECOLOGICAL PROCESSES CATEGORY

Altered river flow regimes

Conserving wildlife habitat

- Protect and restore springheads.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Promote water conservation methods in growth planning to develop sustainable water use.

Representing wildlife values in multiple-use planning

- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Protect sensitive habitats from excessive grazing.
- Remove or modify unnecessary or inoperative dams or diversions.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Representing wildlife values in other processes

- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.

Wildlife management

- Survey for areas of suitable habitat for reestablishment of species.

Domestication of wildlife/game farming

Representing wildlife values in other processes

- Adopt national standards and efforts to reduce and control nuisance species.
- Evaluate regulations and policies for game farms/domestication of wildlife to ensure wild populations and habitats are protected.

Wildlife management

- Manage so as to sustain or enhance native fish and sport fish populations.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Habitat degradation/shrub invasions

Representing wildlife values in multiple-use planning

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Representing wildlife values in other processes

- Use integrated management activities in concert to address nuisance plants.

Habitat fragmentation/barriers

Conserving wildlife habitat

- Protect and restore riparian areas.
- Acquire land to protect important habitat and wildlife corridors.

Maintaining and re-establishing habitat and landscape connectivity

- Identify and protect key wildlife corridors for landscape connectivity.
- Remove artificial stream barriers where appropriate.

Representing wildlife values in multiple-use planning

- Remove or modify unnecessary or inoperative dams or diversions.
- Increase public awareness of the effects of human activities and infrastructure on wildlife habitat fragmentation.
- Modify grazing practices of grasslands to allow for natural fire regimes and reduction in undesirable vegetation.

Representing wildlife values in other processes

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Wildlife management

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Conduct economic impact analyses for legal designations of critical habitat and listed populations.
- Survey for areas of suitable habitat for reestablishment of species.

Insect Infestation

Representing wildlife values in multiple-use planning

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Loss of keystone species

Conserving wildlife habitat

- Protect and restore riparian areas.
- Renovate aquatic systems to remove undesirable species.

Representing wildlife values in multiple-use planning

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Representing wildlife values in other processes

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Wildlife management

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Manage habitat to maximize biodiversity by keeping common species common and protecting imperiled species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Develop plans to conserve priority conservation species (Focal Community, Responsibility, and Vulnerability categories) that are not sufficiently addressed under existing plans.
- Manage so as to sustain or enhance native fish and sport fish populations.

Management for game animals and sport fish

Representing wildlife values in multiple-use planning

- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).

Wildlife management

- Manage so as to sustain or enhance native fish and sport fish populations.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Expand hatchery capabilities to propagate native species.
- Incorporate ecosystem and community level concerns into operational plans.

Soil erosion

Conserving wildlife habitat

- Protect and restore riparian areas.

Maintaining and re-establishing habitat and landscape connectivity

- Implement 'Best Management Practices' when building roads or other infrastructure (dams, mines, developments, etc.).

Representing wildlife values in multiple-use planning

- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Implement watershed based approaches aimed at preventing excessive soil erosion.

Representing wildlife values in other processes

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Revegetate disturbed areas with native plants.

Wildlife management

- Promote guidelines for timber harvesting and associated road building that positively effect wildlife.
- Survey for areas of suitable habitat for reestablishment of species.

Streambank alteration/channelization

Conserving wildlife habitat

- Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.
- Protect and restore riparian areas.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.

Representing wildlife values in multiple-use planning

- Protect sensitive habitats from excessive grazing.
- Prevent or minimize recreational impacts in sensitive habitats.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Representing wildlife values in other processes

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

Wildlife management

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Survey for areas of suitable habitat for reestablishment of species.

Unnatural fire regimes

Conserving wildlife habitat

- Reduce salt cedar and nonnative grasses to improve recolonization of native vegetation.

Public education and law enforcement to benefit wildlife and wildlife habitat

- Encourage the utilization of low water use [and native] plants in landscaping.
- Support prevention of human-caused fire through enforcement of appropriate fire use regulations and education.

Representing wildlife values in multiple-use planning

- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Work with land managers to develop and implement management plans that incorporate

wildlife values.

- Design fire management plans and wildland/urban interface policies that consider wildlife values.

Representing wildlife values in other processes

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use certified weed-free straw or native vegetation for roadside erosion control.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Use integrated management activities in concert to address nuisance plants.
- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

Wildlife management

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

INTERNATIONAL BORDER ISSUES CATEGORY

Altered fire regime as a result of border activities

Conserving wildlife habitat

- Reduce salt cedar and nonnative grasses to improve recolonization of native vegetation.

Representing wildlife values in multiple-use planning

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Representing wildlife values in other processes

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Dispersed camping along the border

Public education and law enforcement to benefit wildlife and wildlife habitat

- Develop cooperative clean up efforts along the border for the benefit of wildlife.

Representing wildlife values in multiple-use planning

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

Representing wildlife values in other processes

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Enforcement activities along the border

Representing wildlife values in other processes

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Enforcement fences along the border

Representing wildlife values in other processes

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Illegal dumping/littering along the border

Public education and law enforcement to benefit wildlife and wildlife habitat

- Develop cooperative clean up efforts along the border for the benefit of wildlife.

Representing wildlife values in multiple-use planning

- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

Representing wildlife values in other processes

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Light pollution along the border

Representing wildlife values in other processes

- Design lighting projects along the borderlands that minimize disturbance to wildlife, but meet the needs for homeland security.

Unauthorized roads & trails created by illegal immigrants and smugglers

Maintaining and re-establishing habitat and landscape connectivity

- Support Border Patrol enforcement activities and wildlife-friendly border barriers.

Representing wildlife values in multiple-use planning

- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.
- Encourage revegetation and restoration of existing unauthorized roads and trails.

Representing wildlife values in other processes

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

Water use/contamination from illegal immigrants and drug smugglers

Public education and law enforcement to benefit wildlife and wildlife habitat

- Develop cooperative clean up efforts along the border for the benefit of wildlife.

Representing wildlife values in other processes

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Work with borderland agencies and landowners to minimize vandalism to livestock and wildlife water sources.

The text below describes conservation actions that may be implemented to address stressors specific to individual species. As such, these actions would be implemented locally in those places where the species and the stressor exists. This material covers 183 current priority species (Tiers 1a and 1b) but has not been collected for Tier 1c species since they are not anticipated to require direct attention before the next review of Arizona's CWCS. Of the 183 species addressed here, 144 are not threatened and endangered species. Note that references for plans and agreements to implement many of these actions may be found in Appendix P.

AMPHIBIANS

<u>Species</u>	<u>Scores</u>
Sonoran Tiger Salamander	Community/Focal: 2
<i>Ambystoma tigrinum stebbinsi</i>	Responsibility: 1
Tier 1a amphibian	
Category: Changes in Ecological Processes	Priority
Stressor: Soil erosion	Medium
- Implement watershed based approaches aimed at preventing excessive soil erosion.	
- Work with land managers to develop and implement management plans that incorporate wildlife values.	
Stressor: Unnatural fire regimes	Medium
- Use controlled burning to limit and reduce fuel loads and shrub invasion.	
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.	
Category: Climate Change	Priority
Stressor: Drought	Medium
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.	
Category: Habitat conversion	Priority
Stressor: Livestock management	High
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.	
- Protect sensitive habitats from excessive grazing.	
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.	
Category: Invasive species	Priority
Stressor: Bait-bucket dumping/illegal stocking	High
- Evaluate and modify Department regulations where appropriate.	
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.	
Stressor: Disease/pathogens/parasites	High
- Adopt national standards and efforts to reduce and control nuisance species.	
Stressor: Hybridization	High
- Evaluate and modify Department regulations where appropriate.	
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.	
- Regulate or prohibit movement of species with high risk of hybridization with native	

species.

Stressor: Nuisance animals High

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

Species

Arizona Toad

Bufo microscaphus

Tier 1b amphibian

Category: Abiotic resource use

Stressor: Water diversion/water catchments

- Promote water conservation methods.
- Protect sensitive habitats from excessive grazing.
- Prevent or minimize recreational impacts in sensitive habitats.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Remove artificial stream barriers where appropriate.

Category: Changes in Ecological Processes

Stressor: Streambank alteration/channelization

- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.

Stressor: Unnatural fire regimes

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change

Stressor: Drought

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Scores

Community/Focal: 2

Responsibility: 1

Priority

High

Priority

Medium

High

Priority

Medium

- Category:** Habitat conversion **Priority**
Stressor: Livestock management Medium
- Revegetate disturbed areas with native plants.
 - Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
 - Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
 - Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
 - Protect sensitive habitats from excessive grazing.
 - Use integrated management activities in concert to address nuisance plants.
 - Protect and restore riparian areas.
- Category:** Invasive species **Priority**
Stressor: Disease/pathogens/parasites Medium
- Adopt national standards and efforts to reduce and control nuisance species.
- Stressor:** Hybridization High
- Evaluate and modify Department regulations where appropriate.
 - Regulate or prohibit movement of species with high risk of hybridization with native species.
 - Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
 - Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Stressor:** Nuisance animals High
- Evaluate and modify Department regulations where appropriate.
 - Adopt national standards and efforts to reduce and control nuisance species.
 - Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
 - Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
 - Identify watersheds and other conservation areas to prioritize renovation activities.
 - Support and participate in the multi-agency Governor's Invasive Species Task Force.
 - Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
 - Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
 - Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
 - Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
 - Use integrated management activities in concert to address nuisance plants.
- Category:** Pollution **Priority**
Stressor: Sediment/ash flows Medium
- Revegetate disturbed areas with native plants.
 - Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
 - Protect and restore riparian areas.

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

Species

Western Barking Frog
Eleutherodactylus augusti cactorum
Tier 1b amphibian

Scores

Community/Focal: 2
Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Mining

Medium

- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Category: Border issues

Priority

Stressor: Dispersed camping along the border

Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Develop cooperative clean up efforts along the border for the benefit of wildlife.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

Stressor: Enforcement activities along the border

Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Climate Change

Priority

Stressor: Drought

High

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Consumptive use of biological resources

Priority

Stressor: Harvesting/collecting animals

Medium

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
- Increase public awareness of regulations pertaining to illegal harvest.

Category: Habitat conversion

Priority

Stressor: Rural development

Medium

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Renovate aquatic systems to remove undesirable species.

- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Transportation and infrastructure

Priority

Stressor: Unauthorized roads & trails

Medium

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Increase enforcement for laws governing recreational activities.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

Species

Scores

Great Plains Narrow-mouthed Toad

Community/Focal: 2

Gastrophryne olivacea

Responsibility: 3

Tier 1b amphibian

Category: Climate Change

Priority

Stressor: Drought

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Consumptive use of biological resources

Priority

Stressor: Forest and woodland management - consumptive use

Medium

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Harvesting/collecting animals

Medium

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
- Increase public awareness of regulations pertaining to illegal harvest.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Protect and restore riparian areas.
- Use integrated management activities in concert to address nuisance plants.
- Protect sensitive habitats from excessive grazing.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Revegetate disturbed areas with native plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

Stressor: Rural development

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Acquire land or conservation easements to protect key conservation areas.
- Promote urban growth planning initiatives that protect instream flow or acquire water

rights (through purchase, conservation agreement, etc.).

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Renovate aquatic systems to remove undesirable species.

Category: Invasive species

Priority

Stressor: Disease/pathogens/parasites

High

- Adopt national standards and efforts to reduce and control nuisance species.

Stressor: Nuisance animals

High

- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
- Adopt national standards and efforts to reduce and control nuisance species.
- Use integrated management activities in concert to address nuisance plants.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Evaluate and modify Department regulations where appropriate.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

Category: Transportation and infrastructure

Priority

Stressor: Roads for motorized vehicles

Medium

- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.
- Encourage wildlife friendly design for all road building.

Species

Lowland Burrowing Treefrog

Pternohyla fodiens

Tier 1b amphibian

Category: Abiotic resource use

Stressor: Mining

- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Category: Climate Change

Stressor: Drought

Scores

Community/Focal: 2

Responsibility: 2

Priority

Medium

Priority

Medium

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
 - Manage upland watersheds to retain vegetation as a buffer against drought effects.
 - Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Category:** Consumptive use of biological resources **Priority**
Stressor: Harvesting/collecting animals Medium
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
 - Increase public awareness of regulations pertaining to illegal harvest.
- Category:** Habitat conversion **Priority**
Stressor: Agricultural conversion Medium
- Acquire land or conservation easements to protect key conservation areas.
 - Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
 - Work with city and county planners to incorporate wildlife values in urban/rural development plans.
 - Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Stressor:** Livestock management Medium
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
 - Protect sensitive habitats from excessive grazing.
 - Evaluate the value of stock tanks to wildlife.
 - Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
 - Protect and restore riparian areas.
 - Use integrated management activities in concert to address nuisance plants.
 - Revegetate disturbed areas with native plants.
 - Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Stressor:** Rural development Medium
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
 - Acquire land or conservation easements to protect key conservation areas.
 - Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
 - Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
 - Renovate aquatic systems to remove undesirable species.
 - Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
 - Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
 - Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Category:** Invasive species **Priority**
Stressor: Disease/pathogens/parasites High
- Adopt national standards and efforts to reduce and control nuisance species.

Stressor: Nuisance animals Medium

- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Adopt national standards and efforts to reduce and control nuisance species.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Use integrated management activities in concert to address nuisance plants.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
- Evaluate and modify Department regulations where appropriate.
- Identify watersheds and other conservation areas to prioritize renovation activities.

Category: Transportation and infrastructure **Priority**

Stressor: Roads for motorized vehicles Medium

- Encourage wildlife friendly design for all road building.
- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.

Species

Plains Leopard Frog

Rana blairi

Tier 1b amphibian

Scores

Community/Focal: 2

Responsibility: 3

Category: Border issues **Priority**

Stressor: Dispersed camping along the border Medium

- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Develop cooperative clean up efforts along the border for the benefit of wildlife.

Stressor: Enforcement activities along the border Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes **Priority**

Stressor: Habitat degradation/shrub invasions High

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize

habitat degradation while maintaining stock ponds where appropriate.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Habitat conversion

Priority

Stressor: Agricultural conversion

High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Acquire land or conservation easements to protect key conservation areas.

Stressor: Livestock management

High

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.
- Revegetate disturbed areas with native plants.

Stressor: Rural development

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Renovate aquatic systems to remove undesirable species.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).

Category: Invasive species

Priority

Stressor: Disease/pathogens/parasites

High

- Adopt national standards and efforts to reduce and control nuisance species.

Stressor: Nuisance animals

High

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Use integrated management activities in concert to address nuisance plants.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Evaluate and modify Department regulations where appropriate.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Adopt national standards and efforts to reduce and control nuisance species.

Category: Pollution

Priority

Stressor: Pesticides/herbicides

High

- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
- Use alternative means for pest control (biocontrol, genetic control, management practices).
- Promote organic agriculture and gardening practices that do not rely on chemical treatments.
- Identify and use pesticides and herbicides that have limited negative impact to wildlife (a wildlife-safe label).

Species

Chiricahua Leopard Frog

Rana chiricahuensis

Tier 1a amphibian

Scores

Community/Focal: 2

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.
- Prevent or minimize recreational impacts in sensitive habitats.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Remove artificial stream barriers where appropriate.

Category: Border issues

Priority

Stressor: Dispersed camping along the border

Medium

- Work with land managers to develop and implement management plans that incorporate

wildlife values.

- Develop cooperative clean up efforts along the border for the benefit of wildlife.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Stressor: Enforcement activities along the border Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes Priority

Stressor: Altered river flow regimes Medium

- Protect sensitive habitats from excessive grazing.
- Protect and restore springheads.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Stressor: Habitat fragmentation/barriers Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Remove artificial stream barriers where appropriate.
- Acquire land to protect important habitat and wildlife corridors.
- Identify and protect key wildlife corridors for landscape connectivity.

Stressor: Soil erosion High

- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.

Stressor: Unnatural fire regimes High

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change Priority

Stressor: Drought High

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Habitat conversion Priority

Stressor: Livestock management High

- Use integrated management activities in concert to address nuisance plants.
- Protect and restore riparian areas.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Revegetate disturbed areas with native plants.
- Protect sensitive habitats from excessive grazing.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Rural development Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Renovate aquatic systems to remove undesirable species.

Category: Invasive species Priority

Stressor: Disease/pathogens/parasites High

- Adopt national standards and efforts to reduce and control nuisance species.

Stressor: Nuisance animals High

- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
- Adopt national standards and efforts to reduce and control nuisance species.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Evaluate and modify Department regulations where appropriate.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Use integrated management activities in concert to address nuisance plants.
- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

- Category:** Pollution **Priority**
Stressor: Sediment/ash flows High
- Protect and restore riparian areas.
 - Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
 - Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
 - Revegetate disturbed areas with native plants.

Species **Scores**
Relict Leopard Frog Community/Focal: 2
Rana onca Responsibility: 2
Tier 1a amphibian

- Category:** Abiotic resource use **Priority**
Stressor: Water diversion/water catchments High
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
 - Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
 - Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
 - Promote water conservation methods.
 - Remove artificial stream barriers where appropriate.
 - Protect sensitive habitats from excessive grazing.
 - Prevent or minimize recreational impacts in sensitive habitats.

- Category:** Changes in Ecological Processes **Priority**
Stressor: Streambank alteration/channelization Medium
- Protect sensitive habitats from excessive grazing.
 - Protect and restore riparian areas.

- Stressor:** Unnatural fire regimes Medium
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
 - Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
 - Use controlled burning to limit and reduce fuel loads and shrub invasion.
 - Encourage the utilization of low water use [and native] plants in landscaping.
 - Use integrated management activities in concert to address nuisance plants.
 - Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

- Category:** Climate Change **Priority**
Stressor: Drought Medium
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
 - Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
 - Manage upland watersheds to retain vegetation as a buffer against drought effects.

- Category:** Habitat conversion **Priority**
Stressor: Agricultural conversion Medium
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.

Stressor: Livestock management Medium

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Revegetate disturbed areas with native plants.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.
- Use integrated management activities in concert to address nuisance plants.

Category: Invasive species Priority

Stressor: Disease/pathogens/parasites High

- Adopt national standards and efforts to reduce and control nuisance species.

Stressor: Nuisance animals High

- Identify watersheds and other conservation areas to prioritize renovation activities.
- Evaluate and modify Department regulations where appropriate.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Adopt national standards and efforts to reduce and control nuisance species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Use integrated management activities in concert to address nuisance plants.

Category: Transportation and infrastructure Priority

Stressor: Roads for motorized vehicles Medium

- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.
- Encourage wildlife friendly design for all road building.

Species

Northern Leopard Frog

Rana pipiens

Tier 1b amphibian

Category: Abiotic resource use

Scores

Community/Focal: 2

Responsibility: 1

Priority

Stressor: Groundwater depletion and springhead use High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments Medium

- Promote water conservation methods.
- Remove artificial stream barriers where appropriate.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Prevent or minimize recreational impacts in sensitive habitats.
- Protect sensitive habitats from excessive grazing.

Category: Changes in Ecological Processes **Priority**

Stressor: Unnatural fire regimes High

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change **Priority**

Stressor: Drought High

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Habitat conversion **Priority**

Stressor: Livestock management High

- Protect and restore riparian areas.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Protect sensitive habitats from excessive grazing.
- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Revegetate disturbed areas with native plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Invasive species **Priority**

Stressor: Disease/pathogens/parasites High

- Adopt national standards and efforts to reduce and control nuisance species.

Stressor: Nuisance animals High

- Implement recovery plans, habitat conservation plans, and other cooperative agreements

for sustaining wildlife resources..

- Use integrated management activities in concert to address nuisance plants.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
- Adopt national standards and efforts to reduce and control nuisance species.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Evaluate and modify Department regulations where appropriate.

Category: Non-consumptive resource use

Priority

Stressor: Motorized recreation off-trail

Medium

- Increase enforcement for laws governing recreational activities.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Increase public awareness of responsible OHV use and laws.
- Prevent or minimize recreational impacts in sensitive habitats.

Category: Pollution

Priority

Stressor: Sediment/ash flows

High

- Revegetate disturbed areas with native plants.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Protect and restore riparian areas.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Category: Transportation and infrastructure

Priority

Stressor: Roads for motorized vehicles

Medium

- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.
- Encourage wildlife friendly design for all road building.

Species

Ramsey Canyon Leopard Frog

Rana subaquavocalis

Tier 1b amphibian

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Border issues

Stressor: Enforcement activities along the border

Scores

Community/Focal: 2

Responsibility: 1

Priority

High

Priority

Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Priority

Stressor: Habitat fragmentation/barriers

Medium

- Identify and protect key wildlife corridors for landscape connectivity.
- Remove artificial stream barriers where appropriate.
- Acquire land to protect important habitat and wildlife corridors.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Soil erosion

High

- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Promote guidelines for timber harvesting and associated road building that positively effect wildlife.
- Protect and restore riparian areas.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Stressor: Unnatural fire regimes

High

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Use integrated management activities in concert to address nuisance plants.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Habitat conversion

Priority

Stressor: Agricultural conversion

Medium

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.

Stressor: Livestock management

Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Protect and restore riparian areas.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Use integrated management activities in concert to address nuisance plants.
- Revegetate disturbed areas with native plants.

Stressor: Rural development

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Acquire land or conservation easements to protect key conservation areas.
- Renovate aquatic systems to remove undesirable species.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Urban growth

High

- Identify key conservation areas to protect from development.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Create and maintain habitat improvement features for aquatic species.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.
- Renovate aquatic systems to remove undesirable species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Identify and protect key wildlife corridors for landscape connectivity.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Invasive species

Priority

Stressor: Disease/pathogens/parasites

High

- Adopt national standards and efforts to reduce and control nuisance species.

Stressor: Nuisance animals

High

- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Use integrated management activities in concert to address nuisance plants.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).

- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Adopt national standards and efforts to reduce and control nuisance species.
- Evaluate and modify Department regulations where appropriate.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

Category: Pollution

Priority

Stressor: Sediment/ash flows

High

- Protect and restore riparian areas.
- Revegetate disturbed areas with native plants.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Species

Scores

Tarahumara Frog

Community/Focal: 3

Rana tarahumarae

Responsibility: 2

Tier 1b amphibian

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Border issues

Priority

Stressor: Dispersed camping along the border

Medium

- Develop cooperative clean up efforts along the border for the benefit of wildlife.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Category: Changes in Ecological Processes

Priority

Stressor: Unnatural fire regimes

High

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Use integrated management activities in concert to address nuisance plants.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Category: Climate Change

Priority

Stressor: Drought Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Habitat conversion **Priority**

Stressor: Livestock management Medium

- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Revegetate disturbed areas with native plants.
- Protect sensitive habitats from excessive grazing.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect and restore riparian areas.

Category: Invasive species **Priority**

Stressor: Disease/pathogens/parasites High

- Adopt national standards and efforts to reduce and control nuisance species.

Stressor: Nuisance animals High

- Evaluate and modify Department regulations where appropriate.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Use integrated management activities in concert to address nuisance plants.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Adopt national standards and efforts to reduce and control nuisance species.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Category: Pollution **Priority**

Stressor: Sediment/ash flows High

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Protect and restore riparian areas.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Revegetate disturbed areas with native plants.

Species

Lowland Leopard Frog

Rana yavapaiensis

Tier 1b amphibian

Scores

Community/Focal: 3

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Protect and restore springheads.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Habitat fragmentation/barriers

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land to protect important habitat and wildlife corridors.
- Remove artificial stream barriers where appropriate.

Stressor: Soil erosion

Medium

- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Promote guidelines for timber harvesting and associated road building that positively effect wildlife.
- Protect and restore riparian areas.

Stressor: Unnatural fire regimes

Medium

- Use integrated management activities in concert to address nuisance plants.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against

drought effects.

Category: Habitat conversion

Priority

Stressor: Agricultural conversion

Medium

- Acquire land or conservation easements to protect key conservation areas.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Livestock management

Medium

- Revegetate disturbed areas with native plants.
- Use integrated management activities in concert to address nuisance plants.
- Protect sensitive habitats from excessive grazing.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect and restore riparian areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Rural development

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Renovate aquatic systems to remove undesirable species.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.

Stressor: Urban growth

High

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Create and maintain habitat improvement features for aquatic species.
- Renovate aquatic systems to remove undesirable species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Acquire land or conservation easements to protect key conservation areas.
- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Identify and protect key wildlife corridors for landscape connectivity.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).

Category: Invasive species

Priority

Stressor: Disease/pathogens/parasites

High

- Adopt national standards and efforts to reduce and control nuisance species.

Stressor: Nuisance animals

High

- Evaluate and modify Department regulations where appropriate.
- Use integrated management activities in concert to address nuisance plants.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Adopt national standards and efforts to reduce and control nuisance species.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.

Category: Non-consumptive resource use

Priority

Stressor: Motorized recreation off-trail

Medium

- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.
- Increase enforcement for laws governing recreational activities.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Encourage revegetation and restoration of existing unauthorized roads and trails.

Category: Pollution

Priority

Stressor: Sediment/ash flows

Medium

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Revegetate disturbed areas with native plants.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Protect and restore riparian areas.

BIRDS

Species

Apache Northern Goshawk

Scores

Community/Focal: 1

<i>Accipiter gentilis apache</i> Tier 1b bird	Responsibility: 2
Category: Abiotic resource use	Priority
Stressor: Groundwater depletion and springhead use	Medium
<ul style="list-style-type: none">- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.	
Category: Changes in Ecological Processes	Priority
Stressor: Unnatural fire regimes	High
<ul style="list-style-type: none">- Design fire management plans and wildland/urban interface policies that consider wildlife values.- Use controlled burning to limit and reduce fuel loads and shrub invasion.- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.	
Category: Climate Change	Priority
Stressor: Drought	Medium
<ul style="list-style-type: none">- Manage upland watersheds to retain vegetation as a buffer against drought effects.	
Category: Habitat conversion	Priority
Stressor: Forest and woodland management - habitat conversion	Medium
<ul style="list-style-type: none">- Encourage revegetation and restoration of existing unauthorized roads and trails.	
Stressor: Livestock management	Medium
<ul style="list-style-type: none">- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.- Protect sensitive habitats from excessive grazing.	
Stressor: Recreational sites/facilities	High
<ul style="list-style-type: none">- Increase enforcement for laws governing recreational activities.- Support prevention of human-caused fire through enforcement of appropriate fire use regulations and education.- Educate the public about maintaining sensitive habitat for wildlife.	
Category: Transportation and infrastructure	Priority
Stressor: Trails for foot, bike, or equine use	Medium
<ul style="list-style-type: none">- Encourage revegetation and restoration of existing unauthorized roads and trails.- Acquire land or conservation easements on portions of rangeland critical to wildlife.- Clearly mark designated roads and trails for recreational users.- Prevent or minimize recreational impacts in sensitive habitats.	

Species

Northern Goshawk

Accipiter gentilis atricapillus

Tier 1b bird

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Scores

Community/Focal: 1

Responsibility: 2

Priority

Medium

Category: Changes in Ecological Processes	Priority
Stressor: Insect Infestation	Medium
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.	
Stressor: Soil erosion	Medium
- Promote guidelines for timber harvesting and associated road building that positively effect wildlife.	
- Work with land managers to develop and implement management plans that incorporate wildlife values.	
Stressor: Unnatural fire regimes	High
- Use controlled burning to limit and reduce fuel loads and shrub invasion.	
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.	
Category: Consumptive use of biological resources	Priority
Stressor: Grazing by ungulates	Medium
- Work with land managers to develop and implement management plans that incorporate wildlife values.	
- Protect sensitive habitats from excessive grazing.	
Category: Habitat conversion	Priority
Stressor: Forest and woodland management - habitat conversion	High
- Encourage revegetation and restoration of existing unauthorized roads and trails.	
Stressor: Livestock management	Medium
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.	
- Protect sensitive habitats from excessive grazing.	
Stressor: Recreational sites/facilities	Medium
- Educate the public about maintaining sensitive habitat for wildlife.	
- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.	
- Support prevention of human-caused fire through enforcement of appropriate fire use regulations and education.	
- Increase enforcement for laws governing recreational activities.	
- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.	
Category: Non-consumptive resource use	Priority
Stressor: Dispersed camping	Medium
- Increase public awareness of responsible camping practices (low impact camping).	
- Increase enforcement for laws governing recreational activities.	
Stressor: Motorized recreation off-trail	Medium
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.	
- Prevent or minimize recreational impacts in sensitive habitats.	
- Increase enforcement for laws governing recreational activities.	
- Encourage revegetation and restoration of existing unauthorized roads and trails.	
Stressor: Non-motorized recreation off-trail	Medium

- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

Species

Clark's Grebe
Aechmophorus clarkii
Tier 1b bird

Scores

Community/Focal: 1
Responsibility: 3

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

Medium

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Management for game animals and sport fish

Medium

- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).

Stressor: Soil erosion

Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Implement watershed based approaches aimed at preventing excessive soil erosion.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Livestock management

Medium

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

- Use integrated management activities in concert to address nuisance plants.

- Protect and restore riparian areas.

- Protect sensitive habitats from excessive grazing.

Stressor: Urban growth

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Renovate aquatic systems to remove undesirable species.

- Create and maintain habitat improvement features for aquatic species.

- Promote legislation to increase water conservation.

Category: Non-consumptive resource use

Priority

Stressor: Watercraft operation

Medium

- Increase public awareness on the impacts of watercraft and watercraft operating practices to wildlife and wildlife habitat.

- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.

- Increase enforcement for laws governing recreational activities.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Stressor: Sediment/ash flows Medium

- Revegetate disturbed areas with native plants.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Species

Botteri's Sparrow

Aimophila botterii

Tier 1b bird

Scores

Community/Focal: 1

Responsibility: 3

Category: Abiotic resource use **Priority**

Stressor: Groundwater depletion and springhead use Medium

- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.

Stressor: Streambank alteration/channelization Medium

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

Stressor: Unnatural fire regimes High

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change **Priority**

Stressor: Drought Medium

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

Category: Habitat conversion **Priority**

Stressor: Livestock management High

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

- Protect sensitive habitats from excessive grazing.
- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Urban growth

High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Identify key conservation areas to protect from development.

Species

Violet-crowned Hummingbird

Amazilia violiceps

Tier 1b bird

Category: Abiotic resource use

Scores

Community/Focal: 1

Responsibility: 3

Stressor: Groundwater depletion and springhead use

Priority

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Stressor: Water diversion/water catchments

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Remove artificial stream barriers where appropriate.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Prevent or minimize recreational impacts in sensitive habitats.
- Promote water conservation methods.

Category: Border issues

Priority

Stressor: Altered fire regime as a result of border activities

High

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Category: Changes in Ecological Processes

Priority

Stressor: Habitat fragmentation/barriers

Medium

- Acquire land to protect important habitat and wildlife corridors.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Unnatural fire regimes

High

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Habitat conversion

Priority

Stressor: Livestock management

High

- Use integrated management activities in concert to address nuisance plants.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.

Category: Pollution

Priority

Stressor: Sediment/ash flows

Medium

- Revegetate disturbed areas with native plants.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect and restore riparian areas.

Species

Baird's Sparrow

Scores

Community/Focal: 1

Ammodramus bairdii

Responsibility: 3

Tier 1b bird

Category: Changes in Ecological Processes

Priority

Stressor: Habitat degradation/shrub invasions

High

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Habitat fragmentation/barriers

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Unnatural fire regimes

High

- Use integrated management activities in concert to address nuisance plants.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Habitat conversion

Priority

Stressor: Livestock management

High

- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.

Stressor: Rural development

High

- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Species

Arizona Grasshopper Sparrow
Ammodramus savannarum ammoregus
Tier 1b bird

Scores
Community/Focal: 1
Responsibility: 2

Category: Changes in Ecological Processes

Priority

Stressor: Habitat degradation/shrub invasions

High

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Use integrated management activities in concert to address nuisance plants.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Stressor: Habitat fragmentation/barriers

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Unnatural fire regimes

High

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Category: Habitat conversion

Priority

Stressor: Livestock management

High

- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Rural development

High

- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Species

Western Grasshopper Sparrow
Ammodramus savannarum perpallidus
Tier 1b bird

Scores
Community/Focal: 1
Responsibility: 3

Category: Changes in Ecological Processes

Priority

Stressor: Habitat degradation/shrub invasions

Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Habitat fragmentation/barriers

High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Acquire land to protect important habitat and wildlife corridors.

Category: Habitat conversion **Priority**
Stressor: Livestock management Medium

- Protect sensitive habitats from excessive grazing.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Rural development High

- Acquire land or conservation easements to protect key conservation areas.
- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Urban growth High

- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Species

Sprague's Pipit

Anthus spragueii

Tier 1b bird

Scores

Community/Focal: 1

Responsibility: 3

Category: Changes in Ecological Processes **Priority**

Stressor: Habitat degradation/shrub invasions High

- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Stressor: Habitat fragmentation/barriers Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Unnatural fire regimes Medium

- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Habitat conversion **Priority**

Stressor: Livestock management High

- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.

Stressor: Rural development High

- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Species

Great Egret
Ardea alba

Tier 1b bird

Scores

Community/Focal: 2
Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Water diversion/water catchments

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Remove artificial stream barriers where appropriate.
- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Prevent or minimize recreational impacts in sensitive habitats.
- Protect sensitive habitats from excessive grazing.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect and restore springheads.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Protect sensitive habitats from excessive grazing.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Stressor: Habitat fragmentation/barriers

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Streambank alteration/channelization

Medium

- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.
- Prevent or minimize recreational impacts in sensitive habitats.
- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Unnatural fire regimes

High

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Climate Change

Priority

Stressor: Drought

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife

and riparian habitat.

- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Rural development

High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Renovate aquatic systems to remove undesirable species.
- Promote legislation to increase water conservation.
- Acquire land or conservation easements to protect key conservation areas.
- Protect and restore riparian areas.
- Identify key conservation areas to protect from development.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Urban growth

High

- Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.
- Promote legislation to increase water conservation.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Create and maintain habitat improvement features for aquatic species.
- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Protect and restore riparian areas.
- Renovate aquatic systems to remove undesirable species.

Category: Non-consumptive resource use

Priority

Stressor: Motorized recreation off-trail

High

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible OHV use and laws.
- Prevent or minimize recreational impacts in sensitive habitats.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

Medium

- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Species

Northern Gray Hawk

Asturina nitida maxima

Tier 1b bird

Scores

Community/Focal: 1

Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Water diversion/water catchments

Medium

- Protect sensitive habitats from excessive grazing.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Remove artificial stream barriers where appropriate.
- Prevent or minimize recreational impacts in sensitive habitats.
- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Border issues

Priority

Stressor: Altered fire regime as a result of border activities

High

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore springheads.
- Protect sensitive habitats from excessive grazing.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Habitat fragmentation/barriers

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Acquire land to protect important habitat and wildlife corridors.
- Remove artificial stream barriers where appropriate.

Stressor: Streambank alteration/channelization

Medium

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Promote water conservation methods.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Prevent or minimize recreational impacts in sensitive habitats.
- Protect sensitive habitats from excessive grazing.
- Protect and restore riparian areas.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Stressor: Unnatural fire regimes

High

- Use integrated management activities in concert to address nuisance plants.
- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Climate Change

Priority

Stressor: Drought

High

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Habitat conversion

Priority

Stressor: Livestock management High

- Protect sensitive habitats from excessive grazing.
- Use integrated management activities in concert to address nuisance plants.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Protect and restore riparian areas.

Category: Non-consumptive resource use **Priority**

Stressor: Dispersed camping Medium

- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible camping practices (low impact camping).

Stressor: Motorized recreation off-trail Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Increase enforcement for laws governing recreational activities.

Species

American Bittern

Botaurus lentiginosus

Tier 1b bird

Scores

Community/Focal: 1

Responsibility: 3

Category: Abiotic resource use **Priority**

Stressor: Groundwater depletion and springhead use Medium

- Encourage gray water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage low water use agriculture.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes High

- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Stressor: Unnatural fire regimes Medium

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Climate Change

Priority

Stressor: Drought

High

- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Urban growth

Medium

- Identify key conservation areas to protect from development.
- Acquire land or conservation easements to protect key conservation areas.
- Create and maintain habitat improvement features for aquatic species.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Protect and restore riparian areas.
- Promote legislation to increase water conservation.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Species Specific

Priority

Stressor: Unknown

Medium

- Develop research needs to assess population trends and/or habitat needs.

Species

Ferruginous Hawk

Buteo regalis

Tier 1b bird

Scores

Community/Focal: 1

Responsibility: 2

Category: Changes in Ecological Processes

Priority

Stressor: Habitat degradation/shrub invasions

High

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize

habitat degradation while maintaining stock ponds where appropriate.

Stressor: Habitat fragmentation/barriers High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Unnatural fire regimes Medium

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change **Priority**

Stressor: Drought Medium

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Habitat conversion **Priority**

Stressor: Livestock management High

- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Rural development Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Urban growth Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Invasive species **Priority**

Stressor: Nuisance plants High

- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Use integrated management activities in concert to address nuisance plants.
- Revegetate disturbed areas with native plants.
- Adopt national standards and efforts to reduce and control nuisance species.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.

Category: Non-consumptive resource use **Priority**

Stressor: Motorized recreation off-trail Medium

- Prevent or minimize recreational impacts in sensitive habitats.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible OHV use and laws.

Category: Transportation and infrastructure **Priority**

Stressor: Power lines/wind-harnessing turbines Medium

- Assess and implement current recommendations for power lines/wind-harnessing turbines/telephone lines/cell phone towers/radio towers to minimize impacts to wildlife.
- Encourage use of underground power and telephone lines where feasible.

- Develop guidelines for location and design of new infrastructure installations to minimize effects on wildlife and habitats.

Species

Common Black-Hawk
Buteogallus anthracinus
Tier 1b bird

Scores

Community/Focal: 1
Responsibility: 2

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments

Medium

- Protect sensitive habitats from excessive grazing.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

- Remove artificial stream barriers where appropriate.

- Promote water conservation methods.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

Medium

- Protect sensitive habitats from excessive grazing.

- Protect and restore springheads.

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Remove or modify unnecessary or inoperative dams or diversions.

- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Habitat fragmentation/barriers

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Streambank alteration/channelization

Medium

- Prevent or minimize recreational impacts in sensitive habitats.

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

- Protect sensitive habitats from excessive grazing.

- Protect and restore riparian areas.

- Promote water conservation methods.

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

Stressor: Unnatural fire regimes High

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.
- Use integrated management activities in concert to address nuisance plants.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Climate Change Priority

Stressor: Drought High

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Habitat conversion Priority

Stressor: Dams/reservoirs/impoundments Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Forest and woodland management - habitat conversion Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.

Stressor: Livestock management High

- Use integrated management activities in concert to address nuisance plants.
- Protect and restore riparian areas.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect sensitive habitats from excessive grazing.

Stressor: Recreational sites/facilities Medium

- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.
- Educate the public about maintaining sensitive habitat for wildlife.
- Design recreation site management plans and policies that minimize impacts to wildlife and

habitats.

- Increase enforcement for laws governing recreational activities.
- Support prevention of human-caused fire through enforcement of appropriate fire use regulations and education.

Category: Non-consumptive resource use

Priority

Stressor: Dispersed camping

High

- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible camping practices (low impact camping).
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Stressor: Motorized recreation off-trail

Medium

- Increase enforcement for laws governing recreational activities.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.

Species

Scores

Crested Caracara

Community/Focal: 2

Caracara cheriway

Responsibility: 3

Tier 1b bird

Category: Changes in Ecological Processes

Priority

Stressor: Unnatural fire regimes

High

- Use integrated management activities in concert to address nuisance plants.
- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Species

Scores

Swainson's Thrush

Community/Focal: 1

Catharus ustulatus

Responsibility: 3

Tier 1b bird

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Changes in Ecological Processes

Priority

Stressor: Habitat fragmentation/barriers

High

- Acquire land to protect important habitat and wildlife corridors.

Stressor: Streambank alteration/channelization Medium

- Promote water conservation methods.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Unnatural fire regimes High

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.

Category: Climate Change **Priority**

Stressor: Drought Medium

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Consumptive use of biological resources **Priority**

Stressor: Grazing by ungulates High

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Disseminate information to partners on effects of grazing on resources.
- Protect sensitive habitats from excessive grazing.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Category: Habitat conversion **Priority**

Stressor: Forest and woodland management - habitat conversion High

- Encourage revegetation and restoration of existing unauthorized roads and trails.

Stressor: Livestock management High

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect sensitive habitats from excessive grazing.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Protect and restore riparian areas.

Category: Pollution **Priority**

Stressor: Sediment/ash flows High

- Revegetate disturbed areas with native plants.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Protect and restore riparian areas.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Species

Belted Kingfisher

Ceryle alcyon

Tier 1b bird

Scores

Community/Focal: 1

Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Stressor: Water diversion/water catchments

Medium

- Remove artificial stream barriers where appropriate.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Protect sensitive habitats from excessive grazing.
- Promote water conservation methods.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

Medium

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Protect sensitive habitats from excessive grazing.
- Protect and restore springheads.

Stressor: Habitat fragmentation/barriers

Medium

- Remove or modify unnecessary or inoperative dams or diversions.
- Acquire land to protect important habitat and wildlife corridors.
- Remove artificial stream barriers where appropriate.

Stressor: Streambank alteration/channelization Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.
- Prevent or minimize recreational impacts in sensitive habitats.
- Protect and restore riparian areas.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Stressor: Unnatural fire regimes High

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change **Priority**

Stressor: Drought High

- Promote water conservation methods.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Habitat conversion **Priority**

Stressor: Livestock management Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Use integrated management activities in concert to address nuisance plants.

Category: Non-consumptive resource use **Priority**

Stressor: Dispersed camping Medium

- Increase public awareness of responsible camping practices (low impact camping).
- Increase enforcement for laws governing recreational activities.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Category: Pollution

Priority

Stressor: Sediment/ash flows

High

- Protect and restore riparian areas.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Revegetate disturbed areas with native plants.

Species

Scores

Western Snowy Plover

Community/Focal: 2

Charadrius alexandrinus nivosus

Responsibility: 3

Tier 1b bird

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

- Encourage low water use agriculture.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Climate Change

Priority

Stressor: Drought

High

- Promote water conservation methods.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Use integrated management activities in concert to address nuisance plants.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Non-consumptive resource use

Priority

Stressor: Motorized recreation off-trail

Medium

- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible OHV use and laws.
- Prevent or minimize recreational impacts in sensitive habitats.
- Encourage revegetation and restoration of existing unauthorized roads and trails.

Species

Scores

Western Yellow-billed Cuckoo

Community/Focal: 1

Coccyzus americanus occidentalis

Responsibility: 2

Tier 1a bird

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Encourage gray water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage low water use agriculture.

Stressor: Water diversion/water catchments Medium

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Prevent or minimize recreational impacts in sensitive habitats.
- Promote water conservation methods.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.
- Remove artificial stream barriers where appropriate.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Border issues **Priority**
Stressor: Altered fire regime as a result of border activities High

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Changes in Ecological Processes **Priority**
Stressor: Altered river flow regimes High

- Remove or modify unnecessary or inoperative dams or diversions.
- Protect sensitive habitats from excessive grazing.
- Protect and restore springheads.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Habitat fragmentation/barriers High

- Remove or modify unnecessary or inoperative dams or diversions.
- Acquire land to protect important habitat and wildlife corridors.
- Remove artificial stream barriers where appropriate.

Stressor: Streambank alteration/channelization Medium

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

- Prevent or minimize recreational impacts in sensitive habitats.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Stressor: Unnatural fire regimes **High**

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.
- Use integrated management activities in concert to address nuisance plants.
- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

Category: Climate Change **Priority**

Stressor: Drought **High**

- Promote water conservation methods.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Consumptive use of biological resources **Priority**

Stressor: Grazing by ungulates **Medium**

- Disseminate information to partners on effects of grazing on resources.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.

Category: Habitat conversion **Priority**

Stressor: Dams/reservoirs/impoundments **High**

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Forest and woodland management - habitat conversion **High**

- Use integrated management activities in concert to address nuisance plants.

Stressor: Livestock management **High**

- Protect sensitive habitats from excessive grazing.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Protect and restore riparian areas.
- Use integrated management activities in concert to address nuisance plants.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

Stressor: Recreational sites/facilities Medium

- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Use environmentally-friendly materials, landscaping, and structure designs for recreational sites.
- Increase enforcement for laws governing recreational activities.
- Educate the public about maintaining sensitive habitat for wildlife.
- Support prevention of human-caused fire through enforcement of appropriate fire use regulations and education.
- Conduct boat inspections at marina and boat launch ramps to detect and prevent the spread of aquatic nuisance species.

Stressor: Rural development Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Identify key conservation areas to protect from development.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Acquire land or conservation easements to protect key conservation areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Protect and restore riparian areas.
- Renovate aquatic systems to remove undesirable species.
- Promote legislation to increase water conservation.

Stressor: Urban growth High

- Promote legislation to increase water conservation.
- Protect and restore riparian areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Acquire land or conservation easements to protect key conservation areas.
- Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.
- Identify key conservation areas to protect from development.
- Create and maintain habitat improvement features for aquatic species.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Invasive species **Priority**

Stressor: Nuisance plants High

- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.

- Adopt national standards and efforts to reduce and control nuisance species.
- Use integrated management activities in concert to address nuisance plants.
- Revegetate disturbed areas with native plants.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.

Category: Non-consumptive resource use

Priority

Stressor: Dispersed camping

Medium

- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible camping practices (low impact camping).
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Stressor: Motorized recreation off-trail

Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness of responsible OHV use and laws.
- Increase enforcement for laws governing recreational activities.

Species

Scores

Masked Bobwhite

Community/Focal: 1

Colinus virginianus ridgwayi

Responsibility: 1

Tier 1a bird

Category: Border issues

Priority

Stressor: Altered fire regime as a result of border activities

Medium

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Priority

Stressor: Habitat degradation/shrub invasions

High

- Use integrated management activities in concert to address nuisance plants.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Habitat fragmentation/barriers

Medium

- Acquire land to protect important habitat and wildlife corridors.

Stressor: Soil erosion

Medium

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Revegetate disturbed areas with native plants.

Stressor: Unnatural fire regimes

High

- Use integrated management activities in concert to address nuisance plants.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Climate Change

Priority

Stressor: Shift to warmer climate

Medium

- Develop plans to conserve priority conservation species (Focal Community,

Responsibility, and Vulnerability categories) that are not sufficiently addressed under existing plans.

Category: Habitat conversion **Priority**
Stressor: Livestock management **Medium**

- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Protect sensitive habitats from excessive grazing.
- Revegetate disturbed areas with native plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Invasive species **Priority**
Stressor: Nuisance plants **Medium**

- Revegetate disturbed areas with native plants.
- Use integrated management activities in concert to address nuisance plants.

Species

Olive-sided Flycatcher

Contopus cooperi

Tier 1b bird

Scores
Community/Focal: 1
Responsibility: 3

Category: Changes in Ecological Processes **Priority**
Stressor: Habitat fragmentation/barriers **High**

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Unnatural fire regimes **High**

- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.

Category: Climate Change **Priority**
Stressor: Drought **Medium**

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Consumptive use of biological resources **Priority**
Stressor: Grazing by ungulates **Medium**

- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Habitat conversion **Priority**
Stressor: Forest and woodland management - habitat conversion **High**

- Encourage revegetation and restoration of existing unauthorized roads and trails.

Stressor: Livestock management **Medium**

- Protect sensitive habitats from excessive grazing.

Stressor: Urban growth **Medium**

- Identify key conservation areas to protect from development.
- Promote legislation to increase water conservation.

Species

Black-bellied Whistling-Duck
Dendrocygna autumnalis
Tier 1b bird

Scores

Community/Focal: 2
Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage low water use agriculture.
- Encourage gray water use.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Category: Changes in Ecological Processes

Priority

Stressor: Habitat fragmentation/barriers

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Acquire land to protect important habitat and wildlife corridors.

Stressor: Unnatural fire regimes

High

- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

- Use integrated management activities in concert to address nuisance plants.

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Climate Change

Priority

Stressor: Drought

High

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Promote water conservation methods.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Protect and restore riparian areas.

Stressor: Rural development

Medium

- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Promote legislation to increase water conservation.
- Protect and restore riparian areas.
- Renovate aquatic systems to remove undesirable species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Acquire land or conservation easements to protect key conservation areas.
- Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).

Stressor: Urban growth

High

- Identify key conservation areas to protect from development.
- Acquire land or conservation easements to protect key conservation areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Create and maintain habitat improvement features for aquatic species.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Promote legislation to increase water conservation.
- Renovate aquatic systems to remove undesirable species.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.

Species

Gray Catbird
Dumetella carolinensis
Tier 1b bird

Scores

Community/Focal: 1
Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Promote water conservation methods in growth planning to develop sustainable water use.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Category: Changes in Ecological Processes

Priority

Stressor: Habitat fragmentation/barriers

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Acquire land to protect important habitat and wildlife corridors.

Stressor: Streambank alteration/channelization

High

- Protect and restore riparian areas.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Protect sensitive habitats from excessive grazing.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Stressor: Unnatural fire regimes

High

- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

High

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.

Category: Habitat conversion

Priority

Stressor: Livestock management

High

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect and restore riparian areas.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Protect sensitive habitats from excessive grazing.

Stressor: Rural development

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Renovate aquatic systems to remove undesirable species.
- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.

Stressor: Urban growth

High

- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Protect and restore riparian areas.
- Acquire land or conservation easements to protect key conservation areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Renovate aquatic systems to remove undesirable species.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Create and maintain habitat improvement features for aquatic species.

Species

Snowy Egret

Egretta thula

Tier 1b bird

Scores

Community/Focal: 1

Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Water diversion/water catchments

High

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Protect sensitive habitats from excessive grazing.
- Promote water conservation methods.
- Remove artificial stream barriers where appropriate.
- Prevent or minimize recreational impacts in sensitive habitats.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect and restore springheads.
- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Stressor: Habitat fragmentation/barriers

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Acquire land to protect important habitat and wildlife corridors.

Stressor: Streambank alteration/channelization

Medium

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Prevent or minimize recreational impacts in sensitive habitats.
- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect sensitive habitats from excessive grazing.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Protect and restore riparian areas.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

Stressor: Unnatural fire regimes

High

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Category:** Consumptive use of biological resources **Priority**
Stressor: Harvesting/collecting animals **Medium**
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
 - Increase public awareness of regulations pertaining to illegal harvest.
- Category:** Habitat conversion **Priority**
Stressor: Dams/reservoirs/impoundments **High**
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
 - Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Stressor:** Rural development **High**
- Acquire land or conservation easements to protect key conservation areas.
 - Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
 - Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.
 - Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
 - Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
 - Work with city and county planners to incorporate wildlife values in urban/rural development plans.
 - Promote legislation to increase water conservation.
 - Protect and restore riparian areas.
 - Renovate aquatic systems to remove undesirable species.
- Stressor:** Urban growth **High**
- Acquire land or conservation easements to protect key conservation areas.
 - Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
 - Protect and restore riparian areas.
 - Promote legislation to increase water conservation.
 - Renovate aquatic systems to remove undesirable species.
 - Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
 - Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
 - Work with city and county planners to incorporate wildlife values in urban/rural development plans.
 - Identify key conservation areas to protect from development.
 - Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.
 - Create and maintain habitat improvement features for aquatic species.
- Category:** Non-consumptive resource use **Priority**
Stressor: Motorized recreation off-trail **Medium**
- Increase public awareness of responsible OHV use and laws.
 - Prevent or minimize recreational impacts in sensitive habitats.

- Increase enforcement for laws governing recreational activities.
- Encourage revegetation and restoration of existing unauthorized roads and trails.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Species

Scores

Northern Buff-breasted Flycatcher
Empidonax fulvifrons pygmaeus
Tier 1b bird

Community/Focal: 1
Responsibility: 3

Category: Border issues

Priority

Stressor: Altered fire regime as a result of border activities

High

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Priority

Stressor: Unnatural fire regimes

High

- Design fire management plans and wildland/urban interface policies that consider wildlife values.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Habitat conversion

Priority

Stressor: Forest and woodland management - habitat conversion

High

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Livestock management

Medium

- Protect sensitive habitats from excessive grazing.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Stressor:** Recreational sites/facilities Medium
- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
 - Support prevention of human-caused fire through enforcement of appropriate fire use regulations and education.
 - Increase public awareness on ways to reduce nuisance wildlife in residential areas (that is: not leaving out pet food, proper disposal of waste, storage of food, fencing gardens or yards).
 - Increase enforcement for laws governing recreational activities.
 - Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.
 - Educate the public about maintaining sensitive habitat for wildlife.

Species

Southwestern Willow Flycatcher
Empidonax traillii extimus
Tier 1a bird

Scores
Community/Focal: 1
Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage low water use agriculture.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage gray water use.

Stressor: Water diversion/water catchments

Medium

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
 - Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
 - Remove artificial stream barriers where appropriate.
 - Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
 - Prevent or minimize recreational impacts in sensitive habitats.
 - Protect sensitive habitats from excessive grazing.
 - Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
 - Promote water conservation methods.
 - Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Category:** Changes in Ecological Processes **Priority**
- Stressor:** Altered river flow regimes **High**
- Protect and restore springheads.
 - Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
 - Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Protect sensitive habitats from excessive grazing.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Habitat fragmentation/barriers High

- Remove or modify unnecessary or inoperative dams or diversions.
- Remove artificial stream barriers where appropriate.
- Acquire land to protect important habitat and wildlife corridors.

Stressor: Streambank alteration/channelization Medium

- Protect sensitive habitats from excessive grazing.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Protect and restore riparian areas.
- Prevent or minimize recreational impacts in sensitive habitats.

Stressor: Unnatural fire regimes High

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.
- Encourage the utilization of low water use [and native] plants in landscaping.

Category: Climate Change Priority

Stressor: Drought High

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

Category: Consumptive use of biological resources Priority

Stressor: Grazing by ungulates High

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Disseminate information to partners on effects of grazing on resources.

- Protect sensitive habitats from excessive grazing.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.

Stressor: Forest and woodland management - habitat conversion

High

- Use integrated management activities in concert to address nuisance plants.

Stressor: Livestock management

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Use integrated management activities in concert to address nuisance plants.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Protect and restore riparian areas.

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

Stressor: Rural development

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Renovate aquatic systems to remove undesirable species.

- Promote legislation to increase water conservation.

- Acquire land or conservation easements to protect key conservation areas.

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Urban growth

High

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

- Renovate aquatic systems to remove undesirable species.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Create and maintain habitat improvement features for aquatic species.

- Acquire land or conservation easements to protect key conservation areas.

- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).

Category: Invasive species

Priority

Stressor: Nuisance plants

High

- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.

- Revegetate disturbed areas with native plants.

Category: Non-consumptive resource use

Priority

Stressor: Motorized recreation off-trail

Medium

- Increase public awareness on the negative effects of creation and use of unauthorized

roads and trails for recreation.

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.
- Increase enforcement for laws governing recreational activities.

Category: Pollution

Priority

Stressor: Sediment/ash flows

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Work with land managers to reduce or prevent high sedimentation of aquatic systems where appropriate.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Species

Scores

Northern Aplomado Falcon

Community/Focal: 3

Falco femoralis septentrionalis

Responsibility: 2

Tier 1a bird

Category: Changes in Ecological Processes

Priority

Stressor: Habitat degradation/shrub invasions

High

- Use integrated management activities in concert to address nuisance plants.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Habitat fragmentation/barriers

High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Modify grazing practices of grasslands to allow for natural fire regimes and reduction in undesirable vegetation.

Stressor: Unnatural fire regimes

High

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Category: Habitat conversion

Priority

Stressor: Livestock management

High

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Rural development

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Acquire land or conservation easements to protect key conservation areas.

Species

American Peregrine Falcon
Falco peregrinus anatum
Tier 1b bird

Scores
Community/Focal: 1
Responsibility: 2

Category: Climate Change

Priority

Stressor: Drought

Medium

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Consumptive use of biological resources

Priority

Stressor: Harvesting/collecting animals

Medium

- Increase public awareness of regulations pertaining to illegal harvest.
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.

Category: Non-consumptive resource use

Priority

Stressor: Non-motorized recreation off-trail

Medium

- Seasonally close areas to recreational and commercial use when sensitive breeding wildlife are present.

Category: Pollution

Priority

Stressor: Pesticides/herbicides

Medium

- Use alternative means for pest control (biocontrol, genetic control, management practices).

Category: Transportation and infrastructure

Priority

Stressor: Power lines/wind-harnessing turbines

Medium

- Assess and implement current recommendations for power lines/wind-harnessing turbines/telephone lines/cell phone towers/radio towers to minimize impacts to wildlife.
- Develop guidelines for location and design of new infrastructure installations to minimize effects on wildlife and habitats.
- Encourage use of underground power and telephone lines where feasible.

Species

Cactus Ferruginous Pygmy-Owl
Glaucidium brasilianum cactorum
Tier 1a bird

Scores
Community/Focal: 2
Responsibility: 2

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Encourage the utilization of low water use [and native] plants in landscaping.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments

Medium

- Protect sensitive habitats from excessive grazing.
- Prevent or minimize recreational impacts in sensitive habitats.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Border issues

Priority

Stressor: Altered fire regime as a result of border activities

High

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

- Use controlled burning to limit and reduce fuel loads and shrub invasion.

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Stressor: Habitat fragmentation/barriers

High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Acquire land to protect important habitat and wildlife corridors.

Stressor: Streambank alteration/channelization

Medium

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Protect sensitive habitats from excessive grazing.

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

- Prevent or minimize recreational impacts in sensitive habitats.

- Protect and restore riparian areas.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Stressor: Unnatural fire regimes

High

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change

Priority

Stressor: Drought

High

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Stressor:** Forest and woodland management - habitat conversion Medium
- Use integrated management activities in concert to address nuisance plants.
- Stressor:** Livestock management Medium
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Use integrated management activities in concert to address nuisance plants.
- Protect and restore riparian areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect sensitive habitats from excessive grazing.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Stressor:** Rural development High
- Identify key conservation areas to protect from development.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Acquire land or conservation easements to protect key conservation areas.
- Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Identify and protect key wildlife corridors for landscape connectivity.
- Stressor:** Urban growth High
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.
- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Protect and restore riparian areas.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Identify and protect key wildlife corridors for landscape connectivity.
- Renovate aquatic systems to remove undesirable species.
- Acquire land or conservation easements to protect key conservation areas.
- Category:** Invasive species **Priority**
Stressor: Nuisance plants High
- Revegetate disturbed areas with native plants.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Adopt national standards and efforts to reduce and control nuisance species.
- Use integrated management activities in concert to address nuisance plants.
- Category:** Non-consumptive resource use **Priority**
Stressor: Motorized recreation off-trail Medium

- Prevent or minimize recreational impacts in sensitive habitats.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness of responsible OHV use and laws.
- Increase enforcement for laws governing recreational activities.

Species

California Condor

Gymnogyps californianus

Tier 1a bird

Scores

Community/Focal: 2

Responsibility: 1

Category: Consumptive use of biological resources

Priority

Stressor: Harvesting/collecting animals

Medium

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.

Category: Invasive species

Priority

Stressor: Disease/pathogens/parasites

High

- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.

Category: Pollution

Priority

Stressor: Illegal dumping/littering

High

- Increase public awareness of dumping and littering impacts to wildlife and their habitat.

Category: Transportation and infrastructure

Priority

Stressor: Power lines/wind-harnessing turbines

Medium

- Encourage use of underground power and telephone lines where feasible.
- Assess and implement current recommendations for power lines/wind-harnessing turbines/telephone lines/cell phone towers/radio towers to minimize impacts to wildlife.

Species

Bald Eagle

Haliaeetus leucocephalus

Tier 1a bird

Scores

Community/Focal: 2

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments

High

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Protect sensitive habitats from excessive grazing.

- Remove artificial stream barriers where appropriate.

- Prevent or minimize recreational impacts in sensitive habitats.

- Promote water conservation methods in growth planning to develop sustainable water use.

- Promote water conservation methods.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore springheads.
- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Loss of keystone species High

- Protect and restore riparian areas.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Renovate aquatic systems to remove undesirable species.
- Manage habitat to maximize biodiversity by keeping common species common and protecting imperiled species.

Stressor: Management for game animals and sport fish High

- Manage so as to sustain or enhance native fish and sport fish populations.
- Expand hatchery capabilities to propagate native species.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

Stressor: Soil erosion High

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Implement 'Best Management Practices' when building roads or other infrastructure (dams, mines, developments, etc.).
- Revegetate disturbed areas with native plants.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect and restore riparian areas.
- Promote guidelines for timber harvesting and associated road building that positively effect wildlife.

Stressor: Streambank alteration/channelization High

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore riparian areas.

- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Prevent or minimize recreational impacts in sensitive habitats.
- Protect sensitive habitats from excessive grazing.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Unnatural fire regimes **High**

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Climate Change **Priority**

Stressor: Drought **Medium**

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

Category: Consumptive use of biological resources **Priority**

Stressor: Harvesting/collecting animals **High**

- Increase public awareness of regulations pertaining to illegal harvest.
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.

Category: Habitat conversion **Priority**

Stressor: Dams/reservoirs/impoundments **High**

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Create and maintain habitat improvement features for aquatic species.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Stressor: Livestock management **High**

- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize

habitat degradation while maintaining stock ponds where appropriate.

- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

Stressor: Recreational sites/facilities

High

- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.
- Increase enforcement for laws governing recreational activities.
- Educate the public about maintaining sensitive habitat for wildlife.
- Use environmentally-friendly materials, landscaping, and structure designs for recreational sites.

Stressor: Rural development

Medium

- Renovate aquatic systems to remove undesirable species.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Acquire land or conservation easements to protect key conservation areas.

Stressor: Urban growth

High

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Protect and restore riparian areas.
- Create and maintain habitat improvement features for aquatic species.
- Renovate aquatic systems to remove undesirable species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Identify key conservation areas to protect from development.

Category: Invasive species

Priority

Stressor: Disease/pathogens/parasites

Medium

- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.

Stressor: Nuisance animals

High

- Use integrated management activities in concert to address nuisance plants.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.

- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Evaluate and modify Department regulations where appropriate.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Identify watersheds and other conservation areas to prioritize renovation activities.

Stressor: Nuisance plants Medium

- Use integrated management activities in concert to address nuisance plants.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Adopt national standards and efforts to reduce and control nuisance species.

Category: Non-consumptive resource use **Priority**

Stressor: Dispersed camping High

- Increase enforcement for laws governing recreational activities.

Stressor: Motorized recreation off-trail Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness of responsible OHV use and laws.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Prevent or minimize recreational impacts in sensitive habitats.

Stressor: Non-motorized recreation off-trail Medium

- Prevent or minimize recreational impacts in sensitive habitats.

Stressor: Off-range recreational shooting High

- Educate users on responsible recreational shooting behavior and habitat stewardship.
- Increase enforcement for laws governing recreational activities.

Stressor: Watercraft operation High

- Increase enforcement for laws governing recreational activities.
- Increase public awareness on the impacts of watercraft and watercraft operating practices to wildlife and wildlife habitat.
- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.

Category: Pollution **Priority**

Stressor: Contaminants from waste water and runoff Medium

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.

Stressor: Heavy metals/mine tailings Medium

- Promote recycling to reduce contamination from landfills and new mine operations.
- Regulate and enforce use of containment measures for commercial operations to prevent

toxins from polluting surrounding habitat.

Stressor: Lead shot/fishing line High

- Increase public awareness on the effects of improper disposal of fishing line.
- Provide more wildlife proof waste receptacles in areas of public recreation.
- Encourage cooperative clean up efforts of aquatic and terrestrial wildlife habitats through existing and new programs.

Stressor: Pesticides/herbicides Medium

- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
- Use alternative means for pest control (biocontrol, genetic control, management practices).
- Promote organic agriculture and gardening practices that do not rely on chemical treatments.

Stressor: Sediment/ash flows High

- Protect and restore riparian areas.
- Work with land managers to reduce or prevent high sedimentation of aquatic systems where appropriate.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.

Category: Species Specific **Priority**

Stressor: Small/localized or highly concentrated population(s) High

- Minimize wildlife access to landfills to discourage use as a source of food.

Category: Transportation and infrastructure **Priority**

Stressor: Air traffic corridors/overflights Medium

- Establish, where necessary, advisory distances for air traffic corridors/overflights in critical wildlife habitats.
- Inform and educate the public on potential negative impacts of low level overflights to wildlife.

Stressor: Power lines/wind-harnessing turbines Medium

- Encourage use of underground power and telephone lines where feasible.
- Develop guidelines for location and design of new infrastructure installations to minimize effects on wildlife and habitats.
- Assess and implement current recommendations for power lines/wind-harnessing turbines/telephone lines/cell phone towers/radio towers to minimize impacts to wildlife.
- Identify problem areas and retrofit existing problem structures to minimize affects on wildlife.

Stressor: Roads for motorized vehicles Medium

- Encourage wildlife friendly design for all road building.
- Reduce sedimentation effects from road and trail construction.

Stressor: Trails for foot, bike, or equine use Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Prevent or minimize recreational impacts in sensitive habitats.

Stressor: Unauthorized roads & trails High

- Increase enforcement for laws governing recreational activities.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Incorporate wildlife values in the design of road and trail networks in and around natural

areas.

- Increase public awareness of responsible OHV use and laws.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

Species

Mississippi Kite

Ictinia mississippiensis

Tier 1b bird

Scores

Community/Focal: 2

Responsibility: 2

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Encourage low water use agriculture.
- Encourage gray water use.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Stressor: Water diversion/water catchments

High

- Prevent or minimize recreational impacts in sensitive habitats.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect sensitive habitats from excessive grazing.
- Remove artificial stream barriers where appropriate.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Protect and restore springheads.
- Protect sensitive habitats from excessive grazing.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Habitat fragmentation/barriers

High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Acquire land to protect important habitat and wildlife corridors.

Stressor: Streambank alteration/channelization

Medium

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Protect and restore riparian areas.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Protect sensitive habitats from excessive grazing.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Prevent or minimize recreational impacts in sensitive habitats.

Stressor: Unnatural fire regimes High

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.
- Incorporate wildlife values in the design of road and trail networks in and around natural areas.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change **Priority**

Stressor: Drought High

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Habitat conversion **Priority**

Stressor: Livestock management High

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect and restore riparian areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.

Stressor: Rural development Medium

- Renovate aquatic systems to remove undesirable species.
- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical

assistance (thru incentive programs) to conservation projects.

- Identify key conservation areas to protect from development.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Invasive species

Priority

Stressor: Nuisance plants

High

- Revegetate disturbed areas with native plants.
- Adopt national standards and efforts to reduce and control nuisance species.
- Use integrated management activities in concert to address nuisance plants.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.

Category: Non-consumptive resource use

Priority

Stressor: Motorized recreation off-trail

Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Increase enforcement for laws governing recreational activities.

Species

California Black Rail

Scores

Community/Focal: 1

Laterallus jamaicensis coturnic

Responsibility: 3

Tier 1b bird

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage low water use agriculture.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments

Medium

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Prevent or minimize recreational impacts in sensitive habitats.
- Protect sensitive habitats from excessive grazing.
- Remove artificial stream barriers where appropriate.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Protect sensitive habitats from excessive grazing.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Protect and restore springheads.

Stressor: Habitat fragmentation/barriers High

- Acquire land to protect important habitat and wildlife corridors.
- Remove artificial stream barriers where appropriate.

Stressor: Soil erosion Medium

- Revegetate disturbed areas with native plants.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Protect and restore riparian areas.

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Stressor: Streambank alteration/channelization High

- Protect sensitive habitats from excessive grazing.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Protect and restore riparian areas.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Prevent or minimize recreational impacts in sensitive habitats.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Stressor: Unnatural fire regimes High

- Use integrated management activities in concert to address nuisance plants.
- Incorporate wildlife values in the design of road and trail networks in and around natural areas.
- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Climate Change Priority

Stressor: Drought Medium

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Habitat conversion Priority

Stressor: Dams/reservoirs/impoundments High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.

Category: Invasive species Priority

Stressor: Nuisance plants Medium

- Use integrated management activities in concert to address nuisance plants.
- Adopt national standards and efforts to reduce and control nuisance species.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Revegetate disturbed areas with native plants.

Species

Sage Thrasher

Oreoscoptes montanus

Tier 1b bird

Scores

Community/Focal: 1

Responsibility: 3

Category: Changes in Ecological Processes

Priority

Stressor: Unnatural fire regimes

High

- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change

Priority

Stressor: Drought

High

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Revegetate disturbed areas with native plants.

- Use integrated management activities in concert to address nuisance plants.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Protect sensitive habitats from excessive grazing.

- Acquire land or conservation easements on portions of rangeland critical to wildlife.

Stressor: Rural development

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Invasive species

Priority

Stressor: Nuisance plants

High

- Support and participate in the multi-agency Governor's Invasive Species Task Force.

- Revegetate disturbed areas with native plants.

- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.

- Adopt national standards and efforts to reduce and control nuisance species.

- Use integrated management activities in concert to address nuisance plants.

Category: Non-consumptive resource use

Priority

Stressor: Motorized recreation off-trail

Medium

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

- Increase enforcement for laws governing recreational activities.

- Increase public awareness of responsible OHV use and laws.

- Prevent or minimize recreational impacts in sensitive habitats.

- Encourage revegetation and restoration of existing unauthorized roads and trails.

Species

Rose-throated Becard
Pachyramphus aglaiae
Tier 1b bird

Scores

Community/Focal: 2
Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Encourage gray water use.

Stressor: Water diversion/water catchments

Medium

- Protect sensitive habitats from excessive grazing.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Prevent or minimize recreational impacts in sensitive habitats.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Remove artificial stream barriers where appropriate.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Border issues

Priority

Stressor: Altered fire regime as a result of border activities

High

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Changes in Ecological Processes

Priority

Stressor: Habitat fragmentation/barriers

High

- Acquire land to protect important habitat and wildlife corridors.

Stressor: Unnatural fire regimes

High

- Use integrated management activities in concert to address nuisance plants.
- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Work with city and county planners to limit or prevent development in flood plains and

areas that impact watershed integrity.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Habitat conversion

Priority

Stressor: Forest and woodland management - habitat conversion

Medium

- Use integrated management activities in concert to address nuisance plants.
- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Livestock management

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Rural development

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Renovate aquatic systems to remove undesirable species.

Species

Scores

Osprey

Community/Focal: 1

Pandion haliaetus

Responsibility: 3

Tier 1b bird

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Encourage gray water use.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage low water use agriculture.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect sensitive habitats from excessive grazing.

- Protect and restore springheads.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Soil erosion Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect and restore riparian areas.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Revegetate disturbed areas with native plants.

Stressor: Streambank alteration/channelization Medium

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Prevent or minimize recreational impacts in sensitive habitats.
- Protect and restore riparian areas.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect sensitive habitats from excessive grazing.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Stressor: Unnatural fire regimes High

- Use integrated management activities in concert to address nuisance plants.
- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.
- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

Category: Climate Change **Priority**

Stressor: Drought Medium

- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Habitat conversion **Priority**

Stressor: Dams/reservoirs/impoundments High

- Create and maintain habitat improvement features for aquatic species.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Livestock management High

- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Protect and restore riparian areas.

Stressor: Recreational sites/facilities Medium

- Conduct boat inspections at marina and boat launch ramps to detect and prevent the spread of aquatic nuisance species.
- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.
- Educate the public about maintaining sensitive habitat for wildlife.
- Support prevention of human-caused fire through enforcement of appropriate fire use regulations and education.
- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Increase enforcement for laws governing recreational activities.

Stressor: Urban growth Medium

- Renovate aquatic systems to remove undesirable species.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Create and maintain habitat improvement features for aquatic species.
- Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Identify key conservation areas to protect from development.
- Acquire land or conservation easements to protect key conservation areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Non-consumptive resource use **Priority**

Stressor: Dispersed camping Medium

- Increase public awareness of responsible camping practices (low impact camping).
- Increase enforcement for laws governing recreational activities.

Stressor: Motorized recreation off-trail Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.
- Increase enforcement for laws governing recreational activities.

Category: Pollution

Priority

Stressor: Lead shot/fishing line

High

- Increase public awareness on the effects of improper disposal of fishing line.
- Encourage cooperative clean up efforts of aquatic and terrestrial wildlife habitats through existing and new programs.
- Provide more wildlife proof waste receptacles in areas of public recreation.

Stressor: Sediment/ash flows

High

- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Revegetate disturbed areas with native plants.
- Work with land managers to reduce or prevent high sedimentation of aquatic systems where appropriate.
- Protect and restore riparian areas.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Category: Transportation and infrastructure

Priority

Stressor: Power lines/wind-harnessing turbines

Medium

- Assess and implement current recommendations for power lines/wind-harnessing turbines/telephone lines/cell phone towers/radio towers to minimize impacts to wildlife.
- Develop guidelines for location and design of new infrastructure installations to minimize effects on wildlife and habitats.
- Encourage use of underground power and telephone lines where feasible.

Species

Scores

Black-billed Magpie

Community/Focal: 2

Pica hudsonia

Responsibility: 3

Tier 1b bird

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Stressor: Water diversion/water catchments

Medium

- Promote water conservation methods.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Remove artificial stream barriers where appropriate.
- Protect sensitive habitats from excessive grazing.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Changes in Ecological Processes	Priority
Stressor: Habitat fragmentation/barriers	Medium
- Remove or modify unnecessary or inoperative dams or diversions.	
Stressor: Unnatural fire regimes	High
- Use integrated management activities in concert to address nuisance plants.	
- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.	
Category: Climate Change	Priority
Stressor: Drought	High
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).	
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.	
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.	
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.	
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.	
- Promote water conservation methods.	
Stressor: Shift to warmer climate	High
- Develop plans to conserve priority conservation species (Focal Community, Responsibility, and Vulnerability categories) that are not sufficiently addressed under existing plans.	
Category: Consumptive use of biological resources	Priority
Stressor: Harvesting/collecting animals	Medium
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.	
Category: Habitat conversion	Priority
Stressor: Forest and woodland management - habitat conversion	High
- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.	
- Use integrated management activities in concert to address nuisance plants.	
Stressor: Livestock management	High
- Protect and restore riparian areas.	
- Use integrated management activities in concert to address nuisance plants.	
- Protect sensitive habitats from excessive grazing.	
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.	
Stressor: Rural development	Medium
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.	
- Renovate aquatic systems to remove undesirable species.	
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.	
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).	
Category: Invasive species	Priority

- Stressor:** Nuisance plants Medium
- Revegetate disturbed areas with native plants.
 - Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
 - Adopt national standards and efforts to reduce and control nuisance species.
 - Use integrated management activities in concert to address nuisance plants.

Species

American Three-toed Woodpecker
Picoides dorsalis
Tier 1b bird

Scores
Community/Focal: 2
Responsibility: 3

Category: Climate Change

Priority

Stressor: Drought

Medium

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Stressor: Shift to warmer climate

High

- Develop plans to conserve priority conservation species (Focal Community, Responsibility, and Vulnerability categories) that are not sufficiently addressed under existing plans.

Category: Consumptive use of biological resources

Priority

Stressor: Forest and woodland management - consumptive use

High

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Category: Habitat conversion

Priority

Stressor: Forest and woodland management - habitat conversion

High

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

- Encourage revegetation and restoration of existing unauthorized roads and trails.

Species

Pine Grosbeak
Pinicola enucleator
Tier 1b bird

Scores
Community/Focal: 2
Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Category: Changes in Ecological Processes

Priority

Stressor: Insect Infestation

Medium

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Stressor: Unnatural fire regimes

High

- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.

Category: Climate Change

Priority

Stressor: Drought

High

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Stressor: Shift to warmer climate High

- Develop plans to conserve priority conservation species (Focal Community, Responsibility, and Vulnerability categories) that are not sufficiently addressed under existing plans.

Category: Consumptive use of biological resources Priority

Stressor: Forest and woodland management - consumptive use High

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Grazing by ungulates High

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Disseminate information to partners on effects of grazing on resources.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.

Category: Habitat conversion Priority

Stressor: Forest and woodland management - habitat conversion Medium

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Species

Black-capped Gnatcatcher
Polioptila nigriceps
Tier 1b bird

Scores
Community/Focal: 2
Responsibility: 3

Category: Abiotic resource use Priority

Stressor: Groundwater depletion and springhead use Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Category: Border issues Priority

Stressor: Altered fire regime as a result of border activities Medium

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Category: Changes in Ecological Processes **Priority**
Stressor: Unnatural fire regimes **Medium**

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change **Priority**
Stressor: Drought **Medium**

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Species

Western Purple Martin
Progne subis arboricola
Tier 1b bird

Scores
Community/Focal: 1
Responsibility: 3

Category: Changes in Ecological Processes **Priority**
Stressor: Insect Infestation **Medium**

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Stressor: Unnatural fire regimes **High**

- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Consumptive use of biological resources **Priority**
Stressor: Grazing by ungulates **High**

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Category: Habitat conversion **Priority**
Stressor: Forest and woodland management - habitat conversion **Medium**

- Encourage revegetation and restoration of existing unauthorized roads and trails.

Stressor: Livestock management **Medium**

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Rural development **Medium**

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Identify key conservation areas to protect from development.

Stressor: Urban growth **Medium**

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Species

Yuma Clapper Rail

Rallus longirostris yumanensis

Tier 1a bird

Scores

Community/Focal: 2

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Encourage low water use agriculture.

- Promote water conservation methods in growth planning to develop sustainable water use.

Stressor: Water diversion/water catchments

Medium

- Prevent or minimize recreational impacts in sensitive habitats.

- Remove artificial stream barriers where appropriate.

- Protect sensitive habitats from excessive grazing.

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

Category: Border issues

Priority

Stressor: Altered fire regime as a result of border activities

Medium

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

- Use controlled burning to limit and reduce fuel loads and shrub invasion.

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Stressor: Light pollution along the border

Medium

- Design lighting projects along the borderlands that minimize disturbance to wildlife, but meet the needs for homeland security.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Protect sensitive habitats from excessive grazing.

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Protect and restore springheads.

Stressor: Habitat fragmentation/barriers

Medium

- Acquire land to protect important habitat and wildlife corridors.

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Soil erosion Medium

- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Protect and restore riparian areas.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Revegetate disturbed areas with native plants.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.

Stressor: Streambank alteration/channelization Medium

- Protect sensitive habitats from excessive grazing.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore riparian areas.
- Prevent or minimize recreational impacts in sensitive habitats.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.

Stressor: Unnatural fire regimes High

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Climate Change **Priority**

Stressor: Drought High

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage the utilization of low water use [and native] plants in landscaping.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Habitat conversion **Priority**

Stressor: Dams/reservoirs/impoundments High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.

Stressor: Livestock management Medium

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

- Protect sensitive habitats from excessive grazing.

- Protect and restore riparian areas.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Rural development Medium

- Protect and restore riparian areas.

- Renovate aquatic systems to remove undesirable species.

- Acquire land or conservation easements to protect key conservation areas.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Stressor: Urban growth Medium

- Promote legislation to increase water conservation.

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Create and maintain habitat improvement features for aquatic species.

- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Protect and restore riparian areas.

- Renovate aquatic systems to remove undesirable species.

Category: Invasive species **Priority**

Stressor: Nuisance plants Medium

- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.

- Adopt national standards and efforts to reduce and control nuisance species.

Category: Non-consumptive resource use **Priority**

Stressor: Motorized recreation off-trail Medium

- Increase public awareness of responsible OHV use and laws.

- Encourage revegetation and restoration of existing unauthorized roads and trails.

- Prevent or minimize recreational impacts in sensitive habitats.

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

- Increase enforcement for laws governing recreational activities.

- Category:** Pollution **Priority**
Stressor: Contaminants from waste water and runoff Medium
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
 - Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Stressor:** Heavy metals/mine tailings High
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
 - Support alternative energy and recycling efforts to reduce toxic by-products and wastes from traditional fuels and mineral extraction.
- Stressor:** Pesticides/herbicides High
- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.
 - Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
 - Promote organic agriculture and gardening practices that do not rely on chemical treatments.

Species

Thick-billed Parrot
Rhynchopsitta pachyrhyncha
Tier 1b bird

Scores
Community/Focal: 2
Responsibility: 1

- Category:** Border issues **Priority**
Stressor: Altered fire regime as a result of border activities High
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
 - Use controlled burning to limit and reduce fuel loads and shrub invasion.
 - Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Category:** Changes in Ecological Processes **Priority**
Stressor: Insect Infestation Medium
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Stressor:** Unnatural fire regimes High
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
 - Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Category:** Climate Change **Priority**
Stressor: Drought Medium
- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Species

Azure Bluebird
Sialia sialis fulva

Scores
Community/Focal: 2
Responsibility: 3

Tier 1b bird

Category: Abiotic resource use **Priority**
Stressor: Groundwater depletion and springhead use **High**

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Border issues **Priority**
Stressor: Altered fire regime as a result of border activities **High**

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Category: Changes in Ecological Processes **Priority**
Stressor: Unnatural fire regimes **High**

- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change **Priority**
Stressor: Drought **Medium**

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Consumptive use of biological resources **Priority**
Stressor: Forest and woodland management - consumptive use **High**

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Category: Habitat conversion **Priority**
Stressor: Forest and woodland management - habitat conversion **High**

- Use integrated management activities in concert to address nuisance plants.
- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Livestock management **Medium**

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Work cooperatively with landowners/permittees by providing financial and technical

assistance (thru incentive programs) to conservation projects.

Stressor: Rural development

Medium

- Acquire land or conservation easements to protect key conservation areas.
- Renovate aquatic systems to remove undesirable species.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Species

Red-naped Sapsucker

Sphyrapicus nuchalis

Tier 1b bird

Scores

Community/Focal: 1

Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Changes in Ecological Processes

Priority

Stressor: Unnatural fire regimes

High

- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Consumptive use of biological resources

Priority

Stressor: Forest and woodland management - consumptive use

Medium

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Grazing by ungulates

High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Habitat conversion

Priority

Stressor: Forest and woodland management - habitat conversion

High

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Livestock management

High

- Protect sensitive habitats from excessive grazing.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Rural development Medium

- Renovate aquatic systems to remove undesirable species.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Urban growth Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Species

Mexican Spotted Owl

Strix occidentalis lucida

Tier 1a bird

Scores

Community/Focal: 2

Responsibility: 2

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.

Category: Border issues

Priority

Stressor: Altered fire regime as a result of border activities

High

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Priority

Stressor: Insect Infestation

High

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Stressor: Unnatural fire regimes

High

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.

Category: Climate Change

Priority

Stressor: Drought

High

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
Stressor: Shift to warmer climate High
- Develop plans to conserve priority conservation species (Focal Community, Responsibility, and Vulnerability categories) that are not sufficiently addressed under existing plans.
Category: Consumptive use of biological resources **Priority**
- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
Stressor: Forest and woodland management - consumptive use High
- Develop and implement livestock and big game management strategies that promote wildlife habitat diversity and connectivity.
Stressor: Grazing by ungulates Medium
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
Category: Habitat conversion **Priority**
- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
Stressor: Forest and woodland management - habitat conversion High
- Encourage revegetation and restoration of existing unauthorized roads and trails.
Stressor: Livestock management Medium
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
Stressor: Recreational sites/facilities Medium
- Educate the public about maintaining sensitive habitat for wildlife.
- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Support prevention of human-caused fire through enforcement of appropriate fire use regulations and education.
- Increase enforcement for laws governing recreational activities.
Stressor: Rural development Medium
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
Stressor: Urban growth Medium
- Create and maintain habitat improvement features for aquatic species.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
Category: Non-consumptive resource use **Priority**
- Increase enforcement for laws governing recreational activities.
Stressor: Motorized recreation off-trail Medium
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.

Species

Scores

Elegant Trogon <i>Trogon elegans</i> Tier 1b bird	Community/Focal: 2 Responsibility: 3
Category: Abiotic resource use	Priority
Stressor: Groundwater depletion and springhead use	High
<ul style="list-style-type: none">- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.- Promote water conservation methods in growth planning to develop sustainable water use.- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.	
Category: Border issues	Priority
Stressor: Altered fire regime as a result of border activities	High
<ul style="list-style-type: none">- Use controlled burning to limit and reduce fuel loads and shrub invasion.- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.	
Stressor: Dispersed camping along the border	High
<ul style="list-style-type: none">- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.	
Category: Changes in Ecological Processes	Priority
Stressor: Altered river flow regimes	Medium
<ul style="list-style-type: none">- Protect sensitive habitats from excessive grazing.- Protect and restore springheads.- Work with land managers to develop and implement management plans that incorporate wildlife values.	
Stressor: Streambank alteration/channelization	Medium
<ul style="list-style-type: none">- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.	
Stressor: Unnatural fire regimes	High
<ul style="list-style-type: none">- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.- Use controlled burning to limit and reduce fuel loads and shrub invasion.	
Category: Climate Change	Priority
Stressor: Drought	High
<ul style="list-style-type: none">- Manage upland watersheds to retain vegetation as a buffer against drought effects.- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.	
Category: Habitat conversion	Priority
Stressor: Forest and woodland management - habitat conversion	High

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Livestock management Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

Stressor: Recreational sites/facilities Medium

- Support prevention of human-caused fire through enforcement of appropriate fire use regulations and education.
- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.
- Increase enforcement for laws governing recreational activities.
- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Educate the public about maintaining sensitive habitat for wildlife.

Category: Non-consumptive resource use **Priority**

Stressor: Motorized recreation off-trail Medium

- Increase public awareness of responsible OHV use and laws.
- Increase enforcement for laws governing recreational activities.
- Prevent or minimize recreational impacts in sensitive habitats.
- Encourage revegetation and restoration of existing unauthorized roads and trails.

Category: Pollution **Priority**

Stressor: Sediment/ash flows Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Work with land managers to reduce or prevent high sedimentation of aquatic systems where appropriate.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Protect and restore riparian areas.

Category: Transportation and infrastructure **Priority**

Stressor: Trails for foot, bike, or equine use High

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Clearly mark designated roads and trails for recreational users.
- Prevent or minimize recreational impacts in sensitive habitats.

Species

Thick-billed Kingbird

Tyrannus crassirostris

Tier 1b bird

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Encourage low water use agriculture.

Scores

Community/Focal: 2

Responsibility: 3

Priority

High

- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments Medium

- Promote water conservation methods.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Protect sensitive habitats from excessive grazing.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Prevent or minimize recreational impacts in sensitive habitats.
- Remove artificial stream barriers where appropriate.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Border issues **Priority**
Stressor: Altered fire regime as a result of border activities High

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Changes in Ecological Processes **Priority**
Stressor: Altered river flow regimes High

- Protect sensitive habitats from excessive grazing.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore springheads.

Stressor: Soil erosion High

- Protect and restore riparian areas.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Revegetate disturbed areas with native plants.
- Implement watershed based approaches aimed at preventing excessive soil erosion.

Stressor: Streambank alteration/channelization High

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Protect sensitive habitats from excessive grazing.
- Prevent or minimize recreational impacts in sensitive habitats.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife

and riparian habitat.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Protect and restore riparian areas.

Stressor: Unnatural fire regimes High

- Use integrated management activities in concert to address nuisance plants.
- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.

Category: Climate Change Priority

Stressor: Drought High

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.

Category: Habitat conversion Priority

Stressor: Forest and woodland management - habitat conversion High

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Livestock management High

- Protect and restore riparian areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Revegetate disturbed areas with native plants.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect sensitive habitats from excessive grazing.
- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Rural development Medium

- Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Renovate aquatic systems to remove undesirable species.
- Promote legislation to increase water conservation.

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Identify key conservation areas to protect from development.

Category: Invasive species

Priority

Stressor: Nuisance plants

Medium

- Adopt national standards and efforts to reduce and control nuisance species.
- Use integrated management activities in concert to address nuisance plants.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Revegetate disturbed areas with native plants.

Category: Non-consumptive resource use

Priority

Stressor: Dispersed camping

Medium

- Increase public awareness of responsible camping practices (low impact camping).
- Increase enforcement for laws governing recreational activities.

Stressor: Motorized recreation off-trail

High

- Increase enforcement for laws governing recreational activities.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.
- Encourage revegetation and restoration of existing unauthorized roads and trails.

Stressor: Non-motorized recreation off-trail

Medium

- Prevent or minimize recreational impacts in sensitive habitats.

Category: Pollution

Priority

Stressor: Sediment/ash flows

Medium

- Work with land managers to reduce or prevent high sedimentation of aquatic systems where appropriate.
- Protect and restore riparian areas.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Revegetate disturbed areas with native plants.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.

Species

Tropical Kingbird

Tyrannus melancholicus

Tier 1b bird

Scores

Community/Focal: 2

Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Encourage gray water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness on the importance of conserving groundwater and springs for

the benefit of wildlife.

- Encourage low water use agriculture.

Stressor: Water diversion/water catchments Medium

- Promote water conservation methods.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Prevent or minimize recreational impacts in sensitive habitats.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.
- Remove artificial stream barriers where appropriate.

Category: Border issues **Priority**

Stressor: Altered fire regime as a result of border activities High

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Stressor: Dispersed camping along the border High

- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes Medium

- Protect sensitive habitats from excessive grazing.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore springheads.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Soil erosion High

- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Protect and restore riparian areas.

Stressor: Streambank alteration/channelization High

- Protect sensitive habitats from excessive grazing.
- Promote water conservation methods.
- Protect and restore riparian areas.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.
- Prevent or minimize recreational impacts in sensitive habitats.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Stressor: Unnatural fire regimes High

- Reduce salt cedar and exotic grasses to improve recolonization of native vegetation.
- Incorporate wildlife values in the design of road and trail networks in and around natural areas.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change Priority

Stressor: Drought Medium

- Promote water conservation methods.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

Category: Habitat conversion Priority

Stressor: Forest and woodland management - habitat conversion Medium

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Livestock management High

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Protect and restore riparian areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.

Stressor: Rural development Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Promote legislation to increase water conservation.
- Protect and restore riparian areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.
- Renovate aquatic systems to remove undesirable species.

Category: Invasive species

Priority

Stressor: Nuisance plants

High

- Use integrated management activities in concert to address nuisance plants.
- Revegetate disturbed areas with native plants.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Adopt national standards and efforts to reduce and control nuisance species.

Category: Non-consumptive resource use

Priority

Stressor: Dispersed camping

Medium

- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible camping practices (low impact camping).
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Stressor: Motorized recreation off-trail

High

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible OHV use and laws.

Stressor: Non-motorized recreation off-trail

Medium

- Prevent or minimize recreational impacts in sensitive habitats.

Category: Pollution

Priority

Stressor: Sediment/ash flows

Medium

- Protect and restore riparian areas.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Revegetate disturbed areas with native plants.

FISH

Species

Longfin Dace

Agosia chrysogaster

Tier 1b fish

Category: Abiotic resource use

Stressor: Mining

- Revegetate disturbed areas with native plants.

Scores

Community/Focal: 2

Responsibility: 1

Priority

Medium

- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Stressor: Water diversion/water catchments High

- Remove artificial stream barriers where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes Medium

- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore springheads.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Habitat fragmentation/barriers Medium

- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore riparian areas.
- Remove artificial stream barriers where appropriate.

Stressor: Soil erosion Medium

- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Survey for areas of suitable habitat for reestablishment of species.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Protect and restore riparian areas.

Stressor: Streambank alteration/channelization Medium

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore riparian areas.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Promote water conservation methods.
- Survey for areas of suitable habitat for reestablishment of species.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage development of water use plans that protect instream flow.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Disseminate information to partners on effects of grazing on resources.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

Medium

- Create and maintain habitat improvement features for aquatic species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Livestock management

Medium

- Protect and restore riparian areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Invasive species

Priority

Stressor: Nuisance animals

High

- Survey for areas of suitable habitat for reestablishment of species.
- Use integrated management activities in concert to address nuisance plants.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Identify watersheds and other conservation areas to prioritize renovation activities.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

Medium

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.

Species

Scores

Mexican Stoneroller

Community/Focal: 1

Campostoma ornatum

Responsibility: 1

Tier 1b fish

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Protect and restore springheads.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage gray water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage wise management of ground water.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Stressor: Water diversion/water catchments

High

- Remove artificial stream barriers where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore springheads.

- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Streambank alteration/channelization **Medium**

- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore riparian areas.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Climate Change **Priority**
Stressor: Drought **Medium**

- Encourage the utilization of low water use [and native] plants in landscaping.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Encourage development of water use plans that protect instream flow.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Survey for areas of suitable habitat for reestablishment of species.

Category: Habitat conversion **Priority**
Stressor: Dams/reservoirs/impoundments **High**

- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Create and maintain habitat improvement features for aquatic species.

Category: Invasive species **Priority**
Stressor: Nuisance animals **High**

- Identify watersheds and other conservation areas to prioritize renovation activities.

- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Use integrated management activities in concert to address nuisance plants.

Species

Yaqui Sucker
Catostomus berrardini
Tier 1b fish

Scores

Community/Focal: 1
Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Encourage gray water use.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage wise management of ground water.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Protect and restore springheads.

Stressor: Water diversion/water catchments

High

- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove artificial stream barriers where appropriate.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Promote water conservation methods in growth planning to develop sustainable water use.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

Medium

- Protect and restore springheads.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Survey for areas of suitable habitat for reestablishment of species.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Streambank alteration/channelization

Medium

- Promote water conservation methods.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore riparian areas.
- Promote water conservation methods in growth planning to develop sustainable water use.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Survey for areas of suitable habitat for reestablishment of species.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage development of water use plans that protect instream flow.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Remove or modify unnecessary or inoperative dams or diversions.
- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Create and maintain habitat improvement features for aquatic species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Invasive species

Priority

Stressor: Nuisance animals

High

- Identify watersheds and other conservation areas to prioritize renovation activities.
- Use integrated management activities in concert to address nuisance plants.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Survey for areas of suitable habitat for reestablishment of species.

Species

Desert Sucker
Catostomus clarki

Scores

Community/Focal: 1
Responsibility: 1

Tier 1b fish

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage wise management of ground water.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage gray water use.
- Encourage low water use agriculture.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Protect and restore springheads.

Stressor: Mining

Medium

- Increase public awareness of wildlife impacts and benefits of mining operations.
- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Stressor: Water diversion/water catchments

High

- Promote water conservation methods.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Remove artificial stream barriers where appropriate.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Survey for areas of suitable habitat for reestablishment of species.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Protect and restore springheads.

Stressor: Habitat fragmentation/barriers

Medium

- Remove or modify unnecessary or inoperative dams or diversions.
- Remove artificial stream barriers where appropriate.

- Protect and restore riparian areas.
- Survey for areas of suitable habitat for reestablishment of species.

Stressor: Soil erosion

Medium

- Protect and restore riparian areas.
- Survey for areas of suitable habitat for reestablishment of species.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.

Stressor: Streambank alteration/channelization

Medium

- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore riparian areas.
- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Survey for areas of suitable habitat for reestablishment of species.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Encourage development of water use plans that protect instream flow.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Remove or modify unnecessary or inoperative dams or diversions.
- Create and maintain habitat improvement features for aquatic species.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.

Stressor: Livestock management

Medium

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.

Category: Invasive species

Priority

Stressor: Nuisance animals

High

- Use integrated management activities in concert to address nuisance plants.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Survey for areas of suitable habitat for reestablishment of species.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

Medium

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Species

Bluehead Sucker

Catostomus discobolus

Tier 1a fish

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

Scores

Community/Focal: 1

Responsibility: 3

Priority

Medium

- Encourage wise management of ground water.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Promote water conservation methods in growth planning to develop sustainable water use.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Survey for areas of suitable habitat for reestablishment of species.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Habitat fragmentation/barriers

High

- Remove or modify unnecessary or inoperative dams or diversions.
- Remove artificial stream barriers where appropriate.
- Survey for areas of suitable habitat for reestablishment of species.

Stressor: Management for game animals and sport fish

Medium

- Expand hatchery capabilities to propagate native species.
- Manage so as to sustain or enhance native fish and sport fish populations.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

Stressor: Streambank alteration/channelization

High

- Survey for areas of suitable habitat for reestablishment of species.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Protect and restore riparian areas.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Encourage development of water use plans that protect instream flow.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Encourage development of water recycling systems/programs (effluent, storm water runoff) to increase the amount of water available to wildlife.
- Survey for areas of suitable habitat for reestablishment of species.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage the utilization of low water use [and native] plants in landscaping.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Remove or modify unnecessary or inoperative dams or diversions.
- Create and maintain habitat improvement features for aquatic species.

Category: Invasive species

Priority

Stressor: Bait-bucket dumping/illegal stocking

Medium

- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.

Stressor: Disease/pathogens/parasites

Medium

- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.

Stressor: Hybridization

Medium

- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Address hybridization and replication of rare populations in watershed planning efforts.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Stressor: Nuisance animals

High

- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Use integrated management activities in concert to address nuisance plants.

Species

Zuni Bluehead Sucker
Catostomus discobolus yarrowi
Tier 1a fish

Scores

Community/Focal: 1
Responsibility: 2

Category: Species Specific

Priority

Stressor: Unknown

High

- Develop research needs to assess population trends and/or habitat needs.

Species

Sonora Sucker

Catostomus insignis

Tier 1b fish

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect and restore springheads.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Encourage low water use agriculture.
- Encourage wise management of ground water.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Water diversion/water catchments

High

- Remove artificial stream barriers where appropriate.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Survey for areas of suitable habitat for reestablishment of species.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect and restore springheads.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.

Stressor: Habitat fragmentation/barriers

High

- Survey for areas of suitable habitat for reestablishment of species.

- Protect and restore riparian areas.
- Remove artificial stream barriers where appropriate.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Streambank alteration/channelization

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Protect and restore riparian areas.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Survey for areas of suitable habitat for reestablishment of species.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Encourage development of water use plans that protect instream flow.
- Encourage development of water recycling systems/programs (effluent, storm water runoff) to increase the amount of water available to wildlife.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Survey for areas of suitable habitat for reestablishment of species.
- Promote water conservation methods.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Disseminate information to partners on effects of grazing on resources.
- Protect sensitive habitats from excessive grazing.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Create and maintain habitat improvement features for aquatic species.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Remove or modify unnecessary or inoperative dams or diversions.
- Survey for areas of suitable habitat for reestablishment of species.

Stressor: Livestock management Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.

Category: Invasive species **Priority**
Stressor: Nuisance animals High

- Identify watersheds and other conservation areas to prioritize renovation activities.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Survey for areas of suitable habitat for reestablishment of species.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Use integrated management activities in concert to address nuisance plants.

Species

Flannelmouth Sucker
Catostomus latipinnis
Tier 1a fish

Scores
Community/Focal: 1
Responsibility: 3

Category: Abiotic resource use **Priority**
Stressor: Groundwater depletion and springhead use Medium

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage wise management of ground water.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Promote water conservation methods in growth planning to develop sustainable water use.

Stressor: Mining Medium

- Increase public awareness of wildlife impacts and benefits of mining operations.
- Promote recycling to reduce contamination from landfills and new mine operations.
- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Stressor: Water diversion/water catchments High

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Remove artificial stream barriers where appropriate.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Remove or modify unnecessary or inoperative dams or diversions.
- Survey for areas of suitable habitat for reestablishment of species.

Stressor: Habitat fragmentation/barriers High

- Remove or modify unnecessary or inoperative dams or diversions.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore riparian areas.
- Remove artificial stream barriers where appropriate.

Stressor: Management for game animals and sport fish Medium

- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Manage so as to sustain or enhance native fish and sport fish populations.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Expand hatchery capabilities to propagate native species.

Stressor: Streambank alteration/channelization High

- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore riparian areas.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Survey for areas of suitable habitat for reestablishment of species.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Category: Consumptive use of biological resources Priority

Stressor: Grazing by ungulates Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Disseminate information to partners on effects of grazing on resources.

Category: Habitat conversion Priority

Stressor: Dams/reservoirs/impoundments High

- Survey for areas of suitable habitat for reestablishment of species.
- Create and maintain habitat improvement features for aquatic species.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Livestock management Medium

- Protect and restore riparian areas.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Invasive species **Priority**

Stressor: Bait-bucket dumping/illegal stocking Medium

- Renovate aquatic systems to remove undesirable species.
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.

Stressor: Disease/pathogens/parasites Medium

- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.

Stressor: Hybridization Medium

- Address hybridization and replication of rare populations in watershed planning efforts.

Stressor: Nuisance animals High

- Identify watersheds and other conservation areas to prioritize renovation activities.
- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Use integrated management activities in concert to address nuisance plants.
- Evaluate and modify Department regulations where appropriate.

Species

Little Colorado Sucker

Catostomus sp.

Tier 1b fish

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use **Priority**

Stressor: Groundwater depletion and springhead use Medium

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage wise management of ground water.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Water diversion/water catchments High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove artificial stream barriers where appropriate.

- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.

Stressor: Habitat fragmentation/barriers

High

- Remove or modify unnecessary or inoperative dams or diversions.
- Remove artificial stream barriers where appropriate.

Stressor: Management for game animals and sport fish

Medium

- Manage so as to sustain or enhance native fish and sport fish populations.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).

Stressor: Streambank alteration/channelization

High

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Protect and restore riparian areas.
- Promote water conservation methods.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Survey for areas of suitable habitat for reestablishment of species.
- Create and maintain habitat improvement features for aquatic species.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Remove or modify unnecessary or inoperative dams or diversions.

Category: Invasive species

Priority

Stressor: Bait-bucket dumping/illegal stocking

Medium

- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on

wildlife.

Stressor: Disease/pathogens/parasites High

- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.

Stressor: Hybridization High

- Address hybridization and replication of rare populations in watershed planning efforts.

Stressor: Nuisance animals High

- Identify watersheds and other conservation areas to prioritize renovation activities.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Use integrated management activities in concert to address nuisance plants.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Species

Beautiful Shiner

Cyprinella formosa

Tier 1a fish

Scores
Community/Focal: 1
Responsibility: 2

Category: Abiotic resource use **Priority**

Stressor: Water diversion/water catchments High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Remove artificial stream barriers where appropriate.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Category: Border issues **Priority**

Stressor: Water use/contamination from illegal immigrants and drug smugglers Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Develop cooperative clean up efforts along the border for the benefit of wildlife.

Category: Changes in Ecological Processes **Priority**

Stressor: Soil erosion Medium

- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Protect and restore riparian areas.

Stressor: Streambank alteration/channelization Medium

- Protect and restore riparian areas.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Protect and restore riparian areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.

Category: Invasive species

Priority

Stressor: Hybridization

High

- Address hybridization and replication of rare populations in watershed planning efforts.

Stressor: Nuisance animals

High

- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Use integrated management activities in concert to address nuisance plants.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Species

Quitobaquito Pupfish

Cyprinodon eremus

Tier 1a fish

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Encourage gray water use.

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

- Encourage wise management of ground water.
- Protect and restore springheads.
- Promote water conservation methods in growth planning to develop sustainable water use.

Stressor: Water diversion/water catchments **Medium**

- Remove artificial stream barriers where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Changes in Ecological Processes **Priority**
Stressor: Altered river flow regimes **High**

- Protect and restore springheads.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Category: Climate Change **Priority**
Stressor: Drought **Medium**

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Promote water conservation methods.
- Encourage development of water use plans that protect instream flow.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Habitat conversion **Priority**
Stressor: Livestock management **Medium**

- Protect and restore riparian areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect sensitive habitats from excessive grazing.

Category: Invasive species **Priority**
Stressor: Nuisance animals **High**

- Identify watersheds and other conservation areas to prioritize renovation activities.
- Create barriers between susceptible native species and non-natives to reduce

- hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
 - Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

Species

Desert Pupfish

Cyprinodon macularius

Tier 1a fish

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect and restore springheads.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Mining

Medium

- Revegetate disturbed areas with native plants.
- Promote recycling to reduce contamination from landfills and new mine operations.
- Increase public awareness of wildlife impacts and benefits of mining operations.
- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Stressor: Water diversion/water catchments

High

- Remove artificial stream barriers where appropriate.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Protect and restore springheads.
- Survey for areas of suitable habitat for reestablishment of species.

Stressor: Habitat fragmentation/barriers

Medium

- Remove artificial stream barriers where appropriate.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore riparian areas.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Management for game animals and sport fish Medium

- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

Stressor: Soil erosion Medium

- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Survey for areas of suitable habitat for reestablishment of species.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Protect and restore riparian areas.

Stressor: Streambank alteration/channelization High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore riparian areas.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Category: Climate Change Priority

Stressor: Drought Medium

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Promote water conservation methods.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Survey for areas of suitable habitat for reestablishment of species.

Category: Consumptive use of biological resources Priority

Stressor: Grazing by ungulates High

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Protect sensitive habitats from excessive grazing.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Survey for areas of suitable habitat for reestablishment of species.

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

- Create and maintain habitat improvement features for aquatic species.

Stressor: Livestock management

High

- Protect and restore riparian areas.

Category: Invasive species

Priority

Stressor: Bait-bucket dumping/illegal stocking

Medium

- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.

- Evaluate and modify Department regulations where appropriate.

Stressor: Nuisance animals

High

- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

- Survey for areas of suitable habitat for reestablishment of species.

- Use integrated management activities in concert to address nuisance plants.

- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

- Identify watersheds and other conservation areas to prioritize renovation activities.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

- Manage so as to sustain or enhance native fish and sport fish populations.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

Medium

- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Stressor: Pesticides/herbicides

Medium

- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

Species

Humpback Chub

Scores

Community/Focal: 1

Gila cypha

Responsibility: 1

Tier 1a fish

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Encourage wise management of ground water.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Management for game animals and sport fish

Medium

- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Manage so as to sustain or enhance native fish and sport fish populations.
- Expand hatchery capabilities to propagate native species.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

Stressor: Streambank alteration/channelization

High

- Promote water conservation methods.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods in growth planning to develop sustainable water use.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore riparian areas.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Create and maintain habitat improvement features for aquatic species.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Protect instream flow or acquire water rights (through purchase, conservation agreement,

etc.) to benefit wildlife habitat.

- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.

- Remove or modify unnecessary or inoperative dams or diversions.

- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.

Stressor: Recreational sites/facilities Medium

- Educate the public about maintaining sensitive habitat for wildlife.

- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.

Category: Invasive species **Priority**

Stressor: Disease/pathogens/parasites Medium

- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Stressor: Hybridization Medium

- Address hybridization and replication of rare populations in watershed planning efforts.

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Stressor: Nuisance animals High

- Use integrated management activities in concert to address nuisance plants.

- Identify watersheds and other conservation areas to prioritize renovation activities.

Category: Pollution **Priority**

Stressor: Contaminants from waste water and runoff Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.

- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Stressor: Pesticides/herbicides Medium

- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.

Species

Sonora Chub

Gila ditaenia

Tier 1a fish

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Encourage gray water use.

Scores

Community/Focal: 1

Responsibility: 2

Priority

High

- Encourage low water use agriculture.
- Protect and restore springheads.
- Encourage wise management of ground water.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.

Stressor: Mining Medium

- Promote recycling to reduce contamination from landfills and new mine operations.
- Revegetate disturbed areas with native plants.
- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Stressor: Water diversion/water catchments High

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Remove artificial stream barriers where appropriate.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes Medium

- Survey for areas of suitable habitat for reestablishment of species.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Protect sensitive habitats from excessive grazing.
- Protect and restore springheads.

Stressor: Management for game animals and sport fish Medium

- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Manage so as to sustain or enhance native fish and sport fish populations.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Expand hatchery capabilities to propagate native species.

Stressor: Soil erosion Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of

sediment.

- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Implement 'Best Management Practices' when building roads or other infrastructure (dams, mines, developments, etc.).
- Survey for areas of suitable habitat for reestablishment of species.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Protect and restore riparian areas.

Stressor: Streambank alteration/channelization Medium

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore riparian areas.
- Survey for areas of suitable habitat for reestablishment of species.

Category: Consumptive use of biological resources **Priority**

Stressor: Grazing by ungulates Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Disseminate information to partners on effects of grazing on resources.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Category: Habitat conversion **Priority**

Stressor: Livestock management Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.

Stressor: Recreational sites/facilities Medium

- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.
- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Educate the public about maintaining sensitive habitat for wildlife.
- Use environmentally-friendly materials, landscaping, and structure designs for recreational sites.

Category: Invasive species **Priority**

Stressor: Hybridization Medium

- Address hybridization and replication of rare populations in watershed planning efforts.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.

- Regulate or prohibit movement of species with high risk of hybridization with native species.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Stressor: Nuisance animals **High**

- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Use integrated management activities in concert to address nuisance plants.

Category: Pollution **Priority**

Stressor: Contaminants from waste water and runoff **Medium**

- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

Stressor: Pesticides/herbicides **Medium**

- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.
- Identify and use pesticides and herbicides that have limited negative impact to wildlife (a wildlife-safe label).

Category: Transportation and infrastructure **Priority**

Stressor: Roads for motorized vehicles **Medium**

- Encourage wildlife friendly design for all road building.
- Encourage increased partnering and communication with transportation officials on projects that affect wildlife and their habitat.

Species

Bonytail

Gila elegans

Tier 1a fish

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use **Priority**

Stressor: Groundwater depletion and springhead use **Medium**

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage wise management of ground water.

- Promote water conservation methods in growth planning to develop sustainable water use.

Stressor: Water diversion/water catchments High

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove artificial stream barriers where appropriate.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Remove or modify unnecessary or inoperative dams or diversions.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.

Stressor: Habitat fragmentation/barriers High

- Remove or modify unnecessary or inoperative dams or diversions.
- Remove artificial stream barriers where appropriate.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Management for game animals and sport fish Medium

- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Manage so as to sustain or enhance native fish and sport fish populations.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Expand hatchery capabilities to propagate native species.

Stressor: Soil erosion Medium

- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Protect and restore riparian areas.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.

Stressor: Streambank alteration/channelization Medium

- Promote water conservation methods in growth planning to develop sustainable water use.

- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Protect and restore riparian areas.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Create and maintain habitat improvement features for aquatic species.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.

Category: Invasive species

Priority

Stressor: Hybridization

High

- Address hybridization and replication of rare populations in watershed planning efforts.

Stressor: Nuisance animals

High

- Identify watersheds and other conservation areas to prioritize renovation activities.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Use integrated management activities in concert to address nuisance plants.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

Medium

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Stressor: Pesticides/herbicides

Medium

- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.

Species

Gila Chub

Gila intermedia

Tier 1a fish

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

Scores

Community/Focal: 1

Responsibility: 1

Priority

Medium

- Encourage gray water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Encourage low water use agriculture.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Protect and restore springheads.
- Encourage wise management of ground water.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Mining

Medium

- Promote recycling to reduce contamination from landfills and new mine operations.
- Increase public awareness of wildlife impacts and benefits of mining operations.
- Revegetate disturbed areas with native plants.
- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Stressor: Water diversion/water catchments

High

- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Remove artificial stream barriers where appropriate.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Remove or modify unnecessary or inoperative dams or diversions.
- Protect and restore springheads.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Survey for areas of suitable habitat for reestablishment of species.

Stressor: Habitat fragmentation/barriers

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Remove or modify unnecessary or inoperative dams or diversions.
- Remove artificial stream barriers where appropriate.
- Protect and restore riparian areas.

- Survey for areas of suitable habitat for reestablishment of species.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

Stressor: Management for game animals and sport fish Medium

- Manage so as to sustain or enhance native fish and sport fish populations.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Expand hatchery capabilities to propagate native species.

Stressor: Soil erosion Medium

- Protect and restore riparian areas.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Implement watershed based approaches aimed at preventing excessive soil erosion.

Stressor: Streambank alteration/channelization High

- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods in growth planning to develop sustainable water use.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Protect and restore riparian areas.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Survey for areas of suitable habitat for reestablishment of species.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Category: Consumptive use of biological resources **Priority**

Stressor: Grazing by ungulates Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Disseminate information to partners on effects of grazing on resources.
- Protect sensitive habitats from excessive grazing.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Category: Habitat conversion **Priority**

Stressor: Dams/reservoirs/impoundments High

- Survey for areas of suitable habitat for reestablishment of species.
- Remove or modify unnecessary or inoperative dams or diversions.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

- Create and maintain habitat improvement features for aquatic species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.

Stressor: Livestock management **Medium**

- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Category: Invasive species **Priority**
Stressor: Nuisance animals **High**

- Survey for areas of suitable habitat for reestablishment of species.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Use integrated management activities in concert to address nuisance plants.

Category: Pollution **Priority**
Stressor: Contaminants from waste water and runoff **Medium**

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.
- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Species

Headwater Chub

Gila nigra

Tier 1b fish

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use **Priority**

Stressor: Groundwater depletion and springhead use **Medium**

- Encourage low water use agriculture.
- Protect and restore springheads.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Encourage wise management of ground water.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage gray water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Protect and restore springheads.
- Survey for areas of suitable habitat for reestablishment of species.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Habitat fragmentation/barriers

High

- Protect and restore riparian areas.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Management for game animals and sport fish

Medium

- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Manage so as to sustain or enhance native fish and sport fish populations.
- Expand hatchery capabilities to propagate native species.

Stressor: Streambank alteration/channelization

High

- Survey for areas of suitable habitat for reestablishment of species.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Protect and restore riparian areas.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

Medium

- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Create and maintain habitat improvement features for aquatic species.

- Remove or modify unnecessary or inoperative dams or diversions.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Invasive species **Priority**
Stressor: Bait-bucket dumping/illegal stocking **Medium**

- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Evaluate and modify Department regulations where appropriate.

Stressor: Hybridization **High**

- Address hybridization and replication of rare populations in watershed planning efforts.

Stressor: Nuisance animals **High**

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Survey for areas of suitable habitat for reestablishment of species.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Use integrated management activities in concert to address nuisance plants.

Species

Yaqui Chub

Gila purpurea

Tier 1a fish

Scores
Community/Focal: 1
Responsibility: 1

Category: Abiotic resource use **Priority**
Stressor: Water diversion/water catchments **High**

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Remove artificial stream barriers where appropriate.
- Promote water conservation methods.

Category: Border issues **Priority**
Stressor: Water use/contamination from illegal immigrants and drug smugglers **Medium**

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Develop cooperative clean up efforts along the border for the benefit of wildlife.

Category: Changes in Ecological Processes

Priority

Stressor: Soil erosion

High

- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Protect and restore riparian areas.

Stressor: Streambank alteration/channelization

High

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect and restore riparian areas.
- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Disseminate information to partners on effects of grazing on resources.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Protect sensitive habitats from excessive grazing.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.

Category: Invasive species

Priority

Stressor: Hybridization

Medium

- Address hybridization and replication of rare populations in watershed planning efforts.

Stressor: Nuisance animals

High

- Survey for areas of suitable habitat for reestablishment of species.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Use integrated management activities in concert to address nuisance plants.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Identify watersheds and other conservation areas to prioritize renovation activities.

Species

Roundtail Chub

Gila robusta

Tier 1b fish

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Encourage wise management of ground water.
- Encourage gray water use.
- Protect and restore springheads.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage low water use agriculture.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage the utilization of low water use [and native] plants in landscaping.

Stressor: Water diversion/water catchments

High

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove artificial stream barriers where appropriate.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore springheads.

Stressor: Habitat fragmentation/barriers

High

- Protect and restore riparian areas.
- Remove artificial stream barriers where appropriate.

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Survey for areas of suitable habitat for reestablishment of species.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Management for game animals and sport fish Medium

- Expand hatchery capabilities to propagate native species.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Manage so as to sustain or enhance native fish and sport fish populations.

Stressor: Soil erosion Medium

- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Implement 'Best Management Practices' when building roads or other infrastructure (dams, mines, developments, etc.).
- Protect and restore riparian areas.
- Survey for areas of suitable habitat for reestablishment of species.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.

Stressor: Streambank alteration/channelization High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore riparian areas.
- Promote water conservation methods.
- Survey for areas of suitable habitat for reestablishment of species.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Habitat conversion **Priority**

Stressor: Dams/reservoirs/impoundments High

- Remove or modify unnecessary or inoperative dams or diversions.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Create and maintain habitat improvement features for aquatic species.
- Survey for areas of suitable habitat for reestablishment of species.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Stressor: Livestock management

Medium

- Protect sensitive habitats from excessive grazing.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Protect and restore riparian areas.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Invasive species

Priority

Stressor: Bait-bucket dumping/illegal stocking

Medium

- Evaluate and modify Department regulations where appropriate.

- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.

Stressor: Hybridization

High

- Address hybridization and replication of rare populations in watershed planning efforts.

Stressor: Nuisance animals

High

- Use integrated management activities in concert to address nuisance plants.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.

- Survey for areas of suitable habitat for reestablishment of species.

- Identify watersheds and other conservation areas to prioritize renovation activities.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

Medium

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.

- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.

Species

Virgin Chub

Gila seminuda

Tier 1a fish

Category: Abiotic resource use

Scores

Community/Focal: 1

Responsibility: 2

Priority

Stressor: Mining Medium

- Promote recycling to reduce contamination from landfills and new mine operations.
- Revegetate disturbed areas with native plants.
- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.
- Increase public awareness of wildlife impacts and benefits of mining operations.

Stressor: Water diversion/water catchments High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Remove artificial stream barriers where appropriate.
- Promote water conservation methods.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Remove or modify unnecessary or inoperative dams or diversions.
- Protect and restore springheads.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.

Stressor: Management for game animals and sport fish Medium

- Expand hatchery capabilities to propagate native species.
- Manage so as to sustain or enhance native fish and sport fish populations.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

Stressor: Streambank alteration/channelization High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect and restore riparian areas.
- Promote water conservation methods.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Disseminate information to partners on effects of grazing on resources.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Remove or modify unnecessary or inoperative dams or diversions.
- Create and maintain habitat improvement features for aquatic species.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.

Stressor: Livestock management

Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.

Category: Invasive species

Priority

Stressor: Bait-bucket dumping/illegal stocking

Medium

- Evaluate and modify Department regulations where appropriate.
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.

Stressor: Nuisance animals

High

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Use integrated management activities in concert to address nuisance plants.

Species

Yaqui Catfish

Ictalurus pricei

Tier 1a fish

Scores

Community/Focal: 2

Responsibility: 2

Category: Abiotic resource use

Priority

Stressor: Water diversion/water catchments

Medium

- Remove artificial stream barriers where appropriate.

- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Border issues

Priority

Stressor: Water use/contamination from illegal immigrants and drug smugglers

Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Develop cooperative clean up efforts along the border for the benefit of wildlife.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect and restore springheads.

Stressor: Soil erosion

Medium

- Survey for areas of suitable habitat for reestablishment of species.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Protect and restore riparian areas.

Stressor: Streambank alteration/channelization

High

- Survey for areas of suitable habitat for reestablishment of species.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Protect and restore riparian areas.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Protect and restore riparian areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Invasive species

Priority

Stressor: Hybridization

High

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Regulate or prohibit movement of species with high risk of hybridization with native species.
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Address hybridization and replication of rare populations in watershed planning efforts.

Stressor: Nuisance animals

High

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Use integrated management activities in concert to address nuisance plants.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Species

Virgin Spinedace

Lepidomeda mollispinis mollispinis

Tier 1a fish

Category: Abiotic resource use

Stressor: Water diversion/water catchments

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Scores

Community/Focal: 1

Responsibility: 2

Priority

High

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Remove artificial stream barriers where appropriate.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Remove or modify unnecessary or inoperative dams or diversions.
- Protect and restore springheads.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Habitat fragmentation/barriers

High

- Remove artificial stream barriers where appropriate.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Protect and restore riparian areas.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Soil erosion

Medium

- Protect and restore riparian areas.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Implement 'Best Management Practices' when building roads or other infrastructure (dams, mines, developments, etc.).

Category: Climate Change

Priority

Stressor: Drought

Medium

- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.

- Encourage development of water use plans that protect instream flow.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Consumptive use of biological resources **Priority**
Stressor: Grazing by ungulates **Medium**

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Disseminate information to partners on effects of grazing on resources.
- Protect sensitive habitats from excessive grazing.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Category: Habitat conversion **Priority**
Stressor: Agricultural conversion **Medium**

- Protect and restore riparian areas.
- Collaborate on public outreach, education, and incentive programs to encourage erosion control techniques on private lands.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Dams/reservoirs/impoundments **High**

- Create and maintain habitat improvement features for aquatic species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.

Stressor: Livestock management **Medium**

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Recreational sites/facilities **Medium**

- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Design recreation site management plans and policies that minimize impacts to wildlife and

habitats.

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Educate the public about maintaining sensitive habitat for wildlife.
- Increase enforcement for laws governing recreational activities.

Stressor: Urban growth

Medium

- Renovate aquatic systems to remove undesirable species.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Create and maintain habitat improvement features for aquatic species.
- Protect and restore riparian areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Acquire land or conservation easements to protect key conservation areas.
- Identify key conservation areas to protect from development.

Category: Invasive species

Priority

Stressor: Nuisance animals

High

- Identify watersheds and other conservation areas to prioritize renovation activities.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Use integrated management activities in concert to address nuisance plants.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Category: Pollution

Priority

Stressor: Pesticides/herbicides

Medium

- Use alternative means for pest control (biocontrol, genetic control, management practices).
- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.

Species

Little Colorado Spinedace

Scores
Community/Focal: 1

Lepidomeda vittata

Responsibility: 1

Tier 1a fish

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect and restore springheads.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage wise management of ground water.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for

the benefit of wildlife.

Stressor: Water diversion/water catchments High

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Remove artificial stream barriers where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect and restore springheads.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Management for game animals and sport fish Medium

- Expand hatchery capabilities to propagate native species.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).

Stressor: Soil erosion High

- Protect and restore riparian areas.
- Implement 'Best Management Practices' when building roads or other infrastructure (dams, mines, developments, etc.).
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.

Stressor: Streambank alteration/channelization High

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Protect and restore riparian areas.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife

and riparian habitat.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Stressor: Unnatural fire regimes Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.

Category: Climate Change **Priority**
Stressor: Drought High

- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage development of water use plans that protect instream flow.
- Promote water conservation methods.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Consumptive use of biological resources **Priority**
Stressor: Forest and woodland management - consumptive use Medium

Stressor: Grazing by ungulates Medium

- Protect sensitive habitats from excessive grazing.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Disseminate information to partners on effects of grazing on resources.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Category: Habitat conversion **Priority**
Stressor: Dams/reservoirs/impoundments High

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Remove or modify unnecessary or inoperative dams or diversions.

- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Create and maintain habitat improvement features for aquatic species.

Stressor: Livestock management Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

Stressor: Rural development Medium

- Protect and restore riparian areas.
- Promote establishment and protection of green belts and other preserves including terrestrial and aquatic corridors.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Promote legislation to increase water conservation.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Renovate aquatic systems to remove undesirable species.

Stressor: Urban growth Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Create and maintain habitat improvement features for aquatic species.
- Identify key conservation areas to protect from development.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).

- Renovate aquatic systems to remove undesirable species.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Invasive species **Priority**

Stressor: Bait-bucket dumping/illegal stocking **Medium**

- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Evaluate and modify Department regulations where appropriate.

Stressor: Nuisance animals **High**

- Identify watersheds and other conservation areas to prioritize renovation activities.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Use integrated management activities in concert to address nuisance plants.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Category: Pollution **Priority**

Stressor: Contaminants from waste water and runoff **Medium**

- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Stressor: Pesticides/herbicides **Medium**

- Use alternative means for pest control (biocontrol, genetic control, management practices).
- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.

Category: Transportation and infrastructure **Priority**

Stressor: Roads for motorized vehicles **Medium**

- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
- Encourage wildlife friendly design for all road building.
- Reduce sedimentation effects from road and trail construction.

Species

Spikedace

Meda fulgida

Tier 1a fish

Category: Abiotic resource use **Priority**

Stressor: Groundwater depletion and springhead use **Medium**

- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Scores

Community/Focal: 1

Responsibility: 1

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage wise management of ground water.
- Protect and restore springheads.

Stressor: Mining Medium

- Increase public awareness of wildlife impacts and benefits of mining operations.
- Revegetate disturbed areas with native plants.
- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Stressor: Water diversion/water catchments High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove artificial stream barriers where appropriate.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Changes in Ecological Processes Priority

Stressor: Altered river flow regimes High

- Remove or modify unnecessary or inoperative dams or diversions.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore springheads.
- Survey for areas of suitable habitat for reestablishment of species.

Stressor: Habitat fragmentation/barriers Medium

- Remove or modify unnecessary or inoperative dams or diversions.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore riparian areas.
- Remove artificial stream barriers where appropriate.

Stressor: Management for game animals and sport fish Medium

- Manage so as to sustain or enhance native fish and sport fish populations.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Expand hatchery capabilities to propagate native species.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).

Stressor: Soil erosion Medium

- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Protect and restore riparian areas.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Promote guidelines for timber harvesting and associated road building that positively effect wildlife.
- Implement 'Best Management Practices' when building roads or other infrastructure (dams, mines, developments, etc.).

Stressor: Streambank alteration/channelization High

- Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.
- Protect and restore riparian areas.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Survey for areas of suitable habitat for reestablishment of species.

Category: Consumptive use of biological resources Priority

Stressor: Forest and woodland management - consumptive use Medium

- Encourage design of extractive operations that minimizes disturbance to wildlife.

Stressor: Grazing by ungulates Medium

- Disseminate information to partners on effects of grazing on resources.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Category: Habitat conversion Priority

Stressor: Dams/reservoirs/impoundments High

- Remove or modify unnecessary or inoperative dams or diversions.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Create and maintain habitat improvement features for aquatic species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

Stressor: Livestock management Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.

Category: Invasive species Priority

Stressor: Bait-bucket dumping/illegal stocking Medium

- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Evaluate and modify Department regulations where appropriate.

Stressor: Nuisance animals High

- Identify watersheds and other conservation areas to prioritize renovation activities.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Use integrated management activities in concert to address nuisance plants.
- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Category: Pollution Priority

Stressor: Contaminants from waste water and runoff Medium

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Ensure new and existing landfills are properly lined and sealed from contaminating

surrounding habitat and water sources.

- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.

Stressor: Pesticides/herbicides Medium

- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.
- Use alternative means for pest control (biocontrol, genetic control, management practices).

Species

Apache (Arizona) Trout

Oncorhynchus gilae apache

Tier 1a fish

Scores

Community/Focal: 1

Responsibility: 1

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes High

- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Protect and restore springheads.

Stressor: Habitat fragmentation/barriers Medium

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore riparian areas.
- Remove artificial stream barriers where appropriate.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Management for game animals and sport fish Medium

- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Manage so as to sustain or enhance native fish and sport fish populations.
- Expand hatchery capabilities to propagate native species.

Stressor: Unnatural fire regimes High

- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Design fire management plans and wildland/urban interface policies that consider wildlife values.

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Encourage development of water use plans that protect instream flow.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Promote water conservation methods.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Survey for areas of suitable habitat for reestablishment of species.

Category: Consumptive use of biological resources

Priority

Stressor: Forest and woodland management - consumptive use

Medium

- Encourage design of extractive operations that minimizes disturbance to wildlife.

Stressor: Grazing by ungulates

Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Habitat conversion

Priority

Stressor: Livestock management

High

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.

Stressor: Recreational sites/facilities

Medium

- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Educate the public about maintaining sensitive habitat for wildlife.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Invasive species

Priority

Stressor: Bait-bucket dumping/illegal stocking

High

- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

Stressor: Disease/pathogens/parasites

Medium

- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Stressor: Hybridization

High

- Regulate or prohibit movement of species with high risk of hybridization with native species.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Address hybridization and replication of rare populations in watershed planning efforts.
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.

Stressor: Nuisance animals

High

- Identify watersheds and other conservation areas to prioritize renovation activities.
- Use integrated management activities in concert to address nuisance plants.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Survey for areas of suitable habitat for reestablishment of species.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.

Category: Pollution

Priority

Stressor: Heavy metals/mine tailings

Medium

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Promote recycling to reduce contamination from landfills and new mine operations.

Category: Transportation and infrastructure

Priority

Stressor: Roads for motorized vehicles

Medium

- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to

control undesirable species, especially near sensitive habitat and watercourses.

- Encourage wildlife friendly design for all road building.
- Reduce sedimentation effects from road and trail construction.

Species

Gila Trout

Oncorhynchus gilae gilae

Tier 1a fish

Scores

Community/Focal: 1

Responsibility: 2

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore springheads.

Stressor: Habitat fragmentation/barriers

High

- Protect and restore riparian areas.
- Remove or modify unnecessary or inoperative dams or diversions.
- Remove artificial stream barriers where appropriate.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Management for game animals and sport fish

Medium

- Expand hatchery capabilities to propagate native species.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Manage so as to sustain or enhance native fish and sport fish populations.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).

Stressor: Soil erosion

Medium

- Promote guidelines for timber harvesting and associated road building that positively effect wildlife.
- Protect and restore riparian areas.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Implement 'Best Management Practices' when building roads or other infrastructure (dams, mines, developments, etc.).
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.

Stressor: Unnatural fire regimes High

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Design fire management plans and wildland/urban interface policies that consider wildlife values.

Category: Consumptive use of biological resources **Priority**

Stressor: Grazing by ungulates High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Harvesting/collecting animals Medium

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
- Increase public awareness of regulations pertaining to illegal harvest.

Category: Habitat conversion **Priority**

Stressor: Forest and woodland management - habitat conversion Medium

- Encourage design of extractive operations that minimizes disturbance to wildlife.

Stressor: Livestock management High

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Recreational sites/facilities Medium

- Increase enforcement for laws governing recreational activities.
- Educate the public about maintaining sensitive habitat for wildlife.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Invasive species **Priority**

Stressor: Bait-bucket dumping/illegal stocking High

- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Evaluate and modify Department regulations where appropriate.
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.

Stressor: Disease/pathogens/parasites Medium
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.

Stressor: Hybridization High

- Regulate or prohibit movement of species with high risk of hybridization with native species.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

- Address hybridization and replication of rare populations in watershed planning efforts.

- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.

- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.

Stressor: Nuisance animals High

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

- Identify watersheds and other conservation areas to prioritize renovation activities.

- Create barriers between susceptible native species and non-natives to reduce

hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.

- Use integrated management activities in concert to address nuisance plants.

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Species

Woundfin

Plagopterus argentissimus

Tier 1a fish

Scores

Community/Focal: 1

Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Mining

Medium

- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

- Increase public awareness of wildlife impacts and benefits of mining operations.

- Revegetate disturbed areas with native plants.

Stressor: Water diversion/water catchments High

- Remove artificial stream barriers where appropriate.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Promote water conservation methods.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

- Promote water conservation methods in growth planning to develop sustainable water use.

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Remove or modify unnecessary or inoperative dams or diversions.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore springheads.
- Survey for areas of suitable habitat for reestablishment of species.

Stressor: Habitat fragmentation/barriers

High

- Protect and restore riparian areas.
- Remove artificial stream barriers where appropriate.
- Remove or modify unnecessary or inoperative dams or diversions.
- Survey for areas of suitable habitat for reestablishment of species.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Management for game animals and sport fish

Medium

- Expand hatchery capabilities to propagate native species.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

Stressor: Streambank alteration/channelization

High

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore riparian areas.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Survey for areas of suitable habitat for reestablishment of species.
- Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Remove or modify unnecessary or inoperative dams or diversions.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Create and maintain habitat improvement features for aquatic species.

Stressor: Livestock management

Medium

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect and restore riparian areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.

Category: Invasive species

Priority

Stressor: Bait-bucket dumping/illegal stocking

Medium

- Renovate aquatic systems to remove undesirable species.
- Evaluate and modify Department regulations where appropriate.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.

Stressor: Nuisance animals

High

- Use integrated management activities in concert to address nuisance plants.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Survey for areas of suitable habitat for reestablishment of species.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.

Species

Scores

Gila Topminnow <i>Poeciliopsis occidentalis occidentalis</i> Tier 1a fish	Community/Focal: 1 Responsibility: 2
Category: Abiotic resource use	Priority
Stressor: Groundwater depletion and springhead use	High
<ul style="list-style-type: none">- Protect and restore springheads.- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.- Encourage wise management of ground water.- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.- Encourage the utilization of low water use [and native] plants in landscaping.- Encourage gray water use.- Encourage low water use agriculture.- Promote water conservation methods in growth planning to develop sustainable water use.	
Stressor: Mining	Medium
<ul style="list-style-type: none">- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.- Increase public awareness of wildlife impacts and benefits of mining operations.- Revegetate disturbed areas with native plants.	
Stressor: Water diversion/water catchments	High
<ul style="list-style-type: none">- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).- Promote water conservation methods in growth planning to develop sustainable water use.- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.- Promote water conservation methods.- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.- Remove artificial stream barriers where appropriate.	
Category: Changes in Ecological Processes	Priority
Stressor: Altered river flow regimes	Medium
<ul style="list-style-type: none">- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.- Work with land managers to develop and implement management plans that incorporate wildlife values.- Protect and restore springheads.- Survey for areas of suitable habitat for reestablishment of species.- Remove or modify unnecessary or inoperative dams or diversions.- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.	

- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.

Stressor: Habitat fragmentation/barriers Medium

- Survey for areas of suitable habitat for reestablishment of species.
- Acquire land to protect important habitat and wildlife corridors.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Protect and restore riparian areas.
- Remove artificial stream barriers where appropriate.
- Remove or modify unnecessary or inoperative dams or diversions.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Management for game animals and sport fish Medium

- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

Stressor: Streambank alteration/channelization Medium

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Protect and restore riparian areas.
- Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Survey for areas of suitable habitat for reestablishment of species.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Category: Climate Change **Priority**

Stressor: Drought Medium

- Survey for areas of suitable habitat for reestablishment of species.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Promote water conservation methods.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Encourage development of water use plans that protect instream flow.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Protect sensitive habitats from excessive grazing.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Disseminate information to partners on effects of grazing on resources.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Survey for areas of suitable habitat for reestablishment of species.
- Create and maintain habitat improvement features for aquatic species.

Stressor: Livestock management

Medium

- Protect sensitive habitats from excessive grazing.
- Protect and restore riparian areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.

Category: Invasive species

Priority

Stressor: Bait-bucket dumping/illegal stocking

Medium

- Evaluate and modify Department regulations where appropriate.
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Renovate aquatic systems to remove undesirable species.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

Stressor: Nuisance animals High

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Survey for areas of suitable habitat for reestablishment of species.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Use integrated management activities in concert to address nuisance plants.
- Manage so as to sustain or enhance native fish and sport fish populations.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

Category: Pollution Priority

Stressor: Contaminants from waste water and runoff Medium

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.

Species

Yaqui Topminnow

Poeciliopsis occidentalis sonoriensis

Tier 1a fish

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use Priority

Stressor: Groundwater depletion and springhead use High

- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage wise management of ground water.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Protect and restore springheads.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Encourage low water use agriculture.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage gray water use.

Stressor: Water diversion/water catchments High

- Incorporate stream morphology and wildlife habitat features in canals and flood control

drainages.

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove artificial stream barriers where appropriate.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Border issues

Priority

Stressor: Water use/contamination from illegal immigrants and drug smugglers

Medium

- Develop cooperative clean up efforts along the border for the benefit of wildlife.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Priority

Stressor: Soil erosion

Medium

- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore riparian areas.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Implement 'Best Management Practices' when building roads or other infrastructure (dams, mines, developments, etc.).

Stressor: Streambank alteration/channelization

High

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Protect and restore riparian areas.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Survey for areas of suitable habitat for reestablishment of species.
- Promote water conservation methods.
- Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Protect sensitive habitats from excessive grazing.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore riparian areas.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Category: Invasive species

Priority

Stressor: Hybridization

Medium

- Address hybridization and replication of rare populations in watershed planning efforts.
- Regulate or prohibit movement of species with high risk of hybridization with native species.

Stressor: Nuisance animals

High

- Use integrated management activities in concert to address nuisance plants.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Manage so as to sustain or enhance native fish and sport fish populations.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Survey for areas of suitable habitat for reestablishment of species.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Identify watersheds and other conservation areas to prioritize renovation activities.

Species

Colorado Pikeminnow

Ptychocheilus lucius

Tier 1a fish

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage wise management of ground water.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Stressor: Water diversion/water catchments Medium

- Promote water conservation methods in growth planning to develop sustainable water use.
- Remove artificial stream barriers where appropriate.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes High

- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Habitat fragmentation/barriers High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Remove or modify unnecessary or inoperative dams or diversions.
- Remove artificial stream barriers where appropriate.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

Stressor: Management for game animals and sport fish Medium

- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Manage so as to sustain or enhance native fish and sport fish populations.
- Expand hatchery capabilities to propagate native species.

Stressor: Streambank alteration/channelization Medium

- Promote water conservation methods.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect and restore riparian areas.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Habitat conversion **Priority**

Stressor: Dams/reservoirs/impoundments High

- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Remove or modify unnecessary or inoperative dams or diversions.
- Protect instream flow or acquire water rights (through purchase, conservation agreement,

etc.) to benefit wildlife habitat.

Category: Invasive species **Priority**
Stressor: Nuisance animals **High**

- Identify watersheds and other conservation areas to prioritize renovation activities.

Category: Pollution **Priority**
Stressor: Contaminants from waste water and runoff **Medium**

- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Species

Speckled Dace

Rhinichthys osculus

Tier 1b fish

Scores
Community/Focal: 1
Responsibility: 1

Category: Abiotic resource use **Priority**
Stressor: Groundwater depletion and springhead use **Medium**

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Protect and restore springheads.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Encourage low water use agriculture.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage wise management of ground water.
- Encourage gray water use.

Stressor: Mining **Medium**

- Promote recycling to reduce contamination from landfills and new mine operations.
- Increase public awareness of wildlife impacts and benefits of mining operations.
- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Stressor: Water diversion/water catchments **High**

- Promote water conservation methods.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Remove artificial stream barriers where appropriate.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Survey for areas of suitable habitat for reestablishment of species.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Protect and restore springheads.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.

Stressor: Streambank alteration/channelization

Medium

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.
- Protect and restore riparian areas.
- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Encourage development of water use plans that protect instream flow.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Survey for areas of suitable habitat for reestablishment of species.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

Medium

- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Create and maintain habitat improvement features for aquatic species.
- Survey for areas of suitable habitat for reestablishment of species.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Livestock management

Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect and restore riparian areas.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Protect sensitive habitats from excessive grazing.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Category: Invasive species

Priority

Stressor: Nuisance animals

High

- Survey for areas of suitable habitat for reestablishment of species.
- Use integrated management activities in concert to address nuisance plants.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Identify watersheds and other conservation areas to prioritize renovation activities.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

Medium

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Ensure new and existing landfills are properly lined and sealed from contaminating

surrounding habitat and water sources.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Species

Loach Minnow

Tiaroga cobitis

Tier 1a fish

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Encourage gray water use.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Promote water conservation methods.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage wise management of ground water.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Protect and restore springheads.
- Encourage the utilization of low water use [and native] plants in landscaping.

Stressor: Mining

Medium

- Promote recycling to reduce contamination from landfills and new mine operations.
- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Stressor: Water diversion/water catchments

High

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove artificial stream barriers where appropriate.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Remove or modify unnecessary or inoperative dams or diversions.
- Protect and restore springheads.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Survey for areas of suitable habitat for reestablishment of species.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.

Stressor: Habitat fragmentation/barriers Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Survey for areas of suitable habitat for reestablishment of species.
- Protect and restore riparian areas.
- Remove artificial stream barriers where appropriate.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Management for game animals and sport fish Medium

- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Expand hatchery capabilities to propagate native species.
- Manage so as to sustain or enhance native fish and sport fish populations.

Stressor: Soil erosion Medium

- Protect and restore riparian areas.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Survey for areas of suitable habitat for reestablishment of species.
- Promote guidelines for timber harvesting and associated road building that positively effect wildlife.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Streambank alteration/channelization High

- Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Survey for areas of suitable habitat for reestablishment of species.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect and restore riparian areas.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

High

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Disseminate information to partners on effects of grazing on resources.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Protect sensitive habitats from excessive grazing.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

Medium

- Survey for areas of suitable habitat for reestablishment of species.

- Create and maintain habitat improvement features for aquatic species.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Remove or modify unnecessary or inoperative dams or diversions.

- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

Stressor: Forest and woodland management - habitat conversion

Medium

- Encourage design of extractive operations that minimizes disturbance to wildlife.

Stressor: Livestock management

High

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Protect and restore riparian areas.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Protect sensitive habitats from excessive grazing.

- Acquire land or conservation easements on portions of rangeland critical to wildlife.

Category: Invasive species

Priority

Stressor: Nuisance animals

High

- Survey for areas of suitable habitat for reestablishment of species.

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources.

- Identify watersheds and other conservation areas to prioritize renovation activities.

- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.

- Use integrated management activities in concert to address nuisance plants.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

Medium

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.

Stressor: Pesticides/herbicides

Medium

- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

Species

Scores

Razorback Sucker

Community/Focal: 1

Xyrauchen texanus

Responsibility: 1

Tier 1a fish

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Encourage wise management of ground water.
- Encourage low water use agriculture.
- Encourage gray water use.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect and restore springheads.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Stressor: Water diversion/water catchments

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods in growth planning to develop sustainable water use.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Work with city and county planners to limit or prevent development in flood plains and areas that impact watershed integrity.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Protect and restore springheads.
- Remove or modify unnecessary or inoperative dams or diversions.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Survey for areas of suitable habitat for reestablishment of species.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.

Stressor: Habitat fragmentation/barriers

High

- Protect and restore riparian areas.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Remove or modify unnecessary or inoperative dams or diversions.
- Acquire land to protect important habitat and wildlife corridors.
- Survey for areas of suitable habitat for reestablishment of species.
- Remove artificial stream barriers where appropriate.

Stressor: Management for game animals and sport fish

Medium

- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Manage so as to sustain or enhance native fish and sport fish populations.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Expand hatchery capabilities to propagate native species.

Stressor: Soil erosion

Medium

- Protect and restore riparian areas.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Survey for areas of suitable habitat for reestablishment of species.
- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.

Stressor: Streambank alteration/channelization

Medium

- Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Survey for areas of suitable habitat for reestablishment of species.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Disseminate information to partners on effects of grazing on resources.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect sensitive habitats from excessive grazing.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Remove or modify unnecessary or inoperative dams or diversions.
- Survey for areas of suitable habitat for reestablishment of species.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Determine if adjusting dam operations to adjust water temperatures downstream is a benefit to native species.
- Determine if modifying dam operations can simulate natural sediment transport and improve wildlife habitat.
- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Create and maintain habitat improvement features for aquatic species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Livestock management

Medium

- Protect and restore riparian areas.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Protect sensitive habitats from excessive grazing.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Invasive species

Priority

Stressor: Bait-bucket dumping/illegal stocking

Medium

- Renovate aquatic systems to remove undesirable species.

- Evaluate and modify Department regulations where appropriate.
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

Stressor: Nuisance animals

High

- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Survey for areas of suitable habitat for reestablishment of species.
- Use integrated management activities in concert to address nuisance plants.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

Medium

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Ensure new and existing landfills are properly lined and sealed from contaminating surrounding habitat and water sources.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
 - Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

CRUSTACEANS AND MOLLUSKS

Species

California Floater

Anodonta californiensis

Tier 1b invertebrate

Scores

Community/Focal: 1

Responsibility: 3

Category: Changes in Ecological Processes

Priority

Stressor: Loss of keystone species

High

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Protect and restore riparian areas.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Consumptive use of biological resources

Priority

Stressor: Forest and woodland management - consumptive use

High

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
- Work with fire fighting services to develop fire management plans that minimize effects of

fire retardants and water drawing on wildlife and wildlife habitats.

Category: Habitat conversion

Priority

Stressor: Forest and woodland management - habitat conversion

Medium

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Category: Invasive species

Priority

Stressor: Nuisance animals

High

- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.

- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.

- Identify watersheds and other conservation areas to prioritize renovation activities.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

- Evaluate and modify Department regulations where appropriate.

- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

- Support and participate in the multi-agency Governor's Invasive Species Task Force.

- Use integrated management activities in concert to address nuisance plants.

- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

- Adopt national standards and efforts to reduce and control nuisance species.

- Conduct inspections at state borders to detect and prevent the spread of nuisance plants and animals.

Species

Cockerell's Striate Disc (Snail)

Discus shimekii cockerelli

Tier 1b invertebrate

Scores

Community/Focal: 3

Responsibility: 3

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

High

- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Disseminate information to partners on effects of grazing on resources.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Protect sensitive habitats from excessive grazing.

Category: Habitat conversion

Priority

Stressor: Livestock management

High

- Acquire land or conservation easements on portions of rangeland critical to wildlife.

- Protect and restore riparian areas.

- Protect sensitive habitats from excessive grazing.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Species

Pinaleno Mountainsnail

Oreohelix grahamensis

Tier 1b invertebrate

Category: Changes in Ecological Processes

Stressor: Unnatural fire regimes

- Design fire management plans and wildland/urban interface policies that consider wildlife values.

- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.

- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Consumptive use of biological resources

Stressor: Forest and woodland management - consumptive use

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

- Work with fire fighting services to develop fire management plans that minimize effects of fire retardants and water drawing on wildlife and wildlife habitats.

Category: Habitat conversion

Stressor: Recreational sites/facilities

- Educate the public about maintaining sensitive habitat for wildlife.

- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.

- Increase enforcement for laws governing recreational activities.

Species

Oreohelix yavapai cummingsi

Tier 1b invertebrate

Category: Consumptive use of biological resources

Stressor: Grazing by ungulates

- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Protect sensitive habitats from excessive grazing.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Disseminate information to partners on effects of grazing on resources.

Category: Habitat conversion

Stressor: Livestock management

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Protect and restore riparian areas.

- Develop and implement livestock and big game management guidelines that minimize

Scores

Community/Focal: 1

Responsibility: 1

Priority

High

Priority

High

Priority

Medium

Scores

Community/Focal: 3

Responsibility: 3

Priority

High

Priority

High

habitat degradation while maintaining stock ponds where appropriate.

- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Protect sensitive habitats from excessive grazing.

Species

Niobrara Ambersnail

Oxyloma haydeni haydeni

Tier 1b invertebrate

Scores

Community/Focal: 1

Responsibility: 1

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Remove or modify unnecessary or inoperative dams or diversions.

Category: Climate Change

Priority

Stressor: Drought

High

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Stressor: Shift to warmer climate

High

- Develop plans to conserve priority conservation species (Focal Community, Responsibility, and Vulnerability categories) that are not sufficiently addressed under existing plans.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Remove or modify unnecessary or inoperative dams or diversions.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Category: Transportation and infrastructure

Priority

Stressor: Unauthorized roads & trails

High

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

- Increase enforcement for laws governing recreational activities.

Species

Kanab Ambersnail

Oxyloma haydeni kanabensis

Tier 1a invertebrate

Scores

Community/Focal: 1

Responsibility: 1

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Remove or modify unnecessary or inoperative dams or diversions.

- Protect and restore springheads.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Category: Climate Change

Priority

Stressor: Drought

High

- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Disseminate information to partners on effects of grazing on resources.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Category: Habitat conversion

Priority

Stressor: Dams/reservoirs/impoundments

High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.

Species

Bylas Springsnail

Pyrgulopsis arizonae

Tier 1b invertebrate

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments

High

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Protect sensitive habitats from excessive grazing.
- Remove artificial stream barriers where appropriate.
- Promote water conservation methods.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Scores
Community/Focal: 1
Responsibility: 1

Category: Climate Change

Priority

Stressor: Drought

High

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Promote water conservation methods.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

High

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Disseminate information to partners on effects of grazing on resources.

Category: Habitat conversion

Priority

Stressor: Livestock management

High

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect and restore riparian areas.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

High

- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

Species

Grand Wash Springsnail

Pyrgulopsis bacchus

Tier 1b invertebrate

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Promote water conservation methods.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Promote water conservation methods in growth planning to develop sustainable water use.

Stressor: Water diversion/water catchments

High

- Protect sensitive habitats from excessive grazing.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Remove artificial stream barriers where appropriate.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Prevent or minimize recreational impacts in sensitive habitats.

Category: Climate Change

Priority

Stressor: Drought

High

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Promote water conservation methods.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

High

- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Habitat conversion

Priority

Stressor: Livestock management

High

- Protect and restore riparian areas.
- Develop and implement livestock and big game management guidelines that minimize

habitat degradation while maintaining stock ponds where appropriate.

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

High

- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

Species

San Bernardino Springsnail

Pyrgulopsis bernardina

Tier 1b invertebrate

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.

Stressor: Water diversion/water catchments

High

- Remove artificial stream barriers where appropriate.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect sensitive habitats from excessive grazing.
- Prevent or minimize recreational impacts in sensitive habitats.
- Promote water conservation methods.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Climate Change

Priority

Stressor: Drought

High

- Promote water conservation methods.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

- Encourage development of water recycling systems/programs (effluent, storm water runoff) to increase the amount of water available to wildlife.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.

Species

Scores

Kingman Springsnail

Community/Focal: 1

Pyrgulopsis conica

Responsibility: 1

Tier 1b invertebrate

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Encourage gray water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments

High

- Promote water conservation methods.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Protect sensitive habitats from excessive grazing.
- Prevent or minimize recreational impacts in sensitive habitats.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Remove artificial stream barriers where appropriate.

Category: Climate Change

Priority

Stressor: Drought

High

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

High

- Cooperate with municipalities to develop waste management plans that incorporate

wildlife values.

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.

Species

Desert Springsnail

Pyrgulopsis deserta

Tier 1b invertebrate

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Stressor: Water diversion/water catchments

- Remove artificial stream barriers where appropriate.
- Promote water conservation methods.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Prevent or minimize recreational impacts in sensitive habitats.
- Protect sensitive habitats from excessive grazing.

Category: Climate Change

Stressor: Drought

- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Pollution

Stressor: Contaminants from waste water and runoff

- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

Category: Transportation and infrastructure

Stressor: Roads for motorized vehicles

Scores

Community/Focal: 1

Responsibility: 1

Priority

High

High

Priority

High

Priority

High

Priority

Medium

- Encourage increased partnering and communication with transportation officials on projects that affect wildlife and their habitat.
- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
- Encourage wildlife friendly design for all road building.

Species

Verde Rim Springsnail

Pyrgulopsis glandulosa

Tier 1b invertebrate

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

- Promote water conservation methods in growth planning to develop sustainable water use.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Promote water conservation methods.

Stressor: Water diversion/water catchments

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

- Prevent or minimize recreational impacts in sensitive habitats.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Protect sensitive habitats from excessive grazing.

- Remove artificial stream barriers where appropriate.

Category: Climate Change

Stressor: Drought

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

- Promote water conservation methods.

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Pollution

Stressor: Contaminants from waste water and runoff

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

Species

Montezuma Well Springsnail

Pyrgulopsis montezumensis

Scores

Community/Focal: 1

Responsibility: 1

Priority

High

High

Priority

High

Priority

High

Scores

Community/Focal: 1

Responsibility: 1

Tier 1b invertebrate

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Promote water conservation methods in growth planning to develop sustainable water use.

Stressor: Water diversion/water catchments

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Promote water conservation methods.
- Remove artificial stream barriers where appropriate.

Category: Climate Change

Priority

Stressor: Drought

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

High

- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

Species

Page Springsnail

Scores

Pyrgulopsis morrisoni

Community/Focal: 1

Tier 1a invertebrate

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Promote water conservation methods.
- Encourage gray water use.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

- Encourage the utilization of low water use [and native] plants in landscaping.

Stressor: Water diversion/water catchments **High**

- Promote water conservation methods in growth planning to develop sustainable water use.
- Remove artificial stream barriers where appropriate.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Protect sensitive habitats from excessive grazing.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Promote water conservation methods.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Climate Change **Priority**

Stressor: Drought **High**

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Promote water conservation methods.

Category: Habitat conversion **Priority**

Stressor: Aquaculture **High**

- Work with aquaculture, game farms, and pet store industries to minimize impacts to wild populations and habitat.

Category: Invasive species **Priority**

Stressor: Nuisance animals **Medium**

- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Manage so as to sustain or enhance native fish and sport fish populations.
- Limit recreational and commercial use of crayfish and bullfrogs as fishing bait.
- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Use integrated management activities in concert to address nuisance plants.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Evaluate and modify Department regulations where appropriate.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Adopt national standards and efforts to reduce and control nuisance species.

- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

High

- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Category: Species Specific

Priority

Stressor: Small/localized or highly concentrated population(s)

High

- Develop research needs to assess population trends and/or habitat needs.

Species

Fossil Springsnail

Pyrgulopsis simplex

Tier 1b invertebrate

Scores
Community/Focal: 1
Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Promote water conservation methods in growth planning to develop sustainable water use.

Category: Climate Change

Priority

Stressor: Drought

High

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Non-consumptive resource use

Priority

Stressor: Non-motorized recreation off-trail

High

- Clearly mark designated roads and trails for recreational users.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Prevent or minimize recreational impacts in sensitive habitats.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff High

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Category: Transportation and infrastructure **Priority**

Stressor: Roads for motorized vehicles High

- Encourage increased partnering and communication with transportation officials on projects that affect wildlife and their habitat.
- Encourage wildlife friendly design for all road building.

Species

Brown Springsnail

Pyrgulopsis sola

Tier 1b invertebrate

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use **Priority**

Stressor: Groundwater depletion and springhead use High

- Encourage gray water use.
- Encourage low water use agriculture.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments High

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect sensitive habitats from excessive grazing.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Remove artificial stream barriers where appropriate.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Promote water conservation methods.

Category: Climate Change **Priority**

Stressor: Drought High

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Encourage development of water recycling systems/programs (effluent, storm water runoff) to increase the amount of water available to wildlife.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

High

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.

Species

Huachuca Springsnail

Pyrgulopsis thompsoni

Tier 1a invertebrate

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Encourage the utilization of low water use [and native] plants in landscaping.
- Promote water conservation methods.
- Encourage gray water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage low water use agriculture.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Stressor: Mining

Medium

- Promote recycling to reduce contamination from landfills and new mine operations.
- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Stressor: Water diversion/water catchments

High

- Remove artificial stream barriers where appropriate.
- Promote water conservation methods.
- Protect sensitive habitats from excessive grazing.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Increase public awareness of water cycles, water tables, instream flow, proper stream

morphology, and ecosystem functions (Project WET).

Category: Border issues

Priority

Stressor: Water use/contamination from illegal immigrants and drug smugglers

Medium

- Develop cooperative clean up efforts along the border for the benefit of wildlife.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Work with borderland agencies and landowners to minimize vandalism to livestock and wildlife water sources.

Category: Changes in Ecological Processes

Priority

Stressor: Soil erosion

Medium

- Implement watershed based approaches aimed at preventing excessive soil erosion.
- Revegetate disturbed areas with native plants.
- Protect and restore riparian areas.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Unnatural fire regimes

High

- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Design fire management plans and wildland/urban interface policies that consider wildlife values.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Work with land managers to develop and implement management plans that incorporate wildlife values.

Category: Climate Change

Priority

Stressor: Drought

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage development of water recycling systems/programs (effluent, storm water run-off) to increase the amount of water available to wildlife.
- Promote water conservation methods.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Consumptive use of biological resources

Priority

Stressor: Forest and woodland management - consumptive use

High

- Work with fire fighting services to develop fire management plans that minimize effects of fire retardants and water drawing on wildlife and wildlife habitats.
- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Grazing by ungulates

High

- Disseminate information to partners on effects of grazing on resources.

- Protect sensitive habitats from excessive grazing.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Habitat conversion

Priority

Stressor: Forest and woodland management - habitat conversion

Medium

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Livestock management

High

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect and restore riparian areas.

Category: Invasive species

Priority

Stressor: Bait-bucket dumping/illegal stocking

Medium

- Renovate aquatic systems to remove undesirable species.
- Evaluate and modify Department regulations where appropriate.
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Evaluate additional regional guidelines for use of different fishing baits and risks of bait-bucket dumping.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

Medium

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Species

Three Forks Springsnail

Pyrgulopsis trivialis

Tier 1a invertebrate

Scores

Community/Focal: 1

Responsibility: 1

- Category:** Abiotic resource use **Priority**
Stressor: Groundwater depletion and springhead use **Medium**
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Category:** Changes in Ecological Processes **Priority**
Stressor: Management for game animals and sport fish **Medium**
- Develop and implement integrated fisheries management plans for watersheds (for native and sport fish).
- Manage so as to sustain or enhance native fish and sport fish populations.
- Expand hatchery capabilities to propagate native species.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Stressor:** Streambank alteration/channelization **High**
- Protect sensitive habitats from excessive grazing.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Protect and restore riparian areas.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.
- Category:** Climate Change **Priority**
Stressor: Drought **Medium**
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Category:** Consumptive use of biological resources **Priority**
Stressor: Forest and woodland management - consumptive use **High**
- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
- Work with fire fighting services to develop fire management plans that minimize effects of fire retardants and water drawing on wildlife and wildlife habitats.
- Stressor:** Grazing by ungulates **High**
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Category:** Invasive species **Priority**
Stressor: Bait-bucket dumping/illegal stocking **High**
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Evaluate additional regional guidelines for use of different fishing baits and risks of bait-bucket dumping.
- Renovate aquatic systems to remove undesirable species.
- Evaluate and modify Department regulations where appropriate.
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Stressor:** Nuisance animals **High**
- Limit recreational and commercial use of crayfish and bullfrogs as fishing bait.
- Increase public education and enforcement of rules and regulations on introducing and

spreading nuisance species.

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Manage so as to sustain or enhance native fish and sport fish populations.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.
- Adopt national standards and efforts to reduce and control nuisance species.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Use integrated management activities in concert to address nuisance plants.
- Evaluate and modify Department regulations where appropriate.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.

Category: Pollution

Priority

Stressor: Contaminants from waste water and runoff

High

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

Stressor: Sediment/ash flows

High

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Protect and restore riparian areas.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Revegetate disturbed areas with native plants.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Work with land managers to reduce or prevent high sedimentation of aquatic systems where appropriate.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Species

Scores

Squaw Peak Talussnail

Community/Focal: 1

Sonorella allynsmithi

Responsibility: 1

Tier 1b invertebrate

Category: Habitat conversion

Priority

Stressor: Recreational sites/facilities

Medium

- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Increase enforcement for laws governing recreational activities.

- Educate the public about maintaining sensitive habitat for wildlife.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.

Stressor: Urban growth

High

- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Acquire land or conservation easements to protect key conservation areas.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.

Category: Transportation and infrastructure

Priority

Stressor: Unauthorized roads & trails

High

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

Species

Scores

Clark Peak Talussnail

Community/Focal: 1

Sonorella christenseni

Responsibility: 1

Tier 1b invertebrate

Category: Changes in Ecological Processes

Priority

Stressor: Unnatural fire regimes

High

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.

Category: Consumptive use of biological resources

Priority

Stressor: Forest and woodland management - consumptive use

Medium

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
- Work with fire fighting services to develop fire management plans that minimize effects of fire retardants and water drawing on wildlife and wildlife habitats.

Category: Habitat conversion

Priority

Stressor: Recreational sites/facilities

Medium

- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Increase enforcement for laws governing recreational activities.
- Educate the public about maintaining sensitive habitat for wildlife.
- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.

Species

San Xavier Talussnail

Sonorella eremita

Tier 1a invertebrate

Category: Abiotic resource use

Stressor: Mining

- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

- Promote recycling to reduce contamination from landfills and new mine operations.

Category: Climate Change

Stressor: Shift to warmer climate

- Develop plans to conserve priority conservation species (Focal Community, Responsibility, and Vulnerability categories) that are not sufficiently addressed under existing plans.

Category: Transportation and infrastructure

Stressor: Roads for motorized vehicles

- Encourage maintenance of paved and unpaved roads in a manner that minimizes impacts on wildlife and wildlife habitats.

- Encourage wildlife friendly design for all road building.

- Encourage increased partnering and communication with transportation officials on projects that affect wildlife and their habitat.

Stressor: Unauthorized roads & trails

- Increase enforcement for laws governing recreational activities.

- Increase public awareness of responsible OHV use and laws.

Scores

Community/Focal: 1

Responsibility: 1

Priority

Medium

Priority

High

Priority

Medium

Medium

Species

Pinaleno Talussnail

Sonorella grahamensis

Tier 1b invertebrate

Category: Changes in Ecological Processes

Stressor: Unnatural fire regimes

- Design fire management plans and wildland/urban interface policies that consider wildlife values.

- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.

Category: Consumptive use of biological resources

Stressor: Forest and woodland management - consumptive use

- Work with fire fighting services to develop fire management plans that minimize effects of fire retardants and water drawing on wildlife and wildlife habitats.

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Category: Habitat conversion

Stressor: Recreational sites/facilities

- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize

Scores

Community/Focal: 1

Responsibility: 1

Priority

High

Priority

Medium

Priority

Medium

disturbance to wildlife.

- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Use environmentally-friendly materials, landscaping, and structure designs for recreational sites.
- Increase enforcement for laws governing recreational activities.
- Educate the public about maintaining sensitive habitat for wildlife.

Species

Mimic Talussnail

Sonorella imitator

Tier 1b invertebrate

Category: Changes in Ecological Processes

Stressor: Unnatural fire regimes

- Design fire management plans and wildland/urban interface policies that consider wildlife values.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.

Category: Consumptive use of biological resources

Stressor: Forest and woodland management - consumptive use

- Work with fire fighting services to develop fire management plans that minimize effects of fire retardants and water drawing on wildlife and wildlife habitats.
- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Category: Habitat conversion

Stressor: Recreational sites/facilities

- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.
- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Use environmentally-friendly materials, landscaping, and structure designs for recreational sites.
- Increase enforcement for laws governing recreational activities.
- Educate the public about maintaining sensitive habitat for wildlife.

Species

Wet Canyon Talussnail

Sonorella macrophallus

Tier 1a invertebrate

Category: Changes in Ecological Processes

Stressor: Habitat fragmentation/barriers

- Increase public awareness of the effects of human activities and infrastructure on wildlife habitat fragmentation.
- Identify and protect key wildlife corridors for landscape connectivity.

Stressor: Soil erosion

Scores

Community/Focal: 1

Responsibility: 1

Priority

High

Priority

Medium

Priority

Medium

Scores

Community/Focal: 1

Responsibility: 1

Priority

Medium

Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect and restore riparian areas.
- Implement 'Best Management Practices' when building roads or other infrastructure (dams, mines, developments, etc.).
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Revegetate disturbed areas with native plants.
- Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.

Stressor: Unnatural fire regimes High

- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Design fire management plans and wildland/urban interface policies that consider wildlife values.

Category: Transportation and infrastructure Priority

Stressor: Roads for motorized vehicles Medium

- Encourage wildlife friendly design for all road building.
- Encourage increased partnering and communication with transportation officials on projects that affect wildlife and their habitat.

Stressor: Unauthorized roads & trails High

- Increase enforcement for laws governing recreational activities.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

Species

Papago Talussnail

Sonorella papagorum

Tier 1b invertebrate

Scores

Community/Focal: 1

Responsibility: 1

Category: Habitat conversion Priority

Stressor: Recreational sites/facilities High

- Use environmentally-friendly materials, landscaping, and structure designs for recreational sites.
- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Educate the public about maintaining sensitive habitat for wildlife.
- Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.
- Increase enforcement for laws governing recreational activities.

Category: Non-consumptive resource use Priority

Stressor: Non-motorized recreation off-trail High

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

- Clearly mark designated roads and trails for recreational users.
- Prevent or minimize recreational impacts in sensitive habitats.

Species

Arizona Cave Amphipod

Stygobromus arizonensis

Tier 1b invertebrate

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

- Promote water conservation methods.

- Promote water conservation methods in growth planning to develop sustainable water use.

- Encourage the utilization of low water use [and native] plants in landscaping.

Stressor: Water diversion/water catchments

- Remove artificial stream barriers where appropriate.

- Promote water conservation methods.

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

- Protect sensitive habitats from excessive grazing.

- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).

Category: Pollution

Stressor: Contaminants from waste water and runoff

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Stressor: Pesticides/herbicides

- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.

- Increase public awareness on alternative methods to using fertilizers, pesticides, and other contaminants.

- Identify and use pesticides and herbicides that have limited negative impact to wildlife (a wildlife-safe label).

Species

Gila Tryonia

Tryonia gilae

Tier 1b invertebrate

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

- Increase public awareness on the importance of conserving groundwater and springs for

Scores

Community/Focal: 1

Responsibility: 1

Priority

Medium

Medium

Priority

Medium

Medium

Scores

Community/Focal: 1

Responsibility: 1

Priority

High

the benefit of wildlife.

- Promote water conservation methods.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments **High**

- Remove artificial stream barriers where appropriate.
- Protect sensitive habitats from excessive grazing.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Category: Pollution **Priority**

Stressor: Contaminants from waste water and runoff **Medium**

- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.
- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Cooperate with municipalities to develop waste management plans that incorporate wildlife values.
- Increase public awareness on impacts of fertilizers, pesticides, and other contaminants on wildlife and their habitat.

Species

Quitobaquito Tryonia

Tryonia quitobaquiae

Tier 1a invertebrate

Scores

Community/Focal: 1

Responsibility: 1

Category: Abiotic resource use **Priority**

Stressor: Groundwater depletion and springhead use **Medium**

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Category: Border issues **Priority**

Stressor: Unauthorized roads & trails created by illegal immigrants and smugglers **Medium**

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

Stressor: Water use/contamination from illegal immigrants and drug smugglers **Medium**

- Develop cooperative clean up efforts along the border for the benefit of wildlife.
- Work with borderland agencies and landowners to minimize vandalism to livestock and wildlife water sources.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes **Medium**

- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Protect and restore springheads.

- Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
- Stressor:** Streambank alteration/channelization High
- Protect sensitive habitats from excessive grazing.
 - Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.
 - Protect and restore riparian areas.
 - Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
 - Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Category: Climate Change **Priority**
Stressor: Drought High

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Increase public awareness of water cycles, water tables, instream flow, proper stream morphology, and ecosystem functions (Project WET).
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Invasive species **Priority**
Stressor: Nuisance animals Medium

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Evaluate and modify Department regulations where appropriate.
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Adopt national standards and efforts to reduce and control nuisance species.
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Use integrated management activities in concert to address nuisance plants.
- Manage so as to sustain or enhance native fish and sport fish populations.
- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.

MAMMALS

Species **Scores**
Prospect Valley White-tailed Antelope Squirrel Community/Focal: 3
Ammospermophilus leucurus tersus Responsibility: 1
Tier 1b mammal

Category: Species Specific **Priority**
Stressor: Small/localized or highly concentrated population(s) High

- Acquire land or conservation easements to protect key conservation areas.

- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Protect sensitive habitats from excessive grazing.

Species

Scores

Sonoran Pronghorn	Community/Focal: 2
<i>Antilocapra americana sonoriensis</i>	Responsibility: 1
Tier 1a mammal	
Category: Border issues	Priority
Stressor: Poaching along the border	Medium
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.	
Category: Changes in Ecological Processes	Priority
Stressor: Habitat degradation/shrub invasions	High
- Use controlled burning to limit and reduce fuel loads and shrub invasion.	
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.	
- Use integrated management activities in concert to address nuisance plants.	
Stressor: Habitat fragmentation/barriers	High
- Acquire land to protect important habitat and wildlife corridors.	
- Increase public awareness of the effects of human activities and infrastructure on wildlife habitat fragmentation.	
Stressor: Unnatural fire regimes	Medium
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.	
- Use controlled burning to limit and reduce fuel loads and shrub invasion.	
Category: Climate Change	Priority
Stressor: Drought	High
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.	
- Promote adjustment of livestock management practices during droughts to ensure sufficient forage for wildlife.	
Category: Consumptive use of biological resources	Priority
Stressor: Grazing by ungulates	Medium
- Protect sensitive habitats from excessive grazing.	
- Acquire land or conservation easements on portions of rangeland critical to wildlife.	
- Modify grazing practices of grasslands to allow for natural fire regimes and reduction in undesirable vegetation.	
Category: Habitat conversion	Priority
Stressor: Agricultural conversion	Medium
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.	
Stressor: Livestock management	Medium
- Protect sensitive habitats from excessive grazing.	
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.	
- Encourage use of wildlife-friendly fences.	
Stressor: Rural development	Medium

- Acquire land or conservation easements to protect key conservation areas.
- Identify key conservation areas to protect from development.

Stressor: Urban growth **Priority**
Medium

- Acquire land or conservation easements to protect key conservation areas.
- Identify key conservation areas to protect from development.

Category: Invasive species **Priority**
Medium

Stressor: Disease/pathogens/parasites

- Pursue projects to limit spread of disease to sensitive wildlife populations.
- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.

Category: Non-consumptive resource use **Priority**
Medium

Stressor: Scientific research and collection

- Collaborate with partners to evaluate effects of capture and sampling techniques on wildlife.

Category: Species Specific **Priority**
High

Stressor: Small/localized or highly concentrated population(s)

- Acquire land to protect important habitat and wildlife corridors.
- Identify key conservation areas to protect from development.
- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land or conservation easements to protect key conservation areas.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.

Category: Transportation and infrastructure **Priority**
High

Stressor: Right-of-way fencing along roadways

- Develop species-specific wildlife friendly fencing guidelines.
- Remove unnecessary fences and barriers to wildlife movement.
- Use exclusion fencing and other design features to funnel wildlife movement to existing underpasses, overpasses or culverts.
- Encourage use of wildlife-friendly fences.

Stressor: Roads for motorized vehicles **Priority**
Medium

- Incorporate wildlife values in the design of road and trail networks in and around natural areas.
- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Encourage wildlife friendly design for all road building.

Species

Mexican Gray Wolf

Canis lupus baileyi

Tier 1a mammal

Scores

Community/Focal: 1

Responsibility: 1

Category: Changes in Ecological Processes **Priority**
High

Stressor: Habitat fragmentation/barriers

- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Acquire land to protect important habitat and wildlife corridors.
- Conduct economic impact analyses for legal designations of critical habitat and listed populations.

- Acquire land or conservation easements to protect key conservation areas.
Category: Consumptive use of biological resources **Priority**
Stressor: Harvesting/collecting animals High
- Increase public awareness of regulations pertaining to illegal harvest.
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
Category: Habitat conversion **Priority**
Stressor: Livestock management High
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Protect sensitive habitats from excessive grazing.
Stressor: Rural development Medium
- Acquire land or conservation easements to protect key conservation areas.
- Identify and protect key wildlife corridors for landscape connectivity.
- Identify key conservation areas to protect from development.
Stressor: Urban growth Medium
- Identify key conservation areas to protect from development.
- Acquire land or conservation easements to protect key conservation areas.
Category: Invasive species **Priority**
Stressor: Disease/pathogens/parasites Medium
- Pursue projects to limit spread of disease to sensitive wildlife populations.
- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.
Stressor: Hybridization Medium
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Category:** Non-consumptive resource use **Priority**
Stressor: Scientific research and collection High
- Collaborate with partners to evaluate effects of capture and sampling techniques on wildlife.

Species

Scores

Mexican Long-tongued Bat Community/Focal: 2
Choeronycteris mexicana Responsibility: 2

Tier 1b mammal

Category: Abiotic resource use **Priority**
Stressor: Mining Medium

- Retain and secure old mine adits and shafts for wildlife habitat (primarily for bats).

Category: Border issues **Priority**
Stressor: Dispersed camping along the border Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes **Priority**
Stressor: Habitat degradation/shrub invasions Medium

- Use integrated management activities in concert to address nuisance plants.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve

wildlife habitat.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Habitat fragmentation/barriers **Medium**

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Unnatural fire regimes **Medium**

- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Habitat conversion **Priority**

Stressor: Livestock management **Medium**

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Stressor: Rural development **Medium**

- Acquire land or conservation easements to protect key conservation areas.

- Identify key conservation areas to protect from development.

Category: Non-consumptive resource use **Priority**

Stressor: Non-motorized recreation off-trail **Medium**

- Prevent or minimize recreational impacts in sensitive habitats.

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Species Specific **Priority**

Stressor: Unknown **High**

- Acquire land or conservation easements to protect key conservation areas.

Species

Gunnison's Prairie Dog

Cynomys gunnisoni

Tier 1a mammal

Scores

Community/Focal: 1

Responsibility: 2

Category: Abiotic resource use **Priority**

Stressor: Drilling for fuels **Medium**

- Encourage design of extractive operations that minimizes disturbance to wildlife.

Category: Changes in Ecological Processes **Priority**

Stressor: Habitat degradation/shrub invasions **Medium**

- Use integrated management activities in concert to address nuisance plants.

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Stressor: Habitat fragmentation/barriers **Medium**

- Acquire land to protect important habitat and wildlife corridors.

- Acquire land or conservation easements on portions of rangeland critical to wildlife.

- Acquire land or conservation easements to protect key conservation areas.

Category: Climate Change **Priority**

Stressor: Drought **High**

- Promote adjustment of livestock management practices during droughts to ensure sufficient forage for wildlife.

Category: Consumptive use of biological resources **Priority**

Stressor: Grazing by ungulates	Medium
<ul style="list-style-type: none">- Disseminate information to partners on effects of grazing on resources.- Protect sensitive habitats from excessive grazing.- Acquire land or conservation easements on portions of rangeland critical to wildlife.- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.	
Stressor: Harvesting/collecting animals	Medium
<ul style="list-style-type: none">- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.- Develop harvest guidelines for sensitive species to minimize impacts to important life stages (breeding, raising young, etc.).	
Category: Habitat conversion	Priority
Stressor: Agricultural conversion	Medium
<ul style="list-style-type: none">- Acquire land or conservation easements to protect key conservation areas.- Mitigate habitat loss from agricultural conversion and/or urban/rural development.	
Stressor: Livestock management	High
<ul style="list-style-type: none">- Protect sensitive habitats from excessive grazing.- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.	
Stressor: Rural development	High
<ul style="list-style-type: none">- Acquire land or conservation easements to protect key conservation areas.- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.- Identify key conservation areas to protect from development.	
Stressor: Urban growth	High
<ul style="list-style-type: none">- Acquire land or conservation easements to protect key conservation areas.- Identify key conservation areas to protect from development.	
Category: Invasive species	Priority
Stressor: Disease/pathogens/parasites	High
<ul style="list-style-type: none">- Pursue projects to limit spread of disease to sensitive wildlife populations.- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.	
Stressor: Nuisance plants	Medium
<ul style="list-style-type: none">- Adopt national standards and efforts to reduce and control nuisance species.- Revegetate disturbed areas with native plants.	
Category: Non-consumptive resource use	Priority
Stressor: Off-range recreational shooting	Medium
<ul style="list-style-type: none">- Develop harvest guidelines for sensitive species to minimize impacts to important life stages (breeding, raising young, etc.).	

Species

Black-tailed Prairie Dog
Cynomys ludovicianus

Scores

Community/Focal: 3
Responsibility: 2

Tier 1a	mammal	
Category: Changes in Ecological Processes		Priority
Stressor: Habitat degradation/shrub invasions		High
- Use integrated management activities in concert to address nuisance plants.		
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.		
Stressor: Habitat fragmentation/barriers		High
- Identify key conservation areas to protect from development.		
- Acquire land to protect important habitat and wildlife corridors.		
- Identify and protect key wildlife corridors for landscape connectivity.		
Stressor: Unnatural fire regimes		Medium
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.		
- Use controlled burning to limit and reduce fuel loads and shrub invasion.		
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.		
Category: Climate Change		Priority
Stressor: Drought		Medium
- Promote adjustment of livestock management practices during droughts to ensure sufficient forage for wildlife.		
Category: Consumptive use of biological resources		Priority
Stressor: Grazing by ungulates		Medium
- Acquire land or conservation easements on portions of rangeland critical to wildlife.		
- Disseminate information to partners on effects of grazing on resources.		
- Modify grazing practices of grasslands to allow for natural fire regimes and reduction in undesirable vegetation.		
- Work with land managers to develop and implement management plans that incorporate wildlife values.		
- Protect sensitive habitats from excessive grazing.		
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.		
Category: Habitat conversion		Priority
Stressor: Agricultural conversion		Medium
- Acquire land or conservation easements to protect key conservation areas.		
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.		
Stressor: Livestock management		High
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.		
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.		
- Protect sensitive habitats from excessive grazing.		
- Disseminate information to partners on effects of grazing on resources.		
- Acquire land or conservation easements on portions of rangeland critical to wildlife.		
Stressor: Rural development		High
- Identify key conservation areas to protect from development.		

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Acquire land or conservation easements to protect key conservation areas.
- Stressor:** Urban growth Medium
- Identify key conservation areas to protect from development.
- Acquire land or conservation easements to protect key conservation areas.
- Identify and protect key wildlife corridors for landscape connectivity.
- Category:** Invasive species **Priority**
- Stressor:** Disease/pathogens/parasites High
- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.
- Pursue projects to limit spread of disease to sensitive wildlife populations.
- Stressor:** Nuisance plants Medium
- Use integrated management activities in concert to address nuisance plants.
- Adopt national standards and efforts to reduce and control nuisance species.
- Revegetate disturbed areas with native plants.
- Category:** Non-consumptive resource use **Priority**
- Stressor:** Off-range recreational shooting Medium
- Develop harvest guidelines for sensitive species to minimize impacts to important life stages (breeding, raising young, etc.).
- Category:** Species Specific **Priority**
- Stressor:** Small/localized or highly concentrated population(s) High
- Acquire land to protect important habitat and wildlife corridors.
- Acquire land or conservation easements to protect key conservation areas.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.

<u>Species</u>	<u>Scores</u>
Houserock Valley Chisel-toothed Kangaroo Rat	Community/Focal: 1
<i>Dipodomys microps leucotis</i>	Responsibility: 3
Tier 1b mammal	
Category: Consumptive use of biological resources	Priority
Stressor: Grazing by ungulates	High
- Disseminate information to partners on effects of grazing on resources.	
- Acquire land or conservation easements on portions of rangeland critical to wildlife.	
- Protect sensitive habitats from excessive grazing.	
Category: Habitat conversion	Priority
Stressor: Livestock management	High
- Acquire land or conservation easements on portions of rangeland critical to wildlife.	
- Protect sensitive habitats from excessive grazing.	
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.	
Category: Invasive species	Priority
Stressor: Feral animals	Medium
- Reduce/eliminate the effects of feral animal populations in sensitive wildlife habitats or near wildlife populations of concern.	
Category: Species Specific	Priority

- Stressor:** Small/localized or highly concentrated population(s) High
- Acquire land or conservation easements to protect key conservation areas.
 - Acquire land or conservation easements on portions of rangeland critical to wildlife.
 - Identify and protect key wildlife corridors for landscape connectivity.

<u>Species</u>	<u>Scores</u>
Spotted Bat	Community/Focal: 2
<i>Euderma maculatum</i>	Responsibility: 3
Tier 1b mammal	
Category: Changes in Ecological Processes	Priority
Stressor: Habitat degradation/shrub invasions	Medium
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.	
- Use integrated management activities in concert to address nuisance plants.	
Category: Non-consumptive resource use	Priority
Stressor: Scientific research and collection	Medium
- Evaluate and modify Department regulations where appropriate.	
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).	
Category: Pollution	Priority
Stressor: Pesticides/herbicides	Medium
- Use alternative means for pest control (biocontrol, genetic control, management practices).	
- Identify and use pesticides and herbicides that have limited negative impact to wildlife (a wildlife-safe label).	
Category: Species Specific	Priority
Stressor: Unknown	High
- Develop research needs to assess population trends and/or habitat needs.	

<u>Species</u>	<u>Scores</u>
Greater Western Mastiff Bat	Community/Focal: 2
<i>Eumops perotis californicus</i>	Responsibility: 2
Tier 1b mammal	
Category: Abiotic resource use	Priority
Stressor: Groundwater depletion and springhead use	High
- Promote water conservation methods in growth planning to develop sustainable water use.	
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.	
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.	
Category: Changes in Ecological Processes	Priority
Stressor: Altered river flow regimes	High
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.	
- Work with land managers to develop and implement management plans that incorporate wildlife values.	
Stressor: Unnatural fire regimes	Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Revegetate disturbed areas with native plants.

- Use integrated management activities in concert to address nuisance plants.

Stressor: Urban growth

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Non-consumptive resource use

Priority

Stressor: Non-motorized recreation off-trail

Medium

- Prevent or minimize recreational impacts in sensitive habitats.

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Pollution

Priority

Stressor: Pesticides/herbicides

High

- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.

- Identify and use pesticides and herbicides that have limited negative impact to wildlife (a wildlife-safe label).

- Use alternative means for pest control (biocontrol, genetic control, management practices).

Category: Species Specific

Priority

Stressor: Unknown

High

- Develop research needs to assess population trends and/or habitat needs.

Species

Scores

Underwood's Mastiff Bat

Community/Focal: 2

Eumops underwoodi

Responsibility: 2

Tier 1b mammal

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Promote water conservation methods in growth planning to develop sustainable water use.

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Stressor: Water diversion/water catchments

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Changes in Ecological Processes

Priority

Stressor: Unnatural fire regimes

Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Use controlled burning to limit and reduce fuel loads and shrub invasion.

- Category:** Habitat conversion **Priority**
Stressor: Livestock management **Medium**
- Protect sensitive habitats from excessive grazing.
 - Revegetate disturbed areas with native plants.
 - Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Stressor:** Urban growth **Medium**
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
 - Identify key conservation areas to protect from development.
- Category:** Non-consumptive resource use **Priority**
Stressor: Non-motorized recreation off-trail **Medium**
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
 - Prevent or minimize recreational impacts in sensitive habitats.
- Category:** Pollution **Priority**
Stressor: Pesticides/herbicides **High**
- Use alternative means for pest control (biocontrol, genetic control, management practices).
 - Identify and use pesticides and herbicides that have limited negative impact to wildlife (a wildlife-safe label).
 - Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
- Category:** Species Specific **Priority**
Stressor: Unknown **High**
- Develop research needs to assess population trends and/or habitat needs.

Species

Western Red Bat

Lasiurus blossevillii

Tier 1b mammal

Scores
Community/Focal: 2
Responsibility: 3

- Category:** Abiotic resource use **Priority**
Stressor: Groundwater depletion and springhead use **Medium**
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
 - Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
 - Promote water conservation methods in growth planning to develop sustainable water use.
- Category:** Changes in Ecological Processes **Priority**
Stressor: Altered river flow regimes **High**
- Protect sensitive habitats from excessive grazing.
 - Protect and restore springheads.
 - Work with land managers to develop and implement management plans that incorporate wildlife values.
- Stressor:** Streambank alteration/channelization **High**
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
 - Establish or revise laws and agency policies that protect instream flows to benefit wildlife

and riparian habitat.

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Pollution **Priority**

Stressor: Pesticides/herbicides Medium

- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.

- Use alternative means for pest control (biocontrol, genetic control, management practices).

- Identify and use pesticides and herbicides that have limited negative impact to wildlife (a wildlife-safe label).

Category: Species Specific **Priority**

Stressor: Unknown High

- Develop research needs to assess population trends and/or habitat needs.

Species

Western Yellow Bat

Lasiurus xanthinus

Tier 1b mammal

Scores

Community/Focal: 2

Responsibility: 3

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes Medium

- Protect and restore springheads.

- Protect sensitive habitats from excessive grazing.

- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Streambank alteration/channelization Medium

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Consumptive use of biological resources **Priority**

Stressor: Forest and woodland management - consumptive use High

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

Category: Habitat conversion **Priority**

Stressor: Forest and woodland management - habitat conversion High

- Develop guidelines for location and design of new infrastructure installations to minimize effects on wildlife and habitats.

- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Urban growth Medium

- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Pollution

Priority

Stressor: Pesticides/herbicides

Medium

- Use alternative means for pest control (biocontrol, genetic control, management practices).
- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
- Identify and use pesticides and herbicides that have limited negative impact to wildlife (a wildlife-safe label).

Category: Species Specific

Priority

Stressor: Unknown

High

- Develop research needs to assess population trends and/or habitat needs.

Species

Scores

Ocelot

Community/Focal: 3

Leopardus pardalis

Responsibility: 1

Tier 1a mammal

Category: Border issues

Priority

Stressor: Poaching along the border

Medium

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.

Category: Changes in Ecological Processes

Priority

Stressor: Habitat fragmentation/barriers

High

- Identify and protect key wildlife corridors for landscape connectivity.
- Identify key conservation areas to protect from development.
- Acquire land to protect important habitat and wildlife corridors.

Category: Habitat conversion

Priority

Stressor: Agricultural conversion

Medium

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.

Stressor: Rural development

High

- Identify and protect key wildlife corridors for landscape connectivity.
- Identify key conservation areas to protect from development.
- Acquire land or conservation easements to protect key conservation areas.

Stressor: Urban growth

Medium

- Identify and protect key wildlife corridors for landscape connectivity.
- Identify key conservation areas to protect from development.
- Acquire land or conservation easements to protect key conservation areas.

Species

Scores

Lesser Long-nosed Bat

Community/Focal: 1

Leptonycteris curasoae yerbabuena

Responsibility: 2

Tier 1a mammal

Category: Border issues	Priority
Stressor: Enforcement activities along the border	High
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.	
Stressor: Unauthorized roads & trails created by illegal immigrants and smugglers	High
- Incorporate wildlife values in the design of road and trail networks in and around natural areas.	
- Encourage revegetation and restoration of existing unauthorized roads and trails.	
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.	
Category: Changes in Ecological Processes	Priority
Stressor: Habitat degradation/shrub invasions	Medium
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.	
- Use integrated management activities in concert to address nuisance plants.	
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.	
Stressor: Habitat fragmentation/barriers	Medium
- Acquire land to protect important habitat and wildlife corridors.	
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.	
Stressor: Unnatural fire regimes	Medium
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.	
- Use controlled burning to limit and reduce fuel loads and shrub invasion.	
Category: Habitat conversion	Priority
Stressor: Livestock management	High
- Revegetate disturbed areas with native plants.	
- Protect sensitive habitats from excessive grazing.	
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.	
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.	
Stressor: Rural development	High
- Identify and protect key wildlife corridors for landscape connectivity.	
- Identify key conservation areas to protect from development.	
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.	
Stressor: Urban growth	High
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.	
- Identify key conservation areas to protect from development.	
Category: Non-consumptive resource use	Priority
Stressor: Non-motorized recreation off-trail	High
- Prevent or minimize recreational impacts in sensitive habitats.	

- Design fire management plans and wildland/urban interface policies that consider wildlife values.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Scientific research and collection Medium

- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).

Category: Species Specific **Priority**

Stressor: Small/localized or highly concentrated population(s) High

- Prevent or minimize recreational impacts in sensitive habitats.
- Increase enforcement for laws governing recreational activities.
- Retain and secure old mine adits and shafts for wildlife habitat (primarily for bats).

Stressor: Unknown High

- Develop research needs to assess population trends and/or habitat needs.

Species

Southwestern River Otter
Lutra canadensis sonora
Tier 1b mammal

Scores

Community/Focal: 3
Responsibility: 1

Category: Abiotic resource use **Priority**

Stressor: Groundwater depletion and springhead use Medium

- Promote water conservation methods in growth planning to develop sustainable water use.
- Encourage low water use agriculture.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Protect and restore springheads.

Category: Changes in Ecological Processes **Priority**

Stressor: Altered river flow regimes High

- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Habitat fragmentation/barriers High

- Remove artificial stream barriers where appropriate.
- Remove or modify unnecessary or inoperative dams or diversions.
- Acquire land to protect important habitat and wildlife corridors.

Stressor: Streambank alteration/channelization High

- Protect and restore riparian areas.
- Work with other agencies to employ new techniques in lieu of traditional stream bank armoring and flood control measures.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

Category: Climate Change **Priority**
Stressor: Drought Medium

- Encourage development of water use plans that protect instream flow.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Promote water conservation methods.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Consumptive use of biological resources **Priority**
Stressor: Harvesting/collecting animals High

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.

Category: Habitat conversion **Priority**
Stressor: Dams/reservoirs/impoundments High

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.

Category: Invasive species **Priority**
Stressor: Disease/pathogens/parasites Medium

- Pursue projects to limit spread of disease to sensitive wildlife populations.
- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.

Stressor: Hybridization High

- Regulate or prohibit movement of species with high risk of hybridization with native species.
- Create barriers between susceptible native species and non-natives to reduce hybridization, predation, competition, and transmission of diseases, pathogens, and parasites.

Category: Pollution **Priority**
Stressor: Contaminants from waste water and runoff Medium

- Regulate and enforce use of containment measures for commercial operations to prevent toxins from polluting surrounding habitat.
- Use wetlands to buffer and filter contaminants from storm runoff and irrigation return water in and around urban/rural areas.

Species

California Leaf-nosed Bat

Macrotus californicus

Tier 1b mammal

Scores
Community/Focal: 2
Responsibility: 1

Category: Abiotic resource use **Priority**
Stressor: Mining Medium

- Retain and secure old mine adits and shafts for wildlife habitat (primarily for bats).

Category: Border issues **Priority**
Stressor: Enforcement activities along the border Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes **Priority**
Stressor: Habitat degradation/shrub invasions Medium

- Use integrated management activities in concert to address nuisance plants.

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
Category: Habitat conversion **Priority**
Stressor: Agricultural conversion Medium
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
Stressor: Rural development High
- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
Stressor: Urban growth Medium
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Identify key conservation areas to protect from development.
Category: Non-consumptive resource use **Priority**
Stressor: Non-motorized recreation off-trail High
- Prevent or minimize recreational impacts in sensitive habitats.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
Category: Pollution **Priority**
Stressor: Pesticides/herbicides Medium
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
- Use alternative means for pest control (biocontrol, genetic control, management practices).
Category: Species Specific **Priority**
Stressor: Roost destruction High
- Retain and secure old mine adits and shafts for wildlife habitat (primarily for bats).
Stressor: Unknown High
- Develop research needs to assess population trends and/or habitat needs.

Species

White-bellied Long-tailed Vole
Microtus longicaudus leucophaeus
 Tier 1b mammal

Scores
 Community/Focal: 1
 Responsibility: 1

- Category:** Abiotic resource use **Priority**
Stressor: Groundwater depletion and springhead use High
- Protect and restore springheads.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Protect and restore riparian areas.
Category: Changes in Ecological Processes **Priority**
Stressor: Habitat degradation/shrub invasions Medium
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve

wildlife habitat.

Category: Climate Change **Priority**
Medium
Stressor: Shift to warmer climate

- Support efforts to reduce emission of greenhouse gases.

Category: Consumptive use of biological resources **Priority**
High
Stressor: Grazing by ungulates

- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

Category: Non-consumptive resource use **Priority**
Medium
Stressor: Dispersed camping

- Increase public awareness of responsible camping practices (low impact camping).

Stressor: Motorized recreation off-trail High

- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase enforcement for laws governing recreational activities.

Category: Species Specific **Priority**
Medium
Stressor: Small/localized or highly concentrated population(s)

- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Acquire land or conservation easements to protect key conservation areas.

Category: Transportation and infrastructure **Priority**
High
Stressor: Unauthorized roads & trails

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible OHV use and laws.
- Encourage responsible outdoor recreation through education (for example: "Stay on the Trails," "Leave No Trace," "Be Bear Aware," "Stop Aquatic Hitchhikers").
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

Species

Hualapai Mexican Vole
Microtus mexicanus hualpaiensis
Tier 1a mammal

Scores
Community/Focal: 1
Responsibility: 1

Category: Abiotic resource use **Priority**
Medium
Stressor: Groundwater depletion and springhead use

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Protect and restore springheads.
- Protect and restore riparian areas.

Category: Changes in Ecological Processes **Priority**

- Stressor:** Habitat fragmentation/barriers Medium
- Acquire land to protect important habitat and wildlife corridors.
 - Increase public awareness of the effects of human activities and infrastructure on wildlife habitat fragmentation.
 - Identify and protect key wildlife corridors for landscape connectivity.
- Stressor:** Unnatural fire regimes Medium
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
 - Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Category:** Climate Change **Priority**
- Stressor:** Drought Medium
- Promote adjustment of livestock management practices during droughts to ensure sufficient forage for wildlife.
- Category:** Consumptive use of biological resources **Priority**
- Stressor:** Forest and woodland management - consumptive use Medium
- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.
 - Encourage design of extractive operations that minimizes disturbance to wildlife.
- Stressor:** Grazing by ungulates High
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
 - Acquire land or conservation easements on portions of rangeland critical to wildlife.
 - Disseminate information to partners on effects of grazing on resources.
 - Protect sensitive habitats from excessive grazing.
- Category:** Habitat conversion **Priority**
- Stressor:** Livestock management Medium
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
 - Protect sensitive habitats from excessive grazing.
 - Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Stressor:** Recreational sites/facilities High
- Use environmentally-friendly materials, landscaping, and structure designs for recreational sites.
 - Manage watercraft recreation to reduce impacts to shoreline habitats and minimize disturbance to wildlife.
 - Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Category:** Species Specific **Priority**
- Stressor:** Small/localized or highly concentrated population(s) Medium
- Acquire land or conservation easements to protect key conservation areas.
 - Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Category:** Transportation and infrastructure **Priority**
- Stressor:** Roads for motorized vehicles Medium
- Encourage revegetation and restoration of existing unauthorized roads and trails.
 - Encourage wildlife friendly design for all road building.

Species

Black-footed Ferret

Mustela nigripes

Tier 1a mammal

Category: Changes in Ecological Processes

Stressor: Habitat fragmentation/barriers

- Acquire land to protect important habitat and wildlife corridors.
- Identify and protect key wildlife corridors for landscape connectivity.
- Identify key conservation areas to protect from development.

Stressor: Loss of keystone species

- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Category: Habitat conversion

Stressor: Agricultural conversion

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Acquire land or conservation easements to protect key conservation areas.

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.

Stressor: Rural development

- Identify and protect key wildlife corridors for landscape connectivity.

- Acquire land or conservation easements to protect key conservation areas.

- Identify key conservation areas to protect from development.

Stressor: Urban growth

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Acquire land or conservation easements to protect key conservation areas.

- Identify key conservation areas to protect from development.

Category: Invasive species

Stressor: Disease/pathogens/parasites

- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.

- Pursue projects to limit spread of disease to sensitive wildlife populations.

Stressor: Feral animals

- Increase public awareness on the need to control feral animals.

- Reduce/eliminate the effects of feral animal populations in sensitive wildlife habitats or near wildlife populations of concern.

Category: Non-consumptive resource use

Stressor: Off-range recreational shooting

- Increase enforcement for laws governing recreational activities.

Category: Species Specific

Stressor: Small/localized or highly concentrated population(s)

- Acquire land or conservation easements to protect key conservation areas.

Scores

Community/Focal: 1

Responsibility: 1

Priority

High

High

Priority

Medium

Medium

Medium

Priority

High

Medium

Priority

Medium

Priority

High

- Acquire land or conservation easements on portions of rangeland critical to wildlife.

Species

Big Free-tailed Bat

Nyctinomops macrotis

Tier 1b mammal

Scores

Community/Focal: 2

Responsibility: 2

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

- Promote water conservation methods in growth planning to develop sustainable water use.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Work with land managers to develop and implement management plans that incorporate wildlife values.

Stressor: Habitat degradation/shrub invasions

High

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Use integrated management activities in concert to address nuisance plants.

Stressor: Unnatural fire regimes

Medium

- Work with land managers to develop and implement management plans that incorporate wildlife values.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Use integrated management activities in concert to address nuisance plants.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Revegetate disturbed areas with native plants.

Category: Non-consumptive resource use

Priority

Stressor: Non-motorized recreation off-trail

High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Prevent or minimize recreational impacts in sensitive habitats.

Category: Pollution

Priority

Stressor: Pesticides/herbicides

High

- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.

- Use alternative means for pest control (biocontrol, genetic control, management practices).

- Identify and use pesticides and herbicides that have limited negative impact to wildlife (a wildlife-safe label).

Category: Species Specific

Priority

Stressor: Unknown

High

- Develop research needs to assess population trends and/or habitat needs.

Species

Desert Bighorn Sheep

Ovis canadensis mexicana

Tier 1b mammal

Scores

Community/Focal: 2

Responsibility: 2

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Protect and restore riparian areas.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Protect and restore springheads.

Stressor: Mining

Medium

- Revegetate disturbed areas with native plants.
- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

Medium

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Encourage development of water use plans that protect instream flow.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Stressor: Habitat fragmentation/barriers

High

- Increase public awareness of the effects of human activities and infrastructure on wildlife habitat fragmentation.
- Acquire land to protect important habitat and wildlife corridors.
- Identify and protect key wildlife corridors for landscape connectivity.
- Identify key conservation areas to protect from development.

Stressor: Unnatural fire regimes

High

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Promote adjustment of livestock management practices during droughts to ensure sufficient forage for wildlife.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Promote water conservation methods.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Acquire land or conservation easements on portions of rangeland critical to wildlife.

- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.
- Stressor:** Harvesting/collecting animals **High**
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
- Category:** Habitat conversion **Priority**
- Stressor:** Dams/reservoirs/impoundments **Medium**
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Remove or modify unnecessary or inoperative dams or diversions.
- Stressor:** Rural development **Medium**
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Identify and protect key wildlife corridors for landscape connectivity.
- Identify key conservation areas to protect from development.
- Acquire land or conservation easements to protect key conservation areas.
- Stressor:** Urban growth **Medium**
- Identify and protect key wildlife corridors for landscape connectivity.
- Identify key conservation areas to protect from development.
- Acquire land or conservation easements to protect key conservation areas.
- Category:** Invasive species **Priority**
- Stressor:** Disease/pathogens/parasites **High**
- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.
- Pursue projects to limit spread of disease to sensitive wildlife populations.
- Stressor:** Feral animals **Medium**
- Increase public awareness on the impacts of releasing exotic species, pets, or livestock on wildlife.
- Reduce/eliminate the effects of feral animal populations in sensitive wildlife habitats or near wildlife populations of concern.
- Category:** Non-consumptive resource use **Priority**
- Stressor:** Motorized recreation off-trail **Medium**
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness of responsible OHV use and laws.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase enforcement for laws governing recreational activities.
- Category:** Transportation and infrastructure **Priority**
- Stressor:** Roads for motorized vehicles **Medium**
- Encourage wildlife friendly design for all road building.
- Incorporate wildlife values in the design of road and trail networks in and around natural areas.
- Encourage revegetation and restoration of existing unauthorized roads and trails.

<u>Species</u>	<u>Scores</u>
Jaguar <i>Panthera onca</i> Tier 1a mammal	Community/Focal: 1 Responsibility: 1
Category: Border issues	Priority
Stressor: Poaching along the border	High
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.	
Category: Changes in Ecological Processes	Priority
Stressor: Habitat fragmentation/barriers	High
- Identify and protect key wildlife corridors for landscape connectivity.	
- Identify key conservation areas to protect from development.	
- Acquire land to protect important habitat and wildlife corridors.	
Stressor: Unnatural fire regimes	Medium
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.	
Category: Climate Change	Priority
Stressor: Drought	Medium
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.	
- Manage upland watersheds to retain vegetation as a buffer against drought effects.	
Category: Consumptive use of biological resources	Priority
Stressor: Harvesting/collecting animals	High
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.	
Category: Habitat conversion	Priority
Stressor: Livestock management	High
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.	
Stressor: Rural development	Medium
- Acquire land or conservation easements to protect key conservation areas.	
- Identify key conservation areas to protect from development.	
- Acquire land to protect important habitat and wildlife corridors.	
Stressor: Urban growth	Medium
- Identify and protect key wildlife corridors for landscape connectivity.	
- Acquire land or conservation easements to protect key conservation areas.	
- Identify key conservation areas to protect from development.	
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.	
Category: Non-consumptive resource use	Priority
Stressor: Scientific research and collection	Medium
- Collaborate with partners to evaluate effects of capture and sampling techniques on wildlife.	

<u>Species</u>	<u>Scores</u>
Springerville Pocket Mouse	Community/Focal: 2

<i>Perognathus flavus goodpasteri</i>	Responsibility: 1
Tier 1b mammal	
Category: Climate Change	Priority
Stressor: Drought	Medium
<ul style="list-style-type: none">- Manage upland watersheds to retain vegetation as a buffer against drought effects.- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.- Promote adjustment of livestock management practices during droughts to ensure sufficient forage for wildlife.	
Category: Consumptive use of biological resources	Priority
Stressor: Grazing by ungulates	High
<ul style="list-style-type: none">- Protect sensitive habitats from excessive grazing.- Acquire land or conservation easements on portions of rangeland critical to wildlife.- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.- Disseminate information to partners on effects of grazing on resources.	
Category: Habitat conversion	Priority
Stressor: Agricultural conversion	Medium
<ul style="list-style-type: none">- Mitigate habitat loss from agricultural conversion and/or urban/rural development.- Acquire land or conservation easements to protect key conservation areas.	
Stressor: Rural development	High
<ul style="list-style-type: none">- Identify key conservation areas to protect from development.- Identify and protect key wildlife corridors for landscape connectivity.- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.- Acquire land or conservation easements to protect key conservation areas.	
Category: Invasive species	Priority
Stressor: Nuisance plants	Medium
<ul style="list-style-type: none">- Revegetate disturbed areas with native plants.- Use native plants for roadway landscaping and urban/rural developed areas.- Use integrated management activities in concert to address nuisance plants.	
Category: Species Specific	Priority
Stressor: Small/localized or highly concentrated population(s)	High
<ul style="list-style-type: none">- Acquire land or conservation easements on portions of rangeland critical to wildlife.- Acquire land to protect important habitat and wildlife corridors.- Acquire land or conservation easements to protect key conservation areas.- Identify and protect key wildlife corridors for landscape connectivity.	
Stressor: Unknown	Medium
<ul style="list-style-type: none">- Develop research needs to assess population trends and/or habitat needs.	
Category: Transportation and infrastructure	Priority
Stressor: Unauthorized roads & trails	Medium
<ul style="list-style-type: none">- Increase enforcement for laws governing recreational activities.- Increase public awareness of responsible OHV use and laws.- Encourage revegetation and restoration of existing unauthorized roads and trails.- Use fencing and/or increased law enforcement presence to reduce unauthorized use and	

access to sensitive habitats.

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Encourage responsible outdoor recreation through education (for example: "Stay on the Trails," "Leave No Trace," "Be Bear Aware," "Stop Aquatic Hitchhikers").

Species

Mesquite Mouse
Peromyscus merriami
 Tier 1b mammal

Scores

Community/Focal: 1
 Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.
- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect and restore springheads.
- Encourage low water use agriculture.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

Medium

- Protect and restore riparian areas.

Stressor: Habitat fragmentation/barriers

High

- Increase public awareness of the effects of human activities and infrastructure on wildlife habitat fragmentation.
- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land to protect important habitat and wildlife corridors.
- Identify key conservation areas to protect from development.

Stressor: Streambank alteration/channelization

Medium

- Protect and restore riparian areas.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

High

- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.

Category: Habitat conversion

Priority

Stressor: Agricultural conversion

Medium

- Acquire land or conservation easements to protect key conservation areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.

Stressor: Dams/reservoirs/impoundments

Medium

- Remove or modify unnecessary or inoperative dams or diversions.

Stressor: Forest and woodland management - habitat conversion

High

- Encourage design of extractive operations that minimizes disturbance to wildlife.
- Design forest/woodland harvesting and management strategies that promote wildlife habitat diversity and connectivity.

Stressor: Rural development Medium

- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land or conservation easements to protect key conservation areas.
- Identify key conservation areas to protect from development.

Stressor: Urban growth Medium

- Acquire land to protect important habitat and wildlife corridors.
- Identify key conservation areas to protect from development.
- Acquire land or conservation easements to protect key conservation areas.
- Identify and protect key wildlife corridors for landscape connectivity.

Category: Invasive species **Priority**

Stressor: Nuisance plants Medium

- Use integrated management activities in concert to address nuisance plants.
- Revegetate disturbed areas with native plants.

Species

Chiricahua Fox Squirrel

Sciurus nayaritensis chiricahuae

Tier 1b mammal

Category: Species Specific

Stressor: Small/localized or highly concentrated population(s)

- Acquire land to protect important habitat and wildlife corridors.
- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land or conservation easements to protect key conservation areas.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.

Stressor: Unknown Medium

- Develop research needs to assess population trends and/or habitat needs.

Species

Yavapai Arizona Cotton Rat

Sigmodon arizonae jacksoni

Tier 1b mammal

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

- Protect and restore springheads.

Category: Changes in Ecological Processes

Stressor: Altered river flow regimes

- Remove or modify unnecessary or inoperative dams or diversions.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.
- Encourage development of water use plans that protect instream flow.

Stressor: Habitat fragmentation/barriers High

Scores

Community/Focal: 2

Responsibility: 1

Priority

High

Scores

Community/Focal: 2

Responsibility: 1

Priority

Medium

Priority

High

- Identify and protect key wildlife corridors for landscape connectivity.
 - Identify key conservation areas to protect from development.
 - Acquire land to protect important habitat and wildlife corridors.
- Stressor:** Streambank alteration/channelization Medium
- Protect and restore riparian areas.
- Category:** Climate Change **Priority**
- Stressor:** Drought Medium
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
 - Promote adjustment of livestock management practices during droughts to ensure sufficient forage for wildlife.
 - Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Category:** Habitat conversion **Priority**
- Stressor:** Agricultural conversion Medium
- Acquire land or conservation easements to protect key conservation areas.
 - Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
 - Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Stressor:** Dams/reservoirs/impoundments Medium
- Remove or modify unnecessary or inoperative dams or diversions.
- Category:** Species Specific **Priority**
- Stressor:** Small/localized or highly concentrated population(s) High
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
 - Acquire land or conservation easements to protect key conservation areas.
 - Acquire land to protect important habitat and wildlife corridors.
 - Identify and protect key wildlife corridors for landscape connectivity.
- Stressor:** Unknown Medium
- Develop research needs to assess population trends and/or habitat needs.

Species

Yuma Hispid Cotton Rat
Sigmodon hispidus eremicus
 Tier 1b mammal

Scores
 Community/Focal: 2
 Responsibility: 2

- Category:** Abiotic resource use **Priority**
- Stressor:** Groundwater depletion and springhead use High
- Encourage low water use agriculture.
 - Protect and restore riparian areas.
 - Protect and restore springheads.
- Category:** Changes in Ecological Processes **Priority**
- Stressor:** Altered river flow regimes High
- Encourage development of water use plans that protect instream flow.
 - Develop off-channel wetlands and backwaters along rivers to increase wildlife habitat.
 - Encourage development of water use plans that protect instream flow.
 - Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Habitat fragmentation/barriers High

- Identify and protect key wildlife corridors for landscape connectivity.
- Identify key conservation areas to protect from development.
- Acquire land to protect important habitat and wildlife corridors.

Category: Habitat conversion **Priority**

Stressor: Dams/reservoirs/impoundments Medium

- Remove or modify unnecessary or inoperative dams or diversions.
- Encourage development of water use plans that protect instream flow.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Rural development Medium

- Acquire land or conservation easements to protect key conservation areas.
- Acquire land to protect important habitat and wildlife corridors.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Identify key conservation areas to protect from development.
- Identify and protect key wildlife corridors for landscape connectivity.

Category: Species Specific **Priority**

Stressor: Small/localized or highly concentrated population(s) High

- Acquire land or conservation easements to protect key conservation areas.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Acquire land to protect important habitat and wildlife corridors.

Stressor: Unknown Medium

- Develop research needs to assess population trends and/or habitat needs.

Species

Arizona Shrew

Sorex arizonae

Tier 1b mammal

Scores

Community/Focal: 2

Responsibility: 1

Category: Abiotic resource use **Priority**

Stressor: Groundwater depletion and springhead use High

- Protect and restore springheads.
- Protect and restore riparian areas.
- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

Category: Changes in Ecological Processes **Priority**

Stressor: Habitat fragmentation/barriers Medium

- Acquire land or conservation easements to protect key conservation areas.
- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land to protect important habitat and wildlife corridors.

Category: Consumptive use of biological resources **Priority**

Stressor: Grazing by ungulates High

- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Disseminate information to partners on effects of grazing on resources.
- Develop and implement livestock and big game management guidelines that minimize

habitat degradation while maintaining stock ponds where appropriate.

- Protect sensitive habitats from excessive grazing.

Category: Habitat conversion

Priority

Stressor: Recreational sites/facilities

Medium

- Prevent or minimize recreational impacts in sensitive habitats.

Stressor: Rural development

Medium

- Identify key conservation areas to protect from development.

- Acquire land or conservation easements to protect key conservation areas.

- Identify and protect key wildlife corridors for landscape connectivity.

Species

Scores

Dwarf Shrew

Community/Focal: 3

Sorex nanus

Responsibility: 3

Tier 1b mammal

Category: Species Specific

Priority

Stressor: Small/localized or highly concentrated population(s)

High

- Acquire land or conservation easements to protect key conservation areas.

- Acquire land or conservation easements on portions of rangeland critical to wildlife.

Stressor: Unknown

Medium

- Develop research needs to assess population trends and/or habitat needs.

Species

Scores

Water Shrew

Community/Focal: 1

Sorex palustris

Responsibility: 3

Tier 1b mammal

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Protect and restore springheads.

- Increase public awareness on the importance of conserving groundwater and springs for the benefit of wildlife.

- Promote water conservation methods in growth planning to develop sustainable water use.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Protect and restore springheads.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Encourage development of water use plans that protect instream flow.

- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).

Stressor: Habitat degradation/shrub invasions

Medium

- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Stressor: Habitat fragmentation/barriers

High

- Identify and protect key wildlife corridors for landscape connectivity.

- Acquire land or conservation easements on portions of rangeland critical to wildlife.

- Acquire land to protect important habitat and wildlife corridors.

- Stressor:** Soil erosion Medium
- Protect and restore riparian areas.
 - Protect and restore springheads.
 - Train resource managers, developers, and private landowners in ways to minimize soil erosion and improve habitat.
 - Protect and restore riparian areas.
 - Protect sensitive habitats from excessive grazing.
- Stressor:** Streambank alteration/channelization High
- Protect and restore riparian areas.
 - Remove or modify unnecessary or inoperative dams or diversions.
- Category:** Climate Change **Priority**
- Stressor:** Drought Medium
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
 - Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Category:** Consumptive use of biological resources **Priority**
- Stressor:** Forest and woodland management - consumptive use Medium
- Encourage design of extractive operations that minimizes disturbance to wildlife.
- Stressor:** Grazing by ungulates High
- Protect sensitive habitats from excessive grazing.
 - Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
 - Disseminate information to partners on effects of grazing on resources.
 - Protect and restore riparian areas.
 - Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Category:** Habitat conversion **Priority**
- Stressor:** Dams/reservoirs/impoundments High
- Remove or modify unnecessary or inoperative dams or diversions.
 - Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Stressor:** Rural development Medium
- Acquire land or conservation easements to protect key conservation areas.
 - Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
 - Identify key conservation areas to protect from development.
 - Identify and protect key wildlife corridors for landscape connectivity.
- Category:** Species Specific **Priority**
- Stressor:** Small/localized or highly concentrated population(s) High
- Acquire land or conservation easements to protect key conservation areas.
 - Acquire land or conservation easements on portions of rangeland critical to wildlife.
 - Acquire land to protect important habitat and wildlife corridors.

Species

Thirteen-lined Ground Squirrel
Spermophilus tridecemlineatus

Scores

Community/Focal: 1
Responsibility: 3

Tier 1b mammal

Category: Changes in Ecological Processes

Priority

Stressor: Habitat fragmentation/barriers

High

- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land to protect important habitat and wildlife corridors.
- Acquire land or conservation easements to protect key conservation areas.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Protect sensitive habitats from excessive grazing.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Disseminate information to partners on effects of grazing on resources.

Category: Habitat conversion

Priority

Stressor: Agricultural conversion

Medium

- Acquire land or conservation easements to protect key conservation areas.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Recreational sites/facilities

Medium

- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.

- Prevent or minimize recreational impacts in sensitive habitats.

Stressor: Rural development

Medium

- Identify key conservation areas to protect from development.
- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land or conservation easements to protect key conservation areas.

Category: Non-consumptive resource use

Priority

Stressor: Dispersed camping

Medium

- Prevent or minimize recreational impacts in sensitive habitats.
- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible camping practices (low impact camping).

Stressor: Motorized recreation off-trail

Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness of responsible OHV use and laws.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

- Increase enforcement for laws governing recreational activities.

Category: Species Specific

Priority

Stressor: Small/localized or highly concentrated population(s)

High

- Acquire land to protect important habitat and wildlife corridors.
- Acquire land or conservation easements to protect key conservation areas.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.

Stressor: Unknown

High

- Develop research needs to assess population trends and/or habitat needs.

Category: Transportation and infrastructure

Priority

Stressor: Roads for motorized vehicles

Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Encourage wildlife friendly design for all road building.

Stressor: Unauthorized roads & trails Medium

- Increase enforcement for laws governing recreational activities.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.
- Increase public awareness of responsible OHV use and laws.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Encourage responsible outdoor recreation through education (for example: "Stay on the Trails," "Leave No Trace," "Be Bear Aware," "Stop Aquatic Hitchhikers").
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

Species

Mt Graham Red Squirrel

Tamiasciurus hudsonicus grahamens

Tier 1a mammal

Scores

Community/Focal: 1

Responsibility: 1

Category: Changes in Ecological Processes **Priority**

Stressor: Habitat fragmentation/barriers High

- Acquire land to protect important habitat and wildlife corridors.
- Identify and protect key wildlife corridors for landscape connectivity.
- Identify key conservation areas to protect from development.

Stressor: Unnatural fire regimes Medium

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Category: Consumptive use of biological resources **Priority**

Stressor: Forest and woodland management - consumptive use High

- Encourage design of extractive operations that minimizes disturbance to wildlife.

Category: Habitat conversion **Priority**

Stressor: Forest and woodland management - habitat conversion High

- Promote guidelines for timber harvesting and associated road building that positively effect wildlife.

Stressor: Recreational sites/facilities High

- Seasonally close areas to recreational and commercial use when sensitive breeding wildlife are present.
- Design recreation site management plans and policies that minimize impacts to wildlife and habitats.
- Prevent or minimize recreational impacts in sensitive habitats.

Stressor: Rural development Medium

- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Identify key conservation areas to protect from development.

Category: Invasive species **Priority**

Stressor: Nuisance animals High

- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.

Category: Species Specific

Priority

Stressor: Small/localized or highly concentrated population(s)

High

- Acquire land to protect important habitat and wildlife corridors.
- Acquire land or conservation easements to protect key conservation areas.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Identify and protect key wildlife corridors for landscape connectivity.

Category: Transportation and infrastructure

Priority

Stressor: Roads for motorized vehicles

Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.

Stressor: Telephone lines/cellphone towers

Medium

- Develop guidelines for location and design of new infrastructure installations to minimize effects on wildlife and habitats.
- Implement 'Best Management Practices' when building roads or other infrastructure (dams, mines, developments, etc.).

Species

Scores

Harquahala Southern Pocket Gopher

Community/Focal: 2

Thomomys bottae subsimilis

Responsibility: 1

Tier 1b mammal

Category: Changes in Ecological Processes

Priority

Stressor: Habitat fragmentation/barriers

High

- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land to protect important habitat and wildlife corridors.
- Acquire land or conservation easements to protect key conservation areas.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Consumptive use of biological resources

Priority

Stressor: Grazing by ungulates

Medium

- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Disseminate information to partners on effects of grazing on resources.
- Protect sensitive habitats from excessive grazing.

Category: Non-consumptive resource use

Priority

Stressor: Dispersed camping

Medium

- Increase public awareness of responsible camping practices (low impact camping).

Stressor: Motorized recreation off-trail

Medium

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Encourage responsible outdoor recreation through education (for example: "Stay on the Trails," "Leave No Trace," "Be Bear Aware," "Stop Aquatic Hitchhikers").
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness of responsible OHV use and laws.

Category: Species Specific

Priority

Stressor: Small/localized or highly concentrated population(s)

High

- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Acquire land or conservation easements to protect key conservation areas.

Stressor: Unknown

Medium

- Develop research needs to assess population trends and/or habitat needs.

Category: Transportation and infrastructure

Priority

Stressor: Roads for motorized vehicles

Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

Species

Scores

Southern Pocket Gopher

Community/Focal: 2

Thomomys umbrinus intermedius

Responsibility: 3

Tier 1b mammal

Category: Changes in Ecological Processes

Priority

Stressor: Habitat fragmentation/barriers

Medium

- Identify key conservation areas to protect from development.
- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land to protect important habitat and wildlife corridors.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Non-consumptive resource use

Priority

Stressor: Dispersed camping

Medium

- Increase public awareness of responsible camping practices (low impact camping).

Stressor: Motorized recreation off-trail

Medium

- Encourage responsible outdoor recreation through education (for example: "Stay on the Trails," "Leave No Trace," "Be Bear Aware," "Stop Aquatic Hitchhikers").

- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.

- Encourage revegetation and restoration of existing unauthorized roads and trails.

- Increase public awareness of responsible OHV use and laws.

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

Category: Species Specific

Priority

Stressor: Small/localized or highly concentrated population(s)

High

- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Acquire land or conservation easements to protect key conservation areas.

Stressor: Unknown

Medium

- Develop research needs to assess population trends and/or habitat needs.

Species

New Mexican Jumping Mouse
Zapus hudsonius luteus
Tier 1b mammal

Scores

Community/Focal: 2
Responsibility: 1

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Promote water conservation methods in growth planning to develop sustainable water use.
- Protect and restore springheads.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Encourage development of water use plans that protect instream flow.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Stressor: Habitat fragmentation/barriers

High

- Protect and restore riparian areas.
- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land to protect important habitat and wildlife corridors.

Stressor: Streambank alteration/channelization

Medium

- Protect and restore riparian areas.

Category: Consumptive use of biological resources

Priority

Stressor: Forest and woodland management - consumptive use

Medium

- Encourage design of extractive operations that minimizes disturbance to wildlife.

Stressor: Grazing by ungulates

High

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Disseminate information to partners on effects of grazing on resources.

Category: Habitat conversion

Priority

Stressor: Agricultural conversion

Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Protect and restore riparian areas.
- Acquire land or conservation easements to protect key conservation areas.

Stressor: Dams/reservoirs/impoundments

High

- Remove or modify unnecessary or inoperative dams or diversions.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

Stressor: Livestock management

High

- Develop and implement livestock and big game management guidelines that minimize

habitat degradation while maintaining stock ponds where appropriate.

- Protect sensitive habitats from excessive grazing.
- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Disseminate information to partners on effects of grazing on resources.

Stressor: Rural development

Medium

- Identify key conservation areas to protect from development.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land or conservation easements to protect key conservation areas.

Category: Species Specific

Priority

Stressor: Small/localized or highly concentrated population(s)

High

- Acquire land or conservation easements on portions of rangeland critical to wildlife.
- Acquire land or conservation easements to protect key conservation areas.

REPTILES

Species

Arizona Striped Whiptail

Aspidooscelis arizonae

Tier 1b reptile

Scores

Community/Focal: 1

Responsibility: 1

Category: Changes in Ecological Processes

Priority

Stressor: Habitat degradation/shrub invasions

Medium

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Unnatural fire regimes

Medium

- Use integrated management activities in concert to address nuisance plants.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Revegetate disturbed areas with native plants.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Rural development **High**

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Category: Non-consumptive resource use **Priority**

Stressor: Motorized recreation off-trail **Medium**

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible OHV use and laws.

Species

Giant Spotted Whiptail

Aspidoscelis stictogrammus

Tier 1b reptile

Scores

Community/Focal: 2

Responsibility: 3

Category: Changes in Ecological Processes **Priority**

Stressor: Habitat degradation/shrub invasions **Medium**

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Unnatural fire regimes **High**

- Encourage the utilization of low water use [and native] plants in landscaping.
- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Use integrated management activities in concert to address nuisance plants.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Category: Habitat conversion **Priority**

Stressor: Livestock management **Medium**

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Revegetate disturbed areas with native plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Use integrated management activities in concert to address nuisance plants.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

Stressor: Rural development

Medium

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.

Category: Invasive species

Priority

Stressor: Nuisance plants

Medium

- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Use integrated management activities in concert to address nuisance plants.
- Revegetate disturbed areas with native plants.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.
- Adopt national standards and efforts to reduce and control nuisance species.

Category: Non-consumptive resource use

Priority

Stressor: Motorized recreation off-trail

Medium

- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible OHV use and laws.
- Prevent or minimize recreational impacts in sensitive habitats.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

Species

Red-back Whiptail

Aspidoscelis xanthonota

Tier 1b reptile

Scores

Community/Focal: 3

Responsibility: 3

Category: Changes in Ecological Processes

Priority

Stressor: Unnatural fire regimes

High

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Use integrated management activities in concert to address nuisance plants.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Revegetate disturbed areas with native plants.
- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

Stressor: Rural development Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.

Category: Invasive species **Priority**
Stressor: Nuisance plants High

- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.
- Use integrated management activities in concert to address nuisance plants.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Adopt national standards and efforts to reduce and control nuisance species.
- Revegetate disturbed areas with native plants.

Category: Non-consumptive resource use **Priority**
Stressor: Motorized recreation off-trail Medium

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Increase enforcement for laws governing recreational activities.
- Prevent or minimize recreational impacts in sensitive habitats.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness of responsible OHV use and laws.

Species

Tucson Shovel-nosed Snake
Chionactis occipitalis klauberi
Tier 1b reptile

Scores
Community/Focal: 2
Responsibility: 1

Category: Changes in Ecological Processes **Priority**
Stressor: Habitat fragmentation/barriers Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land to protect important habitat and wildlife corridors.

Stressor: Unnatural fire regimes High

- Use integrated management activities in concert to address nuisance plants.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

- Encourage the utilization of low water use [and native] plants in landscaping.

Category: Habitat conversion

Priority

Stressor: Agricultural conversion

High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.

Stressor: Landfills/dumps

Medium

- Locate new landfills in appropriate locations that reduce impacts to wildlife and water sources.

Stressor: Livestock management

Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Revegetate disturbed areas with native plants.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Rural development

High

- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Urban growth

High

- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Acquire land or conservation easements to protect key conservation areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Identify and protect key wildlife corridors for landscape connectivity.

Category: Invasive species

Priority

Stressor: Nuisance plants

High

- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Revegetate disturbed areas with native plants.
- Adopt national standards and efforts to reduce and control nuisance species.
- Develop regulations on the sale and use of potentially invasive plants for landscaping.

aquariums, and backyard ponds.

- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Use integrated management activities in concert to address nuisance plants.

Category: Non-consumptive resource use

Priority

Stressor: Motorized recreation off-trail

Medium

- Increase enforcement for laws governing recreational activities.
- Increase public awareness of responsible OHV use and laws.
- Prevent or minimize recreational impacts in sensitive habitats.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

Category: Transportation and infrastructure

Priority

Stressor: Roads for motorized vehicles

Medium

- Encourage wildlife friendly design for all road building.
- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.

Species

Organ Pipe Shovel-nosed Snake

Scores
Community/Focal: 2
Responsibility: 3

Chionactis palarostris organica

Tier 1b reptile

Category: Changes in Ecological Processes

Priority

Stressor: Unnatural fire regimes

High

- Use integrated management activities in concert to address nuisance plants.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Category: Invasive species

Priority

Stressor: Nuisance plants

High

- Adopt national standards and efforts to reduce and control nuisance species.
- Use integrated management activities in concert to address nuisance plants.
- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Revegetate disturbed areas with native plants.

Category: Transportation and infrastructure

Priority

Stressor: Roads for motorized vehicles

High

- Encourage wildlife friendly design for all road building.
- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.

Species

Western Twin-spotted Rattlesnake

Scores
Community/Focal: 1
Responsibility: 3

Crotalus pricei pricei

Tier 1b reptile

Category: Border issues

Priority

Stressor: Altered fire regime as a result of border activities Medium
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.

Category: Changes in Ecological Processes **Priority**
Stressor: Unnatural fire regimes High

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Reduce the density of undesirable trees and shrubs (selective thinning and eradication of tamarisk) to prevent crown fires and wildfires in riparian areas.
- Use integrated management activities in concert to address nuisance plants.
- Encourage the utilization of low water use [and native] plants in landscaping.

Category: Climate Change **Priority**
Stressor: Shift to warmer climate High

- Develop plans to conserve priority conservation species (Focal Community, Responsibility, and Vulnerability categories) that are not sufficiently addressed under existing plans.

Category: Consumptive use of biological resources **Priority**
Stressor: Harvesting/collecting animals Medium

- Increase public awareness of regulations pertaining to illegal harvest.
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.

Category: Invasive species **Priority**
Stressor: Nuisance plants Medium

- Revegetate disturbed areas with native plants.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Use integrated management activities in concert to address nuisance plants.
- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.
- Adopt national standards and efforts to reduce and control nuisance species.

Species **Scores**
New Mexico Ridge-nosed Rattlesnake Community/Focal: 1
Crotalus willardi obscurus Responsibility: 3
Tier 1a reptile

Category: Border issues **Priority**
Stressor: Altered fire regime as a result of border activities Medium

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Stressor: Enforcement activities along the border Medium
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Priority

Stressor: Unnatural fire regimes

High

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Encourage the utilization of low water use [and native] plants in landscaping.
- Use integrated management activities in concert to address nuisance plants.

Category: Consumptive use of biological resources

Priority

Stressor: Harvesting/collecting animals

High

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
- Increase public awareness of regulations pertaining to illegal harvest.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Protect and restore riparian areas.
- Use integrated management activities in concert to address nuisance plants.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Revegetate disturbed areas with native plants.

Category: Invasive species

Priority

Stressor: Nuisance plants

Medium

- Revegetate disturbed areas with native plants.
- Adopt national standards and efforts to reduce and control nuisance species.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Use integrated management activities in concert to address nuisance plants.
- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.

Category: Non-consumptive resource use

Priority

Stressor: Motorized recreation off-trail

Medium

- Increase public awareness of responsible OHV use and laws.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Increase enforcement for laws governing recreational activities.
- Prevent or minimize recreational impacts in sensitive habitats.

Species

Arizona Ridge-nosed Rattlesnake

Crotalus willardi willardi

Tier 1b reptile

Category: Border issues

Scores

Community/Focal: 2

Responsibility: 2

Priority

Stressor: Altered fire regime as a result of border activities Medium

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Stressor: Enforcement activities along the border Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes **Priority**

Stressor: Unnatural fire regimes High

- Use integrated management activities in concert to address nuisance plants.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Encourage the utilization of low water use [and native] plants in landscaping.

Category: Consumptive use of biological resources **Priority**

Stressor: Harvesting/collecting animals High

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
- Increase public awareness of regulations pertaining to illegal harvest.

Category: Habitat conversion **Priority**

Stressor: Livestock management High

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Use integrated management activities in concert to address nuisance plants.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Revegetate disturbed areas with native plants.

Category: Invasive species **Priority**

Stressor: Nuisance plants Medium

- Revegetate disturbed areas with native plants.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Use integrated management activities in concert to address nuisance plants.
- Adopt national standards and efforts to reduce and control nuisance species.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.

Category: Non-consumptive resource use **Priority**

Stressor: Motorized recreation off-trail Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.

- Increase enforcement for laws governing recreational activities.

Species

Arizona Skink

Eumeces gilberti arizonensis

Tier 1b reptile

Category: Abiotic resource use

Stressor: Water diversion/water catchments

- Prevent or minimize recreational impacts in sensitive habitats.
- Protect sensitive habitats from excessive grazing.

Category: Consumptive use of biological resources

Stressor: Harvesting/collecting animals

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
- Increase public awareness of regulations pertaining to illegal harvest.

Category: Habitat conversion

Stressor: Livestock management

- Protect and restore riparian areas.
- Use integrated management activities in concert to address nuisance plants.
- Revegetate disturbed areas with native plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.

Stressor: Rural development

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.

Category: Transportation and infrastructure

Stressor: Roads for motorized vehicles

- Encourage wildlife friendly design for all road building.
- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.

Species

Mohave Desert Tortoise

Gopherus agassizii (Mohave Population)

Tier 1a reptile

Category: Changes in Ecological Processes

Stressor: Habitat degradation/shrub invasions

Scores

Community/Focal: 3

Responsibility: 1

Priority

Medium

Priority

Medium

Priority

High

High

Priority

Medium

Scores

Community/Focal: 2

Responsibility: 2

Priority

Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Use integrated management activities in concert to address nuisance plants.

Stressor: Habitat fragmentation/barriers **High**

- Identify and protect key wildlife corridors for landscape connectivity.

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Acquire land to protect important habitat and wildlife corridors.

Stressor: Unnatural fire regimes **High**

- Use integrated management activities in concert to address nuisance plants.

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

- Encourage the utilization of low water use [and native] plants in landscaping.

Category: Climate Change **Priority**

Stressor: Drought **High**

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Habitat conversion **Priority**

Stressor: Livestock management **High**

- Use integrated management activities in concert to address nuisance plants.

- Revegetate disturbed areas with native plants.

- Protect sensitive habitats from excessive grazing.

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Rural development **Medium**

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Acquire land or conservation easements to protect key conservation areas.

Stressor: Urban growth **Medium**

- Acquire land or conservation easements to protect key conservation areas.

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Identify key conservation areas to protect from development.

- Identify and protect key wildlife corridors for landscape connectivity.

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.

Category: Invasive species **Priority**

Stressor: Disease/pathogens/parasites **High**

- Pursue projects to limit spread of disease to sensitive wildlife populations.
- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.
- Adopt national standards and efforts to reduce and control nuisance species.

Category: Transportation and infrastructure

Priority

Stressor: Roads for motorized vehicles

High

- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.
- Encourage wildlife friendly design for all road building.

Stressor: Unauthorized roads & trails

Medium

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Increase enforcement for laws governing recreational activities.

Species

Scores

Sonoran Desert Tortoise

Community/Focal: 2

Gopherus agassizii (Sonoran Population)

Responsibility: 2

Tier 1b reptile

Category: Abiotic resource use

Priority

Stressor: Mining

Medium

- Incorporate wildlife values in planning and locations for new mines, associated structures, and leach fields.

Category: Border issues

Priority

Stressor: Dispersed camping along the border

Medium

- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Develop cooperative clean up efforts along the border for the benefit of wildlife.

Stressor: Enforcement activities along the border

Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Priority

Stressor: Habitat degradation/shrub invasions

Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Habitat fragmentation/barriers

High

- Identify and protect key wildlife corridors for landscape connectivity.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

- Acquire land to protect important habitat and wildlife corridors.
Stressor: Unnatural fire regimes High
- Encourage the utilization of low water use [and native] plants in landscaping.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.
Category: Climate Change **Priority**
- Stressor:** Drought High
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
Category: Consumptive use of biological resources **Priority**
- Stressor:** Harvesting/collecting animals Medium
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
- Increase public awareness of regulations pertaining to illegal harvest.
Category: Habitat conversion **Priority**
- Stressor:** Livestock management High
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Use integrated management activities in concert to address nuisance plants.
- Protect sensitive habitats from excessive grazing.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Revegetate disturbed areas with native plants.
Stressor: Rural development Medium
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Acquire land or conservation easements to protect key conservation areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
Stressor: Urban growth High
- Identify and protect key wildlife corridors for landscape connectivity.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.
- Identify key conservation areas to protect from development.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
Category: Invasive species **Priority**
- Stressor:** Disease/pathogens/parasites High
- Pursue projects to limit spread of disease to sensitive wildlife populations.
- Adopt national standards and efforts to reduce and control nuisance species.
- Collaborate with partners on disease/pathogen/parasite issues to protect wildlife.

Stressor: Nuisance plants High

- Adopt national standards and efforts to reduce and control nuisance species.
- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Revegetate disturbed areas with native plants.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Use integrated management activities in concert to address nuisance plants.

Category: Transportation and infrastructure **Priority**

Stressor: Roads for motorized vehicles High

- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.
- Encourage wildlife friendly design for all road building.

Stressor: Unauthorized roads & trails Medium

- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.
- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Increase enforcement for laws governing recreational activities.

Species

Thornscrub Hook-nosed Snake

Gyalopion quadrangulare

Tier 1b reptile

Scores

Community/Focal: 3

Responsibility: 3

Category: Border issues **Priority**

Stressor: Dispersed camping along the border Medium

- Use fencing and/or increased law enforcement presence to reduce unauthorized use and access to sensitive habitats.
- Work with land managers to develop and implement management plans that incorporate wildlife values.
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Develop cooperative clean up efforts along the border for the benefit of wildlife.

Stressor: Enforcement activities along the border Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Stressor: Unauthorized roads & trails created for law enforcement along the border Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

Category: Changes in Ecological Processes **Priority**

Stressor: Unnatural fire regimes Medium

- Encourage the utilization of low water use [and native] plants in landscaping.

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.

Category: Consumptive use of biological resources

Priority

Stressor: Harvesting/collecting animals

High

- Increase public awareness of regulations pertaining to illegal harvest.
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Revegetate disturbed areas with native plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Use integrated management activities in concert to address nuisance plants.
- Protect sensitive habitats from excessive grazing.

Stressor: Rural development

High

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.

Category: Invasive species

Priority

Stressor: Nuisance plants

Medium

- Use integrated management activities in concert to address nuisance plants.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Revegetate disturbed areas with native plants.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.
- Adopt national standards and efforts to reduce and control nuisance species.

Species

Arizona Mud Turtle

Kinosternon arizonense

Tier 1b reptile

Scores

Community/Focal: 1

Responsibility: 3

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Habitat conversion

Priority

Stressor: Livestock management

High

- Revegetate disturbed areas with native plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Use integrated management activities in concert to address nuisance plants.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Protect and restore riparian areas.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.

Species

Scores

Yellow Mud Turtle

Community/Focal: 2

Kinosternon flavescens

Responsibility: 3

Tier 1b reptile

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Habitat conversion

Priority

Stressor: Agricultural conversion

High

- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Livestock management

Medium

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect and restore riparian areas.
- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize

habitat degradation while maintaining stock ponds where appropriate.

- Revegetate disturbed areas with native plants.
- Protect sensitive habitats from excessive grazing.

Stressor: Rural development

High

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Renovate aquatic systems to remove undesirable species.
- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).

Species

Sonoyta Mud Turtle

Kinosternon sonoriense longifemorale

Tier 1a reptile

Scores

Community/Focal: 2

Responsibility: 2

Category: Abiotic resource use

Priority

Stressor: Groundwater depletion and springhead use

High

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Border issues

Priority

Stressor: Water use/contamination from illegal immigrants and drug smugglers

Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.
- Develop cooperative clean up efforts along the border for the benefit of wildlife.

Category: Changes in Ecological Processes

Priority

Stressor: Altered river flow regimes

High

- Work with land managers to develop and implement management plans that incorporate wildlife values.

- Protect and restore springheads.

- Protect sensitive habitats from excessive grazing.

- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

Category: Climate Change

Priority

Stressor: Drought

High

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

- Encourage proper functioning riparian areas and aquatic habitats as buffers against

drought effects.

Category: Consumptive use of biological resources

Priority

Stressor: Harvesting/collecting animals

Medium

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
- Increase public awareness of regulations pertaining to illegal harvest.

Category: Habitat conversion

Priority

Stressor: Agricultural conversion

Medium

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.

Stressor: Livestock management

High

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect and restore riparian areas.
- Revegetate disturbed areas with native plants.

Category: Pollution

Priority

Stressor: Pesticides/herbicides

Medium

- Use appropriate concentrations and types of pesticides, herbicides, or alternatives to control undesirable species, especially near sensitive habitat and watercourses.
- Promote organic agriculture and gardening practices that do not rely on chemical treatments.
- Use alternative means for pest control (biocontrol, genetic control, management practices).
- Identify and use pesticides and herbicides that have limited negative impact to wildlife (a wildlife-safe label).

Species

New Mexico Milksnake

Scores

Community/Focal: 3

Lampropeltis triangulum celaenops

Responsibility: 3

Tier 1b reptile

Category: Border issues

Priority

Stressor: Altered fire regime as a result of border activities

Medium

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Stressor: Enforcement activities along the border

Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Priority

- Stressor:** Habitat degradation/shrub invasions Medium
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
 - Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
 - Use integrated management activities in concert to address nuisance plants.
- Stressor:** Unnatural fire regimes Medium
- Use integrated management activities in concert to address nuisance plants.
 - Use controlled burning to limit and reduce fuel loads and shrub invasion.
 - Encourage the utilization of low water use [and native] plants in landscaping.
 - Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Category:** Climate Change **Priority**
- Stressor:** Drought Medium
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Category:** Consumptive use of biological resources **Priority**
- Stressor:** Harvesting/collecting animals High
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
 - Increase public awareness of regulations pertaining to illegal harvest.
- Category:** Habitat conversion **Priority**
- Stressor:** Agricultural conversion Medium
- Acquire land or conservation easements to protect key conservation areas.
 - Mitigate habitat loss from agricultural conversion and/or urban/rural development.
 - Work with city and county planners to incorporate wildlife values in urban/rural development plans.
 - Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Stressor:** Livestock management High
- Use integrated management activities in concert to address nuisance plants.
 - Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
 - Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
 - Revegetate disturbed areas with native plants.
 - Protect sensitive habitats from excessive grazing.
- Stressor:** Rural development Medium
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
 - Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
 - Mitigate habitat loss from agricultural conversion and/or urban/rural development.
 - Acquire land or conservation easements to protect key conservation areas.
 - Work with city and county planners to promote in-fill development and limit urban/rural sprawl.

Species

Scores

Utah Milksnake
Lampropeltis triangulum taylori
Tier 1b reptile
Community/Focal: 3
Responsibility: 3

Category: Changes in Ecological Processes **Priority**
Stressor: Habitat degradation/shrub invasions **Medium**

- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Unnatural fire regimes **Medium**

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Use integrated management activities in concert to address nuisance plants.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Encourage the utilization of low water use [and native] plants in landscaping.

Category: Climate Change **Priority**
Stressor: Drought **Medium**

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Consumptive use of biological resources **Priority**
Stressor: Harvesting/collecting animals **High**

- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.
- Increase public awareness of regulations pertaining to illegal harvest.

Category: Habitat conversion **Priority**
Stressor: Livestock management **High**

- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Use integrated management activities in concert to address nuisance plants.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Revegetate disturbed areas with native plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.

Stressor: Rural development **Medium**

- Acquire land or conservation easements to protect key conservation areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.

Species

Brown Vinesnake

Scores

Community/Focal: 3

<i>Oxybelis aeneus</i>	Responsibility: 3
Tier 1b reptile	
Category: Border issues	Priority
Stressor: Altered fire regime as a result of border activities	Medium
- Use controlled burning to limit and reduce fuel loads and shrub invasion.	
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.	
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.	
Stressor: Enforcement activities along the border	Medium
- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.	
Category: Changes in Ecological Processes	Priority
Stressor: Unnatural fire regimes	High
- Use integrated management activities in concert to address nuisance plants.	
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.	
- Use controlled burning to limit and reduce fuel loads and shrub invasion.	
Category: Climate Change	Priority
Stressor: Drought	Medium
- Manage upland watersheds to retain vegetation as a buffer against drought effects.	
Category: Consumptive use of biological resources	Priority
Stressor: Harvesting/collecting animals	Medium
- Increase public awareness of regulations pertaining to illegal harvest.	
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.	
Category: Habitat conversion	Priority
Stressor: Livestock management	High
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.	
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.	
- Protect sensitive habitats from excessive grazing.	
- Revegetate disturbed areas with native plants.	
- Use integrated management activities in concert to address nuisance plants.	
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.	
Stressor: Rural development	High
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.	
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.	
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.	
- Acquire land or conservation easements to protect key conservation areas.	
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.	
Category: Transportation and infrastructure	Priority
Stressor: Roads for motorized vehicles	Medium

- Encourage wildlife friendly design for all road building.
- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.

Species

Flat-tailed Horned Lizard
Phrynosoma mcallii
Tier 1a reptile

Scores
Community/Focal: 2
Responsibility: 2

Category: Border issues

Priority

Stressor: Enforcement activities along the border

High

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Stressor: Unauthorized roads & trails created for law enforcement along the border

High

- Incorporate wildlife values in the design of road and trail networks in and around natural areas.

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Priority

Stressor: Unnatural fire regimes

Medium

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.
- Encourage the utilization of low water use [and native] plants in landscaping.

Category: Habitat conversion

Priority

Stressor: Agricultural conversion

Medium

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Stressor: Urban growth

High

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Identify key conservation areas to protect from development.
- Identify and protect key wildlife corridors for landscape connectivity.
- Acquire land or conservation easements to protect key conservation areas.

Category: Invasive species

Priority

Stressor: Nuisance plants

High

- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Use integrated management activities in concert to address nuisance plants.
- Adopt national standards and efforts to reduce and control nuisance species.

- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Revegetate disturbed areas with native plants.

Category: Non-consumptive resource use

Priority

Stressor: Motorized recreation off-trail

High

- Encourage revegetation and restoration of existing unauthorized roads and trails.
- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Increase enforcement for laws governing recreational activities.

Category: Transportation and infrastructure

Priority

Stressor: Roads for motorized vehicles

Medium

- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.
- Encourage wildlife friendly design for all road building.

Species

Slevin's Bunchgrass Lizard

Scores

Community/Focal: 1

Sceloporus slevini

Responsibility: 3

Tier 1b reptile

Category: Changes in Ecological Processes

Priority

Stressor: Habitat degradation/shrub invasions

Medium

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Unnatural fire regimes

Medium

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Habitat conversion

Priority

Stressor: Livestock management

High

- Protect sensitive habitats from excessive grazing.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

- Use integrated management activities in concert to address nuisance plants.
- Revegetate disturbed areas with native plants.

Stressor: Rural development High

- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Acquire land or conservation easements to protect key conservation areas.

Species

Desert Massasauga

Sistrurus catenatus edwardsii

Tier 1b reptile

Category: Border issues

Stressor: Altered fire regime as a result of border activities

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Stressor: Enforcement activities along the border

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Stressor: Habitat degradation/shrub invasions

- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Use integrated management activities in concert to address nuisance plants.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Stressor: Unnatural fire regimes

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change

Stressor: Drought

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Consumptive use of biological resources

Stressor: Harvesting/collecting animals

- Increase public awareness of regulations pertaining to illegal harvest.
- Increase enforcement of existing laws pertaining to the illegal harvest of wildlife.

Category: Habitat conversion

Stressor: Livestock management

Scores

Community/Focal: 2

Responsibility: 3

Priority

Medium

Medium

Priority

Medium

Medium

Priority

Medium

Priority

High

Priority

High

- Protect sensitive habitats from excessive grazing.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Revegetate disturbed areas with native plants.
- Use integrated management activities in concert to address nuisance plants.

Stressor: Rural development

Medium

- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.

Species

Desert Box Turtle

Terrapene ornata luteola

Tier 1b reptile

Category: Border issues

Stressor: Altered fire regime as a result of border activities

- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Restore natural fire regimes (frequency, intensity, and mosaic distribution) to improve wildlife habitat.

Stressor: Enforcement activities along the border

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Stressor: Unnatural fire regimes

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Use controlled burning to limit and reduce fuel loads and shrub invasion.
- Use integrated management activities in concert to address nuisance plants.

Category: Climate Change

Stressor: Drought

- Manage upland watersheds to retain vegetation as a buffer against drought effects.

Category: Habitat conversion

Stressor: Agricultural conversion

- Acquire land or conservation easements to protect key conservation areas.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Scores

Community/Focal: 2

Responsibility: 3

Priority

Medium

Medium

Priority

Medium

Priority

Medium

Priority

Medium

- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Stressor:** Livestock management High
- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Revegetate disturbed areas with native plants.
- Protect sensitive habitats from excessive grazing.
- Stressor:** Rural development High
- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Stressor:** Urban growth Medium
- Acquire land or conservation easements to protect key conservation areas.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Identify and protect key wildlife corridors for landscape connectivity.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Identify key conservation areas to protect from development.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Category:** Transportation and infrastructure **Priority**
- Stressor:** Roads for motorized vehicles High
- Encourage wildlife friendly design for all road building.
- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.

Species

Northern Mexican Gartersnake

Thamnophis eques megalops

Tier 1b reptile

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Border issues

Stressor: Enforcement activities along the border

Scores

Community/Focal: 2

Responsibility: 2

Priority

High

Priority

Medium

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Priority

Stressor: Streambank alteration/channelization

Medium

- Protect and restore riparian areas.
- Protect sensitive habitats from excessive grazing.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Use integrated management activities in concert to address nuisance plants.
- Protect and restore riparian areas.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.
- Revegetate disturbed areas with native plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect sensitive habitats from excessive grazing.

Stressor: Rural development

High

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Acquire land or conservation easements to protect key conservation areas.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Renovate aquatic systems to remove undesirable species.

Category: Invasive species

Priority

Stressor: Nuisance animals

High

- Evaluate and modify Department regulations where appropriate.
- Use integrated management activities in concert to address nuisance plants.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Identify watersheds and other conservation areas to prioritize renovation activities.

- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Adopt national standards and efforts to reduce and control nuisance species.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).
- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.

Category: Pollution

Priority

Stressor: Sediment/ash flows

Medium

- Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.
- Protect and restore riparian areas.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.
- Revegetate disturbed areas with native plants.

Species

Narrow-headed Gartersnake

Thamnophis rufipunctatus

Tier 1b reptile

Category: Abiotic resource use

Stressor: Groundwater depletion and springhead use

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Stressor: Water diversion/water catchments

- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.
- Prevent or minimize recreational impacts in sensitive habitats.
- Incorporate stream morphology and wildlife habitat features in canals and flood control drainages.

- Establish or revise laws and agency policies that protect instream flows to benefit wildlife and riparian habitat.

- Remove artificial stream barriers where appropriate.

- Protect sensitive habitats from excessive grazing.

- Promote water conservation methods.

Category: Changes in Ecological Processes

Stressor: Soil erosion

- Promote guidelines for timber harvesting and associated road building that positively effect wildlife.

- Protect and restore riparian areas.

- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

- Install streambank stabilization structures or habitat features to reduce erosion and loss of sediment.

- Implement watershed based approaches aimed at preventing excessive soil erosion.

Scores

Community/Focal: 2

Responsibility: 1

Priority

Medium

Medium

Priority

Medium

Stressor: Streambank alteration/channelization Medium

- Protect sensitive habitats from excessive grazing.
- Protect and restore riparian areas.

Category: Climate Change

Priority

Stressor: Drought

Medium

- Encourage proper functioning riparian areas and aquatic habitats as buffers against drought effects.
- Manage upland watersheds to retain vegetation as a buffer against drought effects.
- Manage watersheds to maintain hydrological integrity and incorporate wildlife values.

Category: Habitat conversion

Priority

Stressor: Livestock management

Medium

- Use integrated management activities in concert to address nuisance plants.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.
- Protect and restore riparian areas.
- Develop and implement livestock and big game management guidelines that minimize habitat degradation while maintaining stock ponds where appropriate.
- Protect sensitive habitats from excessive grazing.
- Revegetate disturbed areas with native plants.
- Identify sensitive habitats and associated stressors in watershed planning efforts to prioritize conservation needs.

Stressor: Rural development

Medium

- Mitigate habitat loss from agricultural conversion and/or urban/rural development.
- Promote urban growth planning initiatives that protect instream flow or acquire water rights (through purchase, conservation agreement, etc.).
- Acquire land or conservation easements to protect key conservation areas.
- Renovate aquatic systems to remove undesirable species.
- Protect instream flow or acquire water rights (through purchase, conservation agreement, etc.) to benefit wildlife habitat.
- Work with city and county planners to incorporate wildlife values in urban/rural development plans.
- Work with city and county planners to promote in-fill development and limit urban/rural sprawl.
- Work cooperatively with landowners/permittees by providing financial and technical assistance (thru incentive programs) to conservation projects.

Category: Invasive species

Priority

Stressor: Nuisance animals

High

- Support and participate in the multi-agency Governor's Invasive Species Task Force.
- Evaluate and modify Department regulations where appropriate.
- Renovate/restore suppressed or extirpated wildlife communities, habitats, and connectivity.
- Adopt national standards and efforts to reduce and control nuisance species.
- Build a central database that identifies the distribution of aquatic nuisance species in relation to sensitive habitats and wildlife of concern.
- Increase public education and enforcement of rules and regulations on introducing and spreading nuisance species.

- Develop guidelines for the elimination of nuisance species and re-establishment of native assemblages.
- Implement recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources..
- Identify watersheds and other conservation areas to prioritize renovation activities.
- Use integrated management activities in concert to address nuisance plants.
- Ensure regulatory mechanisms are updated (for example: restrictive live wildlife under Article 4 (ARS R12-4-406).

Species

Yuman Desert Fringe-toed Lizard

Uma rufopunctata

Tier 1b reptile

Category: Border issues

Stressor: Enforcement activities along the border

- Work with Department of Homeland Security agencies to identify sensitive habitats, incorporate wildlife values, and mitigation actions for borderland management activities.

Category: Changes in Ecological Processes

Stressor: Unnatural fire regimes

- Use integrated management activities in concert to address nuisance plants.
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.

Category: Invasive species

Stressor: Nuisance plants

- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.
- Use integrated management activities in concert to address nuisance plants.
- Adopt national standards and efforts to reduce and control nuisance species.
- Revegetate disturbed areas with native plants.
- Support and participate in the multi-agency Governor's Invasive Species Task Force.

Category: Non-consumptive resource use

Stressor: Motorized recreation off-trail

- Prevent or minimize recreational impacts in sensitive habitats.
- Increase public awareness of responsible OHV use and laws.
- Increase enforcement for laws governing recreational activities.
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.
- Encourage revegetation and restoration of existing unauthorized roads and trails.

Category: Transportation and infrastructure

Stressor: Roads for motorized vehicles

- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.
- Encourage wildlife friendly design for all road building.

Scores

Community/Focal: 2

Responsibility: 2

Priority

Medium

Priority

High

Priority

High

Priority

High

Priority

Medium

Species

Scores

Mojave Fringe-toed Lizard <i>Uma scoparia</i> Tier 1b reptile	Community/Focal: 2 Responsibility: 3
Category: Changes in Ecological Processes	Priority
Stressor: Unnatural fire regimes	High
- Manage for vegetation types that reduce fuel loads and provide better wildlife habitat.	
- Use integrated management activities in concert to address nuisance plants.	
Category: Invasive species	Priority
Stressor: Nuisance plants	High
- Develop regulations on the sale and use of potentially invasive plants for landscaping, aquariums, and backyard ponds.	
- Adopt national standards and efforts to reduce and control nuisance species.	
- Use integrated management activities in concert to address nuisance plants.	
- Support and participate in the multi-agency Governor's Invasive Species Task Force.	
- Limit extent and level of disturbance that promotes invasion and spread of nuisance plants.	
- Revegetate disturbed areas with native plants.	
Category: Non-consumptive resource use	Priority
Stressor: Motorized recreation off-trail	High
- Increase enforcement for laws governing recreational activities.	
- Increase public awareness of responsible OHV use and laws.	
- Encourage revegetation and restoration of existing unauthorized roads and trails.	
- Prevent or minimize recreational impacts in sensitive habitats.	
- Increase public awareness on the negative effects of creation and use of unauthorized roads and trails for recreation.	
Category: Transportation and infrastructure	Priority
Stressor: Roads for motorized vehicles	Medium
- Promote design and construction of overpasses, underpasses or culverts to increase permeability of existing or planned roads.	
- Encourage wildlife friendly design for all road building.	

ACTIONS TO ADDRESS INFORMATION NEEDS RELATED TO STRESSORS

HABITAT CONVERSION CATEGORY

<u>Stress Category</u>	<u>Stressor</u>
Habitat conversion	Agricultural conversion
<i>Strategy:</i> Compile data, programs and information	
Compile information on the impacts of the stressor to wildlife and habitats	
<i>Strategy:</i> Determine status and distribution	
Determine habitat needs for all species	
Determine the distribution and extent of native-dominated riparian areas	
<i>Strategy:</i> Develop conservation, research, and monitoring tools	
Identify priorities and opportunities for acquisitions or easements	
<i>Strategy:</i> Research ecosystem conditions	
Conduct a remote sensing/GIS analysis of land-use change	

Identify locations of areas at risk of conversion to agriculture

Strategy: Research stressors

Determine the hydrological effects of agricultural water use

Investigate technological advances in farming practices

Stress Category

Habitat conversion

Stressor

Dams/reservoirs/impoundments

Strategy: Develop conservation, research, and monitoring tools

Determine dam release patterns that support native wildlife

Determine ways to address sedimentation issues (for example, slurry lines)

Identify waterways to be managed for native and nonnative aquatic wildlife

Stress Category

Habitat conversion

Stressor

Landfills/dumps

Strategy: Compile data, programs and information

Compile information from partners regarding existing strategies and actions

Strategy: Research stressors

Determine contaminants and their impacts

Stress Category

Habitat conversion

Stressor

Livestock management

Strategy: Conservation tools

Develop consensus on methods to assess grazing impacts and levels of acceptable use

Strategy: Develop conservation, research, and monitoring tools

Investigate use of remote sensing to monitor habitat quality

Strategy: Research ecosystem conditions

Investigate the differences between pre-grazing and grazed landscapes and the effects on ecosystem function

Strategy: Research stressors

Develop a better understanding of grazing impacts on ecosystem structure and function, and wildlife

Stress Category

Habitat conversion

Stressor

Recreational sites/facilities

Strategy: Research ecosystem conditions

Identify future recreation needs and high growth areas throughout the state

Strategy: Research species biology

Identify important and sensitive wildlife populations and habitat

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Increase monitoring of recreation sites to detect of problems (nuisance plants, disease, etc.) early

Stress Category

Habitat conversion

Stressor

Rural development

Strategy: Compile data, programs and information

- Compile information from partners regarding existing strategies and actions
- Compile information on growth management efforts outside of the state
- Identify opportunities for urban wildlife area development

Strategy: Determine status and distribution

- Determine the distribution and extent of native-dominated riparian areas
- Determine the distribution and population trends for species impacted by urban and rural sprawl
- Identify areas that would benefit from altered or additional law enforcement activity
- Identify important and sensitive wildlife populations and habitat
- Map the distribution of stressors in relation to habitat
- Update and improve spatial information on land ownership

Strategy: Develop conservation, research, and monitoring tools

- Identify and promote OHV managed use areas
- Identify priorities and opportunities for acquisitions or easements

Strategy: Research ecosystem conditions

- Compile information on the effects of urban attributes on wildlife
- Develop human population growth models including water needs and development

Stress Category

Stressor

Habitat conversion

Urban growth

Strategy: Compile data, programs and information

- Compile information from partners regarding existing strategies and actions
- Compile information on growth management efforts outside of the state
- Identify opportunities for urban wildlife area development

Strategy: Determine status and distribution

- Determine the distribution and extent of native-dominated riparian areas
- Determine the distribution and population trends for species impacted by urban and rural sprawl
- Identify areas that would benefit from altered or additional law enforcement activity
- Identify important and sensitive wildlife populations and habitat
- Map the distribution of stressors in relation to habitat
- Update and improve spatial information on land ownership

Strategy: Develop conservation, research, and monitoring tools

- Identify and promote OHV managed use areas
- Identify priorities and opportunities for acquisitions or easements

Strategy: Research ecosystem conditions

- Compile information on the effects of urban attributes on wildlife
- Develop human population growth models including water needs and development

TRANSPORTATION AND INFRASTRUCTURE CATEGORY

Stress Category

Stressor

Transportation and infrastructure

Canals/pipelines

Strategy: Determine status and distribution

Map locations of canals, pipelines, and associated structures
Strategy: Develop conservation, research, and monitoring tools
Determine feasibility of a wildlife friendly canal design that also meets water transport needs.
Strategy: Research stressors
Compile information on the impacts of the stressor to wildlife and habitats

Stress Category *Stressor*
Transportation and infrastructure **Power lines/wind-harnessing turbines**
Strategy: Determine status and distribution
Identify migration pathways
Strategy: Develop conservation, research, and monitoring tools
Investigate deterrence devices for retrofitting problem structures
Investigate removal/reduction of guide wire use on towers
Monitor fatality at existing sites to determine scope of problem
Standardize bird and bat fatality monitoring protocols
Strategy: Research ecosystem conditions
Compile information on the impacts of the stressor to wildlife and habitats
Strategy: Research stressors
Investigate different light sources on towers to reduce impacts on birds and bats

Stress Category *Stressor*
Transportation and infrastructure **Right-of-way fencing along roadways**
Strategy: Determine status and distribution
Determine the locations of barriers to wildlife movement including dams, fences, roads, etc.
Strategy: Develop conservation, research, and monitoring tools
Research/identify which structures (culverts, underpasses, etc.), fencing types, and designs are most effective and will be used by wildlife

Stress Category *Stressor*
Transportation and infrastructure **Roads for motorized vehicles**
Strategy: Compile data, programs and information
Compile information on growth management efforts outside of the state
Strategy: Develop conservation, research, and monitoring tools
Explore possibility of bioaccumulator plants for roadside buffers or and or bio-engineered bacteria to clean up retainage basins
Strategy: Research ecosystem conditions
Develop habitat, vegetation, habitat use, growth and wildlife migration models
Identify important and sensitive wildlife populations and habitat
Strategy: Research stressors
Compile information on the impacts of the stressor to wildlife and habitats
Compile information on the impacts of the stressor to wildlife and habitats

Stress Category *Stressor*
Transportation and infrastructure **Telephone lines/cellphone towers**
Strategy: Determine status and distribution

Identify migration pathways

Strategy: Develop conservation, research, and monitoring tools

Investigate deterrence devices for retrofitting problem structures

Investigate removal/reduction of guide wire use on towers

Monitor fatality at existing sites to determine scope of problem

Standardize bird and bat fatality monitoring protocols

Strategy: Research ecosystem conditions

Compile information on the impacts of the stressor to wildlife and habitats

Strategy: Research stressors

Investigate different light sources on towers to reduce impacts on birds and bats

Stress Category

Stressor

Transportation and infrastructure **Trails for foot, bike, or equine use**

Strategy: Compile data, programs and information

Compile information on the impacts of the stressor to wildlife and habitats

Strategy: Determine status and distribution

Identify important and sensitive wildlife populations and habitat

Stress Category

Stressor

Transportation and infrastructure **Unauthorized roads & trails**

Strategy: Determine status and distribution

Identify unauthorized roads and trails and prioritize problem areas

Identify unauthorized roads and trails and prioritize problem areas

Strategy: Research ecosystem conditions

Identify important and sensitive wildlife populations and habitat

ABIOTIC RESOURCE USE CATEGORY

Stress Category

Stressor

Abiotic resource use **Mining**

Strategy: Determine status and distribution

Determine location of active and inactive mines

Strategy: Develop conservation, research, and monitoring tools

Determine best management practices for revegetation and naturalization

Investigate new extraction techniques that are more wildlife friendly

Strategy: Research stressors

Investigate the short and long term impacts of mining contaminants on wildlife and habitats

Stress Category

Stressor

Abiotic resource use **Water diversion/water catchments**

Strategy: Determine status and distribution

Identify wildlife movement corridors that are important for landscape connectivity

Strategy: Develop conservation, research, and monitoring tools

Identify additional areas where wildlife would benefit from Active Management Area designation

Strategy: Research ecosystem conditions

Determine what density of vegetation is viable within flood control projects

Investigate benefits of Active Management Areas to wildlife

Investigate catchment designs to discourage invasives while encouraging native wildlife

CONSUMPTIVE USE OF BIOLOGICAL RESOURCES CATEGORY

Stress Category

Consumptive use of biological resources

Stressor

Forest and woodland management - consumptive use

Strategy: Determine status and distribution

Determine habitat needs for all species

Identify important and sensitive wildlife populations and habitat

Strategy: Research ecosystem conditions

Investigate the impacts of large-scale Wildlife-Urban Interface forest management

Strategy: Research stressors

Investigate the compatibility of wildlife values with wildfire-risk reduction strategies

Investigate the effects of fire treatments on wildlife

Stress Category

Consumptive use of biological resources

Stressor

Grazing by ungulates

Strategy: Research stressors

Develop a better understanding of grazing impacts on ecosystem structure and function, and wildlife

Investigate how different grazing regimes impact wildlife and their habitats

Stress Category

Consumptive use of biological resources

Stressor

Harvesting/collecting animals

Strategy: Research ecosystem conditions

Identify important and sensitive wildlife populations and habitat

Research most effective means and placement of enforcement efforts

Strategy: Research stressors

Determine the extent and intensity of poaching and collecting

Determine who the interested entities are

NON-CONSUMPTIVE RESOURCE USE CATEGORY

Stress Category

Non-consumptive resource use

Stressor

Dispersed camping

Strategy: Determine status and distribution

Determine the extent and impact of dispersed camping to wildlife and habitats

Stress Category

Stressor

Non-consumptive resource use **Motorized recreation off-trail**

Strategy: Determine status and distribution

Identify unauthorized roads and trails and prioritize problem areas

Identify unauthorized roads and trails and prioritize problem areas

Strategy: Research ecosystem conditions

Identify important and sensitive wildlife populations and habitat

Stress Category

Stressor

Non-consumptive resource use

Non-motorized recreation off-trail

Strategy: Compile data, programs and information

Compile information on the impacts of the stressor to wildlife and habitats

Strategy: Determine status and distribution

Identify important and sensitive wildlife populations and habitat

Stress Category

Stressor

Non-consumptive resource use

Scientific research and collection

Strategy: Develop conservation, research, and monitoring tools

Investigate alternative nondestructive sampling and research techniques

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Investigate the role of scientific researchers in disease transmission

Stress Category

Stressor

Non-consumptive resource use

Watercraft operation

Strategy: Develop conservation, research, and monitoring tools

Identify and detect new species that may represent a threat

Strategy: Research ecosystem conditions

Identify species and habitats that are sensitive to watercraft recreation

Strategy: Research species biology

Identify important and sensitive wildlife populations and habitat

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Evaluate and recommend use of latest technologies in fuel spill attenuation (fueling stations, motor design)

Investigate the effects of watercraft hydrocarbons and other pollutants on freshwater communities

POLLUTION CATEGORY

Stress Category

Stressor

Pollution

Contaminants from waste water and runoff

Strategy: Develop conservation, research, and monitoring tools

Investigate biocontrol agents (plants as accumulators, bacteria and other digesters)

Investigate more effective ways of filtering out contaminants

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats
Investigate the impacts of roads on contaminant loading

Stress Category

Pollution

Stressor

Heavy metals/mine tailings

Strategy: Research ecosystem conditions

Determine background levels and how the biogeochemical cycle responds in different portions of the state

Develop understanding where metals have accumulated within ecosystems and how they are cycled

Stress Category

Pollution

Stressor

Highway/roadway de-icing

Strategy: Compile data, programs and information

Compile information on growth management efforts outside of the state

Strategy: Develop conservation, research, and monitoring tools

Explore possibility of bioaccumulator plants for roadside buffers or and or bio-engineered bacteria to clean up retainage basins

Strategy: Research ecosystem conditions

Develop habitat, vegetation, habitat use, growth and wildlife migration models

Identify important and sensitive wildlife populations and habitat

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Compile information on the impacts of the stressor to wildlife and habitats

Stress Category

Pollution

Stressor

Illegal dumping/littering

Strategy: Determine status and distribution

Determine the locations of illegal dumps

Strategy: Develop conservation, research, and monitoring tools

Develop a task force to enforce laws and regulations, as well as monitor the problem, and develop

innovative solutions to combat illegal dumping/littering

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Research the impacts on limiting access to prevent illegal dumping/littering on wildlife recreation

Stress Category

Pollution

Stressor

Lead shot/fishing line

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Determine toxicity levels for wildlife

Stress Category

Pollution

Stressor

Light pollution

Strategy: Research species biology

Identify important and sensitive wildlife populations and habitat

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Stress Category

Pollution

Stressor

Noise pollution

Strategy: Develop conservation, research, and monitoring tools

Investigate new techniques/strategies to reduce noise

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Stress Category

Pollution

Stressor

Nutrients/algal blooms

Strategy: Determine status and distribution

Determine best treatments

Identify affected sites

Identify affected species

Strategy: Research ecosystem conditions

Conduct research on nutrient cycling related to changes in ecosystem composition

Describe natural variability in nutrient cycles through aquatic systems

Identify taxa-specific problem algae (toxic effects), effects on wildlife and range of their occurrence

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Determine baseline and threshold nutrient loads

Determine threshold conditions for algal blooms and develop monitoring protocols for nutrients and species

Identify sources of nutrients, manmade vs. natural

Stress Category

Pollution

Stressor

Pesticides/herbicides

Strategy: Research stressors

Identify level of harm associated with different chemicals

Stress Category

Pollution

Stressor

Sediment/ash flows

Strategy: Determine status and distribution

Identify, quantify, and prioritize activities, sites and structures that contribute to high levels of sedimentation

Strategy: Develop conservation, research, and monitoring tools

Determine sediment and ash flow after major fires to monitor their impacts to wildlife and habitat

INVASIVE SPECIES CATEGORY

Stress Category

Stressor

Invasive species

Bait-bucket dumping/illegal stocking

Strategy: Research species biology

Identify problematic bait species with regard to invasiveness, competitiveness, predation, and genetic threat

Strategy: Research stressors

Determine the extent and severity of the problem

Stress Category

Stressor

Invasive species

Disease/pathogens/parasites

Strategy: Determine status and distribution

Determine the distribution and impacts of pathogens/parasites

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Develop control methods for disease/pathogens/parasites

Identify vulnerable processes or activities and develop solutions

Investigate methods of chytrid fungus prevention and monitoring

Monitor wildlife populations for outbreaks of diseases

Prioritize diseases/pathogens/parasites based on the potential impact to all wildlife, each taxon group, and priority species

Sample for plague and canine distemper

Stress Category

Stressor

Invasive species

Feral animals

Strategy: Determine status and distribution

Determine the distribution and population sizes for feral species

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Stress Category

Stressor

Invasive species

Hybridization

Strategy: Research ecosystem conditions

Determine conservation/management areas within a watershed context to protect native aquatic species from hybridization risk

Strategy: Research species biology

Identify species that pose greatest risk of hybridization if introduced or moved around the state

Stress Category

Stressor

Invasive species

Nuisance animals

Strategy: Determine status and distribution

Determine the distribution and extent of invasive and potentially irruptive insect species

Determine the distribution and population sizes for feral species

Strategy: Develop conservation, research, and monitoring tools

Investigate methods of reducing numbers of corvids around human facilities

Investigate new methods of aquatic nuisance wildlife control

Strategy: Research stressors

Compile basic ecological information on how nuisance species are transported, how they become invasive, and effects throughout ecosystems

Stress Category

Stressor

Invasive species

Nuisance plants

Strategy: Determine status and distribution

Map the distribution of nuisance plants statewide

Strategy: Develop conservation, research, and monitoring tools

Develop and implement new eradication/control techniques

Strategy: Research species biology

Compile basic ecological information on how nuisance species are transported, how they become invasive, and effects throughout ecosystems

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

CLIMATE CHANGE CATEGORY

Stress Category

Stressor

Climate Change

Drought

Strategy: Determine status and distribution

Develop habitat, vegetation, habitat use, growth and wildlife migration models

Strategy: Develop conservation, research, and monitoring tools

Develop mechanisms to conserve instream flows relative to water demands during periods of drought

Develop monitoring techniques for current drought

Strategy: Research ecosystem conditions

Develop models of habitat response to climate change and/or drought

Strategy: Research species biology

Identify species and populations particularly sensitive to drought impacts

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Compile information on the persistence of drought induced ecosystem changes

Develop water conservation programs that consider wildlife values

Stress Category

Stressor

Climate Change

Shift to warmer climate

Strategy: Compile data, programs and information

Develop models of habitat response to climate change and/or drought

Strategy: Research species biology

Identify wildlife populations vulnerable to extirpation in response to loss of habitat from climate change

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

CHANGES IN ECOLOGICAL PROCESSES CATEGORY

Stress Category

Stressor

Changes in Ecological Processes **Altered river flow regimes**

Strategy: Determine status and distribution

Identify baseline wildlife population levels downstream from dams

Strategy: Research ecosystem conditions

Cost/benefit analysis of dam removal or modification of flow regimes to establish natural flow regimes (flood control, hydroelectric, recreation, water use, ecological)

Determine an effective buffering distance for riparian habitat protection

Identify historic natural variation of flows in aquatic systems of interest

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Investigate the effects of current water law on flow regimes

Stress Category

Stressor

Changes in Ecological Processes **Domestication of wildlife/game farming**

Strategy: Research species biology

Compile information on potential source populations

Stress Category

Stressor

Changes in Ecological Processes **Habitat degradation/shrub invasions**

Strategy: Determine status and distribution

Develop a baseline map of shrubland extent

Strategy: Develop conservation, research, and monitoring tools

Develop and implement new eradication/control techniques

Strategy: Research ecosystem conditions

Determine functional mechanisms for upland woody plant invasions of riparian zones

Strategy: Research stressors

Develop conceptual models to identify strategic interventions leading to desirable flow regimes.

Stress Category

Stressor

Changes in Ecological Processes **Habitat fragmentation/barriers**

Strategy: Determine status and distribution

Determine the locations of barriers to wildlife movement including dams, fences, roads, etc.

Identify wildlife movement corridors that are important for landscape connectivity

Strategy: Research ecosystem conditions

Develop habitat, vegetation, habitat use, growth and wildlife migration models

Stress Category

Stressor

Changes in Ecological Processes **Insect Infestation**

Strategy: Determine status and distribution

Determine the distribution and extent of invasive and potentially irruptive insect species

Strategy: Develop conservation, research, and monitoring tools

Research and development of effective control mechanisms

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Investigate the effects of African bees, invasive ants, and other nonnative insects on native pollinators/wildlife

Stress Category

Stressor

Changes in Ecological Processes

Loss of keystone species

Strategy: Research ecosystem conditions

Investigate the impacts of losing or reintroducing key predator/prey/keystone species

Strategy: Research species biology

Identify keystone and other species that are important to ecosystem functions, determine their functional role and their vulnerability status

Strategy: Research stressors

Determine how the presence of disease impact recovery of key predator/prey/keystone species

Stress Category

Stressor

Changes in Ecological Processes

Management for game animals and sport fish

Strategy: Determine status and distribution

Identify wildlife movement corridors that are important for landscape connectivity

Strategy: Develop conservation, research, and monitoring tools

Improve game and nongame population monitoring

Strategy: Research ecosystem conditions

Identify appropriate locations for barriers to isolate native fish populations from incompatible sport fish game populations or sport fish; identify important corridors for landscape connectivity

Strategy: Research stressors

Continue Department efforts to evaluate effects of water developments

Develop a better understanding of grazing impacts on ecosystem structure and function, and wildlife

Identify spectrum of impacts of game animals and sport fish on native wildlife and wildlife habitat

Stress Category

Stressor

Changes in Ecological Processes

Soil erosion

Strategy: Research ecosystem conditions

Identify, quantify, and rank activities, sites and structures that contribute to high levels of soil erosion

Stress Category

Stressor

Changes in Ecological Processes

Streambank alteration/channelization

Strategy: Determine status and distribution

Identify wildlife movement corridors that are important for landscape connectivity

Strategy: Develop conservation, research, and monitoring tools

Identify additional areas where wildlife would benefit from Active Management Area designation

Strategy: Research ecosystem conditions

Determine what density of vegetation is viable within flood control projects

Investigate benefits of Active Management Areas to wildlife

Investigate catchment designs to discourage invasives while encouraging native wildlife

Stress Category

Stressor

Changes in Ecological Processes

Unnatural fire regimes

Strategy: Determine status and distribution

Prioritize sites across the state for treatment to reduce fuel loads/fire vulnerability

Strategy: Develop conservation, research, and monitoring tools

Investigate the feasibility of biological control of salt cedar communities

Investigate ways to address invasion of nonnative grasses, especially cheatgrass, lovegrass, and bufflegass

Strategy: Research ecosystem conditions

Conduct studies to investigate effects of wildfire on wildlife in different ecosystems

Development of credible, consensus-driven desired future landscape conditions

Identify effects of different fire treatments on communities of wildlife in different ecosystems

INTERNATIONAL BORDER ISSUES CATEGORY

Stress Category

Stressor

International border issues

Altered fire regime as a result of border activities

Strategy: Compile data, programs and information

Compile fire frequency data

Strategy: Determine status and distribution

Update vegetation layers

Strategy: Develop conservation, research, and monitoring tools

Investigate ways to address invasion of nonnative grasses, especially cheatgrass, lovegrass, and bufflegass

Stress Category

Stressor

International border issues

Disease along the border

Strategy: Research stressors

Determine the extent of disease threat to wildlife in Arizona due to contact with high-density population centers in Mexico

Monitor wildlife populations for outbreaks of diseases

Stress Category

Stressor

International border issues

Dispersed camping along the border

Strategy: Compile data, programs and information

Compile data from Border Control (when permissible) on the frequency and duration of enforcement activity within sensitive areas

Strategy: Determine status and distribution

Determine the extent and impact of dispersed camping to wildlife and habitats

Strategy: Research ecosystem conditions

Identify important and sensitive wildlife populations and habitat

Stress Category

Stressor

International border issues

Enforcement activities along the border

Strategy: Compile data, programs and information

Compile data from Border Control (when permissible) on the frequency and duration of enforcement activity within sensitive areas

Quantify OHV activity in sensitive areas

Strategy: Determine status and distribution

Determine the locations of Border Patrol vehicle/pedestrian barriers and enforcement activity as related to wildlife

Strategy: Research ecosystem conditions

Identify important and sensitive wildlife populations and habitat

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Stress Category

Stressor

International border issues

Enforcement fences along the border

Strategy: Determine status and distribution

Map current and proposed border fencing projects

Strategy: Develop conservation, research, and monitoring tools

Develop fence designs that will allow wildlife movements

Strategy: Research species biology

Identify important and sensitive wildlife populations and habitat

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Stress Category

Stressor

International border issues

Illegal dumping/littering along the border

Strategy: Compile data, programs and information

Identify the location of illegal dumps and littered sites along the border

Where permissible, map the location of known target points, congregation points, and avoidance areas

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Stress Category

Stressor

International border issues

Light pollution along the border

Strategy: Develop conservation, research, and monitoring tools

Investigate alternative ways to reduce illegal immigration and drug smuggling

Investigate different light sources on towers to reduce impacts on birds and bats

Strategy: Research stressors

Compile information on the impacts of the stressor to wildlife and habitats

Stress Category

Stressor

**International border issues
immigrants and smugglers**

Unauthorized roads & trails created by illegal

Strategy: Compile data, programs and information

Compile information on undocumented alien use and apprehensions in and adjacent to sensitive areas

Strategy: Determine status and distribution

Determine the locations of Border Patrol vehicle/pedestrian barriers and enforcement activity as related to wildlife

Identify unauthorized roads and trails and prioritize problem areas

Identify unauthorized roads and trails and prioritize problem areas

Where permissible, map the location of known target points, congregation points, and avoidance areas

Strategy: Research ecosystem conditions

Develop habitat, vegetation, habitat use, growth and wildlife migration models

Stress Category

Stressor

**International border issues
enforcement along the border**

Unauthorized roads & trails created for law

Strategy: Compile data, programs and information

Compile information on undocumented alien use and apprehensions in and adjacent to sensitive areas

Strategy: Determine status and distribution

Determine the locations of Border Patrol vehicle/pedestrian barriers and enforcement activity as related to wildlife

Identify unauthorized roads and trails and prioritize problem areas

Identify unauthorized roads and trails and prioritize problem areas

Where permissible, map the location of known target points, congregation points, and avoidance areas

Strategy: Research ecosystem conditions

Develop habitat, vegetation, habitat use, growth and wildlife migration models

Stress Category

Stressor

**International border issues
and drug smugglers**

Water use/contamination from illegal immigrants

Strategy: Determine status and distribution

Determine the location of water sources impacted by border traffic

Strategy: Develop conservation, research, and monitoring tools

Develop strategies to minimize vandalism (installation of pressure-release water spigots so that water tanks will not be vandalized to get at water)

MONITORING AND ADAPTIVE MANAGEMENT (ELEMENT 5)

Monitoring is a critical element in any conservation effort and forms a keystone of the Arizona Comprehensive Wildlife Conservation Strategy and the Department's Mission to "conserve, enhance and restore Arizona's diverse wildlife resources and habitats." Elzinga and others (1998) defined monitoring as the systematic and repetitive collection of information to evaluate changes in condition and progress toward meeting a management objective. Further, modern approaches to wildlife management and conservation biology acknowledge the need for monitoring in the context of "adaptive management." Adaptive management is a scientific approach that: 1)

recognizes uncertainty that is inherent in natural systems (for example, how ecological systems function, or how they might respond to management actions), 2) capitalizes upon change and improvement in data gathering and analysis techniques, and 3) treats actions in an experimental framework in which learning becomes an inherent objective and alternative hypotheses are evaluated. Simply put, adaptive management is a mechanism for continuous improvement based on what has been learned by applying management actions.

Science-based adaptive management generally includes 4 steps (Elliott and others 2003):

1. Set management goals, and identify assumptions within those goals.
2. Implement management actions.
3. Monitor and analyze responses of species and habitats to management.
4. Revise management actions, goals or monitoring strategies as necessary.

The process is then repeated, such that testing and revision become a standard management approach. Perhaps the most important realization of the adaptive management paradigm is that management is not simply an objective, but it is a process, and as the Department gathers information and tests hypotheses, it can adapt its management strategies and policies accordingly (Johnson 1999, Salafsky and others 2001, Schoonmaker and Luscombe 2005). Therefore, monitoring programs are basically research tools designed to address specific conservation action questions (Schoonmaker and Luscombe 2005), the protocols, time frames and study design of which are determined by the characteristics of the species under study (life history characteristics, habitat preferences, etc.).

Monitoring in the context of adaptive management includes 3 interrelated components: effectiveness monitoring, targeted monitoring and implementation monitoring (Atkinson and others 2004). **Effectiveness monitoring** allows the Department to assess the success of a management plan, and might include gathering data on species or habitat trends and status, and the status of stressors. **Targeted monitoring** is the research mechanism through which the Department may improve knowledge of a biological system, stressors or management techniques. This is achieved by either gathering information that can resolve uncertainties (for example, the effects of wind turbines on bat populations) or by applying experimental management techniques (for example, stocking topminnows in various habitats). Whether the data are gathered through observation and measurement, or by experimental manipulation of a system, targeted monitoring through research can address specific questions, either in the long term or short term. **Implementation monitoring** tracks the status of management plan implementation to confirm that management goals were implemented, achieved or require modification. The Department collaborates with state and federal agencies, tribes, conservation groups, colleges, universities and private citizens to address all components of monitoring.

MONITORING HABITAT CONDITION

One of the primary goals of the Arizona Comprehensive Wildlife Conservation Strategy is to "keep common species common," in addition to the immediate, critical conservation needs that must be addressed. It is also clear that wildlife management cannot be considered or practiced

without considering the health and welfare of the habitats in which animals live. Thus, monitoring must have several inextricably connected components, including habitat evaluation coupled with multiple-species and single-species efforts.

Monitoring can be conducted at various hierarchical scales, depending on the particular questions being addressed. Ideally, the Department would engage in a comprehensive program that involved monitoring at several levels, including species, landscape and ecoregion. Many current plans approach monitoring from a habitat level and from a more fine-grained, species level; these correspond closely with TNC "course-filter" and "fine-filter" biodiversity conservation targets. While a landscape approach that assesses habitat status, and therefore encompasses many species of interest, is the ultimate goal, the Department has not developed those plans. One desirable outcome of implementing the CWCS is the development of this landscape level of habitat assessment through coordination of multiple partners.

Habitat characteristics can be mapped and monitored as part of individual species management or recovery efforts, but there is no coordinated statewide effort to monitor long term habitat trends in Arizona. Public land management agencies such as USFWS, USFS, BLM, and non-governmental organizations currently monitor wildlife habitats on lands over which they have management authority, or they have been developing habitat monitoring plans. Examples include, TNC grassland plans (Gori and Enquist 2003, Marshall and others 2004), USFS Forest Health Monitoring (FSM) program (Rogers and others 2001) and the nationwide Multiple Species Inventory and Monitoring (MSIM) protocol (Manley and others 2004, Manley and others in press). But, there is currently no comprehensive effort designed for long term assessment and monitoring of habitats for the entire state, nor is there a plan for assessing habitats on most private lands, or on public lands not specifically managed for wildlife (for example, State Trust Lands).

Certain guilds and taxonomic groups of animals are particularly suited to habitat or landscape level monitoring, for example, grassland herbivores, riparian passerine birds, etc. Other animals, for reasons of biology or legal status, require more narrowly focused, species level monitoring, for example, Kanab ambersnail (highly restricted distribution) or Gila topminnow (monitoring success of stocking program), as described previously.

In certain circumstances, a fine-scaled, single-species approach can accomplish the goals of habitat based monitoring, and provide important information regarding habitat condition. Species that are most strongly associated with specific habitats can act as "umbrella species" for other species in the community and for the habitat (Schoonmaker and Luscombe 2005). Umbrella species are not necessarily linked functionally with a particular habitat or to other species (as are keystone species as defined by Paine (1966), or Keystone and Strongly Interactive Species (Appendix L), but their widespread distribution within a habitat can make them convenient monitoring subjects. In the Arizona CWCS database, the criteria to identify species in the Community Focal category include Habitat Quality Indicator Species, which when present indicate particularly good habitat quality (Appendix L). For example, in high elevation Mixed Conifer habitat, northern goshawks are a Habitat Quality Indicator Species for that vegetative community. The presence of northern goshawks suggests conditions are excellent for other birds

that use similar habitat components or respond positively to management for northern goshawks (for example, wild turkey, flammulated owl, Williamson's sapsucker, solitary vireo, Grace's warbler, western tanager, red crossbill) (Latta and others, 1999), as well as for mammals (for example, Mexican vole, dusky shrew, long-tailed weasel), or amphibians and reptiles (for example, tiger salamander, western chorus frog, wandering gartersnake), despite the obvious differences in specific ecological requirements of the various taxa. In this context, several "Vulnerable Species" in the AZ CWCS can serve as Habitat Quality Indicators for more common animals and habitats. Thus, in this particular example, monitoring strategies for northern goshawks outlined in Arizona Partners in Flight Conservation Plan (Latta and others 1999) could accomplish habitat monitoring goals at the landscape level.

MONITORING WILDLIFE

The Department monitoring priorities until now have been driven by federal funding sources for threatened and endangered species on the one hand, and game or sportfish funding on the other. As described below, this CWCS plan first lists existing monitoring efforts by the Department and cooperators, then highlights current planning activities that are shifting the Department away from crisis and consumption management. These new efforts such as the Arizona All Birds Conservation Initiative, Arizona Partners for Amphibian and Reptile Conservation, and the Arizona Bat Plan, are multispecies planning efforts that aim at documenting guilds in addition to individual species, and common species in addition to rare elements of our natural heritage. In addition, these multispecies efforts all tier off of national and/or regional planning efforts that provide standards for monitoring measures and metrics. All multispecies planning currently underway with the Department requires conservation and monitoring of SGCN identified by Arizona's CWCS.

The Department has a long history of establishing and implementing research and population monitoring activities that withstand scientific scrutiny, although those efforts have traditionally been focused on consumptive uses of wildlife. Existing consumptive use protocols are developed using a process that incorporates best available science and practices, which are then formalized as official Department methods and taught to biologists for implementation throughout the state. Data collected from those efforts are analyzed on a regular basis, made available to the public, and are used to make management decisions. This process provides a template for the development of similar monitoring protocols for SGCN once secure funding has been acquired.

However, statewide research projects and population monitoring protocols for many SGCN have been established. The Department has both a Research and Nongame Branch with personnel dedicated to these activities. Additional efforts are contracted to external partners. Many high priority research and monitoring efforts are conducted by wildlife biologists employed by the Department for their expertise in specific taxon groups. As part of their regular duties, these expert biologists conduct routine survey and monitoring activities, as well as provide training and establish monitoring protocols for other biologists to follow (for example, Chiricahua leopard frog workshop, HDMS, Department School training sessions, etc.). In addition, Wildlife Managers and other biologists located in six regional offices across the state are trained to note the presence or absence of certain SGCN (or invasive nonnative species) and report relevant

information to appropriate personnel in the Department, and those data are incorporated into existing repositories (HDMS, ranid frog database, native fishes database, crayfish database etc.). Additional data are collected through the Department's administration of scientific collecting permits and from the general public.

In order to fill gaps in existing monitoring projects and to implement best monitoring practices, the Department will coordinate monitoring projects with external, existing programs such as: the North American Bird Conservation Initiative (NABCI; www.nabci-us.org), the North American Bat Conservation Plan (www.batcon.org/nabcp/newsite/rwg.html), Partners in Amphibian and Reptile Conservation (PARC; www.parcplace.org), The Wildlands Project (www.twp.org), Pima County's Sonoran Desert Conservation Plan (www.pima.gov/sdcp), and the Central Arizona--Phoenix Long-Term Ecological Research project (www.capter.asu.edu). Many of these initiatives have been further developed for application in Arizona (Latta and others 1999; Foreman and others 2000, Pima County 2002, Hinman and Snow 2003, Grand Canyon Wildlands Council 2004).

The remainder of this section uses examples to provide an overview of monitoring approaches and mechanisms currently used by the Department or in development. Table 22 is a comprehensive list of monitoring efforts underway or planned for the near future. While not all monitoring programs have explicit adaptive management goals written into them, many plans incorporate adaptive management philosophy and discuss the need to reevaluate results at certain intervals and to adjust management protocols accordingly. Other plans have adaptive management clearly built into them. The examples are presented along taxonomic lines, and are meant to illustrate single species and multispecies monitoring (for target and non-target species), habitat monitoring, as well as the incorporation of adaptive management into Departmental protocols. Further, most listed monitoring efforts in Table 22 incorporate both Effectiveness and Targeted monitoring, except those indicated under "Project Follow-up" for which Implementation Monitoring is a major component.

Crustaceans and mollusks

Invertebrate monitoring is in its formative stages in Arizona, and efforts are concentrated on a variety of species of snails, including springsnails, ambersnails, and talussnails. Monitoring is usually single-species based and typically includes a habitat monitoring component. The most well developed monitoring protocols have been established for Kanab ambersnails, for which a fair amount of baseline ecological research has already been done (Stevens and others 1997; Sorensen and Nelson 2002). Monitoring at 6 sites in Arizona comprises standardized plot-based protocols coupled with habitat quality analyses, as outlined in the species recovery plan (USFWS 1995) and an interim conservation plan (Sorensen and Nelson 2002). Based on data accumulated over the past 10 years, Department biologists have recognized the need to modify protocols, and will be testing new methods in the coming years. Where practical and allowable by our enabling legislation, the Department will develop or adjust existing survey and data collection protocol to gather data on all invertebrate SCGN and Unknown Status species).

Monitoring of the Quitobaquito tryonia, a springsnail, is part of a habitat-based, multispecies effort. A conservation agreement that covers the tryonia, Sonoyta pupfish and Sonoyta mud

turtle provides for concurrent monitoring among the 3 species where they co-occur in Organ Pipe Cactus National Monument. Monitoring involves strong collaborative efforts between the Department and the NPS.

From an entirely different perspective, a GIS-linked database has been developed to track the distribution of invasive nonnative crayfish in the White Mountains of Arizona. Crayfish have been implicated in the decline of nongame and sport fishes, as well as mollusks, ranid frogs and gartersnakes. The database is managed by the Department, but data have been contributed largely by private citizens and conservation groups (for example, TNC and Trout Unlimited Zane Gray Chapter), as well as USFS personnel. The Department plans to expand the database to include the entire state.

Fishes

Monitoring of fishes is often single-species focused, primarily because of funding source restrictions, or recovery needs. Information is often collected with respect to downlisting/delisting goals as outlined in recovery plans (or drafts). Examples of this approach include bonytail chub, virgin spinedace, humpback chub, colorado pikeminnow, and razorback sucker monitoring protocols (Table 22). In some cases, despite the necessity of a single species approach, Department biologists often make an effort to gather incidental information on non-target species of fishes and amphibians (for example, Voeltz in lit). Where practical, the Department will develop or adjust existing survey and data collection protocol to gather data on all SCGN and Unknown Status fish species.

Desert pupfish and Gila topminnows, both short lived and inhabitants of small, isolated habitats, require annual monitoring because habitat conditions can change quickly. The draft Gila topminnow recovery plan calls for stocking topminnows into suitable habitat within their former range. At each site, the plan requires monitoring 1 month, 6 months and 1 year post-stocking (Weedman 1999). At each temporal stage in monitoring, the success of the stocking effort is evaluated and subject to adaptive management, the details of which are provided in the draft topminnow and pupfish safe harbor agreement (AGFD in prep.). For example, the plan recognizes, but is not limited to 3 types of "Altered Circumstances" that would lead to modifications in management protocols: drought, invasion by nonnative organisms that may pose a threat to the population, and population failure. The plan outlines possible management alternatives for each circumstance.

Other single species fish surveys, for example, Sonora chub or loach minnow, result in community level data that are incorporated into the monitoring protocols. Multiple species protocols, such as the Muleshoe Ranch surveys, target up to 5 species of native fishes and involve collaborative efforts between the Department and BLM.

Amphibians

Sonoran tiger salamander surveys are also single species monitoring efforts in which incidental information is gathered on other species. The multispecies approach to a single species work plan has resulted in the development of a GIS database that allows the Department to examine changes, spatially and temporally, in distribution of salamanders. But, it also allows tracking of

federally listed Chiricahua leopard frogs and invasive nonnative species such as bullfrogs and crayfish. This has become a powerful tool for management of aquatic habitats in the San Rafael Valley where these animals occur, and provides the potential for rapid adaptive adjustments to recovery efforts. The Department is now incorporating information about Mexican gartersnakes into the database, which will increase its utility for community-wide monitoring.

Conservation action questions have been incorporated into monitoring protocols for several species, including the Tarahumara frog reintroduction program. The success of Tarahumara frog repatriation is measured according to 5 stages in the frog's life history and ecology, all of which are necessary for success and all of which can be measured objectively (and relatively easily): survival of release, survival over winter, long-term survival, reproduction, recruitment. Adaptive management is built into the plan at 1 year, 2 year and 5 year intervals, at which times the project success is evaluated and necessary modifications incorporated. Where practical, the Department will develop or adjust existing survey and data collection protocol to gather data on all amphibian SCGN and Unknown Status amphibian species.

Reptiles

Averill-Murray (2000) outlined a quantitative protocol for monitoring Sonoran desert tortoises on 18, 1km² and 1mi² plots randomly assigned on BLM lands throughout the Arizona distribution of the tortoise. Recent advancements in population estimate techniques suggest line-distance sampling might be more efficient and more accurate. Initial attempts at evaluating line-distance sampling were positive (Averill-Murray and Averill-Murray 2005), which has led the Department to contract a 2-year study to evaluate more fully the new techniques. Should the 2-year study confirm the utility of the new techniques, the Department will adjust monitoring protocols elsewhere. Where practical, the Department will develop or adjust existing survey and data collection protocol to gather data on all reptilian SCGN and Unknown Status reptile species.

Birds

Strategic planning that incorporates pre-existing and future monitoring efforts is best expressed in the Arizona Partners in Flight Bird Conservation Plan implementation strategy. Through this, the Arizona Bird Conservation Initiative (ABCI) has begun to canvas key stakeholders to determine levels of support for implementing an integrated and coordinated approach to statewide bird monitoring efforts in Arizona. ABCI is coordinated by the Department and consists of participants from state, federal and tribal entities, as well as universities and non-governmental organizations. The mission is to coordinate statewide efforts to monitor bird populations of most species in Arizona to provide long-term trend data, as well as to identify species of concern and evaluate land management actions. Recent preliminary efforts have indicated a strong support from many key partners for initiating such an endeavor. Further, bird monitoring efforts in Arizona, as elsewhere, benefit greatly from the input of citizen science (see Table 22 for examples of monitoring programs). As Schoonmaker and Luscombe (2005) pointed out, "properly trained citizens not only reduce the cost of data collection and ground-truthing, they can also become engaged supporters of fish and wildlife conservation." Where practical, the Department will develop or adjust existing survey and data collection protocol to gather data on all avian SCGN and Unknown Status avian species.

Mammals

The Department's Mammals Program has developed the Arizona Bat Conservation Strategic Plan. Like the Arizona Partners in Flight Bird Conservation Plan implementation strategy, the Bat Conservation Plan calls for statewide species and habitat monitoring. Although some species recovery plans, for example, lesser long-nosed bat, require single species monitoring protocols, the vast majority of bat monitoring efforts target multiple species, through mist net and roost surveys. This plan highlights the ability to monitor species regardless of priority, such that rare and common species can be assessed equally.

Another strategic plan is being developed, the Small Mammal Conservation Plan (Appendix P). With direction from the Arizona CWCS, this ambitious document will incorporate the goals of adaptive management into plans for monitoring multiple species across multiple landscapes and ecoregions. This will include efforts for all mammalian SCGN and Unknown Status mammal species.

Unknown Status Species and Monitoring Needs

A critical challenge facing the Department concerns the appropriate mechanisms for accumulating information on the status and distribution of Unknown Status Species (Appendix N). In part, responsibilities for conservation agreements, recovery plans, draft recovery plans, etc. consume many of the resources available to the Department for conservation of Arizona's wildlife. Nonetheless, the Department is committed to gathering data on Unknown Status Species. Many of the monitoring efforts in which the Department is currently involved, or plans for the near future, have built into them mechanisms either explicitly designed for monitoring multiple species, or for including "non-target" species into the protocols (Table 22). These monitoring programs will continue to accumulate significant amounts of data on many Unknown Status Species. Excellent examples of these include: Long-term Bat Monitoring, in which mist net sampling and roost surveys are not species specific; the San Pedro Habitat Management Plan, in which fish monitoring protocols sample the entire community; Chiricahua Leopard Frog Visual Encounter Surveys that collect information on all species of non-target amphibians and reptiles in addition to Chiricahua leopard frogs; and the Hummingbird Monitoring Network that, like the bat monitoring protocols, collects data on all species of hummingbirds in the White Mountains and from throughout southeastern Arizona.

Finally, in addition to programs highlighted above and in Table 22, the Department is actively soliciting proposals from outside cooperators to initiate surveys in areas where little is known about the distribution or status of native wildlife. For example, a specific objective on the 2005 Heritage Sensitive Elements list (the list of species or topics about which outside cooperators may submit proposals to the Department for research funding) was an inventory of amphibians and reptiles of the Arizona Strip, a remote, poorly known part of the State in which many Unknown Status Species occur. The Arizona Bird Conservation Initiative also highlights research needs and solicits proposals to work in areas or with species about which little is known. A clear Departmental commitment is apparent in native fish management. To address gaps in our knowledge of native fishes, the Department has moved towards year round monitoring conducted by native fish specialists that have been stationed at the regional offices.

These are only a few examples of a fledgling effort to understand more about the many lesser known species of wildlife which have historically received little attention.

TRACKING PROGRESS

Perhaps the most difficult aspect of adaptive management is developing the appropriate mechanisms for tracking the success or failure of management protocols, especially when those protocols cover the multitude of species found in Arizona. In its simplest form, tracking progress can be broadly interpreted, for example, achieving recovery of certain threatened or endangered species would indicate healthy habitat and thus ensure the long term success of other, non-target species. But, current mechanisms for most species are imperfect, relying on individual project deliverables and guidelines. Considerable effort is being put into place to attempt to provide for more effective tracking.

The Department's database of planning documents and conservation agreements (Appendix P) includes stressors for species and habitats. Plans are in place to incorporate specific actions into the database according to particular projects, such that management efforts can be updated and tracked. The development of this database will depend on funding and personnel priorities.

Field Operations Division has developed an operational plans database. This database includes information from Regional office annual work plans and is designed to allow the Regions to track progress with respect to expectations. Again, CWCS actions could be incorporated into this database to allow tracking of regionally-based projects. A relational database was developed to facilitate building the Arizona CWCS (see Processes section), and that database can be modified to link with the operational plans database to facilitate communication and data exchange, and to track the implementation of conservation actions.

As a public agency, the Department provides wildlife information to the public and Department cooperators. To that end, the Heritage Database Management System has developed the Arizona Heritage GIS Environmental Review Tool. This is an online pre-screening tool that will allow cooperators to access information regarding development projects and will ultimately track progress on wildlife related progress. The concept for this Tool was presented and accepted during the Governor's Efficiency Review in 2003, awarded funding in 2005 and plans to open to the public in spring 2006.

Because of the reality of limited resources and logistical constraints the Department is involved in many collaborative monitoring efforts with other entities (for example, USFWS, USFS, BLM, USBR, tribes, non-governmental organizations, colleges and universities, etc.). While there is strength in collaboration, these efforts underscore the need for strong data standards for collection, management, and analysis so that information can be shared easily among cooperators. There remains a need for more detailed habitat assessments throughout the State. In many instances, it will be necessary to conduct inventories of habitats and taxa for which there are few or no data, before monitoring programs can be established.

The time frame for reaching CWCS objectives will vary depending on several factors, including: the condition of the habitat necessary to sustain priority species, understanding species requirements, and the capability of the land owner or land manager to manage for the species. Fortunately, the CWCS is a dynamic document for which adaptive management provides the central theme. With an approved CWCS, the Department will examine closely the monitoring activities, priorities and databases to determine where changes are necessary. Through systematic and ongoing review of conservation management strategies and monitoring programs, the Department will ensure that Arizona is effectively conserving species and associated habitats at the statewide and ecoregional scales. Research questions will continue to be developed through the course of monitoring that will have direct application to land managers, and thus provide constant feedback of new information with which to manage Arizona's biodiversity.

Details are described in references under "Document #" which refers to the list of documents in Appendix P.

Table 22. Summary of ongoing and planned SGCN and habitat condition monitoring efforts currently carried out by Arizona Game and Fish Department and cooperators.								
Details are described in references under "Document #" which refers to the list of documents in Appendix P.								
Project	Document #	Single species	Multi-species	Habitat	Long-term	Project Follow-up	Geographic Scope	Agency Lead
Crustaceans and mollusks								
Kanab ambersnail	26, 27		X	X	X		rangewide	AGFD WMNG
Page springsnail	214, 215	X		X	X		local	AGFD WMNG
Three Forks springsnail	212, 215	X		X	X		local	AGFD WMNG
Quitobaquito tryonia	215, 241		X	X	X		local	AGFD WMNG
Wet canyon talussnail	29	X		X	X		local	AGFD WMNG
San Xavier talussnail	28	X		X	X		local	AGFD WMNG
Fishes								
Gila topminnow	145, 35, 235, 237, 249	X		X	X	X	statewide	AGFD WMNG
Desert pupfish	145, 34, 235, 237	X		X	X	X	statewide	AGFD WMNG
Sonoyta pupfish	241		X		X		local	AGFD WMNG
Native fish post-stocking evaluations	239, 250, 251		X		X	X	statewide	AGFD WMNG
Multispecies Conservation Plan	32, 33, 41, 44, 231, 246, 248, 250, 251		X		X	X	local	AGFD WMNG
Rio Yaqui fishes	31		X		X		rangewide	AGFD FOR5
El Coronado Ranch monitoring	21		X		X		local	AGFD FOR5; FWS
Virgin River fishes	47		X		X		rangewide	AGFD FOR2
Gila trout	36	X		X	X		statewide	AGFD WMNG/WMFS; FWS-AZFRO
Apache trout	230, 87, 82	X		X	X	X	rangewide	AGFD

Table 22. Summary of ongoing and planned SGCN and habitat condition monitoring efforts currently carried out by Arizona Game and Fish Department and cooperators.								
Details are described in references under "Document #" which refers to the list of documents in Appendix P.								
							WMNG/FOR1/WMFS; FWS-AZFRO	
Little Colorado River spinedace	42, 107, 115, 116,252	X		X	X	rangewide	AGFD WMNG/FOR1/FOR2	
Loach minnow	43	X			X	statewide	AGFD WMNG	
Sonora chub	45	X			X	local	AGFD WMNG/FOR5	
Spikedace	129, 46	X			X	statewide	AGFD WMNG	
San Pedro Habitat Mgmt Plan	69		X			local	AGFD WMNG/ FOR5; BLM	
Draft Lower Colorado River National Wildlife Mgmt Plan	70		X			local	FWS	
Horseshoe Lake and Bartlett Lake monitoring	76		X		X	local	SRP; FWS; AGFD WMHB	
Sipe native fish monitoring	115		X		X	local	AGFD FOR1	
Packard Ranch/Tavasci Marsh monitoring	129		X		X	local	AGFD FOR3	
Muleshoe Ranch monitoring	147		X		X	local	AGFD WMNG/ FOR5; BLM	
Statewide Conservation Agreement and Strategy for 6 fish species	239		X		X	statewide	AGFD WMNG	
Bonytail chub	246	X			X	statewide	AGFD FOR3/ FOR4	
Virgin spinedace	247	X			X	local	AGFD FOR2	
Humpback chub	248	X			X	local	AGFD WMRS	
Colorado pikeminnow	250	X			X	statewide	AGFD FOR6	
Razorback sucker	251	X			X	statewide	AGFD WMNG/ FOR3/ FOR4/ FOR6	
CAP Monitoring	none		X		X	ecoregion	AGFD WMNG	
Nutrioso Creek	252		X		X	local	AGFD FOR1	
Amphibians								
Sonora tiger salamander	53		X	X	X	local	AGFD WMNG/FOR5	
Chiricahua Leopard Frog Visual Encounter Surveys	217, 223		X		X	rangewide	AGFD WMNG	
Chiricahua leopard frog Sierra Blanca release	217, 222, 223	X				X	local	AGFD FOR1
Chiricahua leopard frog Buckskin Hills Site	217, 222, 223	X			X		local	AGFD FOR2
Chiricahua leopard frog Gentry Site	217, 222, 223	X			X	X	local	AGFD FOR6

Table 22. Summary of ongoing and planned SGCN and habitat condition monitoring efforts currently carried out by Arizona Game and Fish Department and cooperators.							
Details are described in references under "Document #" which refers to the list of documents in Appendix P.							
Ramsey Canyon leopard frog	50, 219, 223	X		X	X	local	AGFD WMNG/ FOR5
Tarahumara frog reintroduction	223, 234	X	X	X	X	local	AGFD WMNG; USFS; USFWS
Relict leopard frog	218, 223	X		X		rangewide	Relict Leopard Frog Conservation Team; AGFD FOR3
Lowland and Plains leopard frogs	223		X			statewide	AGFD Regional offices
Northern leopard frog	223	X		X		rangewide	AGFD FOR2
Chytridiomycosis surveys	223		X	X		statewide	AGFD WMNG
Reptiles							
Flat-tailed horned lizard	48	X	X	X		local	AGFD FOR4,/WMNG
Sonoran Desert tortoise permanent plots	49, 52, 240	X		X		rangewide	AGFD WMNG; BLM
Sonoran Desert tortoise line-distance sampling	49, 240	X				local	UA; AGFD WMNG
Sonoran Desert tortoise disease monitoring	49, 52, 240	X		X		rangewide	AGFD WMNG
Sonoyta mud turtle	241		X	X		local	AGFD; NPS; CEDES
Narrow-headed gartersnake	none	X				rangewide	AGFD Regional offices
Mexican gartersnake	none	X				rangewide	AGFD Regional offices
Tucson shovel-nosed snake	none	X				Rangewide	AGFD FOR6
New Mexico ridgenose rattlesnake	51	X				local	AGFD WMNG
Mammals							
Arizona Bat Conservation Strategic Plan	54		X	X	X	Statewide	AGFD WMNG/ Regional offices
Lesser long-nosed bat roost monitoring	54, 161	X		X	X	Rangewide	AGFD WMNG/ FOR5; many partners
Long-term bat monitoring	54		X	X	X	Statewide	AGFD WMNG/ Regional offices
Fort Huachuca bat monitoring	54, 78		X		X	Local	DOD Ft. Huachuca
SE Arizona bat monitoring	54		X		X	Local	NPS (Ft. Bowie NHS, Chiricahua NM)
Mt. Graham red squirrel	160	X			X	Local	AGFD FOR5; USFS; UA
Sonoran pronghorn	162	X			X	rangewide	AGFD FOR4; CEDES
Jaguar	55	X			X	borderlands	AGFD WMNG
Mexican wolf	57	X			X	White Mtns	AGFD FOR1
Black-footed ferret	58	X			X	Local	AGFD WMNG

Table 22. Summary of ongoing and planned SGCN and habitat condition monitoring efforts currently carried out by Arizona Game and Fish Department and cooperators.							
Details are described in references under "Document #" which refers to the list of documents in Appendix P.							
Prairie dog monitoring	58	X			X		Local AGFD WMNG
Disease monitoring	58		X		X		Local AGFD WMNG
Mammal track surveys	none		X		X		Local Sky Island Alliance
Gunnison's prairie dog	253	X			X		statewide AGFD Regional offices
Birds							
Arizona Bird Conservation Initiative (ABCI)	169		X	X	X		statewide AGFD WMNG
Bald eagle (breeding and winter)	211	X			X		statewide AGFD WMNG
Golden eagle nesting surveys	166	X					statewide AGFD Regional offices
Peregrine falcon	206	X			X		statewide AGFD; USFWS
Southwestern willow flycatcher	165, 203	X			X		statewide AGFD WMRS
Cactus ferruginous pygmy-owl	22, 205	X			X		rangewide AGFD FOR5
California condor	170, 171, 201	X			X		local AGFD FOR2 and Peregrine Fund
(Mexican) spotted owl	204	X			X		rangewide USFS
Burrowing owl	168	X			X	X	rangewide AGFD WMRS/WMNG; Wild At Heart
Yuma clapper rail	210		X		X		rangewide AGFD FOR3/FOR4/FOR6
Northern (masked) bobwhite	72	X			X		local USFWS (Buenos Aires NWR)
Chiricahua elegant trogon count	169	X			X		local USFS (Coronado National Forest)
Breeding Bird Survey	169		X		X		statewide USGS – Laurel; MD
Christmas Bird Count	169		X		X		statewide National Audubon Society
Hummingbird Monitoring Network	169		X		X		local Hummingbird Monitoring Network
Sipe hummingbird banding project	169		X		X		local AGFD FOR1
Fall Hawk Watch	169		X		X		local HawkWatch International
SE Arizona bird migration monitoring	169		X		X		local SE Arizona Bird Observatory
San Pedro River MAPS Station	69, 169		X		X		local BLM
Colonial nesting heron/egret counts	169		X				local AGFD FOR3
Tucson bird count	169		X		X		local Univ of AZ
Important bird area (IBA) monitoring	169		X		X		local Audubon AZ/Tucson Audubon Society
Phoenix area winter urban waterbird	none		X		X		local AGFD WMNG

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Details are described in references under "Document #" which refers to the list of documents in Appendix P.							
count							

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LITERATURE CITED

- [ACERP] Arizona Comprehensive Environmental Risk Project. 1995. The Arizona Comprehensive Environmental Risk Project Report. ACERP Steering Committee. Phoenix, Arizona. <http://earthvision.asu.edu/acerp/>.
- [ADEQ] Arizona Department of Environmental Quality. 2004. Arizona's 2004 303(d) List and Other Impaired Waters. ADEQ, Phoenix, Arizona.
- [ADWR] Arizona Department of Water Resources. 1994. Arizona Riparian Protection Program Legislative Report: A Report to the Governor, President of the Senate and Speaker of the House. ADWR, Phoenix, Arizona.
- Agee, JK. 1993. Fire Ecology of Pacific Northwest Forests. Island Press, Washington, DC.
- [AGFC] Arizona Game and Fish Commission. 1991. Commission policy statement on multiple-use (effective March 15, 1991). A2.18 of the Department Operating Manual. Arizona Game and Fish Department, Phoenix, Arizona.
- [AGFD] Arizona Game and Fish Department. 1988. Threatened Native Wildlife in Arizona. Arizona Game and Fish Department, Phoenix, Arizona. 26 pp.
- [AGFD] Arizona Game and Fish Department. 2001. Wildlife 2006: the Arizona Game and Fish Department's Wildlife Management Program Strategic Plan for the Years 2001-2006. Arizona Game and Fish Department, Phoenix, Arizona.
- [AGFD] Arizona Game and Fish Department. 2004a. Planning Processes in the Arizona Game and Fish Department: Agency Process Team 2 Final Report. Arizona Game and Fish Department, Phoenix, Arizona.
- [AGFD] Arizona Game and Fish Department. 2004b. Report of the Flagstaff and Phoenix Mountain Lion Workshops. Arizona Game and Fish Department, Phoenix, Arizona.
- [AGFD] Arizona Game and Fish Department. (1996). Wildlife of Special Concern in Arizona. (March 16, 1996 version). Arizona Game and Fish Department, Phoenix, Arizona. 32 pp.
- [AGFD] Arizona Game and Fish Department. (in prep). Safe Harbor Agreement for topminnows and pupfish in Arizona. Arizona Game and Fish Department, Phoenix, Arizona.
- Aiken, R. 2004. Fishing and Hunting 1991-2001: Avid, Casual, and Intermediate Participation Trends. Report 2001-5 (Addendum to the 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation). US Fish and Wildlife Service, Arlington, Virginia.

- Allen, CD. 1989. Changes in the landscape of the Jemez Mountains, New Mexico [dissertation]. University of California, Berkeley, California.
- Allen, CD and DD Breshears. 1998. Drought-induced shift of a forest-woodland ecotone: rapid landscape response to climate variation. *Proceedings of the National Academy of Science* **95**: 14839-14842.
- Allen, RB and RK Peet. 1990. Gradient analysis of forests of the Sangre de Cristo Range, Colorado. *Canadian Journal of Botany* **68**: 193-201.
- Archer, S. 1994. Woody plant encroachment into southwestern grasslands and savannas: rates, patterns and proximate causes. Pages 13-68 *in* M. Vavra, W.A. Laycock, and R.D. Pieper (eds). *Ecological Implications of Livestock Herbivory in the West*. Society for Range Management, Denver, Colorado.
- Arizona Department of Commerce. 2002. Statewide Economic Study Part 1: Economic Base Study and Special Reports. Phoenix, Arizona.
- Armour, C, D Duff, and W Elmore. 1994. The effects of livestock grazing on western riparian and stream ecosystem. *Fisheries* **19**: 9-12.
- Aro, RS. 1971, Evaluation of Pinyon-Juniper Conversion to Grassland. *Journal of Range Management*. **24**:188-197.
- Atkinson, AJ, PC Trenham, RN Fisher, SA Hathaway, BS Johnson, SG Torres and YC Moore. 2004. Designing monitoring programs in an adaptive management context for regional multiple species conservation plans. US Geological Survey Technical Report. USGS Western Ecological Research Center, Sacramento, CA. 69 pp.
- Averill-Murray, RC. 2000. Survey protocol for Sonoran desert tortoise monitoring plots: reviewed and revised. Arizona Interagency Desert Tortoise Team. AGFD, Phoenix, Arizona. 41 pp.
- Averill-Murray, RC and A Averill-Murray. 2005. Regional-scale estimation of density and habitat use of the desert tortoise (*Gopherus agassizii*) in Arizona. *Journal of Herpetology* **39**: 65-72.
- Bahre, CJ. 1991. *A Legacy of Change: Historic Human Impact on Vegetation of the Arizona Borderlands*. University of Arizona Press, Tucson, Arizona.
- Bahre, CJ and CF Hutchinson. 1985. The impact of historic fuel woodcutting on the semidesert woodlands of southeastern Arizona. *Journal of Forest History* **29**: 175-186.
- Bahre, CJ and ML Shelton. 1993. Historic vegetation change, mesquite increases, and climate in southeastern Arizona. *Journal of Biogeography* **20**: 489-504.

- Bahre, CJ and ML Shelton. 1996. Rangeland destruction: cattle and drought in southeastern Arizona at the turn of the century. *Journal of the Southwest* 38(1): 1-22.
- Bailey, RG. 1994. Ecoregions of the United States (revised map). USDA Forest Service. Washington DC.
- Bailey, RG. 1995. Descriptions of the Ecoregions of the United States. 2nd ed. USDA Forest Service Miscellaneous Publication Number 1391. Washington, DC.
- Bailey, RG. 1998. Ecoregions Map of North America: Explanatory Note. Prepared in Cooperation with The Nature Conservancy and the US Geological Survey. USDA Forest Service, Miscellaneous Publication Number 1548. Washington, DC.
- Baillie, JEM, C Hilton-Taylor, and SN Stuart (eds). 2004. 2004 IUCN Red List of Threatened Species. A Global Species Assessment. IUCN, Gland, Switzerland and Cambridge, United Kingdom. 191 pp.
- Bailowitz, RA and JP Brock. 1991. *Butterflies of Southeastern Arizona*. Sonoran Arthropod Studies, Inc., Tucson, Arizona.
- Barton, AM. 1994. Gradient analysis of relationships among fire, environment, and vegetation in a southwestern USA mountain range. *Bulletin of the Torrey Botanical Club* 121 (3) 251-265.
- Bazzaz, FA and RW Carlson. 1984. The response of plants to elevated CO₂ (carbon dioxide). Competition among an assemblage of annuals at two levels of soil moisture (*Amaranthus retroflexus*, *Polygonum pensylvanicum*, *Ambrosia artemisiifolia*, *Abutilon theophrasti*). *Oecologia*. 62: 196-198.
- Beatty, GL, JT Driscoll, and JG Koloszar. 1998. Arizona bald eagle nestwatch program: 1997 summary report. Nongame and Endangered Wildlife Program Technical Report Number 131. Arizona Game and Fish Department, Phoenix, Arizona.
- Behavior Research Center, Inc. 2004. Comprehensive Wildlife Conservation Strategy Survey—Arizona. Prepared for the Arizona Game and Fish Department, Phoenix, Arizona.
- Bell, G, J Baumgartner, J Humke, A Laurenzi, P McCarthy, P Mehlhop, K Rich, M Silbert, E Smith, B Spicer, T Sullivan, S Yanoff. 1999. Ecoregional conservation analysis of the Arizona - New Mexico Mountains. The Nature Conservancy of New Mexico, Santa Fe. 151 pp. Available online: www.azconservation.org.
- Belsky, AJ and DM Blumenthal. 1997. Effects of livestock grazing on stand dynamics and soils in upland forests of the interior West. *Conservation Biology* 11: 315-327.

- Belsky, AJ, A Matzke, and S Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. *Journal of Soil and Water Conservation* 54: 419-431.
- Beschta, RL, JJ Rhodes, JB Kauffman, RE Gresswell, GW Minshall, JR Karr, DA Perry, FR Hauer, and CA Frissell. 2004. Postfire management on forested public lands of the western United States. *Conservation Biology* 18: 957-967.
- Betancourt, JL 1990. Late Quaternary biogeography of the Colorado Plateau. Pages 259-293 *in* Betancourt, JL, TRV Devender, and PS Martin (eds). *Packrat Middens: The Last 40,000 Years of Biotic Change*. University of Arizona Press, Tucson, Arizona.
- Beyer, WN, LJ Blus, CJ Henny, D Audet. 1997. The role of sediment ingestion in exposing wood ducks to lead. *Ecotoxicology* 6:181-186.
- Bogan, MA, CD Allen, EH Muldavin, SP Platania, JN Stuart, GH Farley, P Mehlhop, and J Belnap. 1998. Southwest. Pages 543-592 *in* MJ Mac, PA Opler, CE Puckett Haecker, and PD Doran (eds). *Status and Trends of the Nation's Biological Resources*. 2 vols. US Geological Survey, Reston, Virginia.
- Bohrer, VL. 1975. The prehistoric and historic role of the cool-season grasses in the Southwest. *Ethnobotany* 29: 199-207.
- Bolin, B, BR Doos, J Jager, and RA Warrick. 1986. *The Greenhouse Effect, Climate Change, and Ecosystems*. John Wiley and Sons, New York, New York.
- Bowman, WD, DM Cairns, JS Baron, and TR Seastedt. 2002. Islands in the sky: alpine and treeline ecosystems of the Rockies. Pages 183-202 *in* JS Baron (ed). *Rocky Mountain Futures: An Ecological Perspective*. Island Press, Washington, DC.
- Bradley, GA, PC Rosen, MJ Sredl, TR Jones and JE Longcore. 2002. Chytridiomycosis in native Arizona frogs. *Journal of Wildlife Diseases* 38:206-212.
- Branson, FA. 1985. Vegetation changes on western rangelands. *Range Monograph* 2: 1-76. Society for Range Management, Denver, Colorado.
- Brattstrom, BH and MC Bondello. 1983. Effects of off-road vehicle noise on desert vertebrates. *in* RH Webb and HG Wilshire (eds). *Environmental Effects of Off-Road Vehicles: Impacts and Management in Arid Regions*. Springer-Verlag, New York, New York.
- Breshears, DD, NS Cobb, PM Rich, KP Price, CD Allen, RG Balice, WH Romme, JH Kastensf, ML Floyd, J Belnap, JJ Anderson, OB Myers, and CW Meyer. 2005. Regional vegetation die-off in response to global-change-type drought. *Proceedings of the National Academy of Science* 102 (42): 15144-15148.

- Brooks, ML and B Lair. 2005. Ecological effects of vehicular routes in a desert ecosystem. Report of USGS Recoverability and Vulnerability of Desert Ecosystems Program. Available online: http://www.dmg.gov/documents/Desert_Road_Ecology_report.pdf
- Brown, DE (ed). 1994. Biotic Communities: Southwestern United States and Northwestern Mexico. University of Utah Press, Salt Lake City, Utah. 342 pp. Originally published 1982 as Desert Plants 4 (1-4).
- Brown, DE, NB Carmony, and RM Turner. 1981. Drainage map of Arizona showing perennial streams and some important wetlands. Arizona Game and Fish Department, Phoenix, Arizona. 1 sheet (1:1,000,000).
- Brown, DE, and CH Lowe. 1974. A digitized computer-compatible classification for natural and potential vegetation in the Southwest with particular reference to Arizona. *Journal Arizona Academy Science* **9**, Supplement 2: 1-11
- Brown, JH, TJ Valone, and CG Curtin. 1997. Reorganization of an arid ecosystem in response to recent climate change. *Proceedings of the National Academy of Science*. **94**: 9729-9733.
- Brown, LR and T Ford. 2002. Effects of flow on the fish communities of a regulated California river: implications for managing native fishes. *River Research and Applications* **18**: 331-342.
- Brown, S, C Hickey, B Harrington, and R Gill (eds). 2001. The US Shorebird Conservation Plan. 2nd ed. Manomet Center for Conservation Sciences, Manomet, Massachusetts.
- Buffington, LC and CH Herbel. 1965. Vegetational changes on a semiarid desert grassland range from 1858 to 1963. *Ecological Monographs* **35**: 139-164.
- Busack, SD and RB Bury. 1974. Some effects of off-road vehicles and sheep grazing on lizard populations in the Mohave Desert. *Biological Conservation* **6**: 179-183.
- Carmichael, GJ, JN Hanson, ME Schmidt and DC Morizot. 1993. Introgression among Apache, cutthroat and rainbow trout in Arizona. *Transactions of the American Fisheries Society* **122**: 121-130.
- Center for Wildlife Law, Defenders of Wildlife, and Environmental Law Institute. 1999. New Mexico's natural heritage: a handbook of law and policy. Albuquerque, New Mexico. 26 pp.
- Clark, E and N Cobb (compilers). 2003. 2003 Southwest Drought Summit Summary Report. Available online: <http://watershed.nau.edu/2003DroughtSummit/index.htm>
- Clark, MJ. 2002. Dealing with uncertainty: adaptive approaches to sustainable river management. *Aquatic Conservation: Marine and Freshwater Ecosystems* **12**: 347-363.

- [CMP] Conservation Measures Partnership. 2004a (draft). Proposed Taxonomy of Direct Threats. CMP Working Paper. www.ConservationMeasures.org
- [CMP] Conservation Measures Partnership. 2004b (draft). Proposed Taxonomy of Conservation Actions. CMP Working Paper. www.ConservationMeasures.org
- Collier, M and RH Webb. 2002. Floods, Droughts, and Climate Change. University of Arizona Press, Tucson, Arizona. 153 pp.
- Collins, JP, TR Jones, and HA Berna. 1988. Conserving genetically distinctive populations: the case of the Huachuca tiger salamander (*Ambystoma tigrinum stebbinsi*), Pp. 45-53 in RC Szaro, KC Severson and DR Patton, eds. Management of amphibians, reptiles, and small mammals in North America. USDA Forest Service GTR-RM-166, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
- Conner, RC, JD Born, AW Green, and RA O'Brien. 1990. Forest Resources of Arizona. US Forest Service Resource Bulletin INT-69. US Dept of Agriculture, Forest Service, Ogden, Utah.
- Cooke, RU and RW Reeves. 1976. Arroyos and Environmental Change in the American Southwest. Clarendon Press, Oxford, England. 213 pp.
- Cooper, CF. 1960. Changes in vegetation, structure, and growth of southwestern pine forests since white settlement. Ecological Monographs **30**:129-164.
- Cooperrider, CK and BA Hendricks. 1937. Soil erosion and stream flow on range and forest lands of the upper Rio Grande watershed in relation to land resources and human welfare. US Forest Service Technical Bulletin 567. US Dept of Agriculture, Forest Service, Washington, DC.
- Cottam, WP and G Stewart. 1940. Plant succession as a result of grazing and of meadow desiccation by erosion since settlement in 1862. Journal of Forestry **38**: 613-626.
- Covington, WW and MM Moore. 1994. Southwestern ponderosa forest structure: changes since Euro-American settlement. Journal of Forestry **92**: 39-47.
- Cox, GW. 1999. Alien species in North America and Hawaii: impacts on natural ecosystems. Island Press, Washington, D.C.
- [CSE] Center for Sustainable Environments, Terralingua, and Grand Canyon Wildlands Council. 2002. Safeguarding the uniqueness of the Colorado Plateau: an ecoregional assessment of biocultural diversity. Flagstaff, Arizona. 98 pp. <http://www.terralingua.org/OtherPubs/Colorado%20Plateau.pdf>

- Dahms, CW, and BW Geils. 1997. An assessment of forest ecosystem health in the Southwest. General Technical Report RM-GTR-295. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Southwest Region, Fort Collins, CO.
- Dale, VH, LA Joyce, S McNulty, and RP Nielson. 2000. The interplay between climate changes, forests, and disturbances. *Science of the Total Environment* **262**: 201-204.
- Dale, VH, LA Joyce, S McNulty, RP Nielson, MP Ayres, MD Flannigan, PJ Hanson, LC Irland, AE Lugo, CJ Peterson, D Simberloff, FJ Swanson, BJ Stocks, and BM Wotton. 2001. Climate change and forest disturbances. *Bioscience* **51**:723-734.
- DeBano, LF, PF Ffolliott, A Ortega-Rubio, GJ Gottfried, RH Hamre, and CB Edminster. 1995. Biodiversity and management of the Madrean Archipelago: the sky islands of southwestern United States and northwestern Mexico: September 19-23, 1994, Tucson, Arizona. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. 669 pp.
- deBuys, W. 1985. Enchantment and exploitation: the life and hard times of a New Mexico mountain range. University of New Mexico Press, Albuquerque, New Mexico. 394 pp.
- DeLoach, CJ, RI Carruthers, JE Lovich, TL Dudley, and SD Smith. 2000. Ecological interactions in the biological control of saltcedar (*Tamarix* spp.) in the United States: toward a new understanding. In N.R. Spencer (ed.), *Proceedings of the X International Symposium on Biological Control of Weeds*. July 1999, Montana State University, Bozeman, Montana.
- DeMent, SH, JJ Chisolm, Jr, JC Barber, JD Strandberg. 1986. Lead exposure in an "urban" peregrine falcon and its avian prey. *Journal of Wildlife Diseases* **22**(2):238-244.
- Dinerstein, E, D Olson, J Atchley, C Loucks, S Contreras-Balderas, R Abell, E Inigo, E Enkerlin, C Williams, and G Castilleja. 2000. Ecoregion-based conservation in the Chihuahuan Desert-a biological assessment. World Wildlife Fund, Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), The Nature Conservancy, PRONATURA Noreste, and Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM).
- Dinsmore, SJ, GC White, and FL Knopf. 2002. Advanced techniques for modeling avian nest survival. *Ecology* **83**: 3476-3488.
- Drabowski, EF. 1993. Water quality impacts at abandoned hardrock mines. *Natural Science Technology* **28**: 399-407.
- Edison, J, M Malone, R Ruisinger, RO Russell, J Tweit, R Tweit, and D Yetman. 1995. Davis and Russell's finding birds in southeast Arizona. Tucson Audubon Society, Tucson, Arizona.

- Ehleringer JR, RF Sage, LB Flanagan, and RW Pearcy. 1991 Climate change and the evolution of C₄ photosynthesis. *Trends in Ecology and Evolution* 6: 95-99.
- Elliott, G, M Chase, G. Geupel and E Cohen. 2003. Developing and implementing an adaptive conservation strategy: A guide for improving adaptive management and sharing the learning among conservation practitioners. PRBO Conservation Science 2003. Website of PRBO Conservation Science. <http://www.prbo.org/>.
- Elton, CS. 1958. The ecology of invasions by animals and plants. University of Chicago Press, Chicago, Illinois.
- Elzinga, CL, DW Salzer, and JW Willoughby. 1998. Measuring and monitoring plant populations. BLM Tech. Reference 1730-1. BLM/RS/ST-98/005+1730.
- Esque, TC and CR Schwalbe. 2002. Alien annual grasses and their relationships to fire and biotic change in Sonoran Desertscrub. pp. 165-194. *In: Invasive exotic species in the Sonoran region*. B. Tellman (ed.).
- Etzenhouser, MJ. 1998. Foraging behaviour of browsing ruminants in a heterogeneous landscape. *Landscape Ecology* 13 (1): 55-64.
- Everett, RL. 1987. Proceeding - Pinyon Juniper Conference. USDA, Forest Service General Tech Report, INT- 215 Intermountain Forest and Range Experiment Station. 48p.
- Ewing, R, J Kostyack, D Chen, B Stein, and M Ernst. 2005. Endangered by sprawl: how runaway development threatens America's wildlife. National Wildlife Foundation, Smart Growth America, and NatureServe. Washington, DC. 53 pp.
- Federal Register. 1999. Presidential Documents. Executive Order 13112 of February 2, 1999. Invasive Species. Federal Register 64: 6183-6186.
- Felger, RS and MF Wilson. 1995. Northern Sierra Madre Occidental and its Apachian outliers: neglected center of biodiversity. Pages 36-51 *in* LF DeBano, PF Ffolliott, A Ortega-Rubio, GJ Gottfried, RH Hamre, and CB Edminster (tech. coords.), Biodiversity and management of the Madrean Archipelago: the Sky Islands of the southwestern United States and northwestern Mexico. Sept. 19-23, 1995. Tucson, Arizona. US Forest Service General Technical Report RM-GTR-264. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- Fernandez, PJ and PC Rosen. 1996. Effects of the introduced crayfish *Orconectes virilis* on native aquatic herpetofauna in Arizona. Arizona Game and Fish Department.
- Ffolliott, PF and Gottfried, GJ. 2002. Dynamics of a Pinyon Juniper stand in Northern Arizona: A Half Century in Review. USDA Forest Service Research Paper RMRS-RP-35. Rocky Mountain Research Station. 10pp.

- Finch, DM (ed). 2004. Assessment of Grassland Ecosystem Conditions in the Southwestern United States, Volume 1. US Forest Service General Technical Report RMRS-GTR-135. Rocky Mountain Research Station, Fort Collins, Colorado.
- Fleischner, TL. 1994. Ecological costs of livestock grazing in western North America. *Conservation Biology* 8: 629-644.
- Foreman, D, K Daly, B Dugelby, R Hanson, R Howard, J Humphrey, L Linck, R List, and K Vacariu. 2000. Sky Islands Wildlands Network Conservation Plan. The Wildlands Project, Tucson, Arizona. 220 pp.
- Foreman, D, K Daly, R Noss, M Clark, K Menke, DR Parsons, and R Howard. 2003. New Mexico highlands wildlands network vision: connecting the Sky Islands to the southern Rockies. The Wildlands Project. Richmond, Vermont.
- Forman, RTT, D Sperling, JA Bissonnette, AP Clevenger. 2003. Road ecology: science and solutions. Island Press, Washington, DC. 481 pp.
- Franklin, JF, FJ Swanson, ME Harmon, DA Perry, TA Spies, VH Dale, A McKee, WK Ferrell, JE Means, SV Gregory, JD Lattin, TD Schowalter, and D David. 1992. Effects of global climatic change on forests in northwestern North America. P. 244-257 in RL Peters and TE Lovejoy (eds.), *Global warming and biological diversity*. Yale University Press: New Haven, CT
- Frenzel, RW and RG Anthony. 1989. Relationships of diets and environmental contaminants in wintering bald eagles. *Journal of Wildlife Management* 53(3):792-802.
- Friederici, P (ed). 2003. Ecological Restoration of Southwestern Ponderosa Pine Forests. Island Press, Washington. 560pp.
- Frissel, CA. 1993. Topology of extinction and endangerment of native fishes in the Pacific Northwest and California. *Conservation Biology* 8: 629-644.
- Furniss, MJ, TD Roeloffs, and CS Lee. 1991. Road construction and maintenance. Pages 297-323 in WR Meehan (ed), Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, Maryland.
- Gara, RI, WR Littke, JK Agee, DR Geiszler, JD Stuart, and CH Driver. 1985. Influences of fires, fungi, and mountain pine beetles on development of a lodgepole pine forest in south-central Oregon. Pages 153-162 in DM Baumgartner (ed), Lodgepole pine: the species and its management. Washington State University, Pullman, Washington.

- Gardner, RH, RV O'Neill, MG Turner, and VH Dale. 1989. Quantifying scale-dependent effects of animal movement with simple percolation models. *Landscape Ecology* **3** (3/4): 217-227.
- Gebow, B, E Albrecht, D Caldwell, L Carder, B Powell, A Hubbard, and B Halvorson. 2004. Sonoran Desert Network Inventory and Monitoring Program: assessing the state of ecological resources in 11 southwestern national parks. National Park Service, Tucson, Arizona. 10 pp.
- Gibbs, JP, S Droege, and P Eagle. 1998. Monitoring populations of plants and animals. *Bioscience* **48**: 935-940.
- Gori, DF, and CAF Enquist. 2003. An assessment of the spatial extent and condition of grasslands in central and southern Arizona, southwestern New Mexico, and northern Mexico. The Nature Conservancy, Tucson, Arizona.
- Gottfried, GJ, PF Ffolliott, and LF DeBano. 1995. Forests and woodlands of the Sky Islands: stand characteristics and silvicultural prescriptions. Pages 152-164 in LF DeBano, PF Ffolliott, A Ortega-Rubio, GJ Gottfried, RH Hamre, and CB Edminster (tech. coords.), *Biodiversity and management of the Madrean Archipelago: the Sky Islands of the southwestern United States and northwestern Mexico*. 1994. Tucson, Arizona. US Forest Service General Technical Report RM-GTR-264. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- Griffin, JR. 1977. Oak woodland. In M Barbour and J Major (eds), *Terrestrial vegetation of California*. Wiley-Interscience, New York, New York.
- Grover, HD, and HB Musick. 1990. Shrubland encroachment in southern New Mexico, USA: an analysis of desertification processes in the American Southwest. *Climatic Change* **17**: 305-330.
- Grand Canyon Wildlands Council. 2004 (draft). Grand Canyon Wildlands Network: a proposal. Grand Canyon Wildlands Council, Flagstaff, Arizona.
- Gruell, GE. 1999. Historical and modern roles of fire in pinyon-juniper. Pp. 24-28 in Monsen, S.B., and R. Stevens. *Ecology and management of pinyon-juniper communities within the Interior West*. Proceedings RMRS-P-9. U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, UT.

- Gunn, T. 2005a. Comprehensive Wildlife Conservation Strategy: Wildlife Summits Report Final. Submitted to the Arizona Game and Fish Department, January 2005. Gunn Communications, Inc., Peoria, Arizona. 87 pp. Available online: http://www.azgfd.gov/w_c/cwcs_format.shtml
- Gunn, T. 2005b. Comprehensive Wildlife Conservation Strategy: CoNexus Online Survey Report Final. Submitted to the Arizona Game and Fish Department, February 2005. Gunn Communications, Inc., Peoria, Arizona. 23 pp.
- Haack, RA and JW Byler. 1993. Insects and pathogens: regulators of forested ecosystems. *Journal of Forestry* 91: 32-37.
- Hall, JA, S Weinstein, and CL McIntyre. 2005. The impacts of livestock grazing in the Sonoran Desert: a literature review and synthesis. The Nature Conservancy in Arizona, Tucson.
- Harris, LD. 1984. The fragmented forest: island biogeography theory and the preservation of biotic diversity. University of Chicago Press. Chicago, Illinois.
- Hastings, JR and RM Turner. 1965. The changing mile: an ecological study of vegetation change with time in the lower mile of an arid and semi-arid region. University of Arizona Press, Tucson, Arizona.
- Hendrickson, DA, and WL Minckley. 1984. Cienegas - vanishing climax communities of the American Southwest. *Desert Plants* 6(3): 131-175.
- Henny, CJ, LJ Blus, DJ Hoffman, L Sileo, DJ Audet, MR Snyder. 2000. Field evaluation of lead effects on Canada geese and mallards in the Coeur d'Alene River Basin, Idaho. *Environmental Contamination and Toxicology* 39(97).
- Hessburg, PF and JK Agee. 2003. An environmental narrative of inland northwest United States forests, 1800-2000. *Forest Ecology and Management* 178: 23-59.
- Hilliard, TJ. 1994. States rights, miners' wrongs. Case studies of water contamination from hardrock mining. Mineral Policy Center, American Fisheries Society, American Rivers, Trout Unlimited. Washington, D.C.
- Hinman, KE and TK Snow (eds). 2003. Arizona Bat Conservation Strategic Plan. Nongame and Endangered Wildlife Program Technical Report 213. Arizona Game and Fish Department, Phoenix, Arizona.
- Holechek, JL, R Valdez, R Pieper, S Schemnitz, and C Davis. 1982. Manipulation of grazing to improve or maintain wildlife habitat. *Wildlife Society Bulletin* 10: 204-210.
- Holechek, JL, RD Pieper, and CH Herbel. 1998. Range management: principles and practices. 3rd ed. Prentice Hall, New Jersey.

- Holechek, JL, TT Baker, and JC Boren. 2004. Impacts of controlled grazing versus grazing exclusion on rangeland ecosystems: what we have learned. New Mexico State University Cooperative Extension Service, Range Improvement Task Force Report 57. Las Cruces, New Mexico. 42 pp.
- Humphrey, RR. 1987. 90 Years and 535 miles: vegetation changes along the Mexican border. University of New Mexico Press, Albuquerque, New Mexico.
- Hunt, WG, DE Driscoll, EW Bianchi, and RE Jackman. 1992. Ecology of Bald Eagles in Arizona. Report to U.S. Bureau of Reclamation, Contract 6-CS-30-04470. BioSystems Analysis Incorporated, Santa Cruz, CA.
- Hunter, AF and LW Aarssen. 1988. Plants helping plants. *Bioscience* 38: 34-40.
- [IPCC] International Panel on Climate Change. 1998. The Regional Impacts of Climate Change. An Assessment of Vulnerability. A Special Report of IPCC Working Group II. Watson, R.T., M.C. Zinyowera, and R.H. Moss (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 517 pp.
- James, MA and SA Baden. 2004. Wind Energy Development and Avian Effects in Northern Arizona: A Review of the State of Current Knowledge and Recommendations for Minimizing Impacts. Grand Canyon Trust, May 2004.
- Johnson, BL. 1999. The role of adaptive management as an operational approach for resource management agencies. *Conservation Ecology* 3: 8. [online] URL: <http://www.consecol.org/vol3/iss2/art8/>
- Johnson, HB, HW Polley, and HS Mayeux. 1993. Increasing CO₂ and plant-plant interactions: effects on natural vegetation. *Vegetatio* 104/105: 157-170.
- Johnson, TN, and Elson, JW. 1979. Sixty Years of Change on a Central Arizona Grassland Woodland Ecotone. U.S. Department of Agriculture, Science and Education Administration, Western Series No.7. 28pp.
- Kennedy, TA, JC Finley and SE Hobbie. 2005. Eradication of invasive *Tamarix ramosissima* along a desert stream increases native fish density. *Ecological Applications* 15: 2072-2083.
- Kie, JG, VC Bleich, AL Medina, JD Yoakum, and JW Thomas. 1994. Managing rangelands for wildlife. Pages 663-688 in RTA Bookhout (ed), Research and management techniques for wildlife. 5th ed. The Wildlife Society, Bethesda, Maryland. 740 pp.
- Kiesecker, JM, AR Blaustein and CL Miller. 2001. Potential mechanisms underlying the displacement of native red-legged frogs by introduced bullfrogs. *Ecology* 82: 1964-1970.

- Koehler, HH. 2000. Natural regeneration and succession results from a 13 years study with reference to mesofauna and vegetation, and implications for management. *Landscape and Urban Planning* **51**: 123-130.
- Krausman, PR (ed). 1996. *Rangeland wildlife*. The Society for Range Management, Denver, Colorado.
- Kristan, WB and WI Boarman. 2002. Spatial pattern of risk of common raven predation on desert tortoises. *Ecology* 84(9):2432-2443.
- Kushlan, JA, MJ Steinkamp, KC Parsons, J Capp, M Acosta Cruz, M Coulter, I Davidson, L Dickson, N Edelson, R Elliot, RM Erwin, S Hatch, S Kress, R Milko, S Miller, K Mills, R Paul, R Phillips, JE Saliva, B Sydeman, J Trapp, J Wheeler, K Wohl. 2002. *Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1*. Waterbird Conservation for the Americas, Washington, DC. 78 pp.
- Latta, JJ, CJ Beardmore, and TE Corman. 1999. *Arizona Partners in Flight Bird Conservation Plan, Version 1.0*. Nongame and Endangered Wildlife Program Technical Report 142. Arizona Game and Fish Department, Phoenix, AZ.
- [LCRMSCP] Lower Colorado River Multi-Species Conservation Program. 2004. *Lower Colorado River Multi-Species Conservation Program, Volume II: Habitat Conservation Plan*. Sacramento, CA. 506 pp.
- Lee, DC, JR Sedell, BR Rieman, RF Thurow, and JE Williams. 1997. Broadscale assessment of aquatic species and habitats. Pages 1058-1496 in TM Quigley and SJ Arbelbide (tech eds), *An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins: Volume 3*. US Forest Service General Technical Report PNW-GTR-405. Pacific Northwest Research Station, Portland, Oregon.
- Leopold, AS. 1924. Grass, brush, timber, and fire in southern Arizona. *Journal of Forestry* 12:1-10.
- Lewis, LA, RJ Poppenga, WR Davidson, JR Fischer, KA Morgan. 2001. Lead toxicosis and trace element levels in wild birds and mammals at a firearms training facility. *Environmental Contamination and Toxicology* 41(208).
- Light, T. 2003. Success and failure in a lotic crayfish invasion: the roles of hydrologic variability and habitat alteration. *Freshwater Biology* 48: 1886-1897.
- Lowe, CH. 1985. *Arizona's Natural Environment*. The University of Arizona Press. Tucson, Arizona.

- Lucas, RW, TT Baker, MK Wood, CD Allison, and DM Vanleeuwen. 2004. Riparian vegetation response to different intensities and seasons of grazing. *Journal of Range Management* 57: 466-474.
- Ma, WC. 1996. Lead in mammals. Pages 281-296 *in* WN Beyer, GH Heinz, AW Redmon-Norwood (eds). *Environmental Contaminants in Wildlife. Interpreting Tissue Concentrations*. SETAC Special Publication Series, CRC Press, Boca Raton.
- MacKenzie, DI, JD Nichols, JE Hines, MG Knutson, and AB Franklin. 2003. Estimating site occupancy, colonization and local extinction probabilities when a species is detected imperfectly. *Ecology* 84: 2200-2207.
- Malcolm, JR, AW Diamond, A Markham, FX Mkanda, and AM Starfield. 1998. Biodiversity: species, communities, and ecosystems *in* JF Feenstra, I Burton, JB Smith, and RSJ Tol (eds), *Handbook on methods for climate change impact assessment and adaptation strategies, version 2.0*. United Nations Environment Programme, Nairobi, and Institute for Environmental Studies, Vrije Universiteit, Amsterdam.
- Malcolm, JR and LF Pitelka. 2000. *Ecosystems and global climate change: a review of potential impacts on US terrestrial ecosystems and biodiversity*. Pew Center on Global Climate Change. Arlington, Virginia.
- Manley, PN, WJ Zielinski, MD Schlesinger and SR Mori. 2004. Evaluation of a multiple-species approach to monitoring species at the ecoregional scale. *Ecological Applications* 14: 296-310.
- Manley, PN, B Van Horne, JK Roth, WJ Zielinski, MM McKenzie, TJ Weller, FW Weckerly and C Vojta. In Press. Multiple species inventory and monitoring technical guide. Review Draft. USDA Forest Service, Washington Office, Ecosystem Management Coordination Staff, Wildlife Fish Watershed Air Research Staff. [online] URL: http://www.fs.fed.us/psw/programs/snrc/featured_topics/msim/documents/msim_preprint.pdf
- Marshall, JT. 1957. *Birds of Pine-Oak Woodland in Southern Arizona and Adjacent Mexico*. Cooper Ornithological Society, Berkeley, California. Pacific Coast Avifauna. 125 pp.
- Marshall, RM, S Anderson, M Batcher, P Comer, S Cornelius, R Cox, A Gondor, D Gori, J Humke, R Paredes Aguilar, IE Parra, S Schwartz. 2000. *An Ecological Analysis of Conservation Priorities in the Sonoran Desert Ecoregion*. Prepared by The Nature Conservancy Arizona Chapter, Sonoran Institute, and Instituto del Medio Ambiente y el Desarrollo Sustentable del Estado de Sonora with support from Department of Defense Legacy Program, Agency and Institutional partners. 146 pp. Available online: www.azconservation.org.

- Marshall, RM, D Turner, A Gondor, D Gori, C Enquist, G Luna, R Paredes Aguilar, S Anderson, S Schwartz, C Watts, E Lopez, P Comer. 2004. An Ecological Analysis of Conservation Priorities in the Apache Highlands Ecoregion. Prepared by The Nature Conservancy of Arizona, Instituto del Medio Ambiente y el Desarrollo Sustentable del Estado de Sonora, agency and institutional partners. 152 pp. Available online: www.azconservation.org.
- Mattson, WJ and RA Haack. 1987. The role of drought in outbreaks of plant-eating insects. *Bioscience* 37: 110-118.
- McAuliffe, JR. 1995. The aftermath of wildfire in the Sonoran Desert. *Sonoran Quarterly* 49:4-8.
- McClaran, MP, LS Allen, and GB Ruyle. 1992. Livestock production and grazing management in the Encinal oak woodlands of Arizona. Pages 57-64 *in* PF Ffolliott, GJ Gottfried, DA Bennett, VM Hernandez C, A Ortega-Rubio, and RH Hamre (tech. coords.), Ecology and management of oak and associated woodlands: perspectives in the southwestern United States and northern Mexico. US Forest Service General Technical Report RM-218. Fort Collins, Colorado.
- McIntosh, BA, JR Sedell, JE Smith, RC Wissmar, SE Clarke, GH Reeves, and LA. Brown. 1994. Management history of east-side ecosystems: changes in fish habitats over 50 years, 1935-1992 *in* Eastside forest ecosystem health assessment, Volume III. US Forest Service General Technical Report PNW-GTR-321, Portland, Oregon.
- McIntyre, NE and JA Wiens. 1999. How does habitat patch size affect animal movement? An experiment with darkling beetles. *Ecology* 80 (7): 2261-2270
- McPherson, GR. 1992. Ecology of oak woodlands in Arizona. Pages 24-33 *in* PF Ffolliott, GJ Gottfried, DA Bennett, VM Hernandez C, A Ortega-Rubio, and RH Hamre (tech. coords.), Ecology and management of oak and associated woodlands: perspectives in the southwestern United States and northern Mexico. US Forest Service General Technical Report RM-218. Fort Collins, Colorado.
- Miller, GC, WB Lyons, and A Davis. 1996. Understanding the water quality of pit lakes. *Environmental Science and Technology* 30: 118-123.
- Mohave County. 1995. Mohave County General Plan. Mohave County Administrator's Office, Kingman, Arizona.
- Moir, WH and JH Dietrich. 1988. Old-growth ponderosa pine from succession in pinebunchgrass habitats in Arizona and New Mexico. *Natural Areas Journal* 8: 17-24.
- Monsen, SB and R Stevens. 1999. Symposium on pinyon and juniper ecology, restoration, and management: introduction. Pp. 3-4 *in* Monsen, S.B., and R. Stevens. Ecology and management of pinyon-juniper communities within the Interior West. Proceedings

- RMRS-P-9. U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, UT.
- Nabhan, GP and AR Holdsworth. 1999. State of the Desert Biome: Uniqueness, Biodiversity, Threats and the Adequacy of Protection in the Sonoran Bioregion. 2nd ed. Arizona-Sonora Desert Museum, Tucson, Arizona. 80pp.
- Nehlsen, W, JE Williams, and JA Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. Fisheries 16: 4-21.
- Nellis, L and K Van Gilder. 2003. The Planning for Results Guidebook: Practical Advice for Building Successful Rural Communities. Western Community Stewardship Forum—joint project of the National Association of Counties and the Sonoran Institute. 104 pp.
- Noss, RF and AY Cooperrider. 1994. Saving nature's legacy: protecting and restoring biodiversity. Island Press, Covelo, California.
- [NPS] National Park Service. 1986. Lake Mead National Recreation Area General Management Plan. On file at Lake Mead National Recreation Area, NV.
- Odum, EP. 1971. Fundamentals of ecology. Saunders. Philadelphia, Pennsylvania.
- [Ohmart](#), RD, [WC Hunter](#), and KV Rosenberg. 1991. Birds of the Lower Colorado River. The University of Arizona Press, Tucson, Arizona. 416 p.
- Osborn, S, V Wright, B Walker, A Cilimburg, and A Perkins. 2002. Linking wilderness research and management-Volume 4. Understanding and managing invasive plants in wilderness and other natural areas: an annotated reading list. US Forest Service General Technical Report RMRS-GTR-79-Vol 4. Rocky Mountain Research Station. Fort Collins, Colorado.
- Osmond, CB, M Austin, J Berry, W Billings, J Boyer, J Dacey, P Nobel, S Smith, and W Winner. 1987. Stress physiology and the distribution of plants. BioScience 37: 38-48.
- Pain, DJ, J Sears, and I Newton. 1994. Lead concentrations in birds of prey in Britain. Environmental Pollution 87:173-180.
- Pain, DJ. 1996. Lead in waterfowl. Pages 251-264 in WN Beyer, GH Heinz, AW Redmon-Norwood (eds). Environmental Contaminants in Wildlife. Interpreting Tissue Concentrations. SETAC Special Publication Series, CRC Press, Boca Raton.
- Paine, RT. 1966. Food web complexity and species diversity. American Naturalist 100: 65-75.

- Paine, RT, MJ Tegner, and EA Johnson. 1998. Compounded perturbations yield ecological surprises. *Ecosystems* 1: 535-545. New Mexico Environment Department, Surface Water Quality Bureau, Santa Fe, New Mexico.
- Parendes, LA and JA Jones. 2000. Light availability, dispersal, and exotic plant invasion along roads and streams in the HJ. Andrews Experimental Forest, Oregon. *Conservation Biology* 14: 64-75.
- Pase, CP and DE Brown. 1994a. Interior Chaparral. Pages 95-99 *in* DE Brown (ed) *Biotic Communities: Southwestern United States and Northwestern Mexico*. University of Utah Press, Salt Lake City, Utah. 342 pp.
- Pase, CP and DE Brown. 1994b. Rocky Mountain (Petran) and Madrean Montane Conifer Forests. Pages 43-48 *in* DE Brown (ed) *Biotic Communities: Southwestern United States and Northwestern Mexico*. University of Utah Press, Salt Lake City, Utah. 342 pp.
- Patten, DT and JC Stromberg. 1995. Dynamics of the landscape patches in the old growth forest on Mt. Graham (Pinaleno Mountains), Arizona. Pages 174-179 *in* DeBano, L.F., P.F. Ffolliott, A. Ortega-Rubio, G.J. Gottfried, R.H. Hamre, and C.B. Edminster, eds. *Biodiversity and management of the Madrean Archipelago: the sky islands of southwestern United States and northwestern Mexico*. General Technical Report RM-GTR-264, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
- Patterson, DT and EP Flint. 1990. Implications of increasing carbon dioxide and climate change for plant communities and competition in natural and managed ecosystems. Pages 83-110 *in* BA Kimball, NJ Rosenberg, LH Allen, GH Heichel, CW Struber, DE Kissel, S Ernst (eds), *Impact of carbon dioxide, trace gases, and climate change on global agriculture*. American Society of Agronomy Special Publication No. 53.
- Peet, RK. 1988. Forests of the Rocky Mountains. *In* MG Barbour and WD Billings (eds), *North American vegetation*. Cambridge University Press, New York, New York.
- Phillips, SJ and PW Comus. 2000. *A Natural History of the Sonoran Desert*. University of California Press. 650 pp.
- Pickett, STA and ML Cadenasso. 1995. Landscape ecology: spatial heterogeneity in ecological systems. *Science*. **269**: 331-334.
- Pickett, STA and PS White. 1985. *The Ecology of Natural Disturbance and Patch Dynamics*. Academic Press, Orlando, Florida.
- Pieper, RD. 1994. Ecological implications of livestock grazing. Pages 177-211 *in* M Vavra, WA Laycock, and RD Pieper (eds), *Ecological implications of livestock herbivory in the West*. Society for Range Management, Denver, Colorado.

- Pigott, CD and S Pigott. 1993. Water as a determinate of the distribution of trees at the boundary of the Mediterranean zone. *Journal of Applied Ecology* 81: 557-566.
- Pima County. 2000. Springs in Pima County. Sonoran Desert Conservation Plan. Pima County Administrator's Office, Tucson, Arizona.
- Pima County. 2002. Priority Biological Resources of the Sonoran Desert Conservation Plan: providing urban development guidelines as adopted in the Environmental Element of the Comprehensive Plan. Pima County Administrator's Office, Tucson, Arizona.
- PRBO Conservation Science. 2005. Adaptive Conservation Planning. Website of PRBO Conservation Science. <http://www.prbo.org/>.
- Pulliam, HR and B Babbitt. 1997. Science and the protection of endangered species. *Science* 275: 499-500.
- Pyne, SJ. 1984. Introduction to wildland fire: fire management in the United States. Wiley, New York.
- Reece, BA. 1995. Perpetual pollution. *Clementine*, winter edition, 1995. Pages 3-6.
- Reed, RA, J Johnson-Barnard, and WL Baker. 1996. Contribution of roads to forest fragmentation in the Rocky Mountains. *Conservation Biology* 10: 1098-1106.
- Responsive Management. 2003a. Arizona residents' opinions on the Arizona Game and Fish Department and its activities. Conducted for the Arizona Game and Fish Department. Responsive Management National Office, Harrisonburg, Virginia.
- Responsive Management. 2003b. Arizona residents' attitudes toward nongame wildlife. Conducted for the Arizona Game and Fish Department. Responsive Management National Office, Harrisonburg, Virginia.
- Responsive Management. 2004. Arizona residents' opinions on the Arizona Game and Fish Department and its activities. Conducted for the Arizona Game and Fish Department. Responsive Management National Office, Harrisonburg, Virginia.
- Rich, TD, CJ Beardmore, H Berlanga, PJ Blancher, MSW Bradstreet, GS Butcher, DW Demarest, EH Dunn, WC Hunter, EE Inigo-Elias, JA Kennedy, AM Martell, AO Panjabi, DN Pashley, KV Rosenberg, CM Rustay, JS Wendt, and TC Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology, Ithaca, New York.
- Rieman, BE, DC Lee, and RF Thurow. 1997. Distribution, status, and likely future trends of bull trout in the interior Columbia River and Klamath River basins. *Transactions of the 46th North American Wildlife and Natural Resources Conference* 117: 1111-1125.

- Rogers, P, D Atkins, M Frank, and D Parker. 2001. Forest Health Monitoring in the Interior West: A Baseline Summary of Forest Issues, 1996-1999. General Technical Report RMRS-GTR-75. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Rosen, PC and CR Schwalbe. 1995. Bullfrogs: introduced predators in southwestern wetlands. Pp. 542-454 in Laroe, E. T., G. S. Farris, C. E. Puckett, P. D. Doran, and M. J. Mac (eds.), Our Living Resources: A Report on the Distribution, Abundance, and Health of U.S. Plants, Animals, and Ecosystems. US Dept. of Interior, National Biological Service, Washington, DC. 530 pp.
- Rosen, PC and CR Schwalbe. 1997. Bullfrog impacts on sensitive wetland herpetofauna, and Herpetology of the San Bernardino National Wildlife Refuge. Final Report to Arizona Game and Fish Dept. Heritage Program, and USFWS. 30 pp.
- Rosenstock, SS, MJ Rabe, CS O'Brien, and RB Waddell. 2004. Studies of wildlife water developments in southwestern Arizona: wildlife use, water quality, wildlife diseases, wildlife mortalities, and influences on native pollinators. Arizona Game and Fish Department, Research Branch Technical Guidance Bulletin No. 8. Phoenix, Arizona. 15 pp.
- Salafsky, N, R Margoluis, and K Redford. 2001. Adaptive Management: A Tool for Conservation Practitioners. The Biodiversity Support Program, World Wildlife Fund, Inc. http://fosonline.org/resources/Publications/AdapManHTML/Adman_1.html
- Salafsky, N, D Salzer, J Ervin, T Boucher, and W Ostlie. 2003 (draft). Conventions for Defining, Naming, Measuring, Combining, and Mapping Threats in Conservation: An Initial Proposal for a Standard System. December 2003 version. Foundations of Success. Bethesda, Maryland. 33 pp.
- Samuels, ML and JL Betancourt. 1982. Modeling the long-term effects of fuelwood harvests on pinyon-juniper woodlands. Environmental Management 6: 505-515.
- Sanderson, EW, KH Redford, A Vedder, PB Coppolillo, and SE Ward. 2002. A conceptual model for conservation planning based on landscape species requirements. Landscape and Urban Planning 58: 41-56.
- Sarr, DA. 2002. Riparian livestock exclosure research in the western United States: a critique and some recommendations. Environmental Management 40: 516-526.
- Saunders, DA, RJ Hobbs, and CR Margules. 1991. Biological consequences of ecosystem fragmentation: a review. Conservation Biology 5: 18-32.

- Savage, M and TW Swetnam. 1990. Early and persistent fire decline in a Navajo ponderosa pine forest. *Ecology* 70: 2374-2378.
- Sayre, N. 1999. The cattle boom in southern Arizona: towards a critical political ecology. *Journal of the Southwest* 41(2): 239-271.
- Schaffer, WM., DW Zeh, SL Buchmann, S Kleinhaus, MV Schaffer, and J Antrim. 1983. Competition for nectar between introduced honeybees and native North American bees and ants. *Ecology* 64:564-577.
- Schmidt, KM, JP Menakis, CC Hardy, WJ Hann, and DL Bunnell. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. General Technical Report RMRS-GTR-87. US Department of Agriculture Forest Service, Rocky Mountain Research Station, Fort Collins, CO.
- Schoonmaker, P and W Luscombe. 2005. Habitat Monitoring: An Approach for Reporting Status and Trends for State Comprehensive Wildlife Conservation Strategies. Defenders of Wildlife. [online] www.biodiversitypartners.org
- Schowalter, TD. 1994. An ecosystem-centered view of insect and disease effects on forest health. In WW Covington and LF DeBano (eds), *Sustainable ecological systems: implementing an ecological approach to land management*. US Forest Service Technical Report RM-247. Fort Collins, Colorado.
- Schowalter, TD, WW Hargrove, and DA Crossley, Jr. 1986. Herbivory in forested ecosystems. *Annual Review of Entomology* 31: 177-196.
- Schowalter, TD and P Turchin. 1993. Southern pine beetle infestation and development: interaction between pine and hardwood basal areas. *Forest Science* 39: 201-210.
- Schulze, ED, R Robichaux, J Grace, P Rundel, and J Ehleringer. 1987. Plant water balance. *BioScience* 37: 30-37.
- Schussman, H and D Gori. 2004. An Ecological Assessment of the Bureau of Land Management's Current Fire Management Plans: Materials and Recommendations for Future Fire Planning. Report to Bureau of Land Management, Arizona State Office, Phoenix, Arizona. 101 pp.
- Sears, J. 1988. Regional and seasonal variations in lead poisoning in the mute swan *Cygnus olor* in relation to the distribution of lead and lead weights in the Thames area, England. *Biological Conservation* 46:115-134.
- Semlitsch, RD and JR Bodie. 2003. Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles. *Conservation Biology* 17:1219-1228.

- Sheridan, TE. 1995. *Arizona: A History*. University of Arizona Press, Tucson, Arizona.
- Silberman, J. 2001. The Economic Importance of Fishing and Hunting for the State of Arizona. School of Management, Arizona State University, Tempe, Arizona.
- Silberman, J. 2002. The Economic Importance of Off-Highway Vehicle Recreation for the State of Arizona. School of Management, Arizona State University, Tempe, Arizona.
- Smith, ER. 1953. History of grazing industry and range conservation developments in the Rio Grande basin. *Journal of Range Management* 6: 405-409.
- Sorensen, JA and CB Nelson. 2002. Interim conservation plan for *Oxyloma (haydeni) kanabensis* complex and related ambersnails in Arizona and Utah. Nongame and Endangered Wildlife Program Technical Report 192. Arizona Game and fish Department, Phoenix, Arizona.
- Southwick Associates. 2003. Economic Impact Analysis of Nonconsumptive Wildlife-Related Recreation in Arizona. Conducted for the Arizona Game and Fish Department. In conjunction with the Responsive Management project, Arizona residents' attitudes toward nongame wildlife.
- Sprigg, W, T Hinkley, and the Southwest Regional Assessment Group. 2000. Preparing for a Changing Climate: the potential consequences of climate variability and change. Report for the US Global Change Research Program. Institute for the Study of Planet Earth, University of Arizona, Tucson, Arizona. 60 pp.
- Stark, C and B Cestero. 2001. *Landscapes, Wildlife, and People: a Community Workbook for Habitat Conservation*. Sonoran Institute. Tucson, Arizona. 76 pp.
- Starnes, LB and DC Gasper. 1996. Effects of surface mining on aquatic resources in North America. American fisheries society position statement. *Fisheries* 21: 24-26.
- Stein, BA, LS Kutner, and JS Adams (eds). 2000. *Precious Heritage: the Status of Biodiversity in the United States*. Oxford University Press. 416 pp.
- Stevens, LE and VJ Meretsky (eds). In press. Every last drop: ecology and conservation of North American springs. University of Arizona Press, Tucson, Arizona.
- Stevens, LE, FR Protiva, DM Kubly, VJ Meretsky and JR Petterson. 1997. The ecology of Kanab ambersnail (Succineidae: *Oxyloma haydeni kanabensis* Pilsbry, 1948) at Vaseys Paradise, Grand Canyon, Arizona: Final Report, US Bureau of Reclamation Glen Canyon Environmental Studies Program Report, Flagstaff, Arizona.

- Stevens, LE, and AE Springer. 2004. A conceptual model of springs ecosystem ecology: Task 1b final report. NPS cooperative agreement number CA 1200-99-009. Report to the National Park Service.
- Stevens, R, and SB Monson. 2004. Guidelines for Restoration of Principal Plant Communities. In Monson, SB, R. Stevens, and N Shaw (comps), Restoring Western Ranges and Wildlands, USDA Forest Service Rocky Mountain Research Station RMRS-GTR 136 vol.1. Available online: http://www.fs.fed.us/rm/pubs/rmrs_gtr136.html.
- Stohlgren, TJ, D Brinkley, GW Chong, MA Kalkhan, LD Schell, KA Bull, Y Otsuki, G Newman, M Bashkin, and Y Son. 1999. Exotic plant species invade hot spots of native plant diversity. *Ecological Monographs* 69: 25-46.
- Stromberg, JC. 2001. Restoration of riparian vegetation in the southwestern United States: importance of flow regimes and fluvial dynamism. *Journal of Arid Environments* 49: 17-34.
- Swetnam, TW. 1990. Fire history and climate in the southwestern United States. Pages 6-17 in JS Krammes (tech coord), Proceedings-Effects of Fire Management of Southwestern Natural Resources, 1988. Tucson, Arizona. US Forest Service General Technical Report RM-191.
- Swetnam, TW and CH Baisan. 1996. Historical fire regime patterns in southwestern United States since A.D. 1700. Pages 11-32 in CD Allen (tech ed), Fire effects in southwestern forests: proceedings of the Second La Mesa Fire Symposium. US Forest Service General Technical Report RM-GTR 286. Fort Collins, Colorado.
- Swetnam, TW and JL Betancourt. 1990. Fire-southern oscillation relations in the southwestern United States. *Science* 249: 1017-1021.
- Szacki, J and A Liro. 1991. Movements of small mammals in the heterogeneous landscape. *Landscape Ecology* 5 (4): 219-224.
- Tausch, RJ 1999. Historic pinyon and juniper woodland development. Pp. 12-19 in Monsen, S.B., and R. Stevens. Ecology and management of pinyon-juniper communities within the Interior West. Proceedings RMRS-P-9. U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, UT.
- Tellman, B. (ed.). 2002. Invasive Exotic Species in the Sonoran Desert Region. University of Arizona Press, Tucson, Arizona.
- Tellman, B., R. Yarde, M.G. Wallace. 1997. Arizona's changing rivers: how people have affected the rivers. Water Resources Research Center, College of Agriculture, The University of Arizona, Tucson, Ariz.

- The Wildlife Society. 1996. Position statement on livestock grazing on federal rangelands in the western United States. *The Wildlifer* 274: 10-13.
- Thurow, RF, DC Lee, and BE Rieman. 1997. Distribution and status of seven native salmonids in the interior Columbia Basin and portions of the Klamath River and Great Basins. *Transactions of the 46th North American Wildlife and Natural Resources Conference* 117: 1094-1110.
- [TNC] The Nature Conservancy. 2001. Ecoregion-based conservation in the Mojave Desert. The Nature Conservancy of Nevada, Las Vegas. 367 pp. Available online: www.azconservation.org.
- [TNC] The Nature Conservancy. 2004a. Arizona Forest Legacy Program: Assessment of Need. Report to Arizona State Land Department, Fire Management Division, Phoenix, Arizona. 269 pp.
- [TNC] The Nature Conservancy. 2004b. Management of Arizona's Wildlife Habitat: an analysis of selected habitat types for use in Arizona's Comprehensive Wildlife Conservation Strategy. Submitted to the Arizona Game and Fish Department, August 2004. The Nature Conservancy, Tucson, Arizona. 12 pp. Available online: www.azconservation.org, and www.azgfd.gov/w_c/cwcs_format.shtml
- [TNC] The Nature Conservancy. 2005. Ecoregional Assessment Results for Arizona: information for Arizona's Comprehensive Wildlife Conservation Strategy that can be derived from ecoregional analyses. Submitted to the Arizona Game and Fish Department, January 2005. The Nature Conservancy, Tucson, Arizona. 10 pp. Available online: www.azconservation.org, and www.azgfd.gov/w_c/cwcs_format.shtml
- Trousil, J. 2001. Integrated Natural Resources Management Plan and Environmental Assessment 2001-2005: US Army Intelligence Center and Fort Huachuca, Arizona. Prepared by Gene Stout and Associates and Universe Technologies, Inc.
- Tuhy, JS, P Comer, D Dorfman, M Lammert, J Humke, B Cholvin, G Bell, B Neely, S Silbert, L Whitham, and B Baker. 2002. A conservation assessment of the Colorado Plateau ecoregion. The Nature Conservancy, Moab, Utah. 110 p. + appendices. Available online: www.azconservation.org.
- Turner, RM. 1994a. Mohave Desertscrub. *in* Brown, DE (ed). *Biotic Communities: Southwestern United States and Northwestern Mexico*. University of Utah Press, Salt Lake City, Utah. 342 pp.
- Turner, RM. 1994b. Great Basin Desertscrub. *in* Brown, DE (ed). *Biotic Communities: Southwestern United States and Northwestern Mexico*. University of Utah Press, Salt Lake City, Utah. 342 pp.

Turner, RM, RH Webb, JE Bowers, and JR Hastings. 2003. The Changing Mile Revisited: an ecological study of vegetation change with time in the lower mile of an arid and semiarid region. The University of Arizona Press, Tucson, Arizona. 334 pp.

[TWW] Teaming With Wildlife Committee. 2003a. State Wildlife Grants: The Nation's Core Program for Preventing Wildlife from Becoming Endangered. International Association of Fish and Wildlife Agencies, Washington DC. www.teaming.com

[TWW] Teaming With Wildlife Committee. 2003b. State Wildlife Conservation Strategies: Defining a Vision for Conservation Success. International Association of Fish and Wildlife Agencies, Washington DC. www.teaming.com

[TWW] Teaming With Wildlife Committee. 2003c. State Wildlife Conservation Strategies: Eight Required Elements. International Association of Fish and Wildlife Agencies, Washington DC. www.teaming.com

[TWW] Teaming With Wildlife Committee. 2003d. Identifying Species in Greatest Need of Conservation. International Association of Fish and Wildlife Agencies, Washington DC. www.teaming.com

[TWW] Teaming With Wildlife Committee. 2005. CWCS: Monitoring and Evaluation. International Association of Fish and Wildlife Agencies, Washington DC. www.teaming.com

US Census Bureau. 2000. Arizona County and State Statistics. <http://www.census.gov/census2000/states/az.html>

US Census Bureau. 2005. Arizona County and State Statistics. <http://www.census.gov/census2005/states/az.html>

US Department of Justice, Immigration and Naturalization Service. 2000. Revised draft supplemental programmatic environmental impact statement for INS and joint task force six activities along the U.S./Mexico Border. US Army Corps of Engineers, Fort Worth.

[USFS] US Forest Service. 1993. Changing conditions in southwestern forests and implications on land stewardship. USDA Forest Service, Southwest Region, Albuquerque, New Mexico.

[USFS] US Forest Service. 2000. Forest service roadless area conservation draft environmental impact statement, Volume 1. USDA Forest Service, Washington Office. Washington, D.C.

[USFS] US Forest Service. 2003. Draft RPA 2002 Forest Resource Tables. St. Paul, MN: US Department of Agriculture, Forest Service. Accessed December 2005, available at http://ncrs2.fs.fed.us/4801/fiadb/rpa_table/2002_rpa_draft_tables.htm.

- [USFS] US Forest Service. 2003. Forest Insect and Disease Conditions in the Southwestern Region, 2002. Report R3-03-01, Southwestern Region Forestry and Forest Health, US Department of Agriculture Forest Service, Albuquerque, NM. Available online: <http://www.fs.fed.us/r3/publications/documents/fidc2003.pdf>
- [USFS] US Forest Service. 2004a (draft). Recommendations for Monitoring Terrestrial Animal Species and Their Habitats (Multi-Species Inventory and Monitoring Protocol). Report of the Wildlife Monitoring Steering Committee, USDA Forest Service, Flagstaff, Arizona.
- [USFS] US Forest Service. 2004b. Forest Insect and Disease Conditions in the Southwestern Region, 2003. Report R3-04-02, Southwestern Region Forestry and Forest Health, US Department of Agriculture Forest Service, Albuquerque, NM. Available online: <http://www.fs.fed.us/r3/publications/documents/fidc2004.pdf>
- [USFS] US Forest Service. 2005. Forest Insect and Disease Conditions in the Southwestern Region, 2004. Report R3-05-01, Southwestern Region Forestry and Forest Health, USDA Forest Service, Albuquerque, New Mexico. Available online: <http://www.fs.fed.us/r3/publications/documents/fidc2005.pdf>
- [USGS] National Gap Analysis Program. 2005. Provisional Digital Land Stewardship Map for the Southwestern United States. Version 1.0. Center for Applied Spatial Ecology, New Mexico Cooperative Fish and Wildlife Research Unit, New Mexico State University.
- [USFWS] US Fish and Wildlife Service. 1995. Kanab Ambersnail (*Oxyloma haydeni kanabensis*) Recovery Plan. US Fish and Wildlife Service, Denver, Colorado. 21 pp.
- Valencia, RA 1993. Arizona riparian inventory and mapping project a report to the Governor, President of the Senate and Speaker of the House. Arizona Game and Fish Department, Phoenix, Arizona.
- Voeltz, J. in lit. *Rana yavapaiensis* (Lowland Leopard Frog) Reproduction. To be submitted to Herpetological Review.
- Walstad, JD, SR Radosevich, and DV Sandberg (eds). 1990. Natural and prescribed fire in Pacific Northwest forests. Oregon State University Press, Corvallis, Oregon.
- Walter, H. 1973. Vegetation of the Earth in Relation to Climate and the Ecophysiological Conditions. Heidelberg Science Library 15:1-237. English Universities Press, London, Springer-Verlag, New York, Heidelberg, Berlin. (cited in Brown 1994)
- Walters, C. 1997. Challenges in adaptive management of riparian and coastal ecosystems, Conservation Ecology 1 (2): 1. <http://www.consecol.org/vol1/iss2/art1>

- Waring, RH, and GB Pittman. 1983. Physiological stress in lodgepole pine as a precursor for mountain pine beetle attack. *Zeitschrift fur angewandte Entomologie* 96: 265-270.
- Warshall, P. 1995. Southwestern sky island ecosystems. Pages 318-322 in ET LaRoe, GS Farris, CE Puckett, PD Doran, and MJ Mac (eds), *Our living resources: a report to the nation on the distribution, abundance, and health of US plants, animals, and ecosystems*. US Department of the Interior, National Biological Service, Washington, DC.
- Warshall, P. 1995. The Madrean sky island archipelago: A planetary overview. Pp. 6-18 in LF DeBano, PF Ffolliott, A Ortega-Rubio, GJ Gottfried, RH Hamre, and CB Edminister (technical coordinators). *Biodiversity and management of the madrean archipelago: the sky islands of southwestern United States and northwestern Mexico*. 1994 September 19-23, Tucson, Arizona. General Technical Report RM-GTR-264. Fort Collins, Colorado: US Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 669 pp.
- Webb, RH and JL Betancourt. 1992. Climatic variability and flood frequency of the Santa Cruz River, Pima County, Arizona. Geological Survey Water Supply Paper 2379. Reston, Virginia. 40 pp.
- Weedman, DA. 1999 (draft). Gila Topminnow, *Poeciliopsis occidentalis occidentalis*, Revised Recovery Plan. Prepared by Arizona Game and Fish Department for US Fish and Wildlife Service, Albuquerque, New Mexico, 83 pp.
- Weltzin, JF and GR McPherson. 1995. Potential effects of climate change on lower treelines in the southwestern United States. Pages 180-193 in LF DeBano, PF Ffolliott, A Ortega-Rubio, GJ Gottfried, RH Hamre, and CB Edminister (tech coords), *Biodiversity and management of the Madrean Archipelago: the Sky Islands of the southwestern United States and northwestern Mexico*. 1995. Tucson, Arizona. US Forest Service General Technical Report RM-GTR-264. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- Wemple, BC, JA Jones, and GE Grant. 1996. Channel network extension by logging roads in two basins, Western Cascades, Oregon. *Water Resources Bulletin* 32: 1195-1207.
- White, D, EM Preston, KE Freemark, and AR Kiester. 1999. A Hierarchical framework for conserving biodiversity. Pages 127-153 in JM Klopatek and RH Gardner (editors), *Landscape ecological analysis: issues and applications*. 1999. Springer-Verlag, New York, New York
- White, MR. 2002. Characterization of, and changes in the Subalpine and Montane Grasslands, Apache - Sitgreaves National Forests, Arizona [dissertation]. Northern Arizona University, Flagstaff, Arizona. 206pp.

- White, PS and JS Walker. 1997. Approximating nature's variation: selecting and using reference information in restoration ecology. *Restoration Ecology* **5** (4): 338-349.
- Wilcox, BA and DD Murphy. 1985. Conservation strategy: the effects of fragmentation on extinction. *American Naturalist*. 125: 879-887.
- Wildlife Workgroup. 2003. Wildlife Reference Document for Coconino County, Arizona. Developed for the Coconino County Comprehensive Plan by the Comprehensive Planning Partnership Wildlife Workgroup. Flagstaff, Arizona.
- Williams, BK. 2003. Policy, research, and adaptive management in avian conservation. *Auk* **120** (1): 212-217.
- Wilson, AD and ND MacLeod. 1991. Overgrazing: present or absent? *Journal of Range Management* 44: 475-482.
- Wilson, JL and BM Tkacz. 1994. Status of insects and diseases in the Southwest: implications for forest health. In: WW Covington and LF DeBano (eds). Sustainable ecological systems: implementing an ecological approach to land management. US Forest Service Technical Report RM-247. USDA Forest Service, Fort Collins, Colorado.
- Wisdom, MJ, RS Holthausen, BK Wales, CD Hargis, VA Saab, DC Lee, WJ Hann, TD Rich, MM Rowland, WJ Murphy, and MR Eames. 2000. Source habitats for terrestrial vertebrates of focus in the interior Columbia Basin: broad-scale trends and management implications. US Forest Service General Technical Report PNW-GTR-485. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon.
- Wooten, EO. 1908. The range problem in New Mexico. *New Mexico College of Agriculture and Mechanical Arts, Agriculture Experiment Station Bulletin* 66, Las Cruces, New Mexico.
- Wright HA, LF Neuenschwander, and CM Britton. 1979. The role of fire in sagebrush grass and pinyon-juniper plant communities: a state of the art review. USDA Forest Service General Tech Report, INT- 58. USDA Forest Service, Intermountain Forest and Range Experiment Station. 48pp.
- Wright, JP, CG Jones, and AS Flecker. 2002. An ecosystem engineer, the beaver, increases species richness at the landscape level. *Oecologia* 132 (1): 96-101.
- York, JC and WA Dick-Peddie. 1969. Vegetation changes in southern New Mexico during the past hundred years. Pages 157-199 *in* WG McGinnies and BJ Goldman (eds), *Arid lands in perspective*. University of Arizona Press, Tucson, Arizona.
- Zavaleta, ES, RJ Hobbs, and HA Mooney. 2001. Viewing invasive species removal in a whole-ecosystem context. *Trends in Ecology and Evolution* 16: 454-459.

APPENDIX A. CWCS GLOSSARY OF TERMS

“*” Indicates use of the official US definitions regarding invasive species. These were provided in Executive Order 13112 signed by President William Clinton on February 3, 1999. These and other definitions are available at the Invasive Species website: www.invasivespeciesinfo.gov/laws/execorder.shtml.

Abiotic Resource: non-living materials (for example: air, water, soil, minerals, fuels, wind, and solar radiation).

Aboriginal: native or initial human occupants of a specific location.

Accidental or casual migrants: bird species that do not typically travel through or into a specific area (=outside their normal range, distribution, or migration routes).

***Alien species:** with respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem. CONVENTIONALLY, THESE SPECIES ARE REFERED TO AS “NONNATIVES” BY THE DEPARTMENT. “NONNATIVE” IS USED IN THIS CWCS.

Anadromous: species that reproduce in freshwater habitats and migrate to marine habitats to mature.

Biodiversity: a variety of plant and animal species within communities or ecosystems; includes genetic variants within a population and transient or migratory species.

Biotic Resource: living plant and animal species.

Candidate: a conservation status under the ESA where a species or population is potentially at risk of decline throughout all or a significant portion of its range (=proposed for listing as either threatened or endangered).

Community: an assemblage of species co-existing within a specific location.

***Control:** as appropriate, eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of invasive species from areas where they are present, and taking steps such as restoration of native species and habitats to reduce the effects of invasive species and to prevent further invasions.

Crustaceans: crayfish, shrimp, and amphipods (=scuds).

Ecoregion: a large area of land and water that is characterized by distinct plant communities, plant and animal species, and environmental conditions such as climate and landforms.

APPENDIX A. GLOSSARY (CONTINUED)

*Ecosystem: the complex of a community of organisms and its environment (Definition under Executive Order 13112). Biologically, the term has less of an organism focus and is considered a system of environmental conditions, habitats, and species that interact.

Endangered: 1) a conservation status under the ESA where a species is at risk of extinction throughout all or a significant portion of its range. 2) a condition where a species or population has a low probability of survival over time due to various stressors and reduced population level or fitness.

Endemic: a species that is native to a specific location and occurs nowhere else.

Ephemeral: water flow or standing water that occurs seasonally within a drainage or area.

Extinct: a species that is no longer alive.

Extirpated: a species or population that is locally extinct, but continues to exist elsewhere.

Fauna: animal species or populations.

Feral: animals that were once domesticated (including their off-spring) but now are living wild.

Flora: plant species or populations.

Game species: those animals that are regulated for hunting or harvest.

Intermittent: water flow that irregularly occurs within a drainage or area (alternating between surface and subsurface flow).

*Introduction: the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity

*Invasive species: an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health (Definition under Executive Order 13112). Biologically, it can refer to a nonnative plant or animal species that under certain conditions significantly out-competes, displaces, or eliminates other species within a community.

Macroinvertebrate: animals without backbones (for example: insects, spiders, crustaceans, mollusks) that can be seen without magnification.

Mollusk: clams and snails.

Monotypic: a community or stand of vegetation that contains one species or type of vegetation.

APPENDIX A. GLOSSARY (CONTINUED)

*Native species: with respect to a particular ecosystem, a species that, other than as a result of an introduction [of a nonnative species], historically occurred or currently occurs in that ecosystem

Nuisance species: a species that is considered a pest or problem (often these are invasive species). Both native and nonnative species may be considered as “nuisance.”

Perennial: water flow or standing water all year long within a drainage or area.

Precipitation: rain and snow.

*Species: a group of organisms all of which have a high degree of physical and genetic similarity, generally interbreed only among themselves, and show persistent differences from members of allied groups of organisms.

Species of Greatest Conservation Need: vertebrates, crustaceans, and mollusks that rank high in the CWCS Vulnerability category and have been identified for immediate action.

Sportfish: fish that are regulated for harvest by angling or other means.

Stakeholders: includes State, tribal, and local government agencies, academic institutions, the scientific community, nongovernmental entities including environmental, agricultural, and conservation organizations, trade groups, commercial interests, and private landowners.

Stressors: activities or conditions (human-caused or natural) that negatively affect the health and distribution of wildlife and vegetative communities.

Taxon/Taxa: classifications or groups of animals or plants that share similar evolutionary lineages, general body forms, life histories, and/or reproductive means (for example: there are 6 taxon groups of animals referenced in the CWCS—amphibians, birds, fish, crustaceans, mollusks, mammals, and reptiles).

Threatened: 1) a conservation status under the ESA where a species is at risk of becoming endangered in the foreseeable future throughout all or a significant portion of its range. 2) a condition where a species or population has a medium to low probability of survival over time due to various stressors and reduced population level or fitness.

Tier 1a or 1b: SGCN that have been identified for immediate conservation action.

APPENDIX B. ACRONYMS USED IN ARIZONA'S CWCS

ACOE	Army Corps of Engineers
ADA	Arizona Dept of Agriculture
ADEQ	Arizona Dept of Environmental Quality
ADHS	Arizona Dept of Health Services
ADOT	Arizona Dept of Transportation
ADWR	Arizona Dept of Water Resources
AFB	Air Force Base
AGFC	Arizona Game and Fish Commission
AGFD	Arizona Game and Fish Department
AHN	Apache Highlands North Ecoregion
AHS	Apache Highlands South Ecoregion
ASP	Arizona State Parks
ASLD	Arizona State Land Department
ATV	All-Terrain Vehicle
AWLW	Arizona Wildlife Linkages Workgroup
AZDEMA	Arizona National Guard-Department of Emergency and Military Affairs
AZNM	Arizona-New Mexico Mountains Ecoregion
BLM	Bureau of Land Management
CP	Colorado Plateau Ecoregion
CSE	Center for Sustainable Environments
CWCS	Comprehensive Wildlife Conservation Strategy
CMP	Conservation Measures Partnership
DHS	Department of Homeland Security-Border Patrol
DoD	Department of Defense
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FHA	Federal Highways Administration
GIS	Geographic Information System
HCP	Habitat Conservation Plans
HPC	Habitat Partnership Committee
HDMS	Heritage Database Management System
IAWFA	International Association of Fish and Wildlife Agencies
IPCC	International Panel on Climate Change
IUCN	International Union for the Conservation of Nature (= World Conservation Union)
LLC	Limited License Company
MD	Mohave Desert Ecoregion
MOU	Memorandums of Understanding
MS	Microsoft
NAAT	National Advisory Acceptance Team
NABCI	North American Birds Conservation Initiative
NEPA	National Environmental Policy Act
NF	National Forest
NGO	Non-Government Organizations

APPENDIX B. ACRONYMS (CONTINUED)

NP	National Park
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NWR	National Wildlife Refuge
NWTF	National Wild Turkey Federation
PARC	Partners in Amphibian and Reptile Conservation
PIF	Partners in Flight
RD	Ranger District
SD	Sonoran Desert Ecoregion
SGCN	Species of Greatest Conservation Need
SHA	Safe Harbor Agreements
SW	Southwest
SWG	State Wildlife Grants
TNC	The Nature Conservancy
TWW	Teaming With Wildlife Committee
UA	University of Arizona
USBR	US Bureau of Reclamation
USDA-WS	US Dept of Agriculture-Wildlife Services
USFWS	US Fish and Wildlife Service
USFS	US Forest Service
USGS	US Geological Survey
WCC	Wildlife Conservation Council
WGCN	Wildlife of Greatest Conservation Need

APPENDIX C. CONTACT LIST

Agencies, Tribes, Local Governments, Non-Governmental Organizations, Constituency Groups, Industry Affiliations, Universities, and Special Interest Groups.

Arizona Dept of Health Services	USFS Kaibab Nat'l Forest (NF)	NPS Southern Arizona Office
Arizona State Parks	USFS Coronado NF	NPS Petrified Nat'l Park (NP)
Arizona Dept of Agriculture	USFS Coconino NF	NPS Grand Canyon NP
Arizona Dept of Transportation	USFS Tonto NF	NPS Saguaro NP East and West
Arizona National Guard-DEMA	USFS Apache-Sitgreaves NF	NPS Lake Mead Nat'l Rec Area
Arizona State Land Dept	USFS Prescott NF	NPS Glen Canyon Nat'l Rec Area
Arizona Dept of Water Resources	USFS Peaks Ranger District (RD)	NPS Organ Pipe Nat'l Monument
Arizona Dept of Enviro Quality	USFS Mormon Lake RD	NPS Pipe Springs Nat'l Monument
Navajo Nation	USFS Red Rock RD	NPS Chiricahua Nat'l Monument
Hopi Tribe	USFS Mogollon RD	NPS Tonto Nat'l Monument
San Carlos Apache Tribe	USFS Williams/Chalander RD	NPS Tuzigoot Nat'l Monument
White Mt Apache Tribe	USFS North Kaibab RD	NPS Flagstaff area Nat'l Monuments
Tohono O'odhom Nation	USFS Tusayan RD	NPS Canyon de Chelly Nat'l Mon
Hualapai Nation	USFS Prescott NF	BLM Phoenix Field Office
Ft McDowell Yavapai Nation	USFS Chino Valley RD	BLM Arizona State Office
Colorado River Indian Tribes	USFS Verde RD	BLM Safford Field Office
Gila River Indian Community	USFS Nogales RD	BLM Arizona Strip Field Office
Kaibab Band of Paiute Indians	USFS Sierra Vista RD	BLM San Pedro Field Office
Ak-Chin Indian Community	USFS Safford RD	BLM Kingman Field Office
Cocopah Tribe	USFS Santa Catalina RD	BLM Lower Colorado Region Office
Pascua Yaqui Tribe	USFS Alpine RD	BLM Tucson Field Office
San Juan Southern Paiute Tribe	USFS Clifton RD	BLM Lake Havasu Field Office
Tonto Apache Tribe	USFS Chevelon/Heber RD	BLM Yuma Field Office
Yavapai Apache Tribe	USFS Springerville RD	Army Corp of Engineers
Yavapai-Prescott Tribe	USFS Lakeside RD	US Bureau of Reclamation
Salt R Pima-Maricopa Indian Com	USFS Cave Creek RD	EPA Region 9 San Diego Office
USFWS AZ Eco Services Office	USFS Tonto NF	USDA Nat Res Cons Service
USFWS Kofa NWR	USFS Globe RD	USDA-Wildlife Services
USFWS Cabeza Prieta NWR	USFS Mesa RD	DOD Ft Huachuca Military Res
USFWS San Bernardino NWR	USFS Payson RD	DOD Luke AFB Goldwater Range
USFWS Bill Williams NWR	USFS Pleasant Valley RD	DOD Yuma Proving Grounds
USFWS Buenos Aires NWR	USFS Tonto Basin	DOD Florence Military Res
USFWS Havasu NWR	US Border Patrol, Tucson Sector	City of Phoenix
USFWS Cibola NWR	Federal Highways Administration	City of Mesa
USFWS Imperial NWR	USGS-Colorado Plateau Studies	City of Scottsdale
Maricopa County Parks & Rec	Yuma County	Town of Cave Creek
Pima County Parks & Recreation	Yavapai County	City of Peoria
Yuma Metro Planning Organization	Santa Cruz County	City of Surprise
Pima Association of Governments	Pinal County	City of Goodyear
Maricopa Assoc of Governments	Pima County	Town of Buckeye
Northern AZ Council of Govts	Navajo County	City of Apache Junction
League of AZ Cities & Towns	Mohave County	City of Prescott
Western AZ Council of Govts	Maricopa County	Town of Prescott Valley
Central AZ Assoc of Governments	La Paz County	City of Cottonwood
Southeastern AZ Govts Organization	Greenlee County	City of Sedona
Salt River Project	Gila County	Town of Camp Verde

APPENDIX C. CWCS CONTACT LIST (CONTINUED)

Arizona Public Service	Coconino County	City of Williams
Tucson Electric Power	Cochise County	City of Flagstaff
El Paso Natural Gas	Apache County	Town of Fredonia
Phelps Dodge Corporation	Bullhead City	City of Kingman
Town of Winslow	TNC State Office	Apache County ATV Roughriders
City of Holbrook	TNC White Mts Program Office	Arizona Wildlife Federation
Town of Snowflake	TNC Tucson Program Office	AZ Wildlife Conservation Council
City of St Johns	TNC Northern AZ Program Office	AZ Desert Bighorn Sheep Society
City of Show Low	TNC Phoenix Program Office	Arizona Antelope Foundation
Town of Pinetop-Lakeside	TNC Prescott Program Office	Arizona Deer Association
Town of Springerville	TNC Ramsey Canyon Preserve	Arizona Elk Association
Town of Eager	Arizona Audubon Council	Rocky Mt Elk Foundation, Arizona
City of Payson	AZ Audubon Huachuca Chapter	AZ Mule Deer Assoc, East Valley
Town of Globe	AZ Audubon Maricopa Chapter	AZ Mule Deer Assoc, Tucson
City of Safford	AZ Audubon Prescott Chapter	AZ Mule Deer Assoc, Flagstaff
Town of Superior	AZ Audubon Sonoran Chapter	Mule Deer Federation, AZ Chapters
Town of Willcox	AZ Audubon Tucson Chapter	Arizona Predator Callers
City of Bisbee	AZ Audubon Northern AZ Chapter	Phoenix Varmint Callers, Inc.
City of Benson	AZ Audubon White Mt Chapter	Southern AZ Wildlife Callers
City of Sierra Vista	AZ Audubon Yuma County Chapter	Cochise Gun Club
City of Nogales	Audubon All Birds Cons Program	Arizona Trappers Association
City of Tucson	Sierra Club Grand Canyon Chapter	Phoenix Retriever Club
Town of Casa Grande	Arizona Riparian Council	Arizona Bow Hunters Association
Town of Gila Bend	Arizona Heritage Alliance	Arizona Quail Alliance
Town of Ajo	Wildlife for Tomorrow Foundation	Safari Club Int'l, Phoenix Chapter
City of Yuma	The Wildlife Society State Chapter	Safari Club Int'l, Arizona Chapter
Town of Quartzsite	Malpai Borderlands Group	US Power Squadron
Town of Wickenburg	Wildlands Project	Yuma Valley Rod & Gun Club
Lake Havasu City	Sky Islands Alliance	Chandler Rod & Gun Club
Town of Parker	Arizona Wilderness Alliance	Mohave Sportsman Club
Town of Paradise Valley	Desert Foothills Land Trust	Coconino Sportsmen
City of Glendale	Diablo Trust	Scottsdale Sportsman's Club
City of Tempe	McDowell Sonoran Land Trust	Southeast AZ Sportsmen Club
City of Chandler	Grand Canyon Trust	Quail Unlimited, Cottonwood-Verde
Town of Gilbert	Greater Flagstaff Forest Partnership	Western Gamebird Alliance
Town of Fountain Hills	Sonoran Institute / Rincon Institute	Northern Arizona Flycasters
Town of Carefree	Southeastern AZ Land Trust	Arizona Flyfishing
Town of Queen Creek	Grand Canyon Wildlands Council	Arizona Flycasters Club
Town of Marana	Defenders of Wildlife	Desert Flycasters
Town of Sahuarita	White Mt Conservation League	Southwest Walleye Anglers
Town of Florence	AZ League of Conservation Voters	Trout Unlimited, Arizona Council
Town of Chino Valley	Animal Defense League of AZ	Trout Unlimited, Lees Ferry Chapter
Town of Page	Animal Crusaders	Trout Unlimited, Old Pueblo Chapter
Arizona Mushroom Club	Southeastern AZ Bird Observatory	Trout Unlimited, Zane Grey Chapter
Arizona Herb Association	Center for Biological Diversity	White Mountain Fly-fishing Club
Washington Garden Club	Arizona Native Plant Society	Arizona Bass Club
Old Fashioned Garden Club	Central AZ Cactus/Succulent Society	Tucson Bass Club
Sun City West Garden Club	Central Arizona Paddlers Club	Old Pueblo Bass Anglers
Valley of the Sun Gardeners	Grand Canyon River Guides	Arizona BASS Federation

APPENDIX C. CWCS CONTACT LIST (CONTINUED)

Tempe Garden Club	AZ State Assoc of 4WD Clubs	Ducks Unlimited, local chapters
Las Piedras Garden Club	AZ Off-Highway Vehicle Coalition	Valley Longbeards, NWTF Phoenix
Litchfield Park Garden Club	Arizona ATV Riders Inc	Arizona Desert Gobblers, NWTF
Good Earth Garden Club	Arizona Trail Riders Association	Nat'l Wild Turkey Fed, Tucson
Gardens for Humanity	Arizona Trail Riders	Nat'l Wild Turkey Fed, Glendale
Desert Designers	White Mt Open Trails Association	Nat'l Wild Turkey Fed, State Chap
Arizona Motorola Hiking Club	Arizona Farm Bureau	TWS Chapter, AZ State University
Volunteers for Outdoor Arizona	Arizona Cattle Growers' Assoc	TWS Chapter, N Arizona University
Outdoors Arizona	Alpine Habitat Partnership Comm	TWS Chapter, University of Arizona
Sonoran Joint Venture	Winslow HPC	AZ State University Life Sciences
Intermountain West Joint Venture	Show Low HPC	Univ of AZ Desert SW Cooperative
National Turtle/Tortoise Society, AZ	Springerville HPC	Northern AZ Univ Biological Sciences
Phoenix Zoo, AZ Zoological Assoc	Flagstaff HPC	Prescott College
Arizona-Sonoran Desert Museum	Williams HPC	Grand Canyon University
Desert Botanical Garden	Fredonia HPC	Payson Natural Resources Comm
Forage Resources Study Group	Kingman HPC	Southwest AZ HPC
Coconino Nat Res Cons District	Prescott HPC	Southeastern AZ HPC

APPENDIX D. ECOREGION WORKGROUP PARTICIPANTS (CONTINUED)

Name	Agency	Threat Assessment Teams						Species Criteria	Conservation Actions
		AHN	AHS	AZNM	CP	MD	SD		
Larry Laing	NPS		X						
Josh Tiaz	USFS		X						
Sheridan Stone	DOD		X					X	
Tom Skinner	USFS		X						
Patti Spindler	ADEQ		X						
Carol Beardmore*	USFWS		X					X	
Frank Toupel*	NRCS		X						
Heidi Kuska*	BLM		X						
Mike Ross*	USFS		X						
Steve Smarick*	NRCS						X		
John Morgart*	USFWS						X		
JT Hess*	DOD						X		
Heidi Plank*	BLM						X	X	
Mark Howell*	BLM						X		
Ron Kearns*	USFWS						X		
Bill Noble	USFS				X				
Steve Mitchelson	NPS				X				
Addison Mohler	Hualapai				X				
Annette Morgan	Hualapai				X				
Bruce Higgins	USFS				X				
Pat Thompson	NPS				X				
Brian Dykstra	USFS			X					
Deb Bumpus	USFS			X					
Jim Copeland	USFS			X					
Bob Csargo	USFS			X					
Cathy Taylor	USFS			X					
Henry Provev	USFS			X					
Doug Powers	BLM							X	
Chris Bates	BLM							X	
Tim Hughes	BLM							X	
Ted Cordery	BLM							X	
Bill Grossi	BLM	X						X	
Rick Toomey	ASP							X	
Joanne Roberts	ASP							X	
Sari Neumeyer	AZ-DEMA						X	X	
Bill Werner	ADWR							X	
David Bergman	USDA-WS							X	
Mike Martinez	USFWS							X	

* International Border Issues Group

APPENDIX E. CWCS SCIENTIFIC REVIEWERS

The following individuals participated as volunteer reviewers of draft components for Arizona's CWCS in April and May 2005 (listed alphabetically):

- Dr Paul Beier, Professor. Northern Arizona University, School of Forestry
- Dr Phil Fernandez, Professor. Grand Canyon University, Biological Sciences
- Rich Glinski, Park Supervisor. Maricopa County Parks and Recreation Program
- Trevor Hare, Conservation Biologist. Sky Islands Alliance
- Sherry Ruther, Environmental Planning Manager, Pima County (Sonora Desert Conservation Plan—Scientific Technical Team Member)
- Tice Supplee, Director of Bird Conservation. Audubon Arizona
- Dr Mitchel White, Forest Rangeland Ecologist, USFS Apache-Sitgreaves National Forest
- Scott Wilbur, Important Bird Area Coordinator. Audubon Arizona
- Marilyn Ethelbah, Environmental Engineer, Salt River Pima Maricopa Indian Community, Cultural and Environmental Service

APPENDIX F. MASTER SPECIES LIST FOR THE APACHE HIGHLANDS NORTH ECOREGION

Distribution within the ecoregion, associated confidence in assigning distribution, and species status in 4 categories. See "Compilation of a Comprehensive List of Wildlife in Arizona (Element 1)" for how species were included on the list, Table 11 for "Distribution Confidence" scoring, and Appendix L for criteria used to assign "Species Status" scores.

ScientificName	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status					
				Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status			
<i>Ambystoma tigrinum mavortium</i>	Barred Tiger Salamander	x																	3	3	3	3
<i>Ambystoma tigrinum nebulosum</i>	Arizona Tiger Salamander						x				x	x		x	x	x			2	1	1c	3
<i>Bufo cognatus</i>	Great Plains Toad					x								x	x				3	2	2	3
<i>Bufo microscaphus</i>	Arizona Toad		2	x	x	x	x	x	x	x	x			x	x				1	2	1b	3
<i>Bufo punctatus</i>	Red-spotted Toad			x	x	x	x							x	x				3	1	2	3
<i>Bufo woodhousii woodhousi</i>	Rocky Mountain Toad			x	x	x	x	x	x	x				x	x	x			3	2	2	3
<i>Eleutherodactylus augusti cactorum</i>	Western Barking Frog		3			x		x	x										3	2	1b	3
<i>Hyla arenicolor</i>	Canyon Treefrog			x		x	x	x	x					x	x				2	1	1c	3
<i>Hyla wrightorum</i>	Mountain Treefrog		2	x		x			x	x	x			x	x				1	2	1c	3
<i>Pseudacris triseriata</i>	Western Chorus Frog						x				x			x	x	x			3	1	1c	3
<i>Rana catesbeiana</i>	American Bullfrog	x																	3	3	3	3
<i>Rana chiricahuensis</i>	Chiricahua Leopard Frog		2			x	x	x	x	x	x			x	x	x			1	2	1a	3
<i>Rana pipiens</i>	Northern Leopard Frog		2			x	x		x		x			x	x	x			1	2	1b	3
<i>Rana yavapaiensis</i>	Lowland Leopard Frog		2	x		x	x	x	x	x	x			x	x	x			1	3	1b	3
<i>Spea multiplicata</i>	Mexican Spadefoot			x		x	x	x	x	x				x	x				3	2	2	3
<i>Accipiter cooperii</i>	Cooper's Hawk			x	x	x	x	x	x	x	x	x	x	x	x	x			2	1	3	3
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk		1						x	x	x	x		x	x	x			2	1	1b	3
<i>Accipiter striatus</i>	Sharp-shinned Hawk			x	x	x	x	x	x	x	x	x	x	x	x	x			2	1	3	2
<i>Actitis macularius</i>	Spotted Sandpiper													x	x	x	x		3	1	3	2
<i>Aechmophorus clarkii</i>	Clark's Grebe		1											x	x	x	x		3	1	1b	3
<i>Aechmophorus occidentalis</i>	Western Grebe		1											x	x	x	x		3	1	1c	3
<i>Aegolius acadicus</i>	Northern Saw-whet Owl			x					x	x	x	x	x	x	x	x			3	2	3	2
<i>Aeronautes saxatalis</i>	White-throated Swift			x	x	x	x	x	x	x	x	x	x	x	x	x			3	1	2	2

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

ScientificName	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type													Species status			
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Agelaius phoeniceus</i>	Red-winged Blackbird				x	x	x	x					x	x	x	x	3	1	2	2	
<i>Aimophila cassinii</i>	Cassin's Sparrow				x		x	x									3	1	2	3	
<i>Aimophila ruficeps</i>	Rufous-crowned Sparrow				x		x	x	x	x					x		3	1	3	3	
<i>Aix sponsa</i>	Wood Duck		1										x	x	x	x	3	1	1c	3	
<i>Alectoris chukar</i>	Chukar	x					x										3	3	3	3	
<i>Ammodramus bairdii</i>	Baird's Sparrow		2				x	x									3	1	1b	3	
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow		2				x	x					x				3	1	1b	3	
<i>Amphispiza belli</i>	Sage Sparrow				x	x	x	x									3	1	2	3	
<i>Amphispiza bilineata</i>	Black-throated Sparrow				x	x	x	x					x				3	1	3	3	
<i>Anas acuta</i>	Northern Pintail		2										x	x	x	x	3	1	1c	3	
<i>Anas americana</i>	American Wigeon		2										x	x	x	x	3	1	1c	3	
<i>Anas clypeata</i>	Northern Shoveler		2										x	x	x	x	3	1	1c	3	
<i>Anas crecca</i>	Green-winged Teal												x	x	x	x	3	1	2	2	
<i>Anas cyanoptera</i>	Cinnamon Teal												x	x	x	x	3	1	3	2	
<i>Anas discors</i>	Blue-winged Teal		2										x	x	x	x	3	1	1c	3	
<i>Anas platyrhynchos</i>	Mallard												x	x	x	x	3	1	3	2	
<i>Anas strepera</i>	Gadwall												x	x	x	x	3	1	3	2	
<i>Anthus rubescens</i>	American Pipit		1				x	x					x	x	x	x	3	1	1c	3	
<i>Anthus spragueii</i>	Sprague's Pipit		2				x	x									3	1	1b	3	
<i>Aphelocoma californica</i>	Western Scrub-Jay				x	x	x	x	x	x	x	x	x	x	x	x	3	2	3	3	
<i>Aphelocoma ultramarina</i>	Mexican Jay						x	x	x	x	x	x	x	x	x	x	3	2	3	3	
<i>Aquila chrysaetos</i>	Golden Eagle				x	x	x	x	x	x	x	x	x	x	x	x	1	1	2	3	
<i>Archilochus alexandri</i>	Black-chinned Hummingbird				x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3	
<i>Ardea alba</i>	Great Egret		1										x	x	x	x	3	2	1b	3	
<i>Ardea herodias</i>	Great Blue Heron												x	x	x	x	3	2	2	3	
<i>Asio otus</i>	Long-eared Owl				x	x	x	x	x	x	x		x	x	x		3	2	2	3	
<i>Athene cunicularia hypugaea</i>	Western Burrowing Owl				x	x	x	x					x				2	2	2	3	
<i>Auriparus flaviceps</i>	Verdin				x	x	x	x	x	x			x	x	x	x	3	3	3	3	
<i>Aythya affinis</i>	Lesser Scaup												x	x	x	x	3	1	2	2	
<i>Aythya americana</i>	Redhead												x	x	x	x	3	1	2	2	

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

ScientificName	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type													Species status		
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Aythya collaris</i>	Ring-necked Duck											x	x	x	x	3	1	2	2	
<i>Aythya valisineria</i>	Canvasback		2									x	x	x	x	3	1	1c	3	
<i>Baeolophus ridgwayi</i>	Juniper Titmouse						x	x	x	x		x	x	x		3	2	3	3	
<i>Baeolophus wollweberi</i>	Bridled Titmouse							x	x	x	x	x	x	x		3	2	3	3	
<i>Botaurus lentiginosus</i>	American Bittern		4									x	x	x	x	3	1	1b	3	
<i>Branta canadensis</i>	Canada Goose		2									x	x	x	x	3	1	1c	3	
<i>Bubo virginianus</i>	Great Horned Owl				x	x	x	x	x	x	x	x	x	x	x	2	2	3	3	
<i>Bubulcus ibis</i>	Cattle Egret		1									x	x	x	x	3	2	1c	3	
<i>Buteo albonotatus</i>	Zone-tailed Hawk				x		x	x	x	x	x		x	x	x	3	1	2	3	
<i>Buteo jamaicensis</i>	Red-tailed Hawk				x	x	x	x	x	x	x	x	x	x	x	3	2	3	3	
<i>Buteo regalis</i>	Ferruginous Hawk		2			x	x			x		x				2	1	1b	3	
<i>Buteo swainsoni</i>	Swainson's Hawk					x	x					x				3	1	2	3	
<i>Buteogallus anthracinus</i>	Common Black-Hawk		1					x	x		x		x	x	x	2	1	1b	3	
<i>Butorides virescens</i>	Green Heron											x	x	x	x	3	1	3	3	
<i>Calamospiza melanocorys</i>	Lark Bunting						x	x				x				3	1	2	2	
<i>Calcarius mccownii</i>	McCown's Longspur		2				x					x				3	1	1c	3	
<i>Calcarius ornatus</i>	Chestnut-collared Longspur		2			x	x					x				3	1	2	1	
<i>Calidris minutilla</i>	Least Sandpiper											x	x	x	x	3	1	3	2	
<i>Callipepla gambelii</i>	Gambel's Quail				x	x	x		x			x	x	x	x	3	3	2	3	
<i>Callipepla squamata</i>	Scaled Quail					x	x					x				3	1	2	3	
<i>Calypte anna</i>	Anna's Hummingbird				x	x	x	x	x	x	x	x	x	x	x	3	2	3	3	
<i>Calypte costae</i>	Costa's Hummingbird				x	x	x		x	x	x	x	x	x	x	3	1	3	3	
<i>Camptostoma imberbe</i>	Northern Beardless-Tyrannulet													x		3	1	2	3	
<i>Campylorhynchus brunneicapillus</i>	Cactus Wren				x	x	x	x	x	x	x	x	x	x	x	3	3	3	3	
<i>Caprimulgus vociferus</i>	Whip-poor-will								x		x			x		3	1	2	2	
<i>Cardellina rubrifrons</i>	Red-faced Warbler								x		x		x	x		3	1	2	3	
<i>Cardinalis cardinalis</i>	Northern Cardinal				x		x	x	x	x		x	x	x	x	3	2	3	3	
<i>Carduelis pinus</i>	Pine Siskin						x	x	x	x	x	x	x	x	x	3	2	2	3	
<i>Carduelis psaltria</i>	Lesser Goldfinch				x	x	x	x	x	x	x	x	x	x	x	3	1	3	3	
<i>Carpodacus cassinii</i>	Cassin's Finch		2						x	x	x	x	x	x	x	3	2	1c	3	

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

ScientificName	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type													Species status		
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Carpodacus mexicanus</i>	House Finch				x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Cathartes aura</i>	Turkey Vulture				x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Catharus guttatus</i>	Hermit Thrush				x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Catharus ustulatus</i>	Swainson's Thrush		2						x	x	x	x	x	x	x		3	1	1b	3
<i>Catherpes mexicanus</i>	Canyon Wren				x	x				x	x	x	x		x		3	1	3	3
<i>Certhia americana</i>	Brown Creeper									x	x	x	x		x	x	3	1	3	3
<i>Ceryle alcyon</i>	Belted Kingfisher		2										x	x	x	x	3	1	1b	3
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover			1											x		3	2	1b	3
<i>Charadrius vociferus</i>	Killdeer						x	x						x	x	x	3	1	3	3
<i>Chen caerulescens</i>	Snow Goose													x		x	3	1	2	3
<i>Chen rossii</i>	Ross's Goose													x		x	3	1	2	3
<i>Chondestes grammacus</i>	Lark Sparrow				x	x	x	x	x		x						3	1	3	3
<i>Chordeiles acutipennis</i>	Lesser Nighthawk				x	x	x	x	x					x	x	x	3	1	3	3
<i>Chordeiles minor</i>	Common Nighthawk						x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Cinclus mexicanus</i>	American Dipper		2												x	x	2	1	1c	3
<i>Circus cyaneus</i>	Northern Harrier		2		x	x	x	x	x					x	x	x	2	1	1c	3
<i>Cistothorus palustris</i>	Marsh Wren		1											x	x	x	3	1	1c	3
<i>Coccothraustes vespertinus</i>	Evening Grosbeak		2								x	x	x	x	x	x	3	1	1c	3
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo		2		x					x	x			x	x	x	2	1	1a	3
<i>Colaptes auratus</i>	Northern Flicker				x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Columba livia</i>	Rock Pigeon		x							x	x	x					3	3	3	3
<i>Columbina inca</i>	Inca Dove				x		x				x			x	x	x	3	2	3	3
<i>Contopus cooperi</i>	Olive-sided Flycatcher		2		x	x	x	x	x	x	x	x	x	x	x	x	3	1	1b	3
<i>Contopus pertinax</i>	Greater Pewee		2						x	x					x		3	1	2	1
<i>Contopus sordidulus</i>	Western Wood-Pewee				x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	2
<i>Corvus brachyrhynchos</i>	American Crow						x	x			x	x	x		x	x	3	1	2	2
<i>Corvus corax</i>	Common Raven				x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Corvus cryptoleucus</i>	Chihuahuan Raven						x	x									3	1	2	3
<i>Cyanocitta stelleri</i>	Steller's Jay								x	x	x	x	x	x	x	x	3	1	3	2
<i>Cyrtonyx montezumae</i>	Montezuma Quail								x	x	x	x		x	x		2	1	2	3

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

ScientificName	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type												Species status		
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability
<i>Himantopus mexicanus</i>	Black-necked Stilt											x	x	x	x	3	2	2	3
<i>Hirundo rustica</i>	Barn Swallow		x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	2
<i>Icteria virens</i>	Yellow-breasted Chat											x	x	x	x	3	1	2	3
<i>Icterus bullockii</i>	Bullock's Oriole		x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Icterus cucullatus</i>	Hooded Oriole		x	x				x	x	x		x	x	x	x	2	1	2	3
<i>Icterus parisorum</i>	Scott's Oriole		x	x	x	x	x	x	x			x	x	x	x	3	1	3	3
<i>Ictinia mississippiensis</i>	Mississippi Kite	1										x	x	x		2	2	1b	3
<i>Ixobrychus exilis hesperis</i>	Western Least Bittern											x	x	x	x	2	2	2	3
<i>Junco hyemalis</i>	Dark-eyed Junco		x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Junco phaeonotus</i>	Yellow-eyed Junco	1							x	x	x			x		3	3	1c	3
<i>Lanius ludovicianus</i>	Loggerhead Shrike		x	x	x	x	x			x		x	x	x	x	3	1	2	3
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher											x	x	x	x	3	1	2	2
<i>Loxia curvirostra</i>	Red Crossbill								x	x	x	x		x		3	2	2	3
<i>Megascops kennicottii</i>	Western Screech-Owl		x	x	x			x	x	x	x	x	x	x	x	3	2	3	3
<i>Melanerpes formicivorus</i>	Acorn Woodpecker		x			x	x	x	x	x	x	x	x	x	x	3	2	3	3
<i>Melanerpes lewis</i>	Lewis's Woodpecker	1							x	x	x	x		x		3	2	1c	3
<i>Melanerpes uropygialis</i>	Gila Woodpecker		x	x					x	x		x	x	x		3	2	3	3
<i>Meleagris gallopavo merriami</i>	Merriam's Turkey							x	x	x	x	x	x	x	x	3	2	2	3
<i>Melospiza lincolni</i>	Lincoln's Sparrow	1	x	x	x	x	x	x	x	x		x	x	x	x	3	1	1c	3
<i>Melospiza melodia</i>	Song Sparrow				x							x	x	x	x	3	1	2	3
<i>Mergus merganser</i>	Common Merganser	1										x		x	x	3	1	1c	3
<i>Micrathene whitneyi</i>	Elf Owl		x	x				x	x			x	x	x		3	1	3	3
<i>Mimus polyglottos</i>	Northern Mockingbird		x	x	x	x	x	x	x	x		x	x	x	x	3	1	3	3
<i>Molothrus aeneus</i>	Bronzed Cowbird		x					x	x	x		x	x	x	x	3	1	2	3
<i>Molothrus ater</i>	Brown-headed Cowbird		x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Myadestes townsendi</i>	Townsend's Solitaire		x					x	x	x	x	x	x	x	x	3	1	3	3
<i>Myiarchus cinerascens</i>	Ash-throated Flycatcher		x	x	x	x	x	x	x	x		x	x	x	x	3	1	3	3
<i>Myiarchus tuberculifer</i>	Dusky-capped Flycatcher								x	x		x	x	x		3	1	2	3
<i>Myiarchus tyrannulus</i>	Brown-crested Flycatcher		x	x	x			x	x			x	x	x	x	3	1	2	3
<i>Myioborus pictus</i>	Painted Redstart							x	x			x	x	x	x	3	1	2	3

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

ScientificName	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type												Species status				
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Myiodynastes luteiventris</i>	Sulphur-bellied Flycatcher		1												x	x		3	2	1c	3
<i>Nucifraga columbiana</i>	Clark's Nutcracker		1												x	x	x	3	1	1c	3
<i>Numenius americanus</i>	Long-billed Curlew		1				x	x							x	x	x	3	1	2	1
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron														x	x	x	3	1	2	3
<i>Oporornis tolmiei</i>	MacGillivray's Warbler		1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Oreoscoptes montanus</i>	Sage Thrasher		1	x	x	x	x	x		x								3	1	1b	3
<i>Otus flammeolus</i>	Flammulated Owl									x		x						3	1	2	3
<i>Oxyura jamaicensis</i>	Ruddy Duck														x	x	x	3	1	2	3
<i>Pandion haliaetus</i>	Osprey		1												x	x	x	3	1	1b	3
<i>Parabuteo unicinctus</i>	Harris's Hawk				x	x	x										x	2	2	2	3
<i>Passer domesticus</i>	House Sparrow	x																3	3	3	3
<i>Passerculus sandwichensis</i>	Savannah Sparrow		1				x	x							x	x	x	3	1	1c	3
<i>Passerina amoena</i>	Lazuli Bunting				x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Passerina caerulea</i>	Blue Grosbeak				x	x	x	x	x						x	x	x	3	1	3	3
<i>Passerina cyanea</i>	Indigo Bunting		2												x	x	x	3	1	1c	3
<i>Patagioenas fasciata</i>	Band-tailed Pigeon																	3	1	2	3
<i>Pelecanus erythrorhynchos</i>	American White Pelican														x		x	3	1	2	2
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				x	x	x	x										3	1	2	3
<i>Peucedramus taeniatus</i>	Olive Warbler																	3	2	2	3
<i>Phainopepla nitens</i>	Phainopepla				x	x	x	x	x	x	x							3	2	2	3
<i>Phalacrocorax auritus albociliatus</i>	Double-crested Cormorant		1															3	1	1c	3
<i>Phalacrocorax brasilianus</i>	Neotropic Cormorant																	3	2	2	2
<i>Phalaenoptilus nuttallii</i>	Common Poorwill				x	x	x	x	x	x								3	1	2	3
<i>Phasianus colchicus</i>	Ring-necked Pheasant	x																3	3	3	3
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak				x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Picoides dorsalis</i>	American Three-toed Woodpecker		1															3	2	1b	3
<i>Picoides pubescens</i>	Downy Woodpecker		2															3	2	1c	3

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

ScientificName	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type													Species status		
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<i>Picoides scalaris</i>	Ladder-backed Woodpecker				x	x	x		x				x	x	x	x	3	2	3	3
<i>Picoides villosus</i>	Hairy Woodpecker									x	x	x		x	x		3	2	3	3
<i>Pinicola enucleator</i>	Pine Grosbeak		2									x					3	2	1b	3
<i>Pipilo aberti</i>	Abert's Towhee												x	x	x	x	3	3	2	3
<i>Pipilo chlorurus</i>	Green-tailed Towhee		1		x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Pipilo fuscus</i>	Canyon Towhee				x	x	x	x	x	x			x	x	x		3	2	3	3
<i>Pipilo maculatus</i>	Spotted Towhee				x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Piranga flava</i>	Hepatic Tanager									x	x	x			x		3	1	2	3
<i>Piranga ludoviciana</i>	Western Tanager				x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Piranga rubra</i>	Summer Tanager									x			x	x	x		3	1	2	3
<i>Plegadis chihi</i>	White-faced Ibis		1										x	x	x	x	3	1	2	1
<i>Podiceps nigricollis</i>	Eared Grebe		2										x	x	x	x	3	1	1c	3
<i>Podilymbus podiceps</i>	Pied-billed Grebe												x	x	x	x	3	1	3	3
<i>Poecile gambeli</i>	Mountain Chickadee									x	x	x	x	x	x		3	1	3	3
<i>Polioptila caerulea</i>	Blue-gray Gnatcatcher				x	x	x	x	x	x	x		x	x	x		3	1	3	3
<i>Polioptila melanura</i>	Black-tailed Gnatcatcher				x	x	x										3	3	3	3
<i>Poocetes gramineus</i>	Vesper Sparrow				x		x	x					x				3	1	2	3
<i>Porzana carolina</i>	Sora												x	x	x	x	3	1	2	3
<i>Progne subis arboricola</i>	Western Purple Martin		1				x	x		x	x	x	x		x	x	3	1	1b	3
<i>Psaltriparus minimus</i>	Bushtit				x		x		x	x	x	x	x	x	x		3	2	2	3
<i>Pyrocephalus rubinus</i>	Vermilion Flycatcher				x	x	x	x					x	x	x	x	3	1	2	3
<i>Quiscalus mexicanus</i>	Great-tailed Grackle				x		x	x					x	x	x	x	3	1	2	3
<i>Rallus limicola</i>	Virginia Rail												x	x	x	x	3	1	2	2
<i>Recurvirostra americana</i>	American Avocet		1										x	x	x	x	3	1	1c	3
<i>Regulus calendula</i>	Ruby-crowned Kinglet		1		x	x	x	x	x	x	x	x	x	x	x		3	1	1c	3
<i>Regulus satrapa</i>	Golden-crowned Kinglet		1										x				3	2	1c	3
<i>Salpinctes obsoletus</i>	Rock Wren				x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Sayornis nigricans</i>	Black Phoebe				x				x	x	x	x	x	x	x		3	1	3	3
<i>Sayornis saya</i>	Say's Phoebe				x	x	x	x	x	x	x		x	x	x		3	1	3	3
<i>Selasphorus platycercus</i>	Broad-tailed Hummingbird				x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Sialia currucoides</i>	Mountain Bluebird				x	x	x	x	x		x		x	x			3	1	2	3
<i>Sialia mexicana</i>	Western Bluebird				x	x	x	x	x	x	x	x	x	x			3	1	2	3

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type													Species status			
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Sitta canadensis</i>	Red-breasted Nuthatch									x	x	x	x	x	x	x	x	3	2	2	3
<i>Sitta carolinensis</i>	White-breasted Nuthatch									x	x	x	x	x	x	x	x	3	2	3	3
<i>Sitta pygmaea</i>	Pygmy Nuthatch											x	x	x				3	2	2	3
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker		1		x	x				x	x	x	x	x	x	x	x	3	1	1b	3
<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker									x	x	x	x	x	x	x	x	3	2	2	3
<i>Spizella atrogularis</i>	Black-chinned Sparrow						x	x	x	x	x				x			3	1	2	3
<i>Spizella breweri</i>	Brewer's Sparrow				x	x	x	x	x				x	x	x	x	x	3	1	2	3
<i>Spizella passerina</i>	Chipping Sparrow				x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow				x	x	x	x	x		x		x	x	x	x	x	3	1	3	3
<i>Streptopelia decaocto</i>	Eurasian Collared-Dove	x											x					3	3	3	3
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl		1						x	x	x	x		x	x			2	2	1a	3
<i>Sturnella magna</i>	Eastern Meadowlark						x	x					x	x				3	1	2	3
<i>Sturnella neglecta</i>	Western Meadowlark				x	x	x	x					x	x	x	x	x	3	1	2	3
<i>Sturnus vulgaris</i>	European Starling	x			x								x	x	x	x	x	3	3	3	3
<i>Tachycineta bicolor</i>	Tree Swallow		1		x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Tachycineta thalassina</i>	Violet-green Swallow				x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Thryomanes bewickii</i>	Bewick's Wren				x	x	x	x	x	x	x	x	x	x	x	x	x	3	2	3	2
<i>Toxostoma bendirei</i>	Bendire's Thrasher		1		x	x	x	x		x			x					3	1	2	1
<i>Toxostoma crissale</i>	Crissal Thrasher				x	x	x	x	x	x	x		x	x	x	x	x	3	2	3	3
<i>Toxostoma curvirostre</i>	Curve-billed Thrasher				x	x	x						x					3	3	3	3
<i>Tringa melanoleuca</i>	Greater Yellowlegs												x	x	x	x	x	3	1	2	2
<i>Troglodytes aedon</i>	House Wren				x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Troglodytes troglodytes</i>	Winter Wren		2									x		x	x			3	1	1c	3
<i>Turdus migratorius</i>	American Robin				x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Tyrannus verticalis</i>	Western Kingbird				x	x	x	x	x		x		x	x	x	x	x	3	1	3	3
<i>Tyrannus vociferans</i>	Cassin's Kingbird						x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Tyto alba</i>	Barn Owl				x	x	x	x	x	x	x		x	x	x	x	x	3	2	3	3
<i>Vermivora celata</i>	Orange-crowned Warbler		1		x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Vermivora luciae</i>	Lucy's Warbler				x	x	x		x	x	x		x	x	x	x	x	2	1	3	3
<i>Vermivora virginiae</i>	Virginia's Warbler							x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Vireo bellii arizonae</i>	Arizona Bell's Vireo				x	x	x	x	x	x	x		x	x	x	x	x	3	1	3	3
<i>Vireo gilvus</i>	Warbling Vireo				x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type													Species status			
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Vireo huttoni</i>	Hutton's Vireo									x	x	x	x	x	x	x	x	3	2	2	3
<i>Vireo plumbeus</i>	Plumbeous Vireo				x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Vireo vicinior</i>	Gray Vireo				x	x	x	x	x	x								3	1	2	3
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird												x	x	x	x		3	1	2	3
<i>Zenaida asiatica</i>	White-winged Dove				x	x	x		x	x	x		x	x	x	x		3	1	2	3
<i>Zenaida macroura</i>	Mourning Dove				x	x	x	x	x	x	x	x	x	x	x	x		3	1	2	3
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow		1		x	x	x	x	x	x		x	x	x	x			3	1	1c	3
<i>Agosia chrysoaster</i>	Longfin Dace		1											x				1	2	1b	3
<i>Ambloplites rupestris</i>	Rock Bass		x												x			3	3	3	3
<i>Carassius auratus</i>	Goldfish		x												x	x		3	3	3	3
<i>Catostomus clarki</i>	Desert Sucker		1												x			1	1	1b	3
<i>Catostomus insignis</i>	Sonora Sucker		1												x			1	1	1b	3
<i>Catostomus latipinnis</i>	Flannelmouth Sucker		1												x			3	1	1a	3
<i>Ctenopharyngodon idella</i>	Grass Carp		x															3	3	3	3
<i>Cyprinodon macularius</i>	Desert Pupfish		1											x	x			1	1	1a	3
<i>Cyprinus carpio</i>	Common Carp		x												x	x		3	3	3	3
<i>Dorosoma petenense</i>	Threadfin Shad		x												x	x		3	3	3	3
<i>Gambusia affinis</i>	Mosquitofish		x										x	x	x	x		3	3	3	3
<i>Gila elegans</i>	Bonytail		1												x			1	1	1a	3
<i>Gila intermedia</i>	Gila Chub		1											x	x			1	1	1a	3
<i>Gila nigra</i>	Headwater Chub		1												x			1	1	1b	3
<i>Gila robusta</i>	Roundtail Chub		1												x			1	1	1b	3
<i>Ictalurus melas</i>	Black Bullhead		x												x	x		3	3	3	3
<i>Ictalurus natalis</i>	Yellow Bullhead		x												x	x		3	3	3	3
<i>Ictalurus punctatus</i>	Channel Catfish		x												x	x		3	3	3	3
<i>Lepomis cyanellus</i>	Green Sunfish		x											x	x	x		3	3	3	3
<i>Lepomis gulosus</i>	Warmouth		x												x			3	3	3	3
<i>Lepomis macrochirus</i>	Bluegill		x												x	x		3	3	3	3
<i>Lepomis microlophus</i>	Redear Sunfish		x													x		3	3	3	3
<i>Meda fulgida</i>	Spikedace		1												x			1	1	1a	3
<i>Micropterus dolomieu</i>	Smallmouth Bass		x												x	x		3	3	3	3
<i>Micropterus salmoides</i>	Largemouth Bass		x												x	x		3	3	3	3

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type											Species status					
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Notropis lutrensis</i>	Red Shiner	x												x	x	3	3	3	3		
<i>Oncorhynchus clarki</i>	Cutthroat Trout	x													x	x	3	3	3	3	
<i>Oncorhynchus gilae apache</i>	Apache (Arizona) Trout		1												x	x	1	1	1a	3	
<i>Oncorhynchus gilae gilae</i>	Gila Trout		1												x		2	1	1a	3	
<i>Oncorhynchus mykiss</i>	Rainbow Trout	x												x	x	3	3	3	3		
<i>Pimephales promelas</i>	Fathead Minnow	x												x	x	x	3	3	3	3	
<i>Plagopterus argentissimus</i>	Woundfin		1												x		3	1	1a	3	
<i>Poeciliopsis occidentalis occidentalis</i>	Gila Topminnow		1											x	x		2	1	1a	3	
<i>Pomoxis nigromaculatus</i>	Black Crappie	x													x	x	3	3	3	3	
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow		1												x		1	1	1a	3	
<i>Pylodictis olivaris</i>	Flathead Catfish	x													x	x	3	3	3	3	
<i>Rhinichthys osculus</i>	Speckled Dace		1												x		1	1	1b	3	
<i>Salmo trutta</i>	Brown Trout	x													x	x	3	3	3	3	
<i>Salvelinus fontinalis</i>	Brook Trout	x													x	x	3	3	3	3	
<i>Stizostedion vitreum</i>	Walleye	x														x	3	3	3	3	
<i>Tiaroga cobitis</i>	Loach Minnow		1												x		1	1	1a	3	
<i>Tilapia sp.</i>	Tilapia	x														x	3	3	3	3	
<i>Xyrauchen texanus</i>	Razorback Sucker		1												x		1	1	1a	3	
<i>Anodonta californiensis</i>	California Floater		4												x	x	x	3	1	1b	3
<i>Artemia franciscana</i>	San Francisco Brine Shrimp														x	x	x	3	3	3	2
<i>Biomphalaria havanensis</i>	Ghost Rams-horn	x															x	3	3	3	3
<i>Branchinecta kaibabensis</i>	Kaibab Fairy Shrimp														x			3	3	3	2
<i>Cyzicus mexicanus</i>	Mexican Clam Shrimp														x	x	x	3	3	3	2
<i>Cyzicus setosa</i>	Bristletail Clam Shrimp															x	x	3	3	3	2
<i>Eocyclus digueti</i>	Straightbacked Clam Shrimp														x	x	x	3	3	3	2
<i>Eubbranchipus bundyi</i>	Knobbedlip Fairy Shrimp														x	x	x	3	3	3	2
<i>Eubbranchipus serratus</i>	Ethologist Fairy Shrimp														x	x	x	3	3	3	2

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type													Species status				
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Pyrgulopsis sola</i>	Brown Springsnail		2												x				1	1	1b	3
<i>Radix auricularia</i>	Big-eared Radix	x													x				3	3	3	3
<i>Streptocephalus dorotheae</i>	New Mexico Fairy Shrimp														x	x	x		3	3	3	2
<i>Streptocephalus mackini</i>	Chihuahuan Desert Fairy Shrimp														x	x	x		3	3	3	2
<i>Streptocephalus sealii</i>	Spinytail Fairy Shrimp														x	x	x		3	3	3	2
<i>Streptocephalus texanus</i>	Greater Plains Fairy Shrimp														x	x	x		3	3	3	2
<i>Thamnocephalus mexicanus</i>	Mexican Beavertail Fairy Shrimp														x	x	x		3	3	3	2
<i>Thamnocephalus platyurus</i>	Beavertail Fairy Shrimp														x	x	x		3	3	3	2
<i>Triops longicaudatus</i>	Longtail Tadpole Shrimp														x	x	x		3	3	3	2
<i>Triops newberryi</i>	Desert Tadpole Shrimp														x	x	x		3	3	3	2
<i>Vertigo berryi</i>	Rotund Vertigo		4												x	x	x		3	3	1c	3
<i>Vitrina pellucida</i>	Western Glass Snail																		3	3	3	2
<i>Vitrina pellucida alaskana</i>	Western Glass Snail																		3	3	3	2
<i>Ammospermophilus harrisi</i>	Harris' Antelope Squirrel				x	x	x	x	x										2	3	3	3
<i>Antilocapra americana americana</i>	America Pronghorn		1				x	x							x	x			1	2	1c	3
<i>Antrozous pallidus</i>	Pallid Bat		1	x	x	x	x	x	x	x	x	x	x	x	x	x	x		2	1	3	1
<i>Bassariscus astutus</i>	Ringtail		1		x	x	x	x	x	x					x	x	x		3	2	2	3
<i>Canis latrans</i>	Coyote		1	x	x	x	x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Castor canadensis</i>	American Beaver		1												x	x	x		1	1	1c	3
<i>Cervus elaphus nelsoni</i>	Rocky Mountain Elk		1			x	x	x	x	x	x						x	x	3	2	2	3
<i>Chaetodipus baileyi</i>	Bailey's Pocket Mouse		1			x		x											1	3	3	3
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse		1			x													3	1	1c	3
<i>Chaetodipus intermedius</i>	Rock Pocket Mouse		1			x	x												1	1	3	3
<i>Clethrionomys gapperi</i>	Southern Red-backed Vole		1												x	x			3	1	2	1
<i>Conepatus leuconotus leuconotus</i>	Hog-nosed Skunk		1	x		x			x	x									2	2	3	1

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

ScientificName	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type												Species status				
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Corynorhinus townsendii pallescens</i>	Pale Townsend's Big-eared Bat				x	x	x	x	x	x	x	x	x	x	x	x	x	3	2	2	1
<i>Cynomys gunnisoni</i>	Gunnison's Prairie Dog		1				x	x	x		x	x						2	1	1a	3
<i>Dipodomys merriami</i>	Merriam's Kangaroo Rat		1				x		x									2	1	2	3
<i>Dipodomys ordii</i>	Ord's Kangaroo Rat		1	x		x			x									3	1	2	3
<i>Eptesicus fuscus</i>	Big Brown Bat				x	x	x	x	x	x	x	x	x	x	x	x	x	3	2	2	3
<i>Erethizon dorsatum</i>	North American Porcupine		1	x		x	x	x	x	x	x							1	2	3	3
<i>Euderma maculatum</i>	Spotted Bat		2			x	x	x	x	x	x		x	x	x			3	2	1b	3
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat		2		x	x	x	x		x	x		x					2	2	1b	3
<i>Eutamias dorsalis</i>	Cliff Chipmunk				x		x	x		x	x							2	3	3	3
<i>Idionycteris phyllotis</i>	Allen's Big-eared Bat					x	x	x	x	x	x			x	x			3	2	2	1
<i>Lasionycteris noctivagans</i>	Silver-haired Bat								x		x	x		x	x			3	2	2	1
<i>Lasiurus blossevillii</i>	Western Red Bat		2	x				x		x	x			x	x			3	2	1b	3
<i>Lasiurus cinereus</i>	Hoary Bat				x		x	x	x	x	x			x	x			3	2	2	1
<i>Lasiurus xanthinus</i>	Western Yellow Bat		2			x	x	x	x	x				x	x			3	2	1b	3
<i>Lepus californicus</i>	Black-tailed Jackrabbit				x	x	x	x			x							3	3	3	3
<i>Lutra canadensis lataxina</i>	Southeastern River Otter		1										x	x	x			3	1	1c	3
<i>Lynx rufus</i>	Bobcat		1	x	x	x	x	x	x	x	x							3	2	3	1
<i>Macrotus californicus</i>	California Leaf-nosed Bat		1		x	x		x	x	x				x	x			1	2	1b	3
<i>Mephitis macroura</i>	Hooded Skunk		1			x		x	x	x			x	x	x			2	2	3	3
<i>Mephitis mephitis</i>	Striped Skunk		1	x	x	x	x	x	x	x	x		x	x	x			3	2	3	3
<i>Microtus mexicanus hualpaiensis</i>	Hualapai Mexican Vole		1						x		x	x						1	1	1a	3
<i>Microtus mexicanus mogollonensis</i>	Mogollon Vole								x	x								1	1	1c	3
<i>Mustela nigripes</i>	Black-footed Ferret		1				x											1	1	1a	3
<i>Myotis auricolus</i>	Southwestern Myotis						x	x	x	x	x			x	x			2	2	3	1
<i>Myotis californicus</i>	California Myotis		1	x	x	x	x	x	x	x	x			x	x			1	2	1c	3
<i>Myotis ciliolabrum</i>	Western Small-footed Myotis				x		x	x	x	x	x			x	x			3	2	2	3
<i>Myotis evotis</i>	Long-eared Myotis									x	x			x	x			3	2	2	1

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

ScientificName	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type												Species status		
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability
<i>Myotis occultus</i>	Arizona Myotis		1	x	x		x		x	x			x	x	1	2	2	1	
<i>Myotis thysanodes</i>	Fringed Myotis			x		x	x	x	x	x			x	x	3	2	2	3	
<i>Myotis velifer</i>	Cave Myotis			x		x	x	x	x	x			x	x	3	2	2	3	
<i>Myotis volans</i>	Long-legged Myotis							x	x	x	x				3	2	2	3	
<i>Myotis yumanensis</i>	Yuma Myotis									x					3	2	2	3	
<i>Nasua nasua</i>	White-nosed Coati		1	x	x	x	x	x	x	x	x		x	x	x	3	2	2	3
<i>Neotoma albigula</i>	Western White-throated Woodrat		1	x	x	x	x	x	x	x	x				3	2	3	3	
<i>Neotoma mexicana</i>	Mexican Woodrat									x	x				3	2	3	1	
<i>Neotoma stephensi</i>	Stephen's Woodrat		1			x	x	x	x	x					1	2	3	1	
<i>Notiosorex crawfordi</i>	Crawford's Desert Shrew		1	x	x	x	x	x	x	x					1	3	3	3	
<i>Nyctinomops femorosaccus</i>	Pocketed Free-tailed Bat					x	x	x	x	x			x	x	2	2	2	1	
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat		1					x	x	x	x		x	x	2	2	1b	3	
<i>Odocoileus hemionus crooki</i>	Desert Mule Deer		1	x	x	x	x	x			x	x			2	2	2	1	
<i>Odocoileus hemionus hemionus</i>	Rocky Mountain Mule Deer										x				3	2	2	3	
<i>Odocoileus virginianus couesi</i>	Coues whitetail deer		1	x		x		x	x	x	x		x	x	2	2	2	3	
<i>Ondatra zibethicus</i>	Common Muskrat		1										x	x	2	1	1c	3	
<i>Onychomys leucogaster</i>	Northern Grasshopper Mouse			x		x	x			x	x				3	2	2	1	
<i>Onychomys torridus</i>	Southern Grasshopper Mouse			x		x	x	x							3	2	2	1	
<i>Ovis canadensis canadensis</i>	Rocky Mountain Bighorn Sheep		1				x						x	x	2	2	1c	3	
<i>Ovis canadensis mexicana</i>	Desert Bighorn Sheep		1	x	x	x	x						x	x	2	2	1b	3	
<i>Panthera onca</i>	Jaguar		1	x	x	x	x	x	x	x	x				1	1	1a	3	
<i>Perognathus amplus</i>	Arizona Pocket Mouse		1			x		x							1	2	3	1	
<i>Perognathus flavus</i>	Silky Pocket Mouse						x	x							3	2	2	1	
<i>Perognathus flavus goodpasteri</i>	Springerville Pocket Mouse		1				x								1	2	1b	3	
<i>Peromyscus boylii</i>	Brush Mouse		1	x		x	x	x	x	x					3	1	3	1	
<i>Peromyscus eremicus</i>	Cactus Mouse			x		x	x	x							3	2	3	1	

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

ScientificName	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type													Species status				
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Peromyscus leucopus</i>	White-footed Mouse				x	x	x	x											3	2	3	1
<i>Peromyscus maniculatus</i>	Deer Mouse		1		x		x	x	x	x	x	x							3	1	3	3
<i>Peromyscus truei</i>	Pinon Mouse							x											3	2	3	1
<i>Pipistrellus hesperus</i>	Western Pipistrelle		1		x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	2	1c	3
<i>Procyon lotor</i>	Raccoon		1				x	x	x	x	x	x	x	x	x	x	x	3	2	3	3	
<i>Puma concolor</i>	Mountain Lion		1		x	x	x	x	x	x	x	x				x		3	1	3	3	
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse		1		x		x	x	x	x	x							3	1	3	1	
<i>Reithrodontomys megalotis megalotis</i>	Western Harvest Mouse		1				x		x		x							2	1	3	1	
<i>Reithrodontomys montanus</i>	Plains Harvest Mouse				x		x	x	x		x							3	2	2	1	
<i>Sciurus aberti</i>	Abert's Squirrel		1							x	x		x					3	2	3	3	
<i>Sciurus arizonensis</i>	Arizona Gray Squirrel		1							x	x			x	x			1	2	1c	3	
<i>Sigmodon arizonae cienegae</i>	Arizona Cotton Rat		1				x	x										1	2	2	1	
<i>Sigmodon arizonae jacksoni</i>	Yavapai Arizona Cotton Rat		1					x										1	2	1b	3	
<i>Sorex arizonae</i>	Arizona Shrew		1						x	x	x			x	x			1	2	1b	3	
<i>Sorex monticolus</i>	Dusky Shrew								x	x	x			x	x			3	3	3	1	
<i>Spermophilus spilosoma</i>	Spotted Ground Squirrel		1				x											3	1	1c	3	
<i>Spermophilus tereticaudus</i>	Round-tailed Ground Squirrel		1				x											2	1	3	1	
<i>Spermophilus variegatus</i>	Rock Squirrel				x	x	x	x	x	x	x	x						3	2	3	3	
<i>Spilogale gracilis</i>	Western Spotted Skunk				x	x	x	x	x	x	x	x						3	3	3	1	
<i>Sylvilagus audubonii</i>	Desert Cottontail				x	x	x	x	x	x								3	2	3	3	
<i>Sylvilagus floridanus</i>	Eastern Cottontail								x	x	x	x						3	2	2	3	
<i>Tadarida brasiliensis</i>	Mexican Free-tailed Bat		1		x	x	x	x	x	x	x	x		x	x	x		3	1	1c	3	
<i>Taxidea taxus</i>	American Badger		1		x	x	x	x	x	x	x							2	1	2	1	
<i>Tayassau tajacu</i>	Collared Peccary		1		x	x	x	x	x	x	x	x						2	2	2	3	
<i>Thomomys bottae</i>	Botta's Pocket Gopher				x		x	x	x	x								2	2	3	1	
<i>Thomomys bottae desertorum</i>	Pocket Gopher				x		x	x	x	x								2	2	3	1	
<i>Urocyon cinereoargenteus</i>	Common Gray Fox		1		x	x	x	x	x	x	x	x						3	2	3	3	

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type											Species status						
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Ursus americanus</i>	American Black Bear		1	x	x	x	x	x	x	x	x	x	x	x	x	x	1	2	3	3		
<i>Zapus hudsonius luteus</i>	New Mexican Jumping Mouse		1														x	x	1	2	1b	3
<i>Apalone spinifera</i>	Spiny Softshell	x															x	x	3	3	3	3
<i>Arizona elegans noctivaga</i>	Arizona Glossy Snake			x	x	x	x	x	x	x	x								3	3	3	3
<i>Aspidoscelis flagellicauda</i>	Gila Spotted Whiptail			x		x	x	x	x	x	x						x		1	3	3	3
<i>Aspidoscelis pai</i>	Pai Striped Whiptail			x	x	x	x	x	x	x	x								1	2	1c	3
<i>Aspidoscelis tigris</i>	Tiger Whiptail			x	x	x	x	x	x	x		x							3	3	3	3
<i>Aspidoscelis uniparens</i>	Desert Grassland Whiptail					x	x										x		2	3	3	3
<i>Aspidoscelis velox</i>	Plateau Striped Whiptail					x	x	x	x	x							x		3	3	3	3
<i>Callisaurus draconoides</i>	Zebra-tailed Lizard			x	x	x	x	x	x										2	3	3	3
<i>Charina trivirgata gracia</i>	Desert Rosy Boa		2					x		x									3	3	1c	3
<i>Coleonyx variegatus bogerti</i>	Tucson Banded Gecko			x		x	x	x	x	x									2	3	3	2
<i>Coleonyx variegatus variegatus</i>	Desert Banded Gecko			x		x	x	x	x	x		x							2	3	3	2
<i>Cophosaurus texanus scitulus</i>	Chihuahuan Greater Earless Lizard			x		x	x	x	x	x									2	3	3	3
<i>Crotalus atrox</i>	Western Diamond-backed Rattlesnake			x	x	x	x	x	x	x	x								3	3	3	3
<i>Crotalus mitchellii pyrrhus</i>	Southwestern Speckled Rattlesnake			x	x			x	x	x									3	3	3	2
<i>Crotalus molossus molossus</i>	Northern Black-tailed Rattlesnake			x	x			x	x	x	x								3	3	3	2
<i>Crotalus oreganus cerberus</i>	Arizona Black Rattlesnake			x		x	x	x	x	x	x								1	3	3	3
<i>Crotalus scutulatus scutulatus</i>	Northern Mohave Rattlesnake			x	x	x	x	x	x	x									3	3	3	2
<i>Crotalus tigris</i>	Tiger Rattlesnake						x	x											3	3	3	3
<i>Crotaphytus bicinctores</i>	Great Basin Collared Lizard					x	x												3	3	2	3
<i>Crotaphytus collaris</i>	Eastern Collared Lizard			x	x	x	x	x	x	x	x								2	3	3	3

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type												Species status				
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Diadophis punctatus regalis</i>	Regal Ring-necked Snake				x		x	x	x	x	x	x		x	x			3	2	3	2
<i>Dipsosaurus dorsalis dorsalis</i>	Northern Desert Iguana					x												3	3	3	3
<i>Elgaria kingii nobilis</i>	Arizona Alligator Lizard						x	x	x	x	x	x			x			2	3	3	3
<i>Eumeces gilberti rubricaudata</i>	Western Red-tailed Skink			2			x		x		x	x			x			1	3	3	1
<i>Eumeces multivirgatus epipluerotus</i>	Variable Skink								x	x	x	x		x	x			3	3	3	3
<i>Eumeces obsoletus</i>	Great Plains Skink						x	x	x	x	x	x			x			3	3	3	3
<i>Gambelia wislizenii</i>	Long-nosed Leopard Lizard					x	x	x	x	x				x	x	x		3	3	3	3
<i>Gopherus agassizii</i> (Sonoran Population)	Sonoran Desert Tortoise			1	x	x	x		x		x							2	2	1b	3
<i>Gyalopion canum</i>	Chihuahuan Hook-nosed Snake			3			x			x								3	3	2	1
<i>Heloderma suspectum cinctum</i>	Banded Gila Monster					x	x		x		x							1	3	2	3
<i>Heloderma suspectum suspectum</i>	Reticulate Gila Monster				x		x		x		x	x						2	3	3	3
<i>Holbrookia maculata approximans</i>	Speckled Earless Lizard						x	x										3	3	3	2
<i>Hypsiglena torquata chlorophaea</i>	Sonoran Nightsnake				x	x	x	x	x	x	x							3	3	3	3
<i>Kinosternon sonoriense sonoriense</i>	Sonora Mud Turtle			2	x		x	x	x	x	x			x	x			2	1	1c	3
<i>Lampropeltis getula californiae</i>	California Kingsnake				x	x	x	x	x	x	x	x	x					2	3	3	3
<i>Lampropeltis pyromelana pyromelana</i>	Arizona Mountain Kingsnake									x	x	x		x	x			1	3	2	3
<i>Masticophis bilineatus</i>	Sonoran Whipsnake				x	x	x	x	x	x				x	x	x		2	2	3	3
<i>Masticophis flagellum piceus</i>	Red Racer						x		x									3	3	3	3
<i>Masticophis taeniatus taeniatus</i>	Desert Striped Whipsnake						x	x	x	x	x				x			3	3	3	2
<i>Phrynosoma hernandesi hernandesi</i>	Hernandez's (Greater) Short-horned Lizard			2			x	x	x	x	x	x						3	2	1c	3

APPENDIX F. APACHE HIGHLANDS NORTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type												Species status				
					Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Phrynosoma solare</i>	Regal Horned Lizard						x											2	3	3	2
<i>Pituophis catenifer affinis</i>	Sonoran Gophersnake				x	x	x	x	x	x	x	x						3	3	3	3
<i>Rhinocheilus lecontei lecontei</i>	Western Long-nosed Snake				x	x	x	x	x									3	3	3	2
<i>Salvadora grahamiae</i>	Eastern Patch-nosed Snake		2							x	x	x						3	3	1c	3
<i>Salvadora hexalepis hexalepis</i>	Desert Patch-nosed Snake				x	x	x		x									2	3	3	3
<i>Sceloporus clarkii</i>	Clark's Spiny Lizard								x	x	x							2	3	2	3
<i>Sceloporus tristichus</i>	Plateau Lizard								x	x	x	x						2	3	2	2
<i>Sonora semiannulata semiannulata</i>	Variable Groundsnake						x		x	x								3	3	3	3
<i>Tantilla hobartsmithi</i>	Smith's Black-headed Snake				x	x	x	x	x	x	x							2	3	1c	3
<i>Thamnophis cyrtopsis cyrtopsis</i>	Western Black-necked Gartersnake		2		x		x	x	x	x	x			x	x	x		3	2	1c	3
<i>Thamnophis elegans vagrans</i>	Wandering Gartersnake				x	x	x	x	x	x	x	x		x	x	x		3	2	2	3
<i>Thamnophis eques megalops</i>	Northern Mexican Gartersnake		2											x	x	x		2	2	1b	3
<i>Thamnophis rufipunctatus</i>	Narrow-headed Gartersnake		2												x			1	2	1b	3
<i>Trimorphodon biscutatus lambda</i>	Western Lyresnake				x	x	x	x	x	x	x							3	3	2	3
<i>Urosaurus ornatus</i>	Ornate Tree Lizard				x	x	x	x	x	x	x	x		x	x	x		3	2	3	3
<i>Uta stansburiana</i>	Common Side-blotched Lizard				x	x	x	x	x	x	x		x					3	2	3	3
<i>Xantusia arizonae</i>	Arizona Night Lizard		2				x		x									1	3	1c	3
<i>Xantusia bezyi</i>	Bezy's Night Lizard						x		x									1	3	1c	3

APPENDIX G. MASTER SEPCIES LIST FOR THE APACHE HIGHLANDS SOUTH ECOREGION

Distribution within the ecoregion, associated confidence in assigning distribution, and species status in 4 categories. See "Compilation of a Comprehensive List of Wildlife in Arizona (Element 1)" for how species were included on the list, Table 11 for "Distribution Confidence" scoring, and Appendix L for criteria used to assign "Species Status" scores.

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status				
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Ambystoma tigrinum mavortium</i>	Barred Tiger Salamander	x																3	3	3	3
<i>Ambystoma tigrinum stebbinsi</i>	Sonoran Tiger Salamander		1			x		x						x		x		1	2	1a	3
<i>Bufo alvarius</i>	Sonoran Desert Toad				x			x						x	x			2	2	2	3
<i>Bufo cognatus</i>	Great Plains Toad				x			x						x	x			3	2	2	3
<i>Bufo debilis insidiar</i>	Western Green Toad				x	x	x							x	x			3	1	2	3
<i>Bufo punctatus</i>	Red-spotted Toad				x	x	x							x	x			3	1	2	3
<i>Bufo retiformis</i>	Sonoran Green Toad					x								x	x			2	1	2	1
<i>Bufo woodhousii australis</i>	Southwestern Woodhouse's Toad				x	x	x	x	x					x	x	x		3	2	2	3
<i>Bufo woodhousii woodhousi</i>	Rocky Mountain Toad				x	x	x	x	x					x	x	x		3	2	2	3
<i>Eleutherodactylus augusti cactorum</i>	Western Barking Frog		3			x			x			x						3	2	1b	3
<i>Gastrophryne olivacea</i>	Great Plains Narrow-mouthed Toad		2			x			x					x	x			3	2	1b	3
<i>Hyla arenicolor</i>	Canyon Treefrog				x	x	x	x	x					x	x			2	1	1c	3
<i>Hyla wrightorum</i>	Mountain Treefrog		2						x			x		x	x			1	2	1c	3
<i>Pternohyla fodiens</i>	Lowland Burrowing Treefrog		2			x								x	x			2	2	1b	3
<i>Rana blairi</i>	Plains Leopard Frog		1			x			x					x				3	2	1b	3
<i>Rana catesbeiana</i>	American Bullfrog	x																3	3	3	3
<i>Rana chiricahuensis</i>	Chiricahua Leopard Frog		2	x	x	x			x			x		x	x			1	2	1a	3
<i>Rana subaquavocalis</i>	Ramsey Canyon Leopard Frog		1			x			x					x	x			1	2	1b	3
<i>Rana tarahumarae</i>	Tarahumara Frog		1						x					x	x			2	3	1b	3
<i>Rana yavapaiensis</i>	Lowland Leopard Frog		2	x	x	x	x	x			x			x	x			1	3	1b	3
<i>Scaphiopus couchii</i>	Couch's Spadefoot			x	x	x	x	x						x	x	x		3	1	2	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status				
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Spea bombifrons</i>	Plains Spadefoot			x	x										x	x		3	1	2	3
<i>Spea multiplicata</i>	Mexican Spadefoot			x	x	x	x	x	x						x	x		3	2	2	3
<i>Accipiter cooperii</i>	Cooper's Hawk			x	x	x	x	x	x	x	x	x	x	x	x	x	x	2	1	3	3
<i>Accipiter gentilis apache</i>	Apache Northern Goshawk		1					x	x	x	x				x	x	x	2	1	1b	3
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk		1					x	x	x	x				x	x	x	2	1	1b	3
<i>Accipiter striatus</i>	Sharp-shinned Hawk			x	x	x	x	x	x	x	x	x	x	x	x	x	x	2	1	3	2
<i>Actitis macularius</i>	Spotted Sandpiper														x	x	x	3	1	3	2
<i>Aechmophorus clarkii</i>	Clark's Grebe		1												x	x	x	3	1	1b	3
<i>Aechmophorus occidentalis</i>	Western Grebe		1												x	x	x	3	1	1c	3
<i>Aegolius acadicus</i>	Northern Saw-whet Owl							x	x	x	x	x	x	x	x	x	x	3	2	3	2
<i>Aeronautes saxatalis</i>	White-throated Swift			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	2
<i>Agelaius phoeniceus</i>	Red-winged Blackbird			x	x	x									x	x	x	3	1	2	2
<i>Aimophila botterii</i>	Botteri's Sparrow		1		x	x									x			3	1	1b	3
<i>Aimophila carpalis</i>	Rufous-winged Sparrow				x										x			3	1	2	3
<i>Aimophila cassinii</i>	Cassin's Sparrow			x	x	x									x			3	1	2	3
<i>Aimophila quinquestriata</i>	Five-striped Sparrow		2		x													3	1	1c	3
<i>Aimophila ruficeps</i>	Rufous-crowned Sparrow			x	x	x	x	x	x						x			3	1	3	3
<i>Aix sponsa</i>	Wood Duck		1												x	x	x	3	1	1c	3
<i>Amazilia violiceps</i>	Violet-crowned Hummingbird		2												x	x	x	3	1	1b	3
<i>Ammodramus bairdii</i>	Baird's Sparrow		2		x	x									x			3	1	1b	3
<i>Ammodramus savannarum ammolagus</i>	Arizona Grasshopper Sparrow		1		x	x									x			2	1	1b	3
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow		2		x	x									x	x		3	1	1b	3
<i>Amphispiza belli</i>	Sage Sparrow			x	x										x			3	1	2	3
<i>Amphispiza bilineata</i>	Black-throated Sparrow			x	x	x	x								x			3	1	3	3
<i>Anas acuta</i>	Northern Pintail		2												x	x	x	3	1	1c	3
<i>Anas americana</i>	American Wigeon		2												x	x	x	3	1	1c	3
<i>Anas clypeata</i>	Northern Shoveler		2												x	x	x	3	1	1c	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status			
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Anas crecca</i>	Green-winged Teal												x	x	x	x	3	1	2	2
<i>Anas cyanoptera</i>	Cinnamon Teal												x	x	x	x	3	1	3	2
<i>Anas discors</i>	Blue-winged Teal		2										x	x	x	x	3	1	1c	3
<i>Anas platyrhynchos</i>	Mallard												x	x	x	x	3	1	3	2
<i>Anas strepera</i>	Gadwall												x	x	x	x	3	1	3	2
<i>Anthus rubescens</i>	American Pipit		1		x	x							x	x	x	x	3	1	1c	3
<i>Anthus spragueii</i>	Sprague's Pipit		2		x	x							x				3	1	1b	3
<i>Aphelocoma californica</i>	Western Scrub-Jay			x	x	x	x	x	x	x			x	x	x	x	3	2	3	3
<i>Aphelocoma ultramarina</i>	Mexican Jay				x	x	x	x	x	x			x	x	x	x	3	2	3	3
<i>Aquila chrysaetos</i>	Golden Eagle			x	x	x	x	x	x	x	x		x	x	x	x	1	1	2	3
<i>Archilochus alexandri</i>	Black-chinned Hummingbird			x	x	x	x	x	x	x	x		x	x	x	x	3	1	3	3
<i>Ardea alba</i>	Great Egret		1										x	x	x	x	3	2	1b	3
<i>Ardea herodias</i>	Great Blue Heron												x	x	x	x	3	2	2	3
<i>Asio otus</i>	Long-eared Owl			x	x	x	x	x	x	x	x		x	x	x	x	3	2	2	3
<i>Asturina nitida maxima</i>	Northern Gray Hawk		1										x	x	x	x	3	1	1b	3
<i>Athene cunicularia hypugaea</i>	Western Burrowing Owl			x	x	x							x				2	2	2	3
<i>Auriparus flaviceps</i>	Verdin			x	x	x	x	x	x				x	x	x	x	3	3	3	3
<i>Aythya affinis</i>	Lesser Scaup												x	x	x	x	3	1	2	2
<i>Aythya americana</i>	Redhead												x	x	x	x	3	1	2	2
<i>Aythya collaris</i>	Ring-necked Duck												x	x	x	x	3	1	2	2
<i>Aythya valisineria</i>	Canvasback		2										x	x	x	x	3	1	1c	3
<i>Baeolophus ridgwayi</i>	Juniper Titmouse					x	x	x	x				x	x	x		3	2	3	3
<i>Baeolophus wollweberi</i>	Bridled Titmouse						x	x	x	x			x	x	x		3	2	3	3
<i>Botaurus lentiginosus</i>	American Bittern		4										x	x	x	x	3	1	1b	3
<i>Branta canadensis</i>	Canada Goose		2										x	x	x	x	3	1	1c	3
<i>Bubo virginianus</i>	Great Horned Owl			x	x	x	x	x	x	x	x		x	x	x	x	2	2	3	3
<i>Bubulcus ibis</i>	Cattle Egret		1										x	x	x	x	3	2	1c	3
<i>Buteo albonotatus</i>	Zone-tailed Hawk			x	x	x	x	x	x	x	x		x	x	x	x	3	1	2	3
<i>Buteo jamaicensis</i>	Red-tailed Hawk			x	x	x	x	x	x	x	x		x	x	x	x	3	2	3	3
<i>Buteo regalis</i>	Ferruginous Hawk		2	x	x	x							x				2	1	1b	3
<i>Buteo swainsoni</i>	Swainson's Hawk			x	x	x							x	x	x		3	1	2	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status				
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Buteogallus anthracinus</i>	Common Black-Hawk		1				x	x						x	x	x	x	2	1	1b	3
<i>Butorides virescens</i>	Green Heron													x	x	x	x	3	1	3	3
<i>Calamospiza melanocorys</i>	Lark Bunting			x	x	x								x				3	1	2	2
<i>Calcarius mccownii</i>	McCown's Longspur		2		x	x								x				3	1	1c	3
<i>Calcarius ornatus</i>	Chestnut-collared Longspur		2	x	x	x								x				3	1	2	1
<i>Calidris minutilla</i>	Least Sandpiper													x	x	x	x	3	1	3	2
<i>Callipepla gambelii</i>	Gambel's Quail			x	x		x							x	x	x	x	3	3	2	3
<i>Callipepla squamata</i>	Scaled Quail			x	x	x								x				3	1	2	3
<i>Calothorax lucifer</i>	Lucifer Hummingbird		2	x	x		x	x	x					x	x	x		3	1	1c	3
<i>Calypte anna</i>	Anna's Hummingbird			x	x	x	x	x	x	x				x	x	x	x	3	2	3	3
<i>Calypte costae</i>	Costa's Hummingbird			x	x	x	x	x	x					x	x	x	x	3	1	3	3
<i>Camptostoma imberbe</i>	Northern Beardless-Tyrannulet				x			x						x	x	x	x	3	1	2	3
<i>Campylorhynchus brunneicapillus</i>	Cactus Wren			x	x	x	x	x	x					x	x	x	x	3	3	3	3
<i>Caprimulgus ridgwayi</i>	Buff-collared Nightjar		2	x	x			x								x		3	1	1c	3
<i>Caprimulgus vociferus</i>	Whip-poor-will							x		x	x			x	x			3	1	2	2
<i>Caracara cheriway</i>	Crested Caracara		1		x									x				3	2	1b	3
<i>Cardellina rubrifrons</i>	Red-faced Warbler							x		x	x			x	x			3	1	2	3
<i>Cardinalis cardinalis</i>	Northern Cardinal			x	x	x	x	x	x					x	x	x		3	2	3	3
<i>Cardinalis sinuatus</i>	Pyrrhuloxia			x	x	x	x							x				3	2	3	3
<i>Carduelis pinus</i>	Pine Siskin				x	x	x	x	x	x	x			x	x	x	x	3	2	2	3
<i>Carduelis psaltria</i>	Lesser Goldfinch			x	x	x	x	x	x	x	x			x	x	x	x	3	1	3	3
<i>Carpodacus cassinii</i>	Cassin's Finch		2					x	x	x				x	x	x	x	3	2	1c	3
<i>Carpodacus mexicanus</i>	House Finch			x	x	x	x	x	x	x	x			x	x	x	x	3	1	3	3
<i>Cathartes aura</i>	Turkey Vulture			x	x	x	x	x	x	x	x			x	x	x	x	3	1	3	3
<i>Catharus guttatus</i>	Hermit Thrush			x	x	x	x	x	x	x	x			x	x	x	x	3	1	2	3
<i>Catharus ustulatus</i>	Swainson's Thrush		2	x			x	x	x	x	x			x	x	x		3	1	1b	3
<i>Catherpes mexicanus</i>	Canyon Wren						x	x	x	x	x				x			3	1	3	3
<i>Certhia americana</i>	Brown Creeper							x	x	x	x				x	x		3	1	3	3
<i>Ceryle alcyon</i>	Belted Kingfisher		2											x	x	x	x	3	1	1b	3
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover		1											x		x	x	3	2	1b	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Charadrius montanus</i>	Mountain Plover		2	x										x			x	3	2	1c	3
<i>Charadrius vociferus</i>	Killdeer			x	x									x	x	x	x	3	1	3	3
<i>Chen caerulescens</i>	Snow Goose													x		x	x	3	1	2	3
<i>Chen rossii</i>	Ross's Goose													x		x	x	3	1	2	3
<i>Chloroceryle americana</i>	Green Kingfisher		1												x	x	x	3	2	1c	3
<i>Chondestes grammacus</i>	Lark Sparrow			x	x	x		x	x					x				3	1	3	3
<i>Chordeiles acutipennis</i>	Lesser Nighthawk			x	x	x	x							x	x	x	x	3	1	3	3
<i>Chordeiles minor</i>	Common Nighthawk			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Cinclus mexicanus</i>	American Dipper		2													x		2	1	1c	3
<i>Circus cyaneus</i>	Northern Harrier		2	x	x	x	x							x	x	x	x	2	1	1c	3
<i>Cistothorus palustris</i>	Marsh Wren		1											x	x	x	x	3	1	1c	3
<i>Coccothraustes vespertinus</i>	Evening Grosbeak		2					x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo		2					x	x					x	x	x	x	2	1	1a	3
<i>Colaptes auratus</i>	Northern Flicker			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Colaptes chrysoides</i>	Gilded Flicker															x		3	2	3	3
<i>Colinus virginianus ridgwayi</i>	Masked Bobwhite		1		x									x				1	1	1a	3
<i>Columba livia</i>	Rock Pigeon	x		x	x									x				3	3	3	3
<i>Columbina inca</i>	Inca Dove			x	x									x	x	x	x	3	2	3	3
<i>Columbina passerina</i>	Common Ground-Dove			x	x									x	x	x	x	3	2	2	2
<i>Contopus cooperi</i>	Olive-sided Flycatcher		2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1b	3
<i>Contopus pertinax</i>	Greater Pewee		2				x	x	x	x	x			x	x	x	x	3	1	2	1
<i>Contopus sordidulus</i>	Western Wood-Pewee			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	2
<i>Coragyps atratus</i>	Black Vulture				x	x	x	x						x	x	x	x	3	1	2	3
<i>Corvus brachyrhynchos</i>	American Crow			x	x									x	x	x	x	3	1	2	2
<i>Corvus corax</i>	Common Raven			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Corvus cryptoleucus</i>	Chihuahuan Raven			x	x	x	x							x	x	x	x	3	1	2	3
<i>Cyanocitta stelleri</i>	Steller's Jay						x	x	x	x	x	x	x	x	x	x	x	3	1	3	2
<i>Cynanthus latirostris</i>	Broad-billed Hummingbird				x			x	x	x				x	x	x	x	3	2	2	3
<i>Cyrtonyx montezumae</i>	Montezuma Quail			x	x	x	x	x	x	x				x	x	x		2	1	2	3
<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck		1											x	x	x	x	3	2	1b	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status			
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<i>Dendroica coronata</i>	Yellow-rumped Warbler			x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Dendroica graciae</i>	Grace's Warbler							x	x	x	x	x	x	x			3	1	2	3
<i>Dendroica nigrescens</i>	Black-throated Gray Warbler			x	x	x	x	x	x	x	x	x	x	x			3	1	2	3
<i>Dendroica petechia</i>	Yellow Warbler			x	x	x	x	x	x			x	x	x	x		3	1	2	3
<i>Dumetella carolinensis</i>	Gray Catbird		1									x	x	x	x		3	1	1b	3
<i>Egretta thula</i>	Snowy Egret		1									x	x	x	x		3	1	1b	3
<i>Empidonax fulvifrons pygmaeus</i>	Northern Buff-breasted Flycatcher		1					x	x	x			x	x			3	1	1b	3
<i>Empidonax oberholseri</i>	Dusky Flycatcher			x			x	x	x	x	x	x	x	x	x		3	1	2	3
<i>Empidonax occidentalis</i>	Cordilleran Flycatcher						x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher		1	x				x					x	x	x	x	1	1	1a	3
<i>Empidonax wrightii</i>	Gray Flycatcher		1	x		x	x	x	x	x			x	x	x	x	3	1	3	1
<i>Eremophila alpestris</i>	Horned Lark			x	x	x							x		x	x	3	1	2	3
<i>Eugenes fulgens</i>	Magnificent Hummingbird		2					x	x	x	x	x	x	x			3	1	1c	3
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird			x	x	x							x	x	x	x	3	1	2	2
<i>Falco femoralis septentrionalis</i>	Northern Aplomado Falcon				x									x	x	x	2	3	1a	3
<i>Falco mexicanus</i>	Prairie Falcon			x	x	x	x	x	x	x			x	x	x	x	2	1	2	3
<i>Falco peregrinus</i>	Peregrine Falcon			x	x	x	x	x	x	x	x			x	x	x	2	1	2	3
<i>Falco peregrinus anatum</i>	American Peregrine Falcon		1	x	x	x	x	x	x	x	x			x	x	x	2	1	1b	3
<i>Falco sparverius</i>	American Kestrel			x	x	x	x	x	x	x	x			x	x	x	3	1	3	2
<i>Fulica americana</i>	American Coot												x	x	x	x	3	2	2	3
<i>Gallinago delicata</i>	Wilson's Snipe		2										x	x	x	x	3	1	1c	3
<i>Gallinula chloropus</i>	Common Moorhen												x	x	x	x	3	2	2	3
<i>Geococcyx californianus</i>	Greater Roadrunner			x	x	x	x	x	x	x			x	x	x	x	3	2	2	3
<i>Geothlypis trichas</i>	Common Yellowthroat			x	x	x							x	x	x	x	3	1	3	3
<i>Glaucidium brasilianum cactorum</i>	Cactus Ferruginous Pygmy-Owl		1		x								x	x	x	x	2	2	1a	3
<i>Glaucidium gnoma californicum</i>	Northern Pygmy-Owl							x	x	x	x			x	x	x	3	2	2	2

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

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<i>Glaucidium gnoma gnoma</i>	Mountain Pygmy-Owl							x	x	x	x	x			x	x	x	3	3	3	2
<i>Grus canadensis</i>	Sandhill Crane			x	x										x	x	x	3	1	2	3
<i>Gymnorhinus cyanocephalus</i>	Pinyon Jay							x	x	x	x							3	2	2	3
<i>Haliaeetus leucocephalus</i>	Bald Eagle	1			x	x									x	x	x	1	2	1a	3
<i>Himantopus mexicanus</i>	Black-necked Stilt														x	x	x	3	2	2	3
<i>Hirundo rustica</i>	Barn Swallow			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	2
<i>Icteria virens</i>	Yellow-breasted Chat														x	x	x	3	1	2	3
<i>Icterus bullockii</i>	Bullock's Oriole			x	x	x	x	x	x	x	x				x	x	x	3	1	3	3
<i>Icterus cucullatus</i>	Hooded Oriole			x	x	x	x	x	x						x	x	x	2	1	2	3
<i>Icterus parisorum</i>	Scott's Oriole			x	x	x	x	x	x	x					x	x	x	3	1	3	3
<i>Ictinia mississippiensis</i>	Mississippi Kite	1			x										x	x	x	2	2	1b	3
<i>Ixobrychus exilis hesperis</i>	Western Least Bittern														x	x	x	2	2	2	3
<i>Junco hyemalis</i>	Dark-eyed Junco			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Junco phaeonotus</i>	Yellow-eyed Junco	1							x	x	x	x				x		3	3	1c	3
<i>Lampornis clemenciae</i>	Blue-throated Hummingbird	1							x	x	x	x	x	x	x	x		3	2	1c	3
<i>Lanius ludovicianus</i>	Loggerhead Shrike			x	x	x	x	x	x						x	x	x	3	1	2	3
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher														x	x	x	3	1	2	2
<i>Loxia curvirostra</i>	Red Crossbill								x	x	x	x				x		3	2	2	3
<i>Megascops kennicottii</i>	Western Screech-Owl			x	x		x	x	x						x	x	x	3	2	3	3
<i>Megascops trichopsis</i>	Whiskered Screech-Owl	1						x	x	x	x							3	2	1c	3
<i>Melanerpes formicivorus</i>	Acorn Woodpecker					x	x	x	x	x	x	x				x	x	3	2	3	3
<i>Melanerpes lewis</i>	Lewis's Woodpecker	1						x	x	x					x	x		3	2	1c	3
<i>Melanerpes uropygialis</i>	Gila Woodpecker			x				x	x						x	x		3	2	3	3
<i>Meleagris gallopavo merriami</i>	Merriam's Turkey							x	x	x	x	x	x	x	x	x		3	2	2	3
<i>Meleagris gallopavo mexicana</i>	Gould's Turkey	1						x	x	x	x	x	x	x	x	x		3	2	1c	3
<i>Melospiza lincolni</i>	Lincoln's Sparrow	1		x	x	x	x	x	x						x	x	x	3	1	1c	3
<i>Melospiza melodia</i>	Song Sparrow				x										x	x	x	3	1	2	3

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<i>Mergus merganser</i>	Common Merganser		1											x		x	x	3	1	1c	3
<i>Micrathene whitneyi</i>	Elf Owl			x				x	x	x				x	x	x		3	1	3	3
<i>Mimus polyglottos</i>	Northern Mockingbird			x	x	x	x	x	x	x				x	x	x	x	3	1	3	3
<i>Molothrus aeneus</i>	Bronzed Cowbird			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Molothrus ater</i>	Brown-headed Cowbird			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Myadestes townsendi</i>	Townsend's Solitaire							x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Myiarchus cinerascens</i>	Ash-throated Flycatcher			x	x	x	x	x	x					x	x	x	x	3	1	3	3
<i>Myiarchus tuberculifer</i>	Dusky-capped Flycatcher							x	x	x	x			x	x	x	x	3	1	2	3
<i>Myiarchus tyrannulus</i>	Brown-crested Flycatcher			x	x			x	x					x	x	x	x	3	1	2	3
<i>Myioborus pictus</i>	Painted Redstart							x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Myiodynastes luteiventris</i>	Sulphur-bellied Flycatcher		1						x		x				x	x		3	2	1c	3
<i>Nucifraga columbiana</i>	Clark's Nutcracker		1					x	x	x	x	x	x	x	x	x		3	1	1c	3
<i>Numenius americanus</i>	Long-billed Curlew		1		x	x								x	x	x	x	3	1	2	1
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron													x	x	x	x	3	1	2	3
<i>Oporornis tolmiei</i>	MacGillivray's Warbler		1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Oreoscoptes montanus</i>	Sage Thrasher		1	x	x	x			x					x				3	1	1b	3
<i>Otus flammeolus</i>	Flammulated Owl							x	x	x	x			x	x			3	1	2	3
<i>Oxyura jamaicensis</i>	Ruddy Duck													x	x	x	x	3	1	2	3
<i>Pachyramphus aglaiae</i>	Rose-throated Becard		1					x							x	x		3	2	1b	3
<i>Pandion haliaetus</i>	Osprey		1											x	x	x	x	3	1	1b	3
<i>Parabuteo unicinctus</i>	Harris's Hawk			x										x		x		2	2	2	3
<i>Passer domesticus</i>	House Sparrow	x												x				3	3	3	3
<i>Passerculus sandwichensis</i>	Savannah Sparrow		1		x	x								x	x	x	x	3	1	1c	3
<i>Passerina amoena</i>	Lazuli Bunting			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Passerina caerulea</i>	Blue Grosbeak			x	x	x								x	x	x	x	3	1	3	3
<i>Passerina cyanea</i>	Indigo Bunting		2											x	x	x	x	3	1	1c	3
<i>Passerina versicolor</i>	Varied Bunting			x	x									x	x	x		3	1	2	3
<i>Patagioenas fasciata</i>	Band-tailed Pigeon							x	x	x	x	x	x	x	x	x		3	1	2	3
<i>Pelecanus erythrorhynchos</i>	American White Pelican													x			x	3	1	2	2

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status				
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow			x	x	x								x	x	x	x	3	1	2	3
<i>Peucedramus taeniatus</i>	Olive Warbler							x		x	x				x			3	2	2	3
<i>Phainopepla nitens</i>	Phainopepla			x	x	x	x	x	x					x	x	x	x	3	2	2	3
<i>Phalacrocorax auritus albociliatus</i>	Double-crested Cormorant		1											x		x	x	3	1	1c	3
<i>Phalacrocorax brasilianus</i>	Neotropic Cormorant													x		x	x	3	2	2	2
<i>Phalaenoptilus nuttallii</i>	Common Poorwill			x	x	x	x	x	x									3	1	2	3
<i>Phasianus colchicus</i>	Ring-necked Pheasant	x												x		x		3	3	3	3
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Picoides arizonae</i>	Arizona Woodpecker		1					x	x	x	x					x		3	2	1c	3
<i>Picoides scalaris</i>	Ladder-backed Woodpecker			x	x			x	x	x				x	x	x	x	3	2	3	3
<i>Picoides villosus</i>	Hairy Woodpecker							x	x	x	x			x	x			3	2	3	3
<i>Pinicola enucleator</i>	Pine Grosbeak		2								x	x						3	2	1b	3
<i>Pipilo aberti</i>	Abert's Towhee													x	x	x	x	3	3	2	3
<i>Pipilo chlorurus</i>	Green-tailed Towhee		1	x	x	x	x	x	x	x				x	x	x	x	3	1	1c	3
<i>Pipilo fuscus</i>	Canyon Towhee			x	x	x	x	x	x					x	x	x	x	3	2	3	3
<i>Pipilo maculatus</i>	Spotted Towhee			x	x	x	x	x	x	x				x	x	x	x	3	1	3	3
<i>Piranga flava</i>	Hepatic Tanager							x	x	x	x					x		3	1	2	3
<i>Piranga ludoviciana</i>	Western Tanager			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Piranga rubra</i>	Summer Tanager							x						x	x	x	x	3	1	2	3
<i>Plegadis chihi</i>	White-faced Ibis		1											x	x	x	x	3	1	2	1
<i>Podiceps nigricollis</i>	Eared Grebe		2											x	x	x	x	3	1	1c	3
<i>Podilymbus podiceps</i>	Pied-billed Grebe													x	x	x	x	3	1	3	3
<i>Poecile gambeli</i>	Mountain Chickadee									x	x	x	x	x				3	1	3	3
<i>Poecile sclateri</i>	Mexican Chickadee		1					x		x	x					x		3	2	1c	3
<i>Polioptila caerulea</i>	Blue-gray Gnatcatcher			x	x	x	x	x	x					x	x	x	x	3	1	3	3
<i>Polioptila melanura</i>	Black-tailed Gnatcatcher			x	x													3	3	3	3
<i>Polioptila nigriceps</i>	Black-capped Gnatcatcher		2		x											x		3	2	1b	3
<i>Poocetes gramineus</i>	Vesper Sparrow			x	x	x								x				3	1	2	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status			
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Porzana carolina</i>	Sora												x	x	x	x	3	1	2	3
<i>Progne subis arboricola</i>	Western Purple Martin		1												x	x	3	1	1b	3
<i>Progne subis hesperia</i>	Desert Purple Martin		1		x										x		3	1	1c	3
<i>Psaltriparus minimus</i>	Bushtit			x	x		x	x	x	x	x	x	x	x	x	x	3	2	2	3
<i>Pyrocephalus rubinus</i>	Vermilion Flycatcher			x	x	x							x	x	x	x	3	1	2	3
<i>Quiscalus mexicanus</i>	Great-tailed Grackle			x	x	x							x	x	x	x	3	1	2	3
<i>Rallus limicola</i>	Virginia Rail												x	x	x	x	3	1	2	2
<i>Recurvirostra americana</i>	American Avocet		1												x	x	3	1	1c	3
<i>Regulus calendula</i>	Ruby-crowned Kinglet		1	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Regulus satrapa</i>	Golden-crowned Kinglet		1							x	x				x		3	2	1c	3
<i>Rhynchopsitta pachyrhyncha</i>	Thick-billed Parrot								x		x						1	2	1b	3
<i>Salpinctes obsoletus</i>	Rock Wren			x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Sayornis nigricans</i>	Black Phoebe							x	x	x			x	x	x	x	3	1	3	3
<i>Sayornis saya</i>	Say's Phoebe			x	x	x	x	x	x				x	x	x	x	3	1	3	3
<i>Selasphorus platycercus</i>	Broad-tailed Hummingbird			x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Sialia currucoides</i>	Mountain Bluebird			x	x	x			x						x		3	1	2	3
<i>Sialia mexicana</i>	Western Bluebird			x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Sialia sialis fulva</i>	Azure Bluebird		1			x		x	x	x			x	x	x	x	3	2	1b	3
<i>Sitta canadensis</i>	Red-breasted Nuthatch							x	x	x	x	x	x	x	x	x	3	2	2	3
<i>Sitta carolinensis</i>	White-breasted Nuthatch							x	x	x	x	x	x	x	x	x	3	2	3	3
<i>Sitta pygmaea</i>	Pygmy Nuthatch								x	x	x						3	2	2	3
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker		1				x	x	x	x	x	x	x	x	x	x	3	1	1b	3
<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker							x	x	x	x	x	x	x	x	x	3	2	2	3
<i>Spizella atrogularis</i>	Black-chinned Sparrow				x	x	x	x	x						x		3	1	2	3
<i>Spizella breweri</i>	Brewer's Sparrow			x	x	x	x						x	x	x	x	3	1	2	3
<i>Spizella passerina</i>	Chipping Sparrow			x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow				x	x	x						x	x	x	x	3	1	3	3
<i>Streptopelia decaocto</i>	Eurasian Collared-Dove	x											x				3	3	3	3
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl		1				x	x	x	x	x			x	x		2	2	1a	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status				
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Sturnella magna</i>	Eastern Meadowlark			x	x	x								x	x			3	1	2	3
<i>Sturnella neglecta</i>	Western Meadowlark			x	x	x								x	x	x	x	3	1	2	3
<i>Sturnus vulgaris</i>	European Starling	x												x	x	x	x	3	3	3	3
<i>Tachycineta bicolor</i>	Tree Swallow		1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Tachycineta thalassina</i>	Violet-green Swallow			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Thryomanes bewickii</i>	Bewick's Wren			x	x	x	x	x	x	x				x	x	x	x	3	2	3	2
<i>Toxostoma bendirei</i>	Bendire's Thrasher		1	x	x	x								x	x			3	1	2	1
<i>Toxostoma crissale</i>	Crissal Thrasher			x	x	x	x	x	x					x	x	x	x	3	2	3	3
<i>Toxostoma curvirostre</i>	Curve-billed Thrasher			x	x									x				3	3	3	3
<i>Tringa melanoleuca</i>	Greater Yellowlegs													x	x	x	x	3	1	2	2
<i>Troglodytes aedon</i>	House Wren			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Troglodytes troglodytes</i>	Winter Wren		2							x	x			x	x			3	1	1c	3
<i>Trogon elegans</i>	Elegant Trogon		1					x	x	x	x			x	x			3	2	1b	3
<i>Turdus migratorius</i>	American Robin			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Tyrannus crassirostris</i>	Thick-billed Kingbird		1												x	x	x	3	2	1b	3
<i>Tyrannus melancholicus</i>	Tropical Kingbird		1		x									x	x	x	x	3	2	1b	3
<i>Tyrannus verticalis</i>	Western Kingbird			x	x	x	x	x	x					x	x	x	x	3	1	3	3
<i>Tyrannus vociferans</i>	Cassin's Kingbird			x	x	x	x	x	x	x				x	x	x	x	3	1	3	3
<i>Tyto alba</i>	Barn Owl			x	x	x	x	x	x					x	x	x	x	3	2	3	3
<i>Vermivora celata</i>	Orange-crowned Warbler		1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Vermivora luciae</i>	Lucy's Warbler			x	x		x	x	x					x	x	x	x	2	1	3	3
<i>Vermivora virginiae</i>	Virginia's Warbler						x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Vireo bellii arizonae</i>	Arizona Bell's Vireo			x	x	x	x	x	x					x	x	x	x	3	1	3	3
<i>Vireo gilvus</i>	Warbling Vireo			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Vireo huttoni</i>	Hutton's Vireo						x	x	x	x				x	x	x	x	3	2	2	3
<i>Vireo plumbeus</i>	Plumbeous Vireo			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Vireo vicinior</i>	Gray Vireo			x			x	x	x									3	1	2	3
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Zenaida asiatica</i>	White-winged Dove			x	x	x	x	x	x					x	x	x	x	3	1	2	3
<i>Zenaida macroura</i>	Mourning Dove			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow		1	x	x	x	x	x	x	x				x	x	x	x	3	1	1c	3
<i>Agosia chrysogaster</i>	Longfin Dace		1											x	x			1	2	1b	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status			
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<i>Camptostoma ornatum</i>	Mexican Stoneroller		1												x		1	1	1b	3
<i>Carassius auratus</i>	Goldfish	x													x	x	3	3	3	3
<i>Catostomus bernardini</i>	Yaqui Sucker														x		3	1	1b	3
<i>Catostomus clarki</i>	Desert Sucker		1												x		1	1	1b	3
<i>Catostomus insignis</i>	Sonora Sucker		1												x		1	1	1b	3
<i>Catostomus latipinnis</i>	Flannelmouth Sucker		1												x		3	1	1a	3
<i>Ctenopharyngodon idella</i>	Grass Carp	x													x		3	3	3	3
<i>Cyprinella formosa</i>	Beautiful Shiner		1												x	x	2	1	1a	3
<i>Cyprinodon macularius</i>	Desert Pupfish		1												x	x	1	1	1a	3
<i>Cyprinus carpio</i>	Common Carp	x													x	x	3	3	3	3
<i>Dorosoma petenense</i>	Threadfin Shad	x													x	x	3	3	3	3
<i>Esox lucius</i>	Northern Pike	x														x	3	3	3	3
<i>Gambusia affinis</i>	Mosquitofish	x													x	x	3	3	3	3
<i>Gila ditaenia</i>	Sonora Chub		1												x		2	1	1a	3
<i>Gila intermedia</i>	Gila Chub		1												x	x	1	1	1a	3
<i>Gila purpurea</i>	Yaqui Chub		1												x	x	1	1	1a	3
<i>Gila robusta</i>	Roundtail Chub		1												x		1	1	1b	3
<i>Ictalurus melas</i>	Black Bullhead	x													x	x	3	3	3	3
<i>Ictalurus natalis</i>	Yellow Bullhead	x													x	x	3	3	3	3
<i>Ictalurus pricei</i>	Yaqui Catfish		1												x	x	2	2	1a	3
<i>Ictalurus punctatus</i>	Channel Catfish	x													x	x	3	3	3	3
<i>Lepomis cyanellus</i>	Green Sunfish	x													x	x	3	3	3	3
<i>Lepomis macrochirus</i>	Bluegill	x													x	x	3	3	3	3
<i>Lepomis microlophus</i>	Redear Sunfish	x														x	3	3	3	3
<i>Meda fulgida</i>	Spikedace		1												x		1	1	1a	3
<i>Micropterus dolomieu</i>	Smallmouth Bass	x														x	3	3	3	3
<i>Micropterus salmoides</i>	Largemouth Bass	x													x	x	3	3	3	3
<i>Notropis lutrensis</i>	Red Shiner	x													x	x	3	3	3	3
<i>Oncorhynchus gilae apache</i>	Apache (Arizona) Trout		1													x	1	1	1a	3
<i>Oncorhynchus mykiss</i>	Rainbow Trout	x													x	x	3	3	3	3
<i>Pimephales promelas</i>	Fathead Minnow	x													x	x	3	3	3	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

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<i>Poeciliopsis occidentalis occidentalis</i>	Gila Topminnow		1												x	x	2	1	1a	3			
<i>Poeciliopsis occidentalis sonoriensis</i>	Yaqui Topminnow		1												x	x	1	1	1a	3			
<i>Pomoxis nigromaculatus</i>	Black Crappie	x														x	3	3	3	3			
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow		1													x	1	1	1a	3			
<i>Pylodictis olivaris</i>	Flathead Catfish	x														x	3	3	3	3			
<i>Rhinichthys osculus</i>	Speckled Dace		1													x	1	1	1b	3			
<i>Salmo trutta</i>	Brown Trout	x														x	3	3	3	3			
<i>Tiaroga cobitis</i>	Loach Minnow		1													x	1	1	1a	3			
<i>Tilapia sp.</i>	Tilapia	x														x	3	3	3	3			
<i>Xyrauchen texanus</i>	Razorback Sucker		1													x	1	1	1a	3			
<i>Anodonta californiensis</i>	California Floater		4												x	x	x	3	1	1b	3		
<i>Artemia franciscana</i>	San Francisco Brine Shrimp														x	x	x	3	3	3	2		
<i>Biomphalaria havanensis</i>	Ghost Rams-horn	x														x	3	3	3	3			
<i>Branchinecta kaibabensis</i>	Kaibab Fairy Shrimp															x	3	3	3	2			
<i>Cipangopaludina chinensis</i>	Chinese Mysterysnail	x														x	x	3	3	3	3		
<i>Cyzicus mexicanus</i>	Mexican Clam Shrimp															x	x	x	3	3	3	2	
<i>Cyzicus setosa</i>	Bristletail Clam Shrimp															2	x	x	3	3	3	2	
<i>Drepanotrema aeruginosum</i>	Rusty Rams-horn	x															x	3	3	3	3		
<i>Eocyclus digueti</i>	Straightbacked Clam Shrimp																x	x	x	3	3	3	2
<i>Eubbranchipus bundyi</i>	Knobbedlip Fairy Shrimp																x	x	x	3	3	3	2
<i>Eubbranchipus serratus</i>	Ethologist Fairy Shrimp																x	x	x	3	3	3	2
<i>Eulimnadia antlei</i>	Fuzzy Cyst Clam Shrimp																x	x	x	3	3	3	2
<i>Eulimnadia cylindrova</i>	Cylindrical Cyst Clam Shrimp																x	x	x	3	3	3	2

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

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<i>Eulimnadia texana</i>	Texan Clam Shrimp													x	x	x	3	3	3	2
<i>Ferrissia fragilis</i>	Fragile Ancyloid													x	x	x	3	3	3	2
<i>Ferrissia rivularis</i>	Creeping Ancyloid													x	x	x	3	3	3	2
<i>Fossaria dalli</i>	Dusky Fossaria				x												3	3	3	2
<i>Fossaria modicella</i>	Rock Fossaria				x												3	3	3	2
<i>Fossaria obrussa</i>	Golden Fossaria				x												3	3	3	2
<i>Fossaria parva</i>	Pygmy Fossaria				x												3	3	3	2
<i>Fossaria techella</i>	A Freshwater Snail				x												3	3	2	2
<i>Helisoma anceps</i>	Two-ridge Rams-horn													x	x	x	3	3	3	2
<i>Helix aspersa</i>	Brown Gardensnail	x		x	x	x	x	x	x	x	x	x	x				3	3	3	3
<i>Leptestheria compleximanus</i>	Spineynose Clam Shrimp													x	x	x	3	3	3	2
<i>Lynceus brachyurus</i>	Holarctic Clam Shrimp													x	x	x	3	3	3	2
<i>Lynceus brevifrons</i>	Short Finger Clam Shrimp													x	x	x	3	3	3	2
<i>Orconectes virilis</i>	Virile Crayfish	x													x	x	3	3	3	3
<i>Oreohelix grahamensis</i>	Pinaleno Mountainsnail		3							x	x						1	1	1b	3
<i>Otala lactea</i>	Milk Snail			x	x	x	x	x	x	x	x	x					3	3	3	2
<i>Physella osculans</i>	Cayuse Physa													x	x	x	3	3	2	2
<i>Planorbella tenuis</i>	Mexican Rams-horn													x	x	x	3	3	3	2
<i>Procambarus clarkii</i>	Red Swamp Crawfish	x												x	x	x	3	3	3	3
<i>Promenetus exacuouus</i>	Sharp Sprite (A Planorbid Snail)													x	x	x	3	3	3	2
<i>Pyrgulopsis arizonae</i>	Bylas Springsnail		3											x			1	1	1b	3
<i>Pyrgulopsis bernardina</i>	San Bernardino Springsnail		2											x			1	1	1b	3
<i>Pyrgulopsis thompsoni</i>	Huachuca Springsnail		2											x			1	1	1a	3
<i>Radix auricularia</i>	Big-eared Radix	x												x		x	3	3	3	3
<i>Sonorella christenseni</i>	Clark Peak Talussnail		2							x	x						1	1	1b	3
<i>Sonorella grahamensis</i>	Pinaleno Talussnail		2							x	x						1	1	1b	3
<i>Sonorella imitator</i>	Mimic Talussnail		2							x	x						1	1	1b	3
<i>Sonorella macrophallus</i>	Wet Canyon Talussnail		2							x	x						1	1	1a	3
<i>Streptocephalus dorotheae</i>	New Mexico Fairy Shrimp													x	x	x	3	3	3	2

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status				
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Streptocephalus mackini</i>	Chihuahuan Desert Fairy Shrimp														x	x	x	3	3	3	2
<i>Streptocephalus sealii</i>	Spinytail Fairy Shrimp														x	x	x	3	3	3	2
<i>Streptocephalus texanus</i>	Greater Plains Fairy Shrimp														x	x	x	3	3	3	2
<i>Stygobromus arizonensis</i>	Arizona Cave Amphipod														x			1	1	1b	3
<i>Thamnocephalus mexicanus</i>	Mexican Beavertail Fairy Shrimp														x	x	x	3	3	3	2
<i>Thamnocephalus platyurus</i>	Beavertail Fairy Shrimp														x	x	x	3	3	3	2
<i>Triops longicaudatus</i>	Longtail Tadpole Shrimp														x	x	x	3	3	3	2
<i>Triops newberryi</i>	Desert Tadpole Shrimp														x	x	x	3	3	3	2
<i>Tryonia gilae</i>	Gila Tryonia		2												x			1	1	1b	3
<i>Vertigo berryi</i>	Rotund Vertigo		4												x	x	x	3	3	1c	3
<i>Ammospermophilus harrisi</i>	Harris' Antelope Squirrel			x	x	x	x											2	3	3	3
<i>Antrozous pallidus</i>	Pallid Bat		1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	2	1	3	1
<i>Baiomys taylori</i>	Northern Pygmy Mouse		1	x	x	x		x		x								3	2	1c	3
<i>Bassariscus astutus</i>	Ringtail		1	x			x	x		x								3	2	2	3
<i>Canis latrans</i>	Coyote		1	x	x	x	x	x	x	x	x	x						3	1	3	3
<i>Castor canadensis</i>	American Beaver		1														x	1	1	1c	3
<i>Chaetodipus baileyi</i>	Bailey's Pocket Mouse		1	x	x			x										1	3	3	3
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse		1		x			x										3	1	1c	3
<i>Chaetodipus intermedius</i>	Rock Pocket Mouse		1	x	x			x										1	1	3	3
<i>Chaetodipus penicillatus</i>	Sonoran Desert Pocket Mouse				x	x	x											2	3	3	3
<i>Choeronycteris mexicana</i>	Mexican Long-tongued Bat		1	x	x	x	x	x	x	x	x				x	x	x	2	2	1b	3
<i>Conepatus leuconotus leuconotus</i>	Hog-nosed Skunk		1	x	x	x	x	x	x	x	x							2	2	3	1
<i>Corynorhinus townsendii pallescens</i>	Pale Townsend's Big-eared Bat				x	x	x	x	x	x	x				x	x	x	3	2	2	1
<i>Cynomys ludovicianus</i>	Black-tailed Prairie Dog				x	x	x											2	3	1a	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status				
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Didelphis virginiana californica</i>	Mexican Opossum		2	x	x	x	x	x	x	x					x	x	x	3	2	1c	3
<i>Didelphis virginiana virginiana</i>	Virginia Opossum		2	x	x	x	x	x	x	x						x	x	3	2	1c	3
<i>Dipodomys merriami</i>	Merriam's Kangaroo Rat		1	x	x			x										2	1	2	3
<i>Dipodomys ordii</i>	Ord's Kangaroo Rat		1		x	x		x										3	1	2	3
<i>Dipodomys spectabilis</i>	Banner-tailed Kangaroo Rat		1	x	x			x										3	1	2	3
<i>Eptesicus fuscus</i>	Big Brown Bat			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	2	2	3
<i>Erethizon dorsatum</i>	North American Porcupine		1					x										1	2	3	3
<i>Euderma maculatum</i>	Spotted Bat		2					x	x	x	x		x	x	x			3	2	1b	3
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat		2	x	x	x	x	x	x	x	x		x					2	2	1b	3
<i>Eumops underwoodi</i>	Underwood's Mastiff Bat		2		x			x										2	2	1b	3
<i>Eutamias dorsalis</i>	Cliff Chipmunk							x	x	x	x							2	3	3	3
<i>Idionycteris phyllotis</i>	Allen's Big-eared Bat				x			x	x	x				x	x			3	2	2	1
<i>Lasionycteris noctivagans</i>	Silver-haired Bat			x				x	x	x	x			x	x			3	2	2	1
<i>Lasiurus blossevillii</i>	Western Red Bat		2	x	x	x		x	x	x				x	x			3	2	1b	3
<i>Lasiurus cinereus</i>	Hoary Bat			x	x	x	x	x	x	x				x	x			3	2	2	1
<i>Lasiurus xanthinus</i>	Western Yellow Bat		2	x	x	x	x	x	x	x				x	x			3	2	1b	3
<i>Leopardus pardalis</i>	Ocelot			x	x	x	x	x	x	x				x	x			1	3	1a	3
<i>Leptonycteris curasoae yerbabuena</i>	Lesser Long-nosed Bat		1	x	x	x	x	x	x	x								2	1	1a	3
<i>Lepus alleni</i>	Antelope Jackrabbit			x	x	x		x										2	3	2	3
<i>Lepus californicus</i>	Black-tailed Jackrabbit			x	x	x			x									3	3	3	3
<i>Lynx rufus</i>	Bobcat		1	x	x	x	x	x	x	x	x			x	x			3	2	3	1
<i>Macrotus californicus</i>	California Leaf-nosed Bat		1	x	x			x	x	x				x	x			1	2	1b	3
<i>Mephitis macroura</i>	Hooded Skunk		1	x	x			x	x					x	x	x		2	2	3	3
<i>Mephitis mephitis</i>	Striped Skunk		1	x	x	x	x	x	x	x	x			x	x	x		3	2	3	3
<i>Microtus longicaudus</i>	Long-tailed Vole		1					x										3	1	1c	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type												Species status				
					Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Microtus longicaudus leucophaeus</i>	White-bellied Long-tailed Vole		1						x									1	1	1b	3
<i>Mustela frenata</i>	Long-tailed Weasel					x			x		x	x						2	2	2	1
<i>Myotis auricolus</i>	Southwestern Myotis				x	x	x	x	x	x	x			x	x			2	2	3	1
<i>Myotis californicus</i>	California Myotis		1		x	x	x	x	x	x	x			x	x			1	2	1c	3
<i>Myotis ciliolabrum</i>	Western Small-footed Myotis				x	x			x	x	x			x	x			3	2	2	3
<i>Myotis occultus</i>	Arizona Myotis		1						x					x	x			1	2	2	1
<i>Myotis thysanodes</i>	Fringed Myotis				x	x	x	x	x	x				x	x			3	2	2	3
<i>Myotis velifer</i>	Cave Myotis				x	x	x	x	x	x				x	x			3	2	2	3
<i>Myotis volans</i>	Long-legged Myotis				x	x	x	x	x	x	x			x	x			3	2	2	3
<i>Myotis yumanensis</i>	Yuma Myotis				x	x	x		x	x				x	x			3	2	2	3
<i>Nasua nasua</i>	White-nosed Coati		1		x	x	x	x	x	x	x							3	2	2	3
<i>Neotoma albigula</i>	Western White-throated Woodrat		1		x	x	x	x	x	x								3	2	3	3
<i>Neotoma mexicana</i>	Mexican Woodrat					x			x	x	x	x						3	2	3	1
<i>Neotoma mexicana mexicana</i>	Mexican Woodrat		1			x			x									3	3	1c	3
<i>Notiosorex cockrumi</i>	Cockrum's Desert Shrew				x	x	x	x	x	x								1	3	3	1
<i>Notiosorex crawfordi</i>	Crawford's Desert Shrew		1		x	x	x	x	x	x								1	3	3	3
<i>Nyctinomops femorosaccus</i>	Pocketed Free-tailed Bat				x	x	x	x	x	x				x	x			2	2	2	1
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat		1			x			x	x				x	x	x		2	2	1b	3
<i>Odocoileus hemionus crooki</i>	Desert Mule Deer		1		x	x			x		x					x		2	2	2	1
<i>Odocoileus virginianus couesi</i>	Coues whitetail deer		1				x	x	x		x	x			x	x		2	2	2	3
<i>Onychomys leucogaster</i>	Northern Grasshopper Mouse					x			x									3	2	2	1
<i>Onychomys torridus</i>	Southern Grasshopper Mouse				x	x			x									3	2	2	1
<i>Ovis canadensis mexicana</i>	Desert Bighorn Sheep		1		x	x	x							x				2	2	1b	3
<i>Panthera onca</i>	Jaguar		1		x	x	x	x	x	x	x			x				1	1	1a	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type												Species status					
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Perognathus apache</i>	Apache Pocket Mouse				x													2	2	2	1
<i>Perognathus apache melanotis</i>	Apache Pocket Mouse		1		x													1	2	1c	3
<i>Perognathus flavus</i>	Silky Pocket Mouse				x													3	2	2	1
<i>Peromyscus boylii</i>	Brush Mouse		1		x	x		x										3	1	3	1
<i>Peromyscus difficilis</i>	Rock Mouse							x	x									3	2	2	1
<i>Peromyscus eremicus</i>	Cactus Mouse				x	x		x										3	2	3	1
<i>Peromyscus leucopus</i>	White-footed Mouse				x	x	x	x										3	2	3	1
<i>Peromyscus maniculatus</i>	Deer Mouse		1	x	x			x	x									3	1	3	3
<i>Peromyscus merriami</i>	Mesquite Mouse		1		x													1	1	1b	3
<i>Pipistrellus hesperus</i>	Western Pipistrelle		1	x	x	x	x	x	x	x		x	x	x				3	2	1c	3
<i>Procyon lotor</i>	Raccoon		1					x		x		x	x	x				3	2	3	3
<i>Puma concolor</i>	Mountain Lion		1	x				x	x	x	x							3	1	3	3
<i>Reithrodontomys fulvescens</i>	Fulvous Harvest Mouse				x	x	x		x									3	2	2	1
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse		1	x	x	x		x										3	1	3	1
<i>Reithrodontomys megalotis megalotis</i>	Western Harvest Mouse		1	x	x	x		x										2	1	3	1
<i>Reithrodontomys montanus</i>	Plains Harvest Mouse				x	x	x		x		x							3	2	2	1
<i>Sciurus aberti</i>	Abert's Squirrel		1						x	x	x							3	2	3	3
<i>Sciurus arizonensis</i>	Arizona Gray Squirrel		1					x		x				x	x			1	2	1c	3
<i>Sciurus nayaritensis chiricahuae</i>	Chiricahua Fox Squirrel		1					x		x				x	x			1	2	1b	3
<i>Sigmodon arizonae cienegae</i>	Arizona Cotton Rat		1	x	x													1	2	2	1
<i>Sigmodon fulviventor</i>	Tawny-bellied Cotton Rat				x	x	x	x										2	2	3	1
<i>Sigmodon hispidus</i>	Hispid Cotton Rat				x			x										3	3	2	1
<i>Sigmodon ochrognathus</i>	Yellow-nosed Cotton Rat				x	x	x	x	x	x	x							3	2	2	1
<i>Sorex arizonae</i>	Arizona Shrew		1					x	x	x				x				1	2	1b	3
<i>Sorex monticolus</i>	Dusky Shrew							x	x	x				x				3	3	3	1
<i>Spermophilus spilosoma</i>	Spotted Ground Squirrel		1	x	x					x								3	1	1c	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

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<i>Spermophilus tereticaudus</i>	Round-tailed Ground Squirrel		1	x	x													2	1	3	1
<i>Spermophilus variegatus</i>	Rock Squirrel			x	x	x	x	x	x									3	2	3	3
<i>Spilogale gracilis</i>	Western Spotted Skunk			x	x	x	x	x	x	x								3	3	3	1
<i>Sylvilagus audubonii</i>	Desert Cottontail			x	x	x	x											3	2	3	3
<i>Sylvilagus floridanus</i>	Eastern Cottontail							x	x	x								3	2	2	3
<i>Tadarida brasiliensis</i>	Mexican Free-tailed Bat		1	x	x	x	x	x	x	x		x	x	x				3	1	1c	3
<i>Tamiasciurus hudsonicus grahamens</i>	Mt Graham Red Squirrel		1							x	x							1	1	1a	3
<i>Taxidea taxus</i>	American Badger		1	x	x	x	x	x	x	x								2	1	2	1
<i>Tayassau tajacu</i>	Collared Peccary		1	x	x	x	x	x	x									2	2	2	3
<i>Thomomys bottae</i>	Botta's Pocket Gopher			x	x	x		x		x								2	2	3	1
<i>Thomomys bottae mearnsi</i>	Mearns' Southern Pocket Gopher			x	x	x		x		x								2	2	2	1
<i>Thomomys umbrinus intermedius</i>	Southern Pocket Gopher		1					x										3	2	1b	3
<i>Urocyon cinereoargenteus</i>	Common Gray Fox		1	x			x	x	x	x								3	2	3	3
<i>Ursus americanus</i>	American Black Bear		1				x	x		x	x		x	x				1	2	3	3
<i>Apalone spinifera</i>	Spiny Softshell	x											x	x				3	3	3	3
<i>Arizona elegans noctivaga</i>	Arizona Glossy Snake			x	x	x	x	x	x									3	3	3	3
<i>Aspidoscelis arizonae</i>	Arizona Striped Whiptail				x													1	1	1b	3
<i>Aspidoscelis exsanguis</i>	Chihuahuan Spotted Whiptail				x			x	x	x			x					3	3	2	2
<i>Aspidoscelis flagellicauda</i>	Gila Spotted Whiptail				x	x	x	x	x	x			x					1	3	3	3
<i>Aspidoscelis sonorae</i>	Sonoran Spotted Whiptail			x	x	x		x					x					3	1	3	3
<i>Aspidoscelis stictogrammus</i>	Giant Spotted Whiptail		2					x					x					3	2	1b	3
<i>Aspidoscelis tigris</i>	Tiger Whiptail			x	x	x	x	x	x				x	x				3	3	3	3
<i>Aspidoscelis uniparens</i>	Desert Grassland Whiptail				x	x							x					2	3	3	3
<i>Aspidoscelis xanthonota</i>	Red-back Whiptail		2		x													3	3	1b	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

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<i>Callisaurus draconoides</i>	Zebra-tailed Lizard			x	x	x	x	x										2	3	3	3
<i>Coleonyx variegatus bogerti</i>	Tucson Banded Gecko			x	x	x	x	x	x									2	3	3	2
<i>Cophosaurus texanus scitulus</i>	Chihuahuan Greater Earless Lizard			x	x	x	x	x	x									2	3	3	3
<i>Crotalus atrox</i>	Western Diamond-backed Rattlesnake			x	x	x	x	x	x	x								3	3	3	3
<i>Crotalus lepidus klauberi</i>	Banded Rock Rattlesnake			x	x	x		x		x								3	2	2	3
<i>Crotalus molossus molossus</i>	Northern Black-tailed Rattlesnake			x				x	x	x	x							3	3	3	2
<i>Crotalus oreganus cerberus</i>	Arizona Black Rattlesnake				x			x	x	x	x							1	3	3	3
<i>Crotalus pricei pricei</i>	Western Twin-spotted Rattlesnake		1								x	x						3	1	1b	3
<i>Crotalus scutulatus scutulatus</i>	Northern Mohave Rattlesnake			x	x	x												3	3	3	2
<i>Crotalus tigris</i>	Tiger Rattlesnake				x	x	x	x										3	3	3	3
<i>Crotalus viridis viridis</i>	Green Prairie Rattlesnake		2	x	x													3	3	1c	3
<i>Crotalus willardi obscurus</i>	New Mexico Ridge-nosed Rattlesnake		1						x									3	1	1a	3
<i>Crotalus willardi willardi</i>	Arizona Ridge-nosed Rattlesnake		1		x	x		x		x								2	2	1b	3
<i>Crotaphytus collaris</i>	Eastern Collared Lizard			x	x	x	x	x	x	x								2	3	3	3
<i>Diadophis punctatus regalis</i>	Regal Ring-necked Snake			x	x	x	x	x	x	x			x	x				3	2	3	2
<i>Elgaria kingii nobilis</i>	Arizona Alligator Lizard			x	x	x	x	x	x	x				x				2	3	3	3
<i>Eumeces callicephalus</i>	Mountain Skink		2					x	x	x	x							2	3	1c	3
<i>Eumeces obsoletus</i>	Great Plains Skink			x	x	x	x	x	x	x				x				3	3	3	3
<i>Gambelia wislizenii</i>	Long-nosed Leopard Lizard			x	x	x	x											3	3	3	3
<i>Gopherus agassizii (Sonoran Population)</i>	Sonoran Desert Tortoise		1	x	x			x	x									2	2	1b	3
<i>Gyalopion canum</i>	Chihuahuan Hook-nosed Snake		3	x	x	x		x										3	3	2	1

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status				
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Gyalopion quadrangulare</i>	Thornscrub Hook-nosed Snake		3		x			x										3	3	1b	3
<i>Heloderma suspectum suspectum</i>	Reticulate Gila Monster			x	x													2	3	3	3
<i>Heterodon nasicus kenerlyi</i>	Mexican Hog-nosed Snake			x	x	x		x						x				3	3	2	3
<i>Holbrookia elegans thermophila</i>	Sonoran (elegant) Earless Lizard		2		x			x										3	2	1c	3
<i>Holbrookia maculata pulchra</i>	Huachuca Earless Lizard			x	x	x		x						x				1	3	3	2
<i>Hypsiglena torquata chlorophaea</i>	Sonoran Nightsnake			x	x	x	x	x	x									3	3	3	3
<i>Kinosternon arizonense</i>	Arizona Mud Turtle				x			x					x	x	x			3	1	1b	3
<i>Kinosternon flavescens</i>	Yellow Mud Turtle		2	x	x			x					x	x				3	2	1b	3
<i>Kinosternon sonoriense sonoriense</i>	Sonora Mud Turtle		2	x	x	x	x	x					x	x				2	1	1c	3
<i>Lampropeltis getula californiae</i>	California Kingsnake				x		x	x	x	x			x					2	3	3	3
<i>Lampropeltis getula nigrita</i>	Western Black Kingsnake		2	x	x	x		x										2	3	1c	3
<i>Lampropeltis getula splendida</i>	Desert Kingsnake			x	x	x		x										2	3	3	3
<i>Lampropeltis pyromelana pyromelana</i>	Arizona Mountain Kingsnake							x	x	x	x		x	x				1	3	2	3
<i>Lampropeltis triangulum celaenops</i>	New Mexico Milksnake		2		x													3	3	1b	3
<i>Leptotyphlops dissectus</i>	New Mexico Threadsnake		2	x	x	x	x	x										3	3	1c	3
<i>Leptotyphlops humilis humilis</i>	Southwestern Threadsnake			x	x	x												3	3	3	3
<i>Leptotyphlops humilis segregus</i>	Trans-Pecos Threadsnake			x	x	x												3	3	2	2
<i>Masticophis bilineatus</i>	Sonoran Whipsnake			x	x	x	x	x	x				x	x	x			2	2	3	3
<i>Masticophis flagellum cingulum</i>	Sonoran Coachwhip			x	x			x										2	3	2	2
<i>Masticophis flagellum lineatulus</i>	Lined Coachwhip		2	x														3	3	1c	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Micruroides euryxanthus euryxanthus</i>	Arizona (Sonoran) Coralsnake			x	x		x											2	3	3	2
<i>Oxybelis aeneus</i>	Brown Vinesnake		3		x			x										3	3	1b	3
<i>Phrynosoma cornutum</i>	Texas Horned Lizard		2	x	x			x										2	2	1c	3
<i>Phrynosoma hernandesi hernandesi</i>	Hernandez's (Greater) Short-horned Lizard		2	x	x		x	x		x								3	2	1c	3
<i>Phrynosoma modestum</i>	Round-tailed Horned Lizard			x	x			x										3	3	2	3
<i>Phrynosoma solare</i>	Regal Horned Lizard				x													2	3	3	2
<i>Pituophis catenifer affinis</i>	Sonoran Gophersnake			x	x	x	x	x	x	x	x							3	3	3	3
<i>Rhinocheilus lecontei lecontei</i>	Western Long-nosed Snake			x	x	x	x											3	3	3	2
<i>Salvadora grahamiae</i>	Eastern Patch-nosed Snake		2					x	x	x								3	3	1c	3
<i>Salvadora hexalepis deserticola</i>	Big Bend Patch-nosed Snake			x	x	x	x											3	3	3	3
<i>Sceloporus clarkii</i>	Clark's Spiny Lizard							x	x	x								2	3	2	3
<i>Sceloporus consobrinus</i>	Prairie Lizard			x	x	x	x											3	3	2	3
<i>Sceloporus jarrovi</i>	Yarrow's Spiny Lizard							x	x	x								3	2	2	3
<i>Sceloporus magister</i>	Desert Spiny Lizard			x	x													3	3	3	3
<i>Sceloporus slevini</i>	Slevin's Bunchgrass Lizard		2		x	x		x		x	x							3	1	1b	3
<i>Sceloporus virgatus</i>	Striped Plateau Lizard		2					x		x								3	3	1c	3
<i>Senticolis triaspis intermedia</i>	Northern Green Ratsnake		2	x	x			x										3	2	1c	3
<i>Sistrurus catenatus edwardsii</i>	Desert Massasauga		2		x	x												3	2	1b	3
<i>Sonora semiannulata semiannulata</i>	Variable Groundsnake			x	x	x	x	x										3	3	3	3
<i>Tantilla hobartsmithi</i>	Smith's Black-headed Snake			x	x	x	x	x	x	x	x							2	3	1c	3
<i>Tantilla nigriceps</i>	Plains Black-headed Snake		2	x	x		x	x										3	3	1c	3
<i>Tantilla wilcoxi</i>	Chihuahuan Black-headed Snake		2		x			x		x								3	3	1c	3

APPENDIX G. APACHE HIGHLANDS SOUTH MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Tantilla yaquia</i>	Yaqui Black-headed Snake		2	x	x			x										3	3	1c	3
<i>Terrapene ornata luteola</i>	Desert Box Turtle		2	x	x	x												3	2	1b	3
<i>Thamnophis cyrtopsis cyrtopsis</i>	Western Black-necked Gartersnake		2	x	x	x	x	x	x	x			x	x	x			3	2	1c	3
<i>Thamnophis elegans vagrans</i>	Wandering Gartersnake				x	x			x	x	x		x	x	x			3	2	2	3
<i>Thamnophis eques megalops</i>	Northern Mexican Gartersnake		2										x	x	x			2	2	1b	3
<i>Thamnophis marcianus marcianus</i>	Marcy's Checkered Gartersnake				x	x							x	x	x			3	2	2	2
<i>Trimorphodon biscutatus lambda</i>	Western Lyresnake			x	x	x	x	x	x									3	3	2	3
<i>Urosaurus ornatus</i>	Ornate Tree Lizard			x	x	x	x	x	x	x	x		x	x	x			3	2	3	3
<i>Uta stansburiana</i>	Common Side-blotched Lizard			x	x	x	x	x										3	2	3	3

APPENDIX H. MASTER SPECIES LIST FOR THE ARIZONA-NEW MEXICO MOUNTAINS ECOREGION

Distribution within the ecoregion, associated confidence in assigning distribution, and species status in 4 categories. See "Compilation of a Comprehensive List of Wildlife in Arizona (Element 1)" for how species were included on the list, Table 11 for "Distribution Confidence" scoring, and Appendix L for criteria used to assign "Species Status" scores.

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species Status			
				Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Ambystoma tigrinum nebulosum</i>	Arizona Tiger Salamander			x	x			x	x	x				x	x	x	2	1	1c	3
<i>Bufo microscaphus</i>	Arizona Toad		2	x		x	x	x	x					x	x		1	2	1b	3
<i>Bufo punctatus</i>	Red-spotted Toad			x		x	x							x	x		3	1	2	3
<i>Bufo woodhousii woodhousi</i>	Rocky Mountain Toad			x		x	x	x	x					x	x	x	3	2	2	3
<i>Hyla arenicolor</i>	Canyon Treefrog			x		x	x							x	x		2	1	1c	3
<i>Hyla wrightorum</i>	Mountain Treefrog		2	x	x	x	x	x	x	x				x	x		1	2	1c	3
<i>Pseudacris triseriata</i>	Western Chorus Frog			x				x	x					x	x	x	3	1	1c	3
<i>Rana blairi</i>	Plains Leopard Frog		1	x													3	2	1b	3
<i>Rana catesbeiana</i>	American Bullfrog	x															3	3	3	3
<i>Rana chiricahuensis</i>	Chiricahua Leopard Frog		2	x			x	x	x					x	x	x	1	2	1a	3
<i>Rana pipiens</i>	Northern Leopard Frog		2	x	x		x	x	x	x				x	x	x	1	2	1b	3
<i>Rana yavapaiensis</i>	Lowland Leopard Frog		2			x	x	x	x					x	x		1	3	1b	3
<i>Spea bombifrons</i>	Plains Spadefoot			x										x	x		3	1	2	3
<i>Spea multiplicata</i>	Mexican Spadefoot			x		x	x	x						x	x		3	2	2	3
<i>Accipiter cooperii</i>	Cooper's Hawk			x	x	x	x	x	x	x	x	x	x	x	x	x	2	1	3	3
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk		1		x	x	x	x	x	x	x	x	x	x	x	x	2	1	1b	3
<i>Accipiter striatus</i>	Sharp-shinned Hawk			x	x	x	x	x	x	x	x	x	x	x	x	x	2	1	3	2
<i>Actitis macularius</i>	Spotted Sandpiper													x	x	x	3	1	3	2
<i>Aechmophorus clarkii</i>	Clark's Grebe		1											x	x	x	3	1	1b	3
<i>Aechmophorus occidentalis</i>	Western Grebe		1											x	x	x	3	1	1c	3
<i>Aegolius acadicus</i>	Northern Saw-whet Owl					x	x	x	x	x				x	x	x	3	2	3	2
<i>Aeronautes saxatalis</i>	White-throated Swift			x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	2
<i>Agelaius phoeniceus</i>	Red-winged Blackbird			x	x									x	x	x	3	1	2	2
<i>Aimophila cassinii</i>	Cassin's Sparrow			x													3	1	2	3
<i>Aimophila ruficeps</i>	Rufous-crowned Sparrow					x	x	x									3	1	3	3
<i>Aix sponsa</i>	Wood Duck		1											x	x	x	3	1	1c	3

APPENDIX H. ARIZONA-NEW MEXICO MOUNTAINS MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type													Species Status							
					Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Community/Focal Responsibility	Vulnerability	Unknown Status						
<i>Buteo albonotatus</i>	Zone-tailed Hawk								x	x	x	x							x	x	x	3	1	2	3
<i>Buteo jamaicensis</i>	Red-tailed Hawk				x	x	x		x	x	x	x							x	x	x	3	2	3	3
<i>Buteo regalis</i>	Ferruginous Hawk		2		x	x																2	1	1b	3
<i>Buteo swainsoni</i>	Swainson's Hawk				x	x																3	1	2	3
<i>Buteogallus anthracinus</i>	Common Black-Hawk		1							x									x	x	x	2	1	1b	3
<i>Butorides virescens</i>	Green Heron																		x	x	x	3	1	3	3
<i>Calamospiza melanocorys</i>	Lark Bunting				x	x																3	1	2	2
<i>Calcarius mccownii</i>	McCown's Longspur		2		x																	3	1	1c	3
<i>Calcarius ornatus</i>	Chestnut-collared Longspur		2		x																	3	1	2	1
<i>Calidris minutilla</i>	Least Sandpiper																		x	x	x	3	1	3	2
<i>Callipepla californica</i>	California Quail	x			x														x	x	x	3	3	3	3
<i>Calypte anna</i>	Anna's Hummingbird							x	x	x									x	x		3	2	3	3
<i>Caprimulgus vociferus</i>	Whip-poor-will								x													3	1	2	2
<i>Cardellina rubrifrons</i>	Red-faced Warbler										x	x										3	1	2	3
<i>Carduelis pinus</i>	Pine Siskin				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	2	2	3
<i>Carduelis psaltria</i>	Lesser Goldfinch				x		x	x	x	x									x	x	x	3	1	3	3
<i>Carpodacus cassinii</i>	Cassin's Finch		2						x	x									x	x	x	3	2	1c	3
<i>Carpodacus mexicanus</i>	House Finch				x		x	x	x	x									x	x	x	3	1	3	3
<i>Cathartes aura</i>	Turkey Vulture				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Catharus guttatus</i>	Hermit Thrush				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Catharus ustulatus</i>	Swainson's Thrush		2		x	x	x	x	x	x									x	x	x	3	1	1b	3
<i>Catherpes mexicanus</i>	Canyon Wren						x	x	x	x									x			3	1	3	3
<i>Certhia americana</i>	Brown Creeper							x	x	x	x								x		x	3	1	3	3
<i>Ceryle alcyon</i>	Belted Kingfisher		2																x	x	x	3	1	1b	3
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover		1																x		x	3	2	1b	3
<i>Charadrius montanus</i>	Mountain Plover		2		x														x			3	2	1c	3
<i>Charadrius vociferus</i>	Killdeer				x	x													x	x	x	3	1	3	3
<i>Chen caerulescens</i>	Snow Goose																		x		x	3	1	2	3
<i>Chen rossii</i>	Ross's Goose																		x		x	3	1	2	3
<i>Chondestes grammacus</i>	Lark Sparrow				x	x													x			3	1	3	3
<i>Chordeiles minor</i>	Common Nighthawk				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3

APPENDIX H. ARIZONA-NEW MEXICO MOUNTAINS MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type											Species Status				
					Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Cinclus mexicanus</i>	American Dipper		2												x	x	2	1	1c	3
<i>Circus cyaneus</i>	Northern Harrier		2	x	x									x	x	x	2	1	1c	3
<i>Cistothorus palustris</i>	Marsh Wren		1											x	x	x	3	1	1c	3
<i>Coccythraustes vespertinus</i>	Evening Grosbeak		2						x	x	x			x	x	x	3	1	1c	3
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo		2											x	x	x	2	1	1a	3
<i>Colaptes auratus</i>	Northern Flicker			x	x	x	x	x	x	x	x			x	x	x	3	1	3	3
<i>Columba livia</i>	Rock Pigeon	x		x				x	x					x			3	3	3	3
<i>Contopus cooperi</i>	Olive-sided Flycatcher		2	x	x	x	x	x	x	x				x	x	x	3	1	1b	3
<i>Contopus pertinax</i>	Greater Pewee		2			x	x	x	x	x					x	x	3	1	2	1
<i>Contopus sordidulus</i>	Western Wood-Pewee			x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	2
<i>Corvus brachyrhynchos</i>	American Crow			x	x	x	x	x	x	x				x	x	x	3	1	2	2
<i>Corvus corax</i>	Common Raven			x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Cyanocitta stelleri</i>	Steller's Jay			x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	2
<i>Cyrtonyx montezumae</i>	Montezuma Quail			x	x		x		x					x	x		2	1	2	3
<i>Dendragapus obscurus</i>	Blue Grouse		1		x				x	x				x			3	2	1c	3
<i>Dendroica coronata</i>	Yellow-rumped Warbler			x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Dendroica graciae</i>	Grace's Warbler						x	x	x	x				x	x	x	3	1	2	3
<i>Dendroica nigrescens</i>	Black-throated Gray Warbler			x		x	x	x	x	x				x	x	x	3	1	2	3
<i>Dendroica petechia</i>	Yellow Warbler					x	x	x						x	x	x	3	1	2	3
<i>Dumetella carolinensis</i>	Gray Catbird		1											x	x	x	3	1	1b	3
<i>Egretta thula</i>	Snowy Egret		1											x	x	x	3	1	1b	3
<i>Empidonax oberholseri</i>	Dusky Flycatcher			x		x	x	x	x	x				x	x	x	3	1	2	3
<i>Empidonax occidentalis</i>	Cordilleran Flycatcher					x	x	x	x	x				x	x	x	3	1	3	3
<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher		1		x									x	x	x	1	1	1a	3
<i>Empidonax wrightii</i>	Gray Flycatcher		1	x		x	x	x	x					x	x	x	3	1	3	1
<i>Eremophila alpestris</i>	Horned Lark			x	x									x	x	x	3	1	2	3
<i>Eugenes fulgens</i>	Magnificent Hummingbird		2						x	x				x			3	1	1c	3
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird			x	x			x	x	x				x	x	x	3	1	2	2
<i>Falco mexicanus</i>	Prairie Falcon			x	x	x	x	x						x	x	x	2	1	2	3
<i>Falco peregrinus</i>	Peregrine Falcon			x	x	x	x	x	x	x	x	x	x	x	x	x	2	1	2	3
<i>Falco peregrinus anatum</i>	American Peregrine Falcon		1	x	x	x	x	x	x	x	x	x	x	x	x	x	2	1	1b	3

APPENDIX H. ARIZONA-NEW MEXICO MOUNTAINS MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type											Species Status				
					Plains & Great Basin Grassland	Subalpine Grassland	Inferior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Community/Focal Responsibility	Vulnerability	Unknown Status	
<i>Falco sparverius</i>	American Kestrel				x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	2
<i>Fulica americana</i>	American Coot												x	x	x	x	3	2	2	3
<i>Gallinago delicata</i>	Wilson's Snipe		2										x	x	x	x	3	1	1c	3
<i>Gallinula chloropus</i>	Common Moorhen												x	x	x	x	3	2	2	3
<i>Geococcyx californianus</i>	Greater Roadrunner				x		x						x		x	x	3	2	2	3
<i>Geothlypis trichas</i>	Common Yellowthroat				x								x	x	x	x	3	1	3	3
<i>Glaucidium gnoma californicum</i>	Northern Pygmy-Owl						x	x	x	x	x						3	2	2	2
<i>Grus canadensis</i>	Sandhill Crane				x	x							x	x	x	x	3	1	2	3
<i>Gymnorhinus cyanocephalus</i>	Pinyon Jay				x		x	x	x	x			x	x	x	x	3	2	2	3
<i>Haliaeetus leucocephalus</i>	Bald Eagle		1		x	x				x	x		x	x	x	x	1	2	1a	3
<i>Himantopus mexicanus</i>	Black-necked Stilt												x	x	x	x	3	2	2	3
<i>Hirundo rustica</i>	Barn Swallow				x	x	x	x	x	x	x		x	x	x	x	3	1	2	2
<i>Icteria virens</i>	Yellow-breasted Chat													x	x	x	3	1	2	3
<i>Icterus bullockii</i>	Bullock's Oriole				x		x	x	x	x			x	x	x	x	3	1	3	3
<i>Icterus cucullatus</i>	Hooded Oriole				x		x							x	x		2	1	2	3
<i>Icterus parisorum</i>	Scott's Oriole				x		x	x	x				x	x	x		3	1	3	3
<i>Junco hyemalis</i>	Dark-eyed Junco				x	x	x	x	x	x	x		x	x	x	x	3	1	2	3
<i>Lanius ludovicianus</i>	Loggerhead Shrike				x	x			x				x	x	x	x	3	1	2	3
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher												x	x	x	x	3	1	2	2
<i>Loxia curvirostra</i>	Red Crossbill					x		x	x	x	x		x	x	x		3	2	2	3
<i>Megascops kennicottii</i>	Western Screech-Owl				x		x	x	x				x	x	x		3	2	3	3
<i>Melanerpes formicivorus</i>	Acorn Woodpecker						x	x	x	x	x		x		x	x	3	2	3	3
<i>Melanerpes lewis</i>	Lewis's Woodpecker		1		x		x	x	x	x			x	x	x	x	3	2	1c	3
<i>Meleagris gallopavo merriami</i>	Merriam's Turkey				x	x	x	x	x	x	x		x	x	x	x	3	2	2	3
<i>Melospiza lincolni</i>	Lincoln's Sparrow		1		x	x	x	x	x				x	x	x	x	3	1	1c	3
<i>Melospiza melodia</i>	Song Sparrow												x	x	x		3	1	2	3
<i>Mergus merganser</i>	Common Merganser		1										x		x	x	3	1	1c	3
<i>Mimus polyglottos</i>	Northern Mockingbird				x		x	x	x				x	x	x	x	3	1	3	3
<i>Molothrus ater</i>	Brown-headed Cowbird				x	x	x	x	x	x			x	x	x	x	3	1	2	3
<i>Myadestes townsendi</i>	Townsend's Solitaire					x	x	x	x	x	x		x	x	x	x	3	1	3	3
<i>Myiarchus cinerascens</i>	Ash-throated Flycatcher				x		x	x	x				x	x	x	x	3	1	3	3

APPENDIX H. ARIZONA-NEW MEXICO MOUNTAINS MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type											Species Status				
					Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Myioborus pictus</i>	Painted Redstart								x		x	x	x	x	x	x	3	1	2	3
<i>Nucifraga columbiana</i>	Clark's Nutcracker		1		x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Numenius americanus</i>	Long-billed Curlew		1		x	x								x	x	x	3	1	2	1
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron													x	x	x	3	1	2	3
<i>Oporornis tolmiei</i>	MacGillivray's Warbler		1		x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Oreoscoptes montanus</i>	Sage Thrasher		1		x				x					x			3	1	1b	3
<i>Otus flammeolus</i>	Flammulated Owl							x	x	x	x			x	x	x	3	1	2	3
<i>Oxyura jamaicensis</i>	Ruddy Duck													x	x	x	3	1	2	3
<i>Pandion haliaetus</i>	Osprey		1											x	x	x	3	1	1b	3
<i>Passer domesticus</i>	House Sparrow	x												x			3	3	3	3
<i>Passerculus sandwichensis</i>	Savannah Sparrow		1		x	x								x	x	x	3	1	1c	3
<i>Passerina amoena</i>	Lazuli Bunting				x	x	x	x	x	x	x			x	x	x	3	1	2	3
<i>Passerina caerulea</i>	Blue Grosbeak				x									x	x	x	3	1	3	3
<i>Passerina cyanea</i>	Indigo Bunting		2											x	x	x	3	1	1c	3
<i>Patagioenas fasciata</i>	Band-tailed Pigeon						x	x	x	x	x			x	x	x	3	1	2	3
<i>Pelecanus erythrorhynchos</i>	American White Pelican													x		x	3	1	2	2
<i>Perisoreus canadensis</i>	Gray Jay		1			x				x	x	x			x		3	2	1c	3
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				x	x								x	x	x	3	1	2	3
<i>Peucedramus taeniatus</i>	Olive Warbler									x	x				x		3	2	2	3
<i>Phainopepla nitens</i>	Phainopepla				x		x		x					x	x	x	3	2	2	3
<i>Phalacrocorax auritus albociliatus</i>	Double-crested Cormorant		1											x		x	3	1	1c	3
<i>Phalaenoptilus nuttallii</i>	Common Poorwill				x		x		x								3	1	2	3
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak				x	x	x	x	x	x	x			x	x	x	3	1	3	3
<i>Picoides dorsalis</i>	American Three-toed Woodpecker		1							x	x						3	2	1b	3
<i>Picoides pubescens</i>	Downy Woodpecker		2						x	x	x			x	x	x	3	2	1c	3
<i>Picoides villosus</i>	Hairy Woodpecker							x	x	x	x			x	x	x	3	2	3	3
<i>Pinicola enucleator</i>	Pine Grosbeak		2							x	x	x					3	2	1b	3
<i>Pipilo chlorurus</i>	Green-tailed Towhee		1		x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Pipilo fuscus</i>	Canyon Towhee				x		x	x	x					x	x	x	3	2	3	3
<i>Pipilo maculatus</i>	Spotted Towhee				x		x	x	x	x				x	x	x	3	1	3	3
<i>Piranga flava</i>	Hepatic Tanager							x		x					x		3	1	2	3

APPENDIX H. ARIZONA-NEW MEXICO MOUNTAINS MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type												Species Status			
					Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Piranga ludoviciana</i>	Western Tanager		x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Piranga rubra</i>	Summer Tanager												x	x	x		3	1	2	3
<i>Plegadis chihi</i>	White-faced Ibis	1											x	x	x	x	3	1	2	1
<i>Podiceps nigricollis</i>	Eared Grebe	2											x	x		x	3	1	1c	3
<i>Podilymbus podiceps</i>	Pied-billed Grebe												x	x	x	x	3	1	3	3
<i>Poecile gambeli</i>	Mountain Chickadee					x	x	x	x				x	x	x	x	3	1	3	3
<i>Poliophtila caerulea</i>	Blue-gray Gnatcatcher		x		x	x	x						x	x	x	x	3	1	3	3
<i>Pooecetes gramineus</i>	Vesper Sparrow		x	x									x				3	1	2	3
<i>Porzana carolina</i>	Sora												x	x	x	x	3	1	2	3
<i>Progne subis arboricola</i>	Western Purple Martin	1							x				x		x	x	3	1	1b	3
<i>Psaltriparus minimus</i>	Bushtit				x	x	x	x	x				x	x	x	x	3	2	2	3
<i>Quiscalus mexicanus</i>	Great-tailed Grackle		x										x	x	x	x	3	1	2	3
<i>Rallus limicola</i>	Virginia Rail												x	x	x	x	3	1	2	2
<i>Recurvirostra americana</i>	American Avocet	1											x	x	x	x	3	1	1c	3
<i>Regulus calendula</i>	Ruby-crowned Kinglet	1	x	x	x	x	x	x	x				x	x	x	x	3	1	1c	3
<i>Regulus satrapa</i>	Golden-crowned Kinglet	1							x	x	x				x		3	2	1c	3
<i>Salpinctes obsoletus</i>	Rock Wren		x		x	x	x	x	x	x			x	x	x	x	3	1	3	3
<i>Sayornis nigricans</i>	Black Phoebe					x	x	x					x	x	x	x	3	1	3	3
<i>Sayornis saya</i>	Say's Phoebe		x	x	x	x	x						x	x	x	x	3	1	3	3
<i>Selasphorus platycercus</i>	Broad-tailed Hummingbird		x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Sialia currucoides</i>	Mountain Bluebird		x	x			x						x	x	x	x	3	1	2	3
<i>Sialia mexicana</i>	Western Bluebird		x	x	x	x	x	x	x				x	x	x	x	3	1	2	3
<i>Sitta canadensis</i>	Red-breasted Nuthatch					x	x	x	x	x			x	x	x	x	3	2	2	3
<i>Sitta carolinensis</i>	White-breasted Nuthatch					x	x	x	x	x			x	x	x	x	3	2	3	3
<i>Sitta pygmaea</i>	Pygmy Nuthatch						x	x	x	x							3	2	2	3
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker	1			x	x	x	x	x				x	x	x	x	3	1	1b	3
<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker					x	x	x	x				x	x	x	x	3	2	2	3
<i>Spizella atrogularis</i>	Black-chinned Sparrow					x	x	x							x		3	1	2	3
<i>Spizella breweri</i>	Brewer's Sparrow		x		x								x	x	x	x	3	1	2	3
<i>Spizella passerina</i>	Chipping Sparrow		x	x	x	x	x	x	x				x	x	x	x	3	1	2	3
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow		x	x	x		x						x	x	x	x	3	1	3	3

APPENDIX H. ARIZONA-NEW MEXICO MOUNTAINS MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type												Species Status						
					Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Community/Focal Responsibility	Vulnerability	Unknown Status				
<i>Streptopelia decaocto</i>	Eurasian Collared-Dove	x																	3	3	3	3	
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl		1				x	x	x	x	x									2	2	1a	3
<i>Sturnella magna</i>	Eastern Meadowlark				x	x														3	1	2	3
<i>Sturnella neglecta</i>	Western Meadowlark				x	x														3	1	2	3
<i>Sturnus vulgaris</i>	European Starling	x																		3	3	3	3
<i>Tachycineta bicolor</i>	Tree Swallow		1		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Tachycineta thalassina</i>	Violet-green Swallow				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Thryomanes bewickii</i>	Bewick's Wren				x		x	x	x											3	2	3	2
<i>Toxostoma crissale</i>	Crissal Thrasher				x		x													3	2	3	3
<i>Tringa melanoleuca</i>	Greater Yellowlegs																			3	1	2	2
<i>Troglodytes aedon</i>	House Wren				x	x	x	x	x	x	x									3	1	3	3
<i>Troglodytes troglodytes</i>	Winter Wren		2																	3	1	1c	3
<i>Turdus migratorius</i>	American Robin				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Tyrannus verticalis</i>	Western Kingbird				x		x		x											3	1	3	3
<i>Tyrannus vociferans</i>	Cassin's Kingbird				x		x	x	x	x										3	1	3	3
<i>Tyto alba</i>	Barn Owl				x				x											3	2	3	3
<i>Vermivora celata</i>	Orange-crowned Warbler		1		x	x	x	x	x	x	x									3	1	1c	3
<i>Vermivora luciae</i>	Lucy's Warbler																			2	1	3	3
<i>Vermivora virginiae</i>	Virginia's Warbler						x	x	x	x										3	1	2	3
<i>Vireo gilvus</i>	Warbling Vireo				x	x	x	x	x	x	x									3	1	3	3
<i>Vireo huttoni</i>	Hutton's Vireo						x	x												3	2	2	3
<i>Vireo plumbeus</i>	Plumbeous Vireo				x		x	x	x	x										3	1	3	3
<i>Vireo vicinior</i>	Gray Vireo				x				x											3	1	2	3
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird																						
<i>Zenaida asiatica</i>	White-winged Dove				x															3	1	2	3
<i>Zenaida macroura</i>	Mourning Dove				x		x	x	x	x										3	1	2	3
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow		1		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Carassius auratus</i>	Goldfish	x																		3	3	3	3
<i>Catostomus clarki</i>	Desert Sucker		1																	1	1	1b	3
<i>Catostomus discobolus</i>	Bluehead Sucker		1																	3	1	1a	3
<i>Catostomus insignis</i>	Sonora Sucker		1																	1	1	1b	3

APPENDIX H. ARIZONA-NEW MEXICO MOUNTAINS MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type											Species Status				
					Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Catostomus latipinnis</i>	Flannelmouth Sucker		1									x		3	1	1a	3			
<i>Catostomus sp.</i>	Little Colorado Sucker		1									x		1	1	1b	3			
<i>Ctenopharyngodon idella</i>	Grass Carp	x								x				3	3	3	3			
<i>Cyprinus carpio</i>	Common Carp	x									x	x		3	3	3	3			
<i>Esox lucius</i>	Northern Pike	x										x		3	3	3	3			
<i>Gambusia affinis</i>	Mosquitofish	x								x		x		3	3	3	3			
<i>Gila robusta</i>	Roundtail Chub		1									x		1	1	1b	3			
<i>Ictalurus melas</i>	Black Bullhead	x										x		3	3	3	3			
<i>Ictalurus natalis</i>	Yellow Bullhead	x										x		3	3	3	3			
<i>Ictalurus punctatus</i>	Channel Catfish	x										x	x	3	3	3	3			
<i>Lepidomeda vittata</i>	Little Colorado Spinedace		1									x		1	1	1a	3			
<i>Lepomis cyanellus</i>	Green Sunfish	x										x	x	3	3	3	3			
<i>Lepomis macrochirus</i>	Bluegill	x											x	3	3	3	3			
<i>Micropterus dolomieu</i>	Smallmouth Bass	x											x	3	3	3	3			
<i>Micropterus salmoides</i>	Largemouth Bass	x											x	3	3	3	3			
<i>Notemigonus crysoleucas</i>	Golden Shiner	x										x	x	3	3	3	3			
<i>Notropis lutrensis</i>	Red Shiner	x										x	x	3	3	3	3			
<i>Oncorhynchus clarki</i>	Cutthroat Trout	x										x	x	3	3	3	3			
<i>Oncorhynchus gilae apache</i>	Apache (Arizona) Trout		1									x	x	1	1	1a	3			
<i>Oncorhynchus gilae gilae</i>	Gila Trout		1									x		2	1	1a	3			
<i>Oncorhynchus mykiss</i>	Rainbow Trout	x										x	x	3	3	3	3			
<i>Perca flavescens</i>	Yellow Perch	x											x	3	3	3	3			
<i>Pimephales promelas</i>	Fathead Minnow	x										x	x	3	3	3	3			
<i>Pomoxis nigromaculatus</i>	Black Crappie	x											x	3	3	3	3			
<i>Rhinichthys osculus</i>	Speckled Dace		1										x	1	1	1b	3			
<i>Salmo trutta</i>	Brown Trout	x										x	x	3	3	3	3			
<i>Salvelinus fontinalis</i>	Brook Trout	x										x	x	3	3	3	3			
<i>Stizostedion vitreum</i>	Walleye	x											x	3	3	3	3			
<i>Thymallus arcticus</i>	Arctic Grayling	x											x	3	3	3	3			
<i>Tiaroga cobitis</i>	Loach Minnow		1										x	1	1	1a	3			
<i>Anodonta californiensis</i>	California Floater		4									x	x	3	1	1b	3			
<i>Artemia franciscana</i>	San Francisco Brine Shrimp											2	x	3	3	3	2			

APPENDIX H. ARIZONA-NEW MEXICO MOUNTAINS MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type											Species Status					
					Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madreaan Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Otala lactea</i>	Milk Snail		x	x	x	x	x	x	x	x								3	3	3	2
<i>Physella gyrina</i>	Tadpole Physa	x																3	3	3	3
<i>Physella osculans</i>	Cayuse Physa												x	x	x			3	3	2	2
<i>Physella virgata</i>	Protean Physa													x				3	3	3	2
<i>Planorbella tenuis</i>	Mexican Rams-horn												x	x	x			3	3	3	2
<i>Procambarus clarkii</i>	Red Swamp Crawfish	x											x	x	x			3	3	3	3
<i>Promenetus exacuouus</i>	Sharp Sprite (A Planorbid Snail)												x	x	x			3	3	3	2
<i>Pyrgulopsis trivialis</i>	Three Forks Springsnail		2										x					1	1	1a	3
<i>Radix auricularia</i>	Big-eared Radix	x													x			3	3	3	3
<i>Streptocephalus dorotheae</i>	New Mexico Fairy Shrimp												x	x	x			3	3	3	2
<i>Streptocephalus mackini</i>	Chihuahuan Desert Fairy Shrimp												x	x	x			3	3	3	2
<i>Streptocephalus sealii</i>	Spinytail Fairy Shrimp												x	x	x			3	3	3	2
<i>Streptocephalus texanus</i>	Greater Plains Fairy Shrimp												x	x	x			3	3	3	2
<i>Thamnocephalus mexicanus</i>	Mexican Beavertail Fairy Shrimp													2	x			3	3	3	2
<i>Thamnocephalus platyurus</i>	Beavertail Fairy Shrimp												x	x	x			3	3	3	2
<i>Triops longicaudatus</i>	Longtail Tadpole Shrimp												x	x	x			3	3	3	2
<i>Triops newberryi</i>	Desert Tadpole Shrimp												x	x	x			3	3	3	2
<i>Vertigo berryi</i>	Rotund Vertigo		4										x	x	x			3	3	1c	3
<i>Vitrina pellucida</i>	Western Glass Snail			x				x	x									3	3	3	2
<i>Vitrina pellucida alaskana</i>	Western Glass Snail			x				x	x									3	3	3	2
<i>Ammospermophilus leucurus</i>	White-tailed Antelope Squirrel							x	x									3	3	3	1
<i>Antilocapra americana americana</i>	America Pronghorn		1	x	x			x	x						x			1	2	1c	3
<i>Antrozous pallidus</i>	Pallid Bat		1	x	x	x	x	x	x				x	x	x	x		2	1	3	1
<i>Bassariscus astutus</i>	Ringtail		1					x	x									3	2	2	3
<i>Canis latrans</i>	Coyote		1	x	x	x	x	x	x	x			x					3	1	3	3
<i>Canis lupus baileyi</i>	Mexican Gray Wolf		1		x	x	x	x	x	x								1	1	1a	3
<i>Castor canadensis</i>	American Beaver		1										x	x	x			1	1	1c	3
<i>Cervus elaphus nelsoni</i>	Rocky Mountain Elk		1	x	x	x	x	x	x	x					x	x		3	2	2	3

APPENDIX H. ARIZONA-NEW MEXICO MOUNTAINS MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type											Species Status					
					Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Clethrionomys gapperi</i>	Southern Red-backed Vole		1		x				x	x	x							3	1	2	1
<i>Corynorhinus townsendii pallescens</i>	Pale Townsend's Big-eared Bat				x		x	x	x	x	x				x	x	x	3	2	2	1
<i>Cynomys gunnisoni</i>	Gunnison's Prairie Dog		1		x	x			x	x								2	1	1a	3
<i>Dipodomys ordii</i>	Ord's Kangaroo Rat		1		x				x	x								3	1	2	3
<i>Eptesicus fuscus</i>	Big Brown Bat				x		x	x	x	x	x		x	x	x	x		3	2	2	3
<i>Equus asinus</i>	Feral Ass	x			x				x											3	3
<i>Erethizon dorsatum</i>	North American Porcupine		1		x		x	x	x	x	x							1	2	3	3
<i>Euderma maculatum</i>	Spotted Bat		2				x			x	x			x	x	x		3	2	1b	3
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat		2							x								2	2	1b	3
<i>Eutamias cinereicollis</i>	Gray-collared Chipmunk		1						x	x	x							2	3	1c	3
<i>Eutamias dorsalis</i>	Cliff Chipmunk				x				x	x	x							2	3	3	3
<i>Eutamias minimus</i>	Least Chipmunk		1						x	x	x	x						3	3	1c	3
<i>Idionycteris phyllotis</i>	Allen's Big-eared Bat				x	x	x	x	x	x	x			x	x			3	2	2	1
<i>Lasionycteris noctivagans</i>	Silver-haired Bat				x	x	x	x	x	x	x			x	x			3	2	2	1
<i>Lasiurus blossevillii</i>	Western Red Bat		2		x	x	x	x	x	x	x			x	x			3	2	1b	3
<i>Lasiurus cinereus</i>	Hoary Bat				x	x	x	x	x	x	x			x	x			3	2	2	1
<i>Lepus californicus</i>	Black-tailed Jackrabbit				x				x									3	3	3	3
<i>Lutra canadensis lataxina</i>	Southeastern River Otter		1												x			3	1	1c	3
<i>Lynx rufus</i>	Bobcat		1		x	x	x	x	x	x	x			x	x			3	2	3	1
<i>Mephitis macroura</i>	Hooded Skunk		1						x									2	2	3	3
<i>Mephitis mephitis</i>	Striped Skunk		1		x	x	x	x	x	x	x			x	x	x		3	2	3	3
<i>Microtus longicaudus</i>	Long-tailed Vole		1						x	x	x							3	1	1c	3
<i>Microtus mexicanus hualpaiensis</i>	Hualapai Mexican Vole		1						x	x								1	1	1a	3
<i>Microtus montanus arizonensis</i>	Arizona Montane Vole		1		x					x	x							1	2	1c	3
<i>Mustela frenata</i>	Long-tailed Weasel				x	x	x	x	x	x	x	x						2	2	2	1
<i>Myotis auriculus</i>	Southwestern Myotis				x	x	x	x	x	x				x	x			2	2	3	1
<i>Myotis californicus</i>	California Myotis		1		x		x	x	x	x				x	x			1	2	1c	3
<i>Myotis ciliolabrum</i>	Western Small-footed Myotis				x	x	x	x	x	x				x	x			3	2	2	3
<i>Myotis evotis</i>	Long-eared Myotis				x	x	x	x	x	x	x	x		x	x			3	2	2	1
<i>Myotis occultus</i>	Arizona Myotis		1		x		x	x	x	x	x			x	x			1	2	2	1

APPENDIX H. ARIZONA-NEW MEXICO MOUNTAINS MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type											Species Status					
					Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Myotis thysanodes</i>	Fringed Myotis				x	x	x	x	x	x						x	x	3	2	2	3
<i>Myotis volans</i>	Long-legged Myotis				x	x	x	x	x	x	x					x	x	3	2	2	3
<i>Myotis yumanensis</i>	Yuma Myotis				x		x	x	x	x						x	x	3	2	2	3
<i>Neotoma albigula</i>	Western White-throated Woodrat		1		x		x	x	x									3	2	3	3
<i>Neotoma mexicana</i>	Mexican Woodrat				x		x	x	x	x	x							3	2	3	1
<i>Neotoma stephensi</i>	Stephen's Woodrat		1		x		x	x	x									1	2	3	1
<i>Notiosorex crawfordi</i>	Crawford's Desert Shrew		1		x		x	x	x									1	3	3	3
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat		1					x	x	x					x	x	x	2	2	1b	3
<i>Odocoileus hemionus hemionus</i>	Rocky Mountain Mule Deer				x	x	x	x	x	x						x	x	3	2	2	3
<i>Odocoileus virginianus couesi</i>	Coues whitetail deer		1		x			x	x	x								2	2	2	3
<i>Ondatra zibethicus</i>	Common Muskrat		1												x		x	2	1	1c	3
<i>Onychomys leucogaster</i>	Northern Grasshopper Mouse				x		x		x									3	2	2	1
<i>Ovis canadensis canadensis</i>	Rocky Mountain Bighorn Sheep		1		x	x				x	x					x	x	2	2	1c	3
<i>Ovis canadensis mexicana</i>	Desert Bighorn Sheep		1		x											x	x	2	2	1b	3
<i>Perognathus apache</i>	Apache Pocket Mouse								x	x								2	2	2	1
<i>Perognathus flavus</i>	Silky Pocket Mouse				x				x									3	2	2	1
<i>Perognathus flavus goodpasteri</i>	Springerville Pocket Mouse		1		x													1	2	1b	3
<i>Peromyscus boylii</i>	Brush Mouse		1		x		x	x	x	x								3	1	3	1
<i>Peromyscus difficilis</i>	Rock Mouse				x				x	x								3	2	2	1
<i>Peromyscus leucopus</i>	White-footed Mouse				x													3	2	3	1
<i>Peromyscus maniculatus</i>	Deer Mouse		1		x	x			x	x	x							3	1	3	3
<i>Peromyscus truei</i>	Pinon Mouse				x		x		x									3	2	3	1
<i>Pipistrellus hesperus</i>	Western Pipistrelle		1		x		x	x	x	x					x	x	x	3	2	1c	3
<i>Procyon lotor</i>	Raccoon		1		x	x	x	x	x	x	x				x	x	x	3	2	3	3
<i>Puma concolor</i>	Mountain Lion		1		x	x	x	x	x	x	x						x	3	1	3	3
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse		1			x	x		x	x								3	1	3	1
<i>Reithrodontomys megalotis megalotis</i>	Western Harvest Mouse		1							x								2	1	3	1
<i>Sciurus aberti</i>	Abert's Squirrel		1						x	x	x					x	x	3	2	3	3

APPENDIX H. ARIZONA-NEW MEXICO MOUNTAINS MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type												Species Status				
					Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Alpine Tundra	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Sorex merriami</i>	Merriam's Shrew		1							x	x							3	3	1c	3
<i>Sorex monticolus</i>	Dusky Shrew									x	x				x	x		3	3	3	1
<i>Sorex nanus</i>	Dwarf Shrew		1							x	x	x						3	3	1b	3
<i>Sorex palustris</i>	Water Shrew		1		x										x	x		3	1	1b	3
<i>Spermophilus lateralis</i>	Golden-mantled Ground Squirrel									x	x	x						3	2	2	1
<i>Spermophilus spilosoma</i>	Spotted Ground Squirrel		1	x						x								3	1	1c	3
<i>Spermophilus tridecemlineatus</i>	Thirteen-lined Ground Squirrel		1		x								x					3	1	1b	3
<i>Spermophilus variegatus</i>	Rock Squirrel			x		x	x	x	x	x								3	2	3	3
<i>Spilogale gracilis</i>	Western Spotted Skunk			x		x	x	x	x									3	3	3	1
<i>Sylvilagus audubonii</i>	Desert Cottontail			x														3	2	3	3
<i>Sylvilagus floridanus</i>	Eastern Cottontail				x	x	x	x	x									3	2	2	3
<i>Sylvilagus nuttallii pinetis</i>	Southwestern Cottontail									x	x							1	2	1c	3
<i>Tadarida brasiliensis</i>	Mexican Free-tailed Bat		1	x	x	x	x	x	x					x	x	x		3	1	1c	3
<i>Tamiasciurus hudsonicus</i>	Red Squirrel		1							x	x							3	1	2	3
<i>Taxidea taxus</i>	American Badger		1	x		x	x	x	x									2	1	2	1
<i>Tayassau tajacu</i>	Collared Peccary		1	x		x	x	x	x									2	2	2	3
<i>Thomomys bottae</i>	Botta's Pocket Gopher			x					x	x								2	2	3	1
<i>Urocyon cinereoargenteus</i>	Common Gray Fox		1	x	x	x	x	x	x	x								3	2	3	3
<i>Ursus americanus</i>	American Black Bear		1	x	x	x	x	x	x	x					x	x		1	2	3	3
<i>Vulpes macrotis</i>	Kit Fox		1	x														2	2	2	1
<i>Zapus hudsonius luteus</i>	New Mexican Jumping Mouse		1												x	x		1	2	1b	3
<i>Apalone spinifera</i>	Spiny Softshell	x													x	x		3	3	3	3
<i>Arizona elegans noctivaga</i>	Arizona Glossy Snake			x		x	x	x										3	3	3	3
<i>Aspidoscelis flagellicauda</i>	Gila Spotted Whiptail			x		x	x	x	x									1	3	3	3
<i>Aspidoscelis pai</i>	Pai Striped Whiptail			x		x	x	x										1	2	1c	3
<i>Aspidoscelis uniparens</i>	Desert Grassland Whiptail			x												x		2	3	3	3
<i>Aspidoscelis velox</i>	Plateau Striped Whiptail			x		x	x	x	x							x		3	3	3	3
<i>Chrysemys picta bellii</i>	Western Painted Turtle		3												x	x	x	3	2	1c	3
<i>Coluber constrictor mormon</i>	Western Yellow-bellied Racer		2	x					x									3	3	1c	3

APPENDIX I. MASTER SPECIES LIST FOR THE COLORADO PLATEAU ECOREGION

Distribution within the Colorado Plateau Ecoregion, associated confidence in assigning distribution, and species status in 4 categories. See "Compilation of a Comprehensive List of Wildlife in Arizona (Element 1)" for how species were included on the list, Table 11 for "Distribution Confidence" scoring, and Appendix L for criteria used to assign "Species Status" scores.

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Ambystoma tigrinum nebulosum</i>	Arizona Tiger Salamander				x	x			x	x	x			x	x	x	2	1	1c	3
<i>Bufo alvarius</i>	Sonoran Desert Toad			x										x	x		2	2	2	3
<i>Bufo cognatus</i>	Great Plains Toad			x	x									x	x		3	2	2	3
<i>Bufo microscaphus</i>	Arizona Toad		2	x	x		x	x						x	x		1	2	1b	3
<i>Bufo punctatus</i>	Red-spotted Toad			x	x									x	x		3	1	2	3
<i>Bufo woodhousii woodhousi</i>	Rocky Mountain Toad			x		x	x	x	x					x	x	x	3	2	2	3
<i>Hyla arenicolor</i>	Canyon Treefrog			x	x		x							x	x		2	1	1c	3
<i>Rana catesbeiana</i>	American Bullfrog	x															3	3	3	3
<i>Rana onca</i>	Relict Leopard Frog		2	x										x	x		2	2	1a	3
<i>Rana pipiens</i>	Northern Leopard Frog		2	x	x			x						x	x	x	1	2	1b	3
<i>Scaphiopus couchii</i>	Couch's Spadefoot				x									x	x		3	1	2	3
<i>Spea bombifrons</i>	Plains Spadefoot				x									x	x		3	1	2	3
<i>Spea intermontana</i>	Great Basin Spadefoot				x	x		x	x	x				x	x		3	1	1c	3
<i>Spea multiplicata</i>	Mexican Spadefoot			x	x			x						x	x		3	2	2	3
<i>Accipiter cooperii</i>	Cooper's Hawk			x	x	x	x	x	x	x	x	x	x	x	x	x	2	1	3	3
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk		1			x	x	x	x	x				x	x	x	2	1	1b	3
<i>Accipiter striatus</i>	Sharp-shinned Hawk			x	x	x	x	x	x	x				x	x	x	2	1	3	2
<i>Actitis macularius</i>	Spotted Sandpiper													x	x	x	3	1	3	2
<i>Aechmophorus clarkii</i>	Clark's Grebe		1											x	x	x	3	1	1b	3
<i>Aechmophorus occidentalis</i>	Western Grebe		1											x	x	x	3	1	1c	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status			
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Aegolius acadicus</i>	Northern Saw-whet Owl						x	x	x	x		x	x	x	3	2	3	2
<i>Aeronautes saxatalis</i>	White-throated Swift			x	x	x	x	x	x	x	x	x	x	x	3	1	2	2
<i>Agelaius phoeniceus</i>	Red-winged Blackbird			x	x	x					x	x	x	x	3	1	2	2
<i>Aimophila cassinii</i>	Cassin's Sparrow				x						x				3	1	2	3
<i>Aimophila ruficeps</i>	Rufous-crowned Sparrow			x			x	x							3	1	3	3
<i>Aix sponsa</i>	Wood Duck		1								x	x	x	x	3	1	1c	3
<i>Alectoris chukar</i>	Chukar	x		x	x		x	x				x	x		3	3	3	3
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow		2		x										3	1	1b	3
<i>Amphispiza belli</i>	Sage Sparrow			x	x						x				3	1	2	3
<i>Amphispiza bilineata</i>	Black-throated Sparrow			x	x		x				x				3	1	3	3
<i>Anas acuta</i>	Northern Pintail		2								x	x	x	x	3	1	1c	3
<i>Anas americana</i>	American Wigeon		2								x	x	x	x	3	1	1c	3
<i>Anas clypeata</i>	Northern Shoveler		2								x	x	x	x	3	1	1c	3
<i>Anas crecca</i>	Green-winged Teal										x	x	x	x	3	1	2	2
<i>Anas cyanoptera</i>	Cinnamon Teal										x	x	x	x	3	1	3	2
<i>Anas discors</i>	Blue-winged Teal		2								x	x	x	x	3	1	1c	3
<i>Anas platyrhynchos</i>	Mallard										x	x	x	x	3	1	3	2
<i>Anas strepera</i>	Gadwall										x	x	x	x	3	1	3	2
<i>Anthus rubescens</i>	American Pipit		1		x	x					x	x	x	x	3	1	1c	3
<i>Anthus spragueii</i>	Sprague's Pipit		2		x										3	1	1b	3
<i>Aphelocoma californica</i>	Western Scrub-Jay			x	x		x	x	x		x	x	x	x	3	2	3	3
<i>Aquila chrysaetos</i>	Golden Eagle			x	x	x	x	x	x	x	x	x	x	x	1	1	2	3
<i>Archilochus alexandri</i>	Black-chinned Hummingbird			x	x		x	x	x		x	x	x	x	3	1	3	3
<i>Ardea alba</i>	Great Egret		1								x	x	x	x	3	2	1b	3
<i>Ardea herodias</i>	Great Blue Heron										x	x	x	x	3	2	2	3
<i>Asio otus</i>	Long-eared Owl			x	x		x	x	x	x		x	x	x	3	2	2	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status			
<i>Athene cunicularia hypugaea</i>	Western Burrowing Owl				x													2	2	2	3
<i>Auriparus flaviceps</i>	Verdin			x	x		x	x										3	3	3	3
<i>Aythya affinis</i>	Lesser Scaup											x	x	x	x			3	1	2	2
<i>Aythya americana</i>	Redhead											x	x	x	x			3	1	2	2
<i>Aythya collaris</i>	Ring-necked Duck											x	x	x	x			3	1	2	2
<i>Aythya valisineria</i>	Canvasback		2									x	x	x	x			3	1	1c	3
<i>Baeolophus ridgwayi</i>	Juniper Titmouse				x		x	x				x	x	x				3	2	3	3
<i>Botaurus lentiginosus</i>	American Bittern		4									x	x	x	x			3	1	1b	3
<i>Branta canadensis</i>	Canada Goose		2									x	x	x	x			3	1	1c	3
<i>Bubo virginianus</i>	Great Horned Owl			x	x	x	x	x	x	x	x	x	x	x	x			2	2	3	3
<i>Bubulcus ibis</i>	Cattle Egret		1									x	x	x	x			3	2	1c	3
<i>Buteo albonotatus</i>	Zone-tailed Hawk								x	x			x	x				3	1	2	3
<i>Buteo jamaicensis</i>	Red-tailed Hawk			x	x	x	x	x	x	x	x	x	x	x	x			3	2	3	3
<i>Buteo regalis</i>	Ferruginous Hawk		2		x	x		x				x						2	1	1b	3
<i>Buteo swainsoni</i>	Swainson's Hawk				x	x		x				x						3	1	2	3
<i>Butorides virescens</i>	Green Heron												x	x	x			3	1	3	3
<i>Calamospiza melanocorys</i>	Lark Bunting				x	x							x					3	1	2	2
<i>Calcarius mccownii</i>	McCown's Longspur		2		x								x					3	1	1c	3
<i>Calcarius ornatus</i>	Chestnut-collared Longspur		2		x								x			x		3	1	2	1
<i>Calidris minutilla</i>	Least Sandpiper												x	x	x	x		3	1	3	2
<i>Callipepla gambelii</i>	Gambel's Quail				x	x								x	x	x		3	3	2	3
<i>Callipepla squamata</i>	Scaled Quail				x													3	1	2	3
<i>Calypte costae</i>	Costa's Hummingbird				x			x					x	x	x			3	1	3	3
<i>Campylorhynchus brunneicapillus</i>	Cactus Wren				x													3	3	3	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status			
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo		2					x			x	x	x	x	2	1	1a	3
<i>Colaptes auratus</i>	Northern Flicker			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Columba livia</i>	Rock Pigeon	x			x			x			x				3	3	3	3
<i>Contopus cooperi</i>	Olive-sided Flycatcher		2	x	x	x	x	x	x	x	x	x	x	x	3	1	1b	3
<i>Contopus sordidulus</i>	Western Wood-Pewee			x	x	x	x	x	x	x	x	x	x	x	3	1	3	2
<i>Corvus brachyrhynchos</i>	American Crow				x	x		x	x		x		x	x	3	1	2	2
<i>Corvus corax</i>	Common Raven			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Cyanocitta stelleri</i>	Steller's Jay			x	x	x	x	x	x	x	x	x	x	x	3	1	3	2
<i>Dendragapus obscurus</i>	Blue Grouse		1			x			x	x		x			3	2	1c	3
<i>Dendroica coronata</i>	Yellow-rumped Warbler			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Dendroica graciae</i>	Grace's Warbler								x	x	x	x	x		3	1	2	3
<i>Dendroica nigrescens</i>	Black-throated Gray Warbler			x	x		x	x	x	x	x	x	x	x	3	1	2	3
<i>Dendroica petechia</i>	Yellow Warbler			x				x			x	x	x	x	3	1	2	3
<i>Dumetella carolinensis</i>	Gray Catbird		1								x	x	x	x	3	1	1b	3
<i>Egretta thula</i>	Snowy Egret		1								x	x	x	x	3	1	1b	3
<i>Empidonax oberholseri</i>	Dusky Flycatcher			x	x		x	x	x	x	x	x	x	x	3	1	2	3
<i>Empidonax occidentalis</i>	Cordilleran Flycatcher						x	x	x	x	x	x	x	x	3	1	3	3
<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher		1					x			x	x	x	x	1	1	1a	3
<i>Empidonax wrightii</i>	Gray Flycatcher		1	x	x		x	x	x		x	x	x	x	3	1	3	1
<i>Eremophila alpestris</i>	Horned Lark			x	x	x					x	x	x	x	3	1	2	3
<i>Eugenes fulgens</i>	Magnificent Hummingbird		2						x	x		x			3	1	1c	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type													Species status		
					Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird					x	x		x	x	x	x	x	x	x	x	3	1	2	2
<i>Falco mexicanus</i>	Prairie Falcon				x	x	x	x	x		x	x	x	x			2	1	2	3
<i>Falco peregrinus</i>	Peregrine Falcon				x	x	x	x	x	x	x	x	x	x			2	1	2	3
<i>Falco peregrinus anatum</i>	American Peregrine Falcon		1		x	x	x	x	x	x	x	x	x	x			2	1	1b	3
<i>Falco sparverius</i>	American Kestrel				x	x	x	x	x	x	x	x	x	x			3	1	3	2
<i>Fulica americana</i>	American Coot										x	x	x	x			3	2	2	3
<i>Gallinago delicata</i>	Wilson's Snipe		2								x	x	x	x			3	1	1c	3
<i>Gallinula chloropus</i>	Common Moorhen											x	x	x			3	2	2	3
<i>Geococcyx californianus</i>	Greater Roadrunner				x	x		x	x		x		x	x			3	2	2	3
<i>Geothlypis trichas</i>	Common Yellowthroat										x	x	x	x			3	1	3	3
<i>Glaucidium gnoma californicum</i>	Northern Pygmy-Owl							x	x	x	x		x	x	x		3	2	2	2
<i>Grus canadensis</i>	Sandhill Crane					x						x	x		x		3	1	2	3
<i>Gymnogyps californianus</i>	California Condor		1		x			x	x	x		x		x	x		1	2	1a	3
<i>Gymnorhinus cyanocephalus</i>	Pinyon Jay					x		x	x			x	x	x			3	2	2	3
<i>Haliaeetus leucocephalus</i>	Bald Eagle		1									x	x	x	x		1	2	1a	3
<i>Himantopus mexicanus</i>	Black-necked Stilt											x	x	x	x		3	2	2	3
<i>Hirundo rustica</i>	Barn Swallow				x	x	x	x	x	x	x	x	x	x			3	1	2	2
<i>Icteria virens</i>	Yellow-breasted Chat											x	x	x	x		3	1	2	3
<i>Icterus bullockii</i>	Bullock's Oriole				x	x		x	x	x		x	x	x	x		3	1	3	3
<i>Icterus cucullatus</i>	Hooded Oriole				x	x						x	x	x			2	1	2	3
<i>Icterus parisorum</i>	Scott's Oriole				x	x		x	x			x	x	x			3	1	3	3
<i>Ixobrychus exilis hesperis</i>	Western Least Bittern												x	x			2	2	2	3
<i>Junco hyemalis</i>	Dark-eyed Junco				x	x	x	x	x	x	x	x	x	x			3	1	2	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type												Species status			
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Lanius ludovicianus</i>	Loggerhead Shrike			x	x			x				x	x	x	x	3	1	2	3
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher											x	x	x	x	3	1	2	2
<i>Loxia curvirostra</i>	Red Crossbill				x			x	x	x	x	x	x			3	2	2	3
<i>Megascops kennicottii</i>	Western Screech-Owl						x	x				x	x	x		3	2	3	3
<i>Melanerpes formicivorus</i>	Acorn Woodpecker						x	x	x	x	x			x		3	2	3	3
<i>Melanerpes lewis</i>	Lewis's Woodpecker		1		x			x	x	x	x	x	x	x		3	2	1c	3
<i>Meleagris gallopavo merriami</i>	Merriam's Turkey					x	x	x	x	x				x	x	3	2	2	3
<i>Melospiza lincolnii</i>	Lincoln's Sparrow		1	x	x	x	x	x				x	x	x	x	3	1	1c	3
<i>Melospiza melodia</i>	Song Sparrow											x	x	x		3	1	2	3
<i>Mergus merganser</i>	Common Merganser		1									x		x	x	3	1	1c	3
<i>Mimus polyglottos</i>	Northern Mockingbird			x	x		x	x				x	x	x	x	3	1	3	3
<i>Molothrus ater</i>	Brown-headed Cowbird			x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Myadestes townsendi</i>	Townsend's Solitaire					x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Myiarchus cinerascens</i>	Ash-throated Flycatcher			x	x		x	x				x	x	x	x	3	1	3	3
<i>Myiarchus tyrannulus</i>	Brown-crested Flycatcher													x		3	1	2	3
<i>Nucifraga columbiana</i>	Clark's Nutcracker		1		x	x	x	x	x	x	x	x	x	x		3	1	1c	3
<i>Numenius americanus</i>	Long-billed Curlew		1		x							x	x	x	x	3	1	2	1
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron											x	x	x	x	3	1	2	3
<i>Oporornis tolmiei</i>	MacGillivray's Warbler		1	x	x	x	x	x	x	x	x	x	x	x		3	1	1c	3
<i>Oreoscoptes montanus</i>	Sage Thrasher		1	x	x			x				x				3	1	1b	3
<i>Otus flammeolus</i>	Flammulated Owl							x	x	x	x	x	x			3	1	2	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type												Species status		
					Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Oxyura jamaicensis</i>	Ruddy Duck											x	x	x	x	3	1	2	3
<i>Pandion haliaetus</i>	Osprey		1									x	x	x	x	3	1	1b	3
<i>Passer domesticus</i>	House Sparrow	x										x				3	3	3	3
<i>Passerculus sandwichensis</i>	Savannah Sparrow		1		x	x						x	x	x	x	3	1	1c	3
<i>Passerina amoena</i>	Lazuli Bunting				x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Passerina caerulea</i>	Blue Grosbeak				x	x	x					x	x	x	x	3	1	3	3
<i>Passerina cyanea</i>	Indigo Bunting		2									x	x	x	x	3	1	1c	3
<i>Patagioenas fasciata</i>	Band-tailed Pigeon							x	x	x	x	x	x			3	1	2	3
<i>Pelecanus erythrorhynchos</i>	American White Pelican											x		x	x	3	1	2	2
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				x	x						x	x	x	x	3	1	2	3
<i>Phainopepla nitens</i>	Phainopepla				x	x		x	x			x	x	x		3	2	2	3
<i>Phalacrocorax auritus albociliatus</i>	Double-crested Cormorant		1									x		x	x	3	1	1c	3
<i>Phalaenoptilus nuttallii</i>	Common Poorwill				x	x		x	x							3	1	2	3
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak				x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Pica hudsonia</i>	Black-billed Magpie		1		x							x	x	x	x	3	2	1b	3
<i>Picoides dorsalis</i>	American Three-toed Woodpecker		1						x	x						3	2	1b	3
<i>Picoides pubescens</i>	Downy Woodpecker		2					x	x	x	x	x	x			3	2	1c	3
<i>Picoides scalaris</i>	Ladder-backed Woodpecker				x	x		x						x		3	2	3	3
<i>Picoides villosus</i>	Hairy Woodpecker							x	x	x	x	x	x			3	2	3	3
<i>Pinicola enucleator</i>	Pine Grosbeak		2					x	x	x						3	2	1b	3
<i>Pipilo chlorurus</i>	Green-tailed Towhee		1		x	x	x	x	x	x	x	x	x	x		3	1	1c	3
<i>Pipilo fuscus</i>	Canyon Towhee					x		x					x			3	2	3	3
<i>Pipilo maculatus</i>	Spotted Towhee				x	x		x	x	x		x	x	x		3	1	3	3
<i>Piranga flava</i>	Hepatic Tanager								x							3	1	2	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type													Species status		
					Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Piranga ludoviciana</i>	Western Tanager				x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Piranga rubra</i>	Summer Tanager										x	x	x	x			3	1	2	3
<i>Plegadis chihi</i>	White-faced Ibis		1								x	x	x	x			3	1	2	1
<i>Podiceps nigricollis</i>	Eared Grebe		2								x		x	x			3	1	1c	3
<i>Podilymbus podiceps</i>	Pied-billed Grebe										x	x	x	x			3	1	3	3
<i>Poecile gambeli</i>	Mountain Chickadee							x	x	x	x	x	x	x			3	1	3	3
<i>Polioptila caerulea</i>	Blue-gray Gnatcatcher				x	x		x	x		x	x	x	x			3	1	3	3
<i>Poocetes gramineus</i>	Vesper Sparrow					x	x				x						3	1	2	3
<i>Porzana carolina</i>	Sora										x	x	x	x			3	1	2	3
<i>Progne subis arboricola</i>	Western Purple Martin		1						x		x		x	x			3	1	1b	3
<i>Psaltriparus minimus</i>	Bushtit				x			x	x	x	x	x	x	x			3	2	2	3
<i>Quiscalus mexicanus</i>	Great-tailed Grackle				x	x					x	x	x	x			3	1	2	3
<i>Rallus limicola</i>	Virginia Rail										x	x	x	x			3	1	2	2
<i>Recurvirostra americana</i>	American Avocet		1								x	x	x	x			3	1	1c	3
<i>Regulus calendula</i>	Ruby-crowned Kinglet		1		x	x	x	x	x	x	x	x	x	x			3	1	1c	3
<i>Regulus satrapa</i>	Golden-crowned Kinglet		1						x	x			x				3	2	1c	3
<i>Salpinctes obsoletus</i>	Rock Wren				x	x		x	x	x	x	x	x	x			3	1	3	3
<i>Sayornis nigricans</i>	Black Phoebe				x						x	x	x	x			3	1	3	3
<i>Sayornis saya</i>	Say's Phoebe				x	x	x	x			x	x	x	x			3	1	3	3
<i>Selasphorus platycercus</i>	Broad-tailed Hummingbird				x	x	x	x	x	x	x	x	x	x			3	1	3	3
<i>Sialia currucoides</i>	Mountain Bluebird				x	x	x		x		x	x	x	x			3	1	2	3
<i>Sialia mexicana</i>	Western Bluebird				x	x	x	x	x	x	x	x	x	x			3	1	2	3
<i>Sitta canadensis</i>	Red-breasted Nuthatch							x	x	x	x	x	x	x			3	2	2	3

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<i>Sitta carolinensis</i>	White-breasted Nuthatch						x	x	x	x		x	x	x	3	2	3	3
<i>Sitta pygmaea</i>	Pygmy Nuthatch							x	x	x	x				3	2	2	3
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker		1	x			x	x	x	x	x	x	x	x	3	1	1b	3
<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker							x	x	x	x	x	x	x	3	2	2	3
<i>Spizella atrogularis</i>	Black-chinned Sparrow				x		x	x							3	1	2	3
<i>Spizella breweri</i>	Brewer's Sparrow			x	x		x	x			x	x	x	x	3	1	2	3
<i>Spizella passerina</i>	Chipping Sparrow			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow			x	x	x	x	x			x	x	x	x	3	1	3	3
<i>Streptopelia decaocto</i>	Eurasian Collared-Dove	x									x				3	3	3	3
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl		1				x	x	x	x		x	x		2	2	1a	3
<i>Sturnella magna</i>	Eastern Meadowlark				x						x				3	1	2	3
<i>Sturnella neglecta</i>	Western Meadowlark			x	x	x					x	x	x	x	3	1	2	3
<i>Sturnus vulgaris</i>	European Starling	x									x	x	x	x	3	3	3	3
<i>Tachycineta bicolor</i>	Tree Swallow		1	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Tachycineta thalassina</i>	Violet-green Swallow			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Thryomanes bewickii</i>	Bewick's Wren			x	x		x	x	x		x	x	x	x	3	2	3	2
<i>Toxostoma bendirei</i>	Bendire's Thrasher		1		x			x			x	x	x	x	3	1	2	1
<i>Toxostoma crissale</i>	Crissal Thrasher			x	x		x	x				x	x	x	3	2	3	3
<i>Tringa melanoleuca</i>	Greater Yellowlegs										x	x	x	x	3	1	2	2
<i>Troglodytes aedon</i>	House Wren			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Troglodytes troglodytes</i>	Winter Wren		2						x	x		x	x		3	1	1c	3
<i>Turdus migratorius</i>	American Robin			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Tyrannus verticalis</i>	Western Kingbird			x	x		x	x			x	x	x	x	3	1	3	3

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<i>Tyrannus vociferans</i>	Cassin's Kingbird			x	x		x	x	x		x	x	x	x	3	1	3	3	
<i>Tyto alba</i>	Barn Owl				x			x			x	x	x	x	3	2	3	3	
<i>Vermivora celata</i>	Orange-crowned Warbler		1	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3	
<i>Vermivora luciae</i>	Lucy's Warbler			x								x	x	x	2	1	3	3	
<i>Vermivora virginiae</i>	Virginia's Warbler				x		x	x			x	x	x	x	3	1	2	3	
<i>Vireo bellii arizonae</i>	Arizona Bell's Vireo												x		3	1	3	3	
<i>Vireo gilvus</i>	Warbling Vireo			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3	
<i>Vireo plumbeus</i>	Plumbeous Vireo			x	x		x	x	x		x	x	x	x	3	1	3	3	
<i>Vireo vicinior</i>	Gray Vireo			x	x		x	x					x		3	1	2	3	
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird											x	x	x	x	3	1	2	3
<i>Zenaida asiatica</i>	White-winged Dove											x			3	1	2	3	
<i>Zenaida macroura</i>	Mourning Dove			x	x		x	x	x		x	x	x	x	3	1	2	3	
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow		1	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3	
<i>Carassius auratus</i>	Goldfish	x											x	x	3	3	3	3	
<i>Catostomus discobolus</i>	Bluehead Sucker		1										x	x	3	1	1a	3	
<i>Catostomus discobolus yarrowi</i>	Zuni Bluehead Sucker		1											x	2	1	1a	3	
<i>Catostomus latipinnis</i>	Flannelmouth Sucker		1										x		3	1	1a	3	
<i>Catostomus sp.</i>	Little Colorado Sucker		1										x		1	1	1b	3	
<i>Ctenopharyngodon idella</i>	Grass Carp	x										x			3	3	3	3	
<i>Cyprinus carpio</i>	Common Carp	x											x	x	3	3	3	3	
<i>Dorosoma petenense</i>	Threadfin Shad	x											x	x	3	3	3	3	
<i>Fundulus zebrinus</i>	Plains Killifish	x											x	x	3	3	3	3	
<i>Gambusia affinis</i>	Mosquitofish	x										x	x	x	3	3	3	3	
<i>Gila cypha</i>	Humpback Chub		1										x		1	1	1a	3	

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status				
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Gila elegans</i>	Bonytail		1											x		1	1	1a	3
<i>Gila robusta</i>	Roundtail Chub		1											x		1	1	1b	3
<i>Ictalurus melas</i>	Black Bullhead	x												x	x	3	3	3	3
<i>Ictalurus natalis</i>	Yellow Bullhead	x												x	x	3	3	3	3
<i>Ictalurus punctatus</i>	Channel Catfish	x												x	x	3	3	3	3
<i>Lepidomeda vittata</i>	Little Colorado Spinedace		1											x		1	1	1a	3
<i>Lepomis cyanellus</i>	Green Sunfish	x												x	x	3	3	3	3
<i>Lepomis macrochirus</i>	Bluegill	x												x		3	3	3	3
<i>Micropterus dolomieu</i>	Smallmouth Bass	x												x	x	3	3	3	3
<i>Micropterus salmoides</i>	Largemouth Bass	x												x	x	3	3	3	3
<i>Morone saxatilis</i>	Striped Bass	x												x		3	3	3	3
<i>Notropis lutrensis</i>	Red Shiner	x												x	x	3	3	3	3
<i>Oncorhynchus gilae apache</i>	Apache (Arizona) Trout		1											x		1	1	1a	3
<i>Oncorhynchus mykiss</i>	Rainbow Trout	x												x	x	3	3	3	3
<i>Pimephales promelas</i>	Fathead Minnow	x												x	x	3	3	3	3
<i>Pomoxis nigromaculatus</i>	Black Crappie	x												x		3	3	3	3
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow		1											x		1	1	1a	3
<i>Pylodictis olivaris</i>	Flathead Catfish	x												x		3	3	3	3
<i>Rhinichthys osculus</i>	Speckled Dace		1											x		1	1	1b	3
<i>Salmo trutta</i>	Brown Trout	x												x	x	3	3	3	3
<i>Stizostedion vitreum</i>	Walleye	x												x		3	3	3	3
<i>Xyrauchen texanus</i>	Razorback Sucker		1											x		1	1	1a	3
<i>Anodonta californiensis</i>	California Floater		4										x	x	x	3	1	1b	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status				
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Artemia franciscana</i>	San Francisco Brine Shrimp											x	x	x	3	3	3	2	
<i>Biomphalaria havanensis</i>	Ghost Rams-horn	x													x	3	3	3	3
<i>Branchinecta kaibabensis</i>	Kaibab Fairy Shrimp												x			3	3	3	2
<i>Cyzicus mexicanus</i>	Mexican Clam Shrimp											x	x	x	3	3	3	2	
<i>Cyzicus setosa</i>	Bristletail Clam Shrimp											x	x	x	3	3	3	2	
<i>Eocyclus digueti</i>	Straightbacked Clam Shrimp											x	x	x	3	3	3	2	
<i>Eubbranchipus bundyi</i>	Knobbedlip Fairy Shrimp											x	x	x	3	3	3	2	
<i>Eubbranchipus serratus</i>	Ethologist Fairy Shrimp											x	x	x	3	3	3	2	
<i>Eulimnadia antlei</i>	Fuzzy Cyst Clam Shrimp											x	x	x	3	3	3	2	
<i>Eulimnadia cylindrova</i>	Cylindrical Cyst Clam Shrimp											x	x	x	3	3	3	2	
<i>Eulimnadia texana</i>	Texan Clam Shrimp											x	x	x	3	3	3	2	
<i>Ferrissia fragilis</i>	Fragile Ancyloid											x	x	x	3	3	3	2	
<i>Ferrissia rivularis</i>	Creeping Ancyloid											x	x	x	3	3	3	2	
<i>Fossaria dalli</i>	Dusky Fossaria			x											3	3	3	2	
<i>Fossaria modicella</i>	Rock Fossaria			x											3	3	3	2	
<i>Fossaria obrussa</i>	Golden Fossaria			x											3	3	3	2	
<i>Fossaria parva</i>	Pygmy Fossaria			x											3	3	3	2	
<i>Fossaria techella</i>	A Freshwater Snail			x											3	3	2	2	
<i>Gyraulus parvus</i>	Ash Gyro											x	x		3	3	3	2	
<i>Helisoma anceps</i>	Two-ridge Rams-horn											x	x	x	3	3	3	2	
<i>Helix aspersa</i>	Brown Gardensnail	x		x	x	x	x	x	x	x					3	3	3	3	
<i>Leptestheria compleximanus</i>	Spineynose Clam Shrimp											x	x	x	3	3	3	2	
<i>Lynceus brachyurus</i>	Holarctic Clam Shrimp											x	x	x	3	3	3	2	

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status				
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Lynceus brevifrons</i>	Short Finger Clam Shrimp												x	x	x	3	3	3	2
<i>Orconectes virilis</i>	Virile Crayfish	x												x	x	3	3	3	3
<i>Oreohelix yavapai</i>	Yavapai Mountain Snail				x					x						3	3	3	2
<i>Oreohelix yavapai cummingsi</i>			4		x					x						3	3	1b	3
<i>Otala lactea</i>	Milk Snail			x	x	x	x	x	x	x						3	3	3	2
<i>Oxyloma haydeni haydeni</i>	Niobrara Ambersnail		2		x				x							1	1	1b	3
<i>Oxyloma haydeni kanabensis</i>	Kanab Ambersnail		2	x	x											1	1	1a	3
<i>Physella humerosa</i>	Corkscrew Physa													x	x	3	3	2	2
<i>Physella osculans</i>	Cayuse Physa												x	x	x	3	3	2	2
<i>Physella virgata</i>	Protean Physa													x		3	3	3	2
<i>Planorbella tenuis</i>	Mexican Rams-horn												x	x	x	3	3	3	2
<i>Procambarus clarkii</i>	Red Swamp Crawfish	x											x	x	x	3	3	3	3
<i>Promenetus exacuus</i>	Sharp Sprite (A Planorbid Snail)												x	x	x	3	3	3	2
<i>Radix auricularia</i>	Big-eared Radix	x													x	3	3	3	3
<i>Streptocephalus dorotheae</i>	New Mexico Fairy Shrimp												x	x	x	3	3	3	2
<i>Streptocephalus mackini</i>	Chihuahuan Desert Fairy Shrimp												x	x	x	3	3	3	2
<i>Streptocephalus sealii</i>	Spinytail Fairy Shrimp												x	x	x	3	3	3	2
<i>Streptocephalus texanus</i>	Greater Plains Fairy Shrimp												x	x	x	3	3	3	2
<i>Thamnocephalus mexicanus</i>	Mexican Beavertail Fairy Shrimp												x	x	x	3	3	3	2
<i>Thamnocephalus platyurus</i>	Beavertail Fairy Shrimp												x	x	x	3	3	3	2
<i>Triops longicaudatus</i>	Longtail Tadpole Shrimp												x	x	x	3	3	3	2
<i>Triops newberryi</i>	Desert Tadpole Shrimp												x	x	x	3	3	3	2

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status			
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Vertigo berryi</i>	Rotund Vertigo		4									x	x	x	3	3	1c	3
<i>Vitrina pellucida</i>	Western Glass Snail			x				x	x						3	3	3	2
<i>Vitrina pellucida alaskana</i>	Western Glass Snail			x				x	x						3	3	3	2
<i>Ammospermophilus leucurus</i>	White-tailed Antelope Squirrel			x	x		x	x							3	3	3	1
<i>Ammospermophilus leucurus tersus</i>	Prospect Valley White-tailed Antelope Squirrel		1	x											1	3	1b	3
<i>Antilocapra americana americana</i>	America Pronghorn		1		x	x		x	x					x	1	2	1c	3
<i>Antrozous pallidus</i>	Pallid Bat		1	x	x		x	x	x		x	x	x	x	2	1	3	1
<i>Bassariscus astutus</i>	Ringtail		1	x	x			x				x	x	x	3	2	2	3
<i>Bos bison</i>		x	1		x	x			x	x				x			3	3
<i>Canis latrans</i>	Coyote		1	x	x	x	x	x	x	x	x				3	1	3	3
<i>Castor canadensis</i>	American Beaver		1										x	x	1	1	1c	3
<i>Cervus elaphus nelsoni</i>	Rocky Mountain Elk		1		x	x	x	x	x	x			x	x	3	2	2	3
<i>Chaetodipus formosus</i>	Long-tailed Pocket Mouse			x	x										2	2	3	1
<i>Chaetodipus intermedius</i>	Rock Pocket Mouse		1	x	x										1	1	3	3
<i>Choeronycteris mexicana</i>	Mexican Long-tongued Bat		1		x										2	2	1b	3
<i>Corynorhinus townsendii pallescens</i>	Pale Townsend's Big-eared Bat			x	x		x	x	x		x	x	x		3	2	2	1
<i>Cynomys gunnisoni</i>	Gunnison's Prairie Dog		1		x			x	x						2	1	1a	3
<i>Dipodomys merriami</i>	Merriam's Kangaroo Rat		1		x			x							2	1	2	3
<i>Dipodomys microps celsus</i>	Chisel-toothed Kangaroo Rat		1	x	x			x							3	1	1c	3
<i>Dipodomys microps leucotis</i>	Houserock Valley Chisel-toothed Kangaroo Rat			1		x										3	1	1b

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status			
<i>Dipodomys ordii</i>	Ord's Kangaroo Rat		1	x				x										3	1	2	3
<i>Dipodomys spectabilis</i>	Banner-tailed Kangaroo Rat		1	x														3	1	2	3
<i>Eptesicus fuscus</i>	Big Brown Bat			x	x	x	x	x	x	x	x	x	x	x	x			3	2	2	3
<i>Equus asinus</i>	Feral Ass	x		x	x			x												3	3
<i>Erethizon dorsatum</i>	North American Porcupine		1		x	x	x	x	x	x								1	2	3	3
<i>Euderma maculatum</i>	Spotted Bat		2	x	x	x	x	x	x	x			x	x	x			3	2	1b	3
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat		2	x	x		x	x	x	x			x					2	2	1b	3
<i>Eutamias dorsalis</i>	Cliff Chipmunk							x	x									2	3	3	3
<i>Eutamias minimus</i>	Least Chipmunk		1					x	x	x								3	3	1c	3
<i>Eutamias quadrivittatus</i>	Colorado Chipmunk		1					x	x	x								3	2	1c	3
<i>Eutamias umbrinus</i>	Uinta Chipmunk		1		x	x		x	x	x								3	3	1c	3
<i>Idionycteris phyllotis</i>	Allen's Big-eared Bat			x	x	x	x	x	x	x				x	x			3	2	2	1
<i>Lasionycteris noctivagans</i>	Silver-haired Bat			x		x	x	x	x	x				x	x			3	2	2	1
<i>Lasiurus blossevillii</i>	Western Red Bat		2	x	x			x	x					x	x			3	2	1b	3
<i>Lasiurus cinereus</i>	Hoary Bat			x		x		x	x	x				x	x			3	2	2	1
<i>Lepus californicus</i>	Black-tailed Jackrabbit			x	x			x										3	3	3	3
<i>Lutra canadensis lataxina</i>	Southeastern River Otter		1												x			3	1	1c	3
<i>Lynx rufus</i>	Bobcat		1	x	x	x	x	x	x	x				x	x			3	2	3	1
<i>Macrotus californicus</i>	California Leaf-nosed Bat		1	x														1	2	1b	3
<i>Mephitis mephitis</i>	Striped Skunk		1	x	x		x	x	x	x			x	x	x			3	2	3	3
<i>Microtus longicaudus</i>	Long-tailed Vole		1						x	x	x							3	1	1c	3
<i>Microtus mexicanus hualpaiensis</i>	Hualapai Mexican Vole		1						x	x								1	1	1a	3
<i>Mustela frenata</i>	Long-tailed Weasel			x				x	x									2	2	2	1

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status				
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Myotis californicus</i>	California Myotis		1	x	x		x	x	x	x				x	x	1	2	1c	3
<i>Myotis ciliolabrum</i>	Western Small-footed Myotis			x	x		x	x						x	x	3	2	2	3
<i>Myotis evotis</i>	Long-eared Myotis				x		x	x	x					x	x	3	2	2	1
<i>Myotis occultus</i>	Arizona Myotis		1					x						x	x	1	2	2	1
<i>Myotis thysanodes</i>	Fringed Myotis				x		x	x	x					x	x	3	2	2	3
<i>Myotis velifer</i>	Cave Myotis							x								3	2	2	3
<i>Myotis volans</i>	Long-legged Myotis				x			x	x	x				x	x	3	2	2	3
<i>Myotis yumanensis</i>	Yuma Myotis			x	x		x	x						x	x	3	2	2	3
<i>Neotoma albigula</i>	Western White-throated Woodrat		1	x	x		x									3	2	3	3
<i>Neotoma cinerea</i>	Bushy-tailed Woodrat		1		x			x	x							3	2	1c	3
<i>Neotoma lepida</i>	Desert Woodrat			x	x		x	x								3	2	3	1
<i>Neotoma mexicana</i>	Mexican Woodrat				x		x	x	x	x						3	2	3	1
<i>Neotoma stephensi</i>	Stephen's Woodrat		1		x		x									1	2	3	1
<i>Notiosorex crawfordi</i>	Crawford's Desert Shrew		1	x	x		x	x								1	3	3	3
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat		1	x	x	x	x	x	x	x			x	x	x	2	2	1b	3
<i>Odocoileus hemionus hemionus</i>	Rocky Mountain Mule Deer			x	x	x	x	x	x				x	x	x	3	2	2	3
<i>Ondatra zibethicus</i>	Common Muskrat		1										x		x	2	1	1c	3
<i>Onychomys leucogaster</i>	Northern Grasshopper Mouse			x	x											3	2	2	1
<i>Onychomys torridus</i>	Southern Grasshopper Mouse			x	x			x								3	2	2	1
<i>Ovis canadensis nelsoni</i>	Desert Bighorn Sheep		1	x	x			x								2	2	2	3
<i>Perognathus amplus</i>	Arizona Pocket Mouse		1		x											1	2	3	1
<i>Perognathus amplus cineris</i>	Wupatki Arizona Pocket Mouse		1		x											1	2	2	1
<i>Perognathus apache</i>	Apache Pocket Mouse				x			x								2	2	2	1

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Perognathus flavus</i>	Silky Pocket Mouse				x												3	2	2	1
<i>Perognathus flavus goodpasteri</i>	Springerville Pocket Mouse		1		x												1	2	1b	3
<i>Perognathus longimembris</i>	Little Pocket Mouse				x												3	2	2	1
<i>Perognathus parvus</i>	Great Basin Pocket Mouse				x	x											3	2	2	1
<i>Peromyscus boylii</i>	Brush Mouse		1		x	x			x	x							3	1	3	1
<i>Peromyscus crinitus</i>	Canyon Mouse				x	x			x								3	2	2	1
<i>Peromyscus difficilis</i>	Rock Mouse								x								3	2	2	1
<i>Peromyscus eremicus</i>	Cactus Mouse				x	x											3	2	3	1
<i>Peromyscus leucopus</i>	White-footed Mouse					x											3	2	3	1
<i>Peromyscus maniculatus</i>	Deer Mouse		1		x	x	x	x	x	x							3	1	3	3
<i>Peromyscus truei</i>	Pinon Mouse				x	x			x								3	2	3	1
<i>Pipistrellus hesperus</i>	Western Pipistrelle		1		x	x		x	x	x			x	x	x		3	2	1c	3
<i>Procyon lotor</i>	Raccoon		1		x	x	x	x	x	x		x	x	x	x		3	2	3	3
<i>Puma concolor</i>	Mountain Lion		1		x		x	x	x	x	x				x		3	1	3	3
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse		1			x			x								3	1	3	1
<i>Reithrodontomys megalotis megalotis</i>	Western Harvest Mouse		1		x	x			x								2	1	3	1
<i>Sciurus aberti</i>	Abert's Squirrel		1					x	x	x				x			3	2	3	3
<i>Sciurus aberti chuscensis</i>	Abert's Chuska Squirrel		1							x	x			x			1	2	1c	3
<i>Sciurus aberti kaibabensis</i>	Kaibab Squirrel		1					x	x	x				x			1	2	1c	3
<i>Sorex merriami</i>	Merriam's Shrew		1			x			x	x							3	3	1c	3
<i>Sorex monticolus</i>	Dusky Shrew					x			x	x				x	x		3	3	3	1
<i>Sorex nanus</i>	Dwarf Shrew		1			x			x	x							3	3	1b	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Spermophilus lateralis</i>	Golden-mantled Ground Squirrel							x	x	x							3	2	2	1
<i>Spermophilus spilosoma</i>	Spotted Ground Squirrel		1	x													3	1	1c	3
<i>Spermophilus variegatus</i>	Rock Squirrel			x	x		x	x	x								3	2	3	3
<i>Spilogale gracilis</i>	Western Spotted Skunk				x		x	x	x								3	3	3	1
<i>Sylvilagus audubonii</i>	Desert Cottontail			x	x		x										3	2	3	3
<i>Sylvilagus nuttallii grangeri</i>	North Kaibab Mountain Cottontail		1			x		x	x	x							1	2	1c	3
<i>Sylvilagus nuttallii pinetis</i>	Southwestern Cottontail								x	x							1	2	1c	3
<i>Tadarida brasiliensis</i>	Mexican Free-tailed Bat		1	x	x	x	x	x	x	x		x	x	x			3	1	1c	3
<i>Tamiasciurus hudsonicus</i>	Red Squirrel		1						x	x							3	1	2	3
<i>Taxidea taxus</i>	American Badger		1	x	x		x	x	x								2	1	2	1
<i>Tayassau tajacu</i>	Collared Peccary		1	x	x		x	x	x								2	2	2	3
<i>Thomomys bottae</i>	Botta's Pocket Gopher			x	x				x	x							2	2	3	1
<i>Thomomys talpoides</i>	Northern Pocket Gopher					x			x	x	x						3	2	2	1
<i>Urocyon cinereoargenteus</i>	Common Gray Fox		1	x	x	x	x	x	x	x							3	2	3	3
<i>Ursus americanus</i>	American Black Bear		1		x	x	x	x	x	x				x	x		1	2	3	3
<i>Vulpes macrotis</i>	Kit Fox		1		x												2	2	2	1
<i>Vulpes vulpes</i>	Red Fox		1		x				x	x		x					3	2	1c	3
<i>Apalone spinifera</i>	Spiny Softshell	x											x	x			3	3	3	3
<i>Aspidoscelis neomexicana</i>	New Mexico Whiptail				x												3	3	3	2
<i>Aspidoscelis pai</i>	Pai Striped Whiptail			x	x				x	x							1	2	1c	3
<i>Aspidoscelis tigris</i>	Tiger Whiptail			x	x				x	x				x			3	3	3	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type										Species status						
				Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Aspidoscelis velox</i>	Plateau Striped Whiptail				x		x	x	x						x		3	3	3	3
<i>Callisaurus draconoides</i>	Zebra-tailed Lizard			x	x		x										2	3	3	3
<i>Chrysemys picta bellii</i>	Western Painted Turtle		3											x	x		3	2	1c	3
<i>Coleonyx variegatus utahensis</i>	Utah Banded Gecko		2	x			x	x									3	3	1c	3
<i>Coleonyx variegatus variegatus</i>	Desert Banded Gecko			x	x		x	x									2	3	3	2
<i>Crotalus atrox</i>	Western Diamond-backed Rattlesnake				x												3	3	3	3
<i>Crotalus mitchellii pyrrhus</i>	Southwestern Speckled Rattlesnake			x			x	x									3	3	3	2
<i>Crotalus molossus molossus</i>	Northern Black-tailed Rattlesnake			x			x	x	x								3	3	3	2
<i>Crotalus oreganus abyssus</i>	Grand Canyon Rattlesnake			x													1	3	2	3
<i>Crotalus oreganus cerberus</i>	Arizona Black Rattlesnake				x			x	x								1	3	3	3
<i>Crotalus oreganus concolor</i>	Midget Faded Rattlesnake		2		x												3	3	1c	3
<i>Crotalus oreganus lutosus</i>	Great Basin Rattlesnake			x	x		x	x	x								3	3	2	2
<i>Crotalus viridis nuntius</i>	Hopi Rattlesnake		2	x	x		x	x									1	3	1c	3
<i>Crotaphytus bicinctores</i>	Great Basin Collared Lizard			x	x												3	3	2	3
<i>Crotaphytus collaris</i>	Eastern Collared Lizard				x			x	x								2	3	3	3
<i>Diadophis punctatus regalis</i>	Regal Ring-necked Snake				x		x	x					x	x			3	2	3	2
<i>Eumeces multivirgatus epipluerotus</i>	Variable Skink								x	x			x	x			3	3	3	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type											Species status					
					Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Eumeces skiltonianus utahensis</i>	Great Basin (Western) Skink					x				x	x						x	3	3	2	3
<i>Gambelia wislizenii</i>	Long-nosed Leopard Lizard				x	x												3	3	3	3
<i>Gopherus agassizii</i> (Mohave Population)	Mohave Desert Tortoise		1		x	x												2	2	1a	3
<i>Holbrookia maculata approximans</i>	Speckled Earless Lizard					x												3	3	3	2
<i>Hypsiglena torquata chlorophaea</i>	Sonoran Nightsnake					x				x								3	3	3	3
<i>Hypsiglena torquata deserticola</i>	Desert Nightsnake		2			x				x								3	3	1c	3
<i>Hypsiglena torquata loreala</i>	Mesa Verde Nightsnake		2			x				x								3	3	1c	3
<i>Lampropeltis getula californiae</i>	California Kingsnake				x	x			x	x	x							2	3	3	3
<i>Lampropeltis pyromelana infralabialis</i>	Utah Mountain Kingsnake		2		x	x			x	x								3	3	1c	3
<i>Lampropeltis triangulum taylori</i>	Utah Milksnake		2			x				x								3	3	1b	3
<i>Leptotyphlops humilis humilis</i>	Southwestern Threadsnake				x													3	3	3	3
<i>Leptotyphlops humilis utahensis</i>	Utah Threadsnake		2		x	x												3	3	1c	3
<i>Masticophis taeniatus taeniatus</i>	Desert Striped Whipsnake				x	x			x	x							x	3	3	3	2
<i>Phrynosoma hernandesi hernandesi</i>	Hernandez's (Greater) Short-horned Lizard		2			x				x	x	x						3	2	1c	3
<i>Pituophis catenifer affinis</i>	Sonoran Gophersnake				x	x				x	x							3	3	3	3

APPENDIX I. COLORADO PLATEAU MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type												Species status				
				Mojave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Subalpine Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Pituophis catenifer deserticola</i>	Great Basin Gophersnake			x	x		x	x	x								3	3	3	3
<i>Rhinocheilus lecontei lecontei</i>	Western Long-nosed Snake			x	x		x										3	3	3	2
<i>Salvadora hexalepis mojavensis</i>	Mojave Patch-nosed Snake			x	x		x										3	3	2	3
<i>Sauromalus ater</i>	Common Chuckwalla			x	x												2	2	2	3
<i>Sceloporus graciosus graciosus</i>	Northern Sagebrush Lizard						x	x	x								3	2	2	3
<i>Sceloporus magister</i>	Desert Spiny Lizard			x	x												3	3	3	3
<i>Sceloporus tristichus</i>	Plateau Lizard						x	x	x								2	3	2	2
<i>Sonora semiannulata semiannulata</i>	Variable Groundsnake			x	x			x									3	3	3	3
<i>Tantilla hobartsmithi</i>	Smith's Black-headed Snake			x	x		x	x									2	3	1c	3
<i>Thamnophis cyrtopsis cyrtopsis</i>	Western Black-necked Gartersnake		2		x			x				x	x	x			3	2	1c	3
<i>Thamnophis elegans vagrans</i>	Wandering Gartersnake			x	x	x	x	x	x	x		x	x	x			3	2	2	3
<i>Thamnophis marcianus marcianus</i>	Marcy's Checkered Gartersnake				x							x	x	x			3	2	2	2
<i>Trimorphodon biscutatus lambda</i>	Western Lyresnake			x	x		x	x									3	3	2	3
<i>Urosaurus ornatus</i>	Ornate Tree Lizard			x	x	x	x	x	x	x		x	x	x			3	2	3	3
<i>Uta stansburiana</i>	Common Side-blotched Lizard			x	x	x	x	x	x	x	x	x	x	x			3	2	3	3
<i>Xantusia vigilis vigilis</i>	Yucca Night Lizard			x	x		x										3	3	1c	3

APPENDIX J. MASTER SPECIES LIST FOR THE MOHAVE DESERT ECOREGION

Distribution within the Mohave Desert Ecoregion, associated confidence in assigning distribution, and species status in 4 categories. See "Compilation of a Comprehensive List of Wildlife in Arizona (Element 1)" for how species were included on the list, Table 11 for "Distribution Confidence" scoring, and Appendix L for criteria used to assign "Species Status" scores.

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				L. Colorado River	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Bufo alvarius</i>	Sonoran Desert Toad					x								x	x	x		2	2	2	3
<i>Bufo cognatus</i>	Great Plains Toad			x	x	x	x	x							x	x		3	2	2	3
<i>Bufo microscaphus</i>	Arizona Toad		2			x				x					x	x		1	2	1b	3
<i>Bufo punctatus</i>	Red-spotted Toad			x	x	x	x	x	x						x	x		3	1	2	3
<i>Bufo woodhousii woodhousi</i>	Rocky Mountain Toad			x	x	x	x	x	x	x					x	x	x	3	2	2	3
<i>Hyla arenicolor</i>	Canyon Treefrog					x			x	x					x	x		2	1	1c	3
<i>Pseudacris regilla deserticola</i>	Desert Pacific Treefrog		3			x									x	x	x	3	3	1c	3
<i>Rana catesbeiana</i>	American Bullfrog	x																3	3	3	3
<i>Rana onca</i>	Relict Leopard Frog		2			x									x	x		2	2	1a	3
<i>Rana yavapaiensis</i>	Lowland Leopard Frog		2			x												1	3	1b	3
<i>Spea intermontana</i>	Great Basin Spadefoot								x		x	x			x	x		3	1	1c	3
<i>Accipiter cooperii</i>	Cooper's Hawk			x	x	x	x	x	x	x	x	x	x	x	x	x		2	1	3	3
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk		1							x	x	x			x			2	1	1b	3
<i>Accipiter striatus</i>	Sharp-shinned Hawk			x	x	x	x	x	x	x	x	x	x	x	x	x		2	1	3	2

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type												Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Actitis macularius</i>	Spotted Sandpiper													x	x	x	x	3	1	3	2
<i>Aechmophorus clarkii</i>	Clark's Grebe		1											x	x	x	x	3	1	1b	3
<i>Aechmophorus occidentalis</i>	Western Grebe		1											x	x	x	x	3	1	1c	3
<i>Aegolius acadicus</i>	Northern Saw-whet Owl			x	x				x	x	x			x	x	x	x	3	2	3	2
<i>Aeronautes saxatalis</i>	White-throated Swift			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	2
<i>Agelaius phoeniceus</i>	Red-winged Blackbird			x	x	x	x	x						x	x	x	x	3	1	2	2
<i>Aimophila ruficeps</i>	Rufous-crowned Sparrow				x	x	x		x	x								3	1	3	3
<i>Aix sponsa</i>	Wood Duck		1											x	x	x	x	3	1	1c	3
<i>Alectoris chukar</i>	Chukar	x				x									x			3	3	3	3
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow		2				x							x				3	1	1b	3
<i>Amphispiza belli</i>	Sage Sparrow			x		x	x	x						x				3	1	2	3
<i>Amphispiza bilineata</i>	Black-throated Sparrow			x	x	x	x	x	x	x				x				3	1	3	3
<i>Anas acuta</i>	Northern Pintail		2											x	x	x	x	3	1	1c	3
<i>Anas americana</i>	American Wigeon		2											x	x	x	x	3	1	1c	3
<i>Anas clypeata</i>	Northern Shoveler		2											x	x	x	x	3	1	1c	3
<i>Anas crecca</i>	Green-winged Teal													x	x	x	x	3	1	2	2
<i>Anas cyanoptera</i>	Cinnamon Teal													x	x	x	x	3	1	3	2
<i>Anas discors</i>	Blue-winged Teal		2											x	x	x	x	3	1	1c	3
<i>Anas platyrhynchos</i>	Mallard													x	x	x	x	3	1	3	2
<i>Anas strepera</i>	Gadwall													x	x	x	x	3	1	3	2

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Anthus rubescens</i>	American Pipit		1				x	x						x	x	x	x	3	1	1c	3
<i>Aphelocoma californica</i>	Western Scrub-Jay			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	2	3	3
<i>Aquila chrysaetos</i>	Golden Eagle			x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	2	3
<i>Archilochus alexandri</i>	Black-chinned Hummingbird			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Ardea alba</i>	Great Egret		1											x	x	x	x	3	2	1b	3
<i>Ardea herodias</i>	Great Blue Heron													x	x	x	x	3	2	2	3
<i>Asio otus</i>	Long-eared Owl			x	x	x	x	x	x	x				x	x	x	x	3	2	2	3
<i>Athene cunicularia hypugaea</i>	Western Burrowing Owl						x	x										2	2	2	3
<i>Auriparus flaviceps</i>	Verdin			x	x	x	x	x	x					x	x	x	x	3	3	3	3
<i>Aythya affinis</i>	Lesser Scaup													x	x	x	x	3	1	2	2
<i>Aythya americana</i>	Redhead													x	x	x	x	3	1	2	2
<i>Aythya collaris</i>	Ring-necked Duck													x	x	x	x	3	1	2	2
<i>Aythya valisineria</i>	Canvasback		2											x	x	x	x	3	1	1c	3
<i>Baeolophus ridgwayi</i>	Juniper Titmouse							x	x	x					x	x		3	2	3	3
<i>Botaurus lentiginosus</i>	American Bittern		4											x	x	x	x	3	1	1b	3
<i>Branta canadensis</i>	Canada Goose		2											x	x	x	x	3	1	1c	3
<i>Bubo virginianus</i>	Great Horned Owl			x	x	x	x	x	x	x	x	x	x	x	x	x	x	2	2	3	3
<i>Bubulcus ibis</i>	Cattle Egret		1											x	x	x	x	3	2	1c	3
<i>Buteo albonotatus</i>	Zone-tailed Hawk								x	x	x			x	x			3	1	2	3

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status			
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability
<i>Buteo jamaicensis</i>	Red-tailed Hawk			x	x	x	x	x	x	x	x	x	x	x	3	2	3	3
<i>Buteo regalis</i>	Ferruginous Hawk		2				x	x				x			2	1	1b	3
<i>Buteo swainsoni</i>	Swainson's Hawk						x	x				x			3	1	2	3
<i>Buteogallus anthracinus</i>	Common Black-Hawk		1										x	x	2	1	1b	3
<i>Butorides virescens</i>	Green Heron											x	x	x	3	1	3	3
<i>Calidris minutilla</i>	Least Sandpiper											x	x	x	3	1	3	2
<i>Callipepla gambelii</i>	Gambel's Quail			x	x	x	x	x	x			x	x	x	3	3	2	3
<i>Calypte anna</i>	Anna's Hummingbird			x	x	x			x			x	x	x	3	2	3	3
<i>Calypte costae</i>	Costa's Hummingbird			x	x	x	x		x			x	x	x	3	1	3	3
<i>Campylorhynchus brunneicapillus</i>	Cactus Wren			x	x	x	x		x			x	x	x	3	3	3	3
<i>Carduelis pinus</i>	Pine Siskin								x	x	x	x	x	x	3	2	2	3
<i>Carduelis psaltria</i>	Lesser Goldfinch			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Carpodacus cassinii</i>	Cassin's Finch		2							x	x	x	x	x	3	2	1c	3
<i>Carpodacus mexicanus</i>	House Finch			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Cathartes aura</i>	Turkey Vulture			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Catharus guttatus</i>	Hermit Thrush			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Catharus ustulatus</i>	Swainson's Thrush		2	x	x	x				x	x	x	x	x	3	1	1b	3
<i>Catherpes mexicanus</i>	Canyon Wren			x	x	x	x		x	x	x		x		3	1	3	3
<i>Certhia americana</i>	Brown Creeper									x	x			x	3	1	3	3

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type												Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Ceryle alcyon</i>	Belted Kingfisher		2											x	x	x	x	3	1	1b	3
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover		1											x		x	x	3	2	1b	3
<i>Charadrius vociferus</i>	Killdeer							x	x					x	x	x	x	3	1	3	3
<i>Chen caerulescens</i>	Snow Goose													x		x	x	3	1	2	3
<i>Chen rossii</i>	Ross's Goose													x		x	x	3	1	2	3
<i>Chondestes grammacus</i>	Lark Sparrow			x	x	x	x	x	x	x				x				3	1	3	3
<i>Chordeiles acutipennis</i>	Lesser Nighthawk			x	x	x	x	x	x					x	x	x	x	3	1	3	3
<i>Chordeiles minor</i>	Common Nighthawk								x	x	x	x			x	x	x	3	1	3	3
<i>Cinclus mexicanus</i>	American Dipper		2													x		2	1	1c	3
<i>Circus cyaneus</i>	Northern Harrier		2	x	x	x	x	x						x	x	x	x	2	1	1c	3
<i>Cistothorus palustris</i>	Marsh Wren		1											x	x	x	x	3	1	1c	3
<i>Coccothraustes vespertinus</i>	Evening Grosbeak		2								x	x			x	x	x	3	1	1c	3
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo		2		x										x	x	x	2	1	1a	3
<i>Colaptes auratus</i>	Northern Flicker			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Colaptes chrysoides</i>	Gilded Flicker			x	x	x				x					x	x		3	2	3	3
<i>Columba livia</i>	Rock Pigeon	x		x	x	x								x		x	x	3	3	3	3
<i>Columbina inca</i>	Inca Dove													x		x		3	2	3	3
<i>Contopus cooperi</i>	Olive-sided Flycatcher		2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1b	3
<i>Contopus sordidulus</i>	Western Wood-Pewee			x	x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	2

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status			
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability
<i>Corvus brachyrhynchos</i>	American Crow												x	x	3	1	2	2
<i>Corvus corax</i>	Common Raven			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Cyanocitta stelleri</i>	Steller's Jay								x	x	x	x	x	x	3	1	3	2
<i>Dendroica coronata</i>	Yellow-rumped Warbler			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Dendroica graciae</i>	Grace's Warbler									x		x	x		3	1	2	3
<i>Dendroica nigrescens</i>	Black-throated Gray Warbler			x	x	x		x	x	x	x	x	x	x	3	1	2	3
<i>Dendroica petechia</i>	Yellow Warbler			x	x	x	x	x	x		x	x	x	x	3	1	2	3
<i>Dumetella carolinensis</i>	Gray Catbird		1									x	x	x	3	1	1b	3
<i>Egretta thula</i>	Snowy Egret		1								x	x	x	x	3	1	1b	3
<i>Empidonax oberholseri</i>	Dusky Flycatcher									x	x	x	x	x	3	1	2	3
<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher		1		x	x						x	x	x	1	1	1a	3
<i>Empidonax wrightii</i>	Gray Flycatcher		1	x	x	x		x	x	x		x	x	x	3	1	3	1
<i>Eremophila alpestris</i>	Horned Lark			x	x	x	x	x				x	x	x	3	1	2	3
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird						x	x				x	x	x	3	1	2	2
<i>Falco mexicanus</i>	Prairie Falcon			x	x	x	x	x	x	x	x	x	x	x	2	1	2	3
<i>Falco peregrinus</i>	Peregrine Falcon			x	x	x	x	x	x	x	x	x	x	x	2	1	2	3
<i>Falco peregrinus anatum</i>	American Peregrine Falcon		1	x	x	x	x	x	x	x	x	x	x	x	2	1	1b	3
<i>Falco sparverius</i>	American Kestrel			x	x	x	x	x	x	x	x	x	x	x	3	1	3	2

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Loxia curvirostra</i>	Red Crossbill									x	x	x	x	x		3	2	2	3	
<i>Megascops kennicottii</i>	Western Screech-Owl				x	x			x	x		x	x	x		3	2	3	3	
<i>Melanerpes formicivorus</i>	Acorn Woodpecker									x	x	x		x		3	2	3	3	
<i>Melanerpes lewis</i>	Lewis's Woodpecker		1							x	x	x	x	x	x	3	2	1c	3	
<i>Melanerpes uropygialis</i>	Gila Woodpecker				x								x	x		3	2	3	3	
<i>Melospiza lincolni</i>	Lincoln's Sparrow		1	x	x	x	x	x	x	x		x	x	x	x	3	1	1c	3	
<i>Melospiza melodia</i>	Song Sparrow											x	x	x	x	3	1	2	3	
<i>Mergus merganser</i>	Common Merganser		1										x	x	x	x	3	1	1c	3
<i>Micrathene whitneyi</i>	Elf Owl				x											3	1	3	3	
<i>Mimus polyglottos</i>	Northern Mockingbird			x	x	x	x	x	x	x		x	x	x	x	3	1	3	3	
<i>Molothrus ater</i>	Brown-headed Cowbird			x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3	
<i>Myadestes townsendi</i>	Townsend's Solitaire				x	x			x	x	x	x	x	x		3	1	3	3	
<i>Myiarchus cinerascens</i>	Ash-throated Flycatcher			x	x	x	x	x	x	x		x	x	x	x	3	1	3	3	
<i>Myiarchus tyrannulus</i>	Brown-crested Flycatcher				x								x	x	x	3	1	2	3	
<i>Nucifraga columbiana</i>	Clark's Nutcracker		1							x	x	x	x	x		3	1	1c	3	
<i>Numenius americanus</i>	Long-billed Curlew		1									x	x	x	x	3	1	2	1	
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron											x	x	x	x	3	1	2	3	
<i>Oporornis tolmiei</i>	MacGillivray's Warbler		1	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3	

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Oreoscoptes montanus</i>	Sage Thrasher		1	x	x	x	x	x		x								3	1	1b	3
<i>Otus flammeolus</i>	Flammulated Owl										x							3	1	2	3
<i>Oxyura jamaicensis</i>	Ruddy Duck											x	x	x	x			3	1	2	3
<i>Pandion haliaetus</i>	Osprey		1									x	x	x	x			3	1	1b	3
<i>Parabuteo unicinctus</i>	Harris's Hawk				x	x									x			2	2	2	3
<i>Passer domesticus</i>	House Sparrow	x													x			3	3	3	3
<i>Passerculus sandwichensis</i>	Savannah Sparrow		1				x	x				x	x	x	x			3	1	1c	3
<i>Passerina amoena</i>	Lazuli Bunting			x	x	x	x	x	x	x	x	x	x	x	x			3	1	2	3
<i>Passerina caerulea</i>	Blue Grosbeak			x	x	x	x								x	x	x	3	1	3	3
<i>Passerina cyanea</i>	Indigo Bunting		2												x	x	x	3	1	1c	3
<i>Patagioenas fasciata</i>	Band-tailed Pigeon										x							3	1	2	3
<i>Pelecanus erythrorhynchos</i>	American White Pelican											x		x	x			3	1	2	2
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow			x	x	x	x	x							x	x	x	3	1	2	3
<i>Phainopepla nitens</i>	Phainopepla			x	x	x	x	x	x	x					x	x	x	3	2	2	3
<i>Phalacrocorax auritus albociliatus</i>	Double-crested Cormorant		1												x		x	3	1	1c	3
<i>Phalaenoptilus nuttallii</i>	Common Poorwill			x	x	x	x	x	x	x								3	1	2	3
<i>Phasianus colchicus</i>	Ring-necked Pheasant	x													x		x	3	3	3	3

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type												Species status			
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3	
<i>Picoides scalaris</i>	Ladder-backed Woodpecker			x	x	x	x	x	x		x	x	x	x	3	2	3	3	
<i>Picoides villosus</i>	Hairy Woodpecker									x	x	x	x		3	2	3	3	
<i>Pipilo aberti</i>	Abert's Towhee										x	x	x	x	3	3	2	3	
<i>Pipilo chlorurus</i>	Green-tailed Towhee		1	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3	
<i>Pipilo fuscus</i>	Canyon Towhee				x	x	x	x	x		x	x	x		3	2	3	3	
<i>Pipilo maculatus</i>	Spotted Towhee			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3	
<i>Piranga ludoviciana</i>	Western Tanager			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3	
<i>Piranga rubra</i>	Summer Tanager										x	x	x	x	3	1	2	3	
<i>Plegadis chihi</i>	White-faced Ibis		1								x	x	x	x	3	1	2	1	
<i>Podiceps nigricollis</i>	Eared Grebe		2								x		x	x	3	1	1c	3	
<i>Podilymbus podiceps</i>	Pied-billed Grebe										x	x	x	x	3	1	3	3	
<i>Poecile gambeli</i>	Mountain Chickadee									x	x	x	x	x	3	1	3	3	
<i>Polioptila caerulea</i>	Blue-gray Gnatcatcher			x	x	x	x	x	x		x	x	x	x	3	1	3	3	
<i>Polioptila melanura</i>	Black-tailed Gnatcatcher			x	x	x	x								3	3	3	3	
<i>Poocetes gramineus</i>	Vesper Sparrow			x	x	x	x	x			x				3	1	2	3	
<i>Porzana carolina</i>	Sora										x	x	x	x	3	1	2	3	
<i>Progne subis arboricola</i>	Western Purple Martin		1										x	x	3	1	1b	3	
<i>Psaltriparus minimus</i>	Bushtit			x	x	x	x	x	x	x	x	x	x	x	3	2	2	3	

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status				
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Pyrocephalus rubinus</i>	Vermilion Flycatcher											x	x	x	x	3	1	2	3
<i>Quiscalus mexicanus</i>	Great-tailed Grackle			x	x	x	x					x	x	x	x	3	1	2	3
<i>Rallus limicola</i>	Virginia Rail											x	x	x	x	3	1	2	2
<i>Rallus longirostris yumanensis</i>	Yuma Clapper Rail		1										x	x	x	1	2	1a	3
<i>Recurvirostra americana</i>	American Avocet		1									x	x	x	x	3	1	1c	3
<i>Regulus calendula</i>	Ruby-crowned Kinglet		1	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Regulus satrapa</i>	Golden-crowned Kinglet		1							x				x		3	2	1c	3
<i>Salpinctes obsoletus</i>	Rock Wren			x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Sayornis saya</i>	Say's Phoebe			x	x	x	x	x	x			x	x	x	x	3	1	3	3
<i>Selasphorus platycercus</i>	Broad-tailed Hummingbird									x	x	x	x			3	1	3	3
<i>Sialia currucoides</i>	Mountain Bluebird			x	x	x	x	x		x		x		x	x	3	1	2	3
<i>Sialia mexicana</i>	Western Bluebird			x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Sitta canadensis</i>	Red-breasted Nuthatch									x	x	x	x	x	x	3	2	2	3
<i>Sitta carolinensis</i>	White-breasted Nuthatch								x	x	x	x	x	x	x	3	2	3	3
<i>Sitta pygmaea</i>	Pygmy Nuthatch									x						3	2	2	3
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker		1		x	x			x	x	x	x	x	x	x	3	1	1b	3
<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker									x	x	x	x	x	x	3	2	2	3
<i>Spizella atrogularis</i>	Black-chinned Sparrow						x		x	x				x		3	1	2	3
<i>Spizella breweri</i>	Brewer's Sparrow			x	x	x	x	x	x			x	x	x	x	3	1	2	3

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type												Species status			
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Spizella passerina</i>	Chipping Sparrow			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3	
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow			x	x	x	x	x	x		x	x	x	x	3	1	3	3	
<i>Streptopelia decaocto</i>	Eurasian Collared-Dove	x												x	3	3	3	3	
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl		1							x	x				2	2	1a	3	
<i>Sturnella neglecta</i>	Western Meadowlark			x	x	x	x	x				x	x	x	x	3	1	2	3
<i>Sturnus vulgaris</i>	European Starling	x			x							x	x	x	x	3	3	3	3
<i>Tachycineta bicolor</i>	Tree Swallow		1	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3	
<i>Tachycineta thalassina</i>	Violet-green Swallow			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3	
<i>Thryomanes bewickii</i>	Bewick's Wren			x	x	x	x	x	x	x	x	x	x	x	3	2	3	2	
<i>Toxostoma bendirei</i>	Bendire's Thrasher		1	x	x	x	x	x		x			x		3	1	2	1	
<i>Toxostoma crissale</i>	Crissal Thrasher				x	x	x	x	x				x	x	3	2	3	3	
<i>Toxostoma curvirostre</i>	Curve-billed Thrasher			x	x	x	x					x			3	3	3	3	
<i>Toxostoma lecontei</i>	Le Conte's Thrasher		1			x									3	2	1c	3	
<i>Tringa melanoleuca</i>	Greater Yellowlegs											x	x	x	x	3	1	2	2
<i>Troglodytes aedon</i>	House Wren			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3	
<i>Troglodytes troglodytes</i>	Winter Wren		2							x		x	x		3	1	1c	3	
<i>Turdus migratorius</i>	American Robin			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3	
<i>Tyrannus verticalis</i>	Western Kingbird				x	x	x	x	x			x	x	x	3	1	3	3	

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status			
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability
<i>Tyrannus vociferans</i>	Cassin's Kingbird						x	x	x	x	x	x	x	x	3	1	3	3
<i>Tyto alba</i>	Barn Owl			x	x	x	x	x	x	x		x	x	x	3	2	3	3
<i>Vermivora celata</i>	Orange-crowned Warbler		1	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Vermivora luciae</i>	Lucy's Warbler			x	x	x	x		x			x	x	x	2	1	3	3
<i>Vermivora virginiae</i>	Virginia's Warbler			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Vireo gilvus</i>	Warbling Vireo			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Vireo plumbeus</i>	Plumbeous Vireo			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Vireo vicinior</i>	Gray Vireo				x	x	x	x	x				x		3	1	2	3
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird											x	x	x	3	1	2	3
<i>Zenaida asiatica</i>	White-winged Dove			x	x	x						x		x	3	1	2	3
<i>Zenaida macroura</i>	Mourning Dove			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow		1	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Agosia chrysogaster</i>	Longfin Dace		1										x		1	2	1b	3
<i>Catostomus clarki</i>	Desert Sucker		1											x	1	1	1b	3
<i>Catostomus latipinnis</i>	Flannelmouth Sucker		1											x	3	1	1a	3
<i>Ctenopharyngodon idella</i>	Grass Carp	x										x			3	3	3	3
<i>Cyprinodon macularius</i>	Desert Pupfish		1										x	x	1	1	1a	3
<i>Cyprinus carpio</i>	Common Carp	x												x	3	3	3	3
<i>Dorosoma petenense</i>	Threadfin Shad	x												x	3	3	3	3
<i>Gambusia affinis</i>	Mosquitofish	x										x	x	x	3	3	3	3

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type												Species status				
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Gila cypha</i>	Humpback Chub		1												x		1	1	1a	3
<i>Gila elegans</i>	Bonytail		1												x	x	1	1	1a	3
<i>Gila robusta</i>	Roundtail Chub		1												x		1	1	1b	3
<i>Gila seminuda</i>	Virgin Chub		1												x		2	1	1a	3
<i>Ictalurus melas</i>	Black Bullhead	x													x	x	3	3	3	3
<i>Ictalurus natalis</i>	Yellow Bullhead	x													x	x	3	3	3	3
<i>Ictalurus punctatus</i>	Channel Catfish	x													x	x	3	3	3	3
<i>Lepidomeda mollispinis mollispinis</i>	Virgin Spinedace		1												x		2	1	1a	3
<i>Lepomis cyanellus</i>	Green Sunfish	x													x	x	3	3	3	3
<i>Lepomis macrochirus</i>	Bluegill	x													x	x	3	3	3	3
<i>Lepomis microlophus</i>	Redear Sunfish	x													x	x	3	3	3	3
<i>Micropterus dolomieu</i>	Smallmouth Bass	x													x	x	3	3	3	3
<i>Micropterus salmoides</i>	Largemouth Bass	x													x	x	3	3	3	3
<i>Morone saxatilis</i>	Striped Bass	x													x	x	3	3	3	3
<i>Notropis lutrensis</i>	Red Shiner	x													x	x	3	3	3	3
<i>Oncorhynchus mykiss</i>	Rainbow Trout	x													x	x	3	3	3	3
<i>Pimephales promelas</i>	Fathead Minnow	x													x	x	3	3	3	3
<i>Plagopterus argentissimus</i>	Woundfin		1												x		3	1	1a	3
<i>Pomoxis nigromaculatus</i>	Black Crappie	x														x	3	3	3	3
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow		1												x		1	1	1a	3

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Native	Confidence	Distribution by habitat type											Species status				
				L. Colorado River	Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Inferior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability
<i>Pylodictis olivaris</i>	Flathead Catfish	x												x	x	3	3	3	3
<i>Rhinichthys osculus</i>	Speckled Dace		1											x		1	1	1b	3
<i>Stizostedion vitreum</i>	Walleye	x												x		3	3	3	3
<i>Tilapia sp.</i>	Tilapia	x												x		3	3	3	3
<i>Xyrauchen texanus</i>	Razorback Sucker		1											x	x	1	1	1a	3
<i>Anodonta californiensis</i>	California Floater		4											x	x	3	1	1b	3
<i>Artemia franciscana</i>	San Francisco Brine Shrimp														2	x	3	3	2
<i>Biomphalaria havanensis</i>	Ghost Rams-horn	x													x	3	3	3	3
<i>Branchinecta kaibabensis</i>	Kaibab Fairy Shrimp														x	3	3	3	2
<i>Cipangopaludin a chinensis</i>	Chinese Mysterysnail	x												x	x	3	3	3	3
<i>Cyzicus mexicanus</i>	Mexican Clam Shrimp													x	x	x	3	3	2
<i>Cyzicus setosa</i>	Bristletail Clam Shrimp													x	x	x	3	3	2
<i>Eocyclus digueti</i>	Straightbacked Clam Shrimp													x	x	x	3	3	2
<i>Eubbranchipus bundyi</i>	Knobbedlip Fairy Shrimp													x	x	x	3	3	2
<i>Eubbranchipus serratus</i>	Ethologist Fairy Shrimp													x	x	x	3	3	2
<i>Eulimnadia antlei</i>	Fuzzy Cyst Clam Shrimp													x	x	x	3	3	2
<i>Eulimnadia cylindrova</i>	Cylindrical Cyst Clam Shrimp													x	x	x	3	3	2
<i>Eulimnadia texana</i>	Texan Clam Shrimp													x	x	x	3	3	2

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Ferrissia fragilis</i>	Fragile Ancyloid													x	x	x	3	3	3	2
<i>Ferrissia rivularis</i>	Creeping Ancyloid													x	x	x	3	3	3	2
<i>Helisoma anceps</i>	Two-ridge Rams-horn													x	x	x	3	3	3	2
<i>Helix aspersa</i>	Brown Gardensnail	x		x	x	x	x	x	x	x	x						3	3	3	3
<i>Leptestheria compleximanus</i>	Spineynose Clam Shrimp														2	x	3	3	3	2
<i>Lynceus brachyurus</i>	Holarctic Clam Shrimp													x	x	x	3	3	3	2
<i>Lynceus brevifrons</i>	Short Finger Clam Shrimp													x	x	x	3	3	3	2
<i>Melanoides tuberculatus</i>	Red-rim Melania	x													x	x	3	3	3	3
<i>Otala lactea</i>	Milk Snail			x	x	x	x	x	x	x							3	3	3	2
<i>Physella humerosa</i>	Corkscrew Physa														x	x	3	3	2	2
<i>Physella osculans</i>	Cayuse Physa													x	x	x	3	3	2	2
<i>Planorbella tenuis</i>	Mexican Rams-horn													x	x	x	3	3	3	2
<i>Procambarus clarkii</i>	Red Swamp Crawfish	x												x	x	x	3	3	3	3
<i>Promenetus exacuus</i>	Sharp Sprite (A Planorbid Snail)													x	x	x	3	3	3	2
<i>Pyrgulopsis bacchus</i>	Grand Wash Springsnail		3											x			1	1	1b	3
<i>Pyrgulopsis conica</i>	Kingman Springsnail		3											x			1	1	1b	3
<i>Pyrgulopsis deserta</i>	Desert Springsnail		3											x			1	1	1b	3
<i>Streptocephalus dorotheae</i>	New Mexico Fairy Shrimp													x	x	x	3	3	3	2

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status				
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Streptocephalus mackini</i>	Chihuahuan Desert Fairy Shrimp												x	x	x	3	3	3	2
<i>Streptocephalus sealii</i>	Spinytail Fairy Shrimp												x	x	x	3	3	3	2
<i>Streptocephalus texanus</i>	Greater Plains Fairy Shrimp												x	x	x	3	3	3	2
<i>Thamnocephalus mexicanus</i>	Mexican Beavertail Fairy Shrimp												x	x	x	3	3	3	2
<i>Thamnocephalus platyurus</i>	Beavertail Fairy Shrimp												x	x	x	3	3	3	2
<i>Triops longicaudatus</i>	Longtail Tadpole Shrimp												x	x	x	3	3	3	2
<i>Triops newberryi</i>	Desert Tadpole Shrimp													2	x	3	3	3	2
<i>Vertigo berryi</i>	Rotund Vertigo		4										x	x	x	3	3	1c	3
<i>Ammospermophilus harrisi</i>	Harris' Antelope Squirrel			x	x	x	x		x							2	3	3	3
<i>Ammospermophilus leucurus</i>	White-tailed Antelope Squirrel					x			x	x						3	3	3	1
<i>Antrozous pallidus</i>	Pallid Bat		1	x	x	x	x	x	x	x	x	x	x	x	x	2	1	3	1
<i>Bassariscus astutus</i>	Ringtail		1			x			x	x						3	2	2	3
<i>Canis latrans</i>	Coyote		1	x	x	x	x	x	x	x	x	x				3	1	3	3
<i>Castor canadensis</i>	American Beaver		1										x	x	x	1	1	1c	3
<i>Chaetodipus formosus</i>	Long-tailed Pocket Mouse					x										2	2	3	1
<i>Chaetodipus intermedius</i>	Rock Pocket Mouse		1			x	x		x							1	1	3	3
<i>Chaetodipus penicillatus</i>	Sonoran Desert Pocket Mouse			x		x										2	3	3	3

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Corynorhinus townsendii pallescens</i>	Pale Townsend's Big-eared Bat			x	x	x	x	x	x	x	x		x	x	x	3	2	2	1	
<i>Dipodomys deserti</i>	Desert Kangaroo Rat		1	x		x										3	1	2	1	
<i>Dipodomys merriami</i>	Merriam's Kangaroo Rat		1	x		x			x	x						2	1	2	3	
<i>Dipodomys microps celsus</i>	Chisel-toothed Kangaroo Rat		1			x										3	1	1c	3	
<i>Dipodomys ordii</i>	Ord's Kangaroo Rat		1							x						3	1	2	3	
<i>Eptesicus fuscus</i>	Big Brown Bat			x	x	x	x	x	x	x	x	x	x	x	x	3	2	2	3	
<i>Erethizon dorsatum</i>	North American Porcupine		1		x				x	x	x					1	2	3	3	
<i>Euderma maculatum</i>	Spotted Bat		2	x	x	x	x	x	x	x			x	x	x	3	2	1b	3	
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat		2	x	x	x	x		x	x	x		x			2	2	1b	3	
<i>Idionycteris phyllotis</i>	Allen's Big-eared Bat					x	x	x	x	x	x		x	x		3	2	2	1	
<i>Lasionycteris noctivagans</i>	Silver-haired Bat					x			x	x			x	x		3	2	2	1	
<i>Lasiurus blossevillii</i>	Western Red Bat		2			x									x	x	3	2	1b	3
<i>Lasiurus cinereus</i>	Hoary Bat			x		x			x	x					x	x	3	2	2	1
<i>Lepus californicus</i>	Black-tailed Jackrabbit			x	x	x	x	x	x	x						3	3	3	3	
<i>Lynx rufus</i>	Bobcat		1		x	x	x	x	x	x	x					3	2	3	1	
<i>Macrotus californicus</i>	California Leaf-nosed Bat		1	x	x	x	x	x	x	x				x	x	1	2	1b	3	
<i>Mephitis mephitis</i>	Striped Skunk		1				x			x						3	2	3	3	
<i>Myotis auriculus</i>	Southwestern Myotis									x	x					2	2	3	1	

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type												Species status			
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Myotis californicus</i>	California Myotis		1	x	x	x	x	x	x	x	x			x	x	1	2	1c	3
<i>Myotis ciliolabrum</i>	Western Small-footed Myotis					x			x	x				x	x	3	2	2	3
<i>Myotis occultus</i>	Arizona Myotis		1	x										x		1	2	2	1
<i>Myotis thysanodes</i>	Fringed Myotis					x	x		x	x				x	x	3	2	2	3
<i>Myotis velifer</i>	Cave Myotis			x	x	x			x	x				x	x	3	2	2	3
<i>Myotis volans</i>	Long-legged Myotis									x	x			x	x	3	2	2	3
<i>Myotis yumanensis</i>	Yuma Myotis			x		x	x	x						x	x	3	2	2	3
<i>Neotoma albigula</i>	Western White-throated Woodrat		1	x		x	x	x	x							3	2	3	3
<i>Neotoma lepida</i>	Desert Woodrat			x	x	x	x	x		x						3	2	3	1
<i>Notiosorex crawfordi</i>	Crawford's Desert Shrew		1	x	x	x	x	x	x	x						1	3	3	3
<i>Nyctinomops femorosaccus</i>	Pocketed Free-tailed Bat			x	x	x			x	x				x	x	2	2	2	1
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat		1	x	x	x	x	x	x	x				x	x	2	2	1b	3
<i>Odocoileus hemionus crooki</i>	Desert Mule Deer		1			x	x		x	x	x					2	2	2	1
<i>Odocoileus hemionus hemionus</i>	Rocky Mountain Mule Deer								x	x						3	2	2	3
<i>Ondatra zibethicus</i>	Common Muskrat		1											x	x	2	1	1c	3
<i>Onychomys torridus</i>	Southern Grasshopper Mouse					x	x		x							3	2	2	1
<i>Ovis canadensis nelsoni</i>	Desert Bighorn Sheep		1	x	x	x	x	x						x	x	2	2	2	3
<i>Perognathus amplus</i>	Arizona Pocket Mouse		1			x										1	2	3	1

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type												Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Perognathus longimembris</i>	Little Pocket Mouse					x												3	2	2	1
<i>Peromyscus boylii</i>	Brush Mouse		1			x			x									3	1	3	1
<i>Peromyscus crinitus</i>	Canyon Mouse					x			x									3	2	2	1
<i>Peromyscus eremicus</i>	Cactus Mouse			x		x	x	x	x	x								3	2	3	1
<i>Peromyscus maniculatus</i>	Deer Mouse		1			x												3	1	3	3
<i>Peromyscus truei</i>	Pinon Mouse					x			x									3	2	3	1
<i>Pipistrellus hesperus</i>	Western Pipistrelle		1	x	x	x	x	x	x	x				x	x	x		3	2	1c	3
<i>Procyon lotor</i>	Raccoon		1										x	x	x	x		3	2	3	3
<i>Puma concolor</i>	Mountain Lion		1		x	x			x	x	x							3	1	3	3
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse		1			x	x											3	1	3	1
<i>Reithrodontomys megalotis megalotis</i>	Western Harvest Mouse		1			x	x											2	1	3	1
<i>Sciurus aberti</i>	Abert's Squirrel		1							x	x							3	2	3	3
<i>Sciurus aberti kaibabensis</i>	Kaibab Squirrel		1							x	x							1	2	1c	3
<i>Spermophilus tereticaudus</i>	Round-tailed Ground Squirrel		1			x	x											2	1	3	1
<i>Spermophilus variegatus</i>	Rock Squirrel			x	x	x	x	x	x	x								3	2	3	3
<i>Spilogale gracilis</i>	Western Spotted Skunk			x	x		x	x	x	x	x							3	3	3	1
<i>Sylvilagus audubonii</i>	Desert Cottontail			x	x	x	x	x	x	x								3	2	3	3
<i>Tadarida brasiliensis</i>	Mexican Free-tailed Bat		1	x	x	x	x	x	x	x	x			x	x	x		3	1	1c	3
<i>Taxidea taxus</i>	American Badger		1	x	x	x	x	x	x	x	x							2	1	2	1

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Tayassau tajacu</i>	Collared Peccary		1	x	x	x	x	x	x	x								2	2	2	3
<i>Thomomys bottae</i>	Botta's Pocket Gopher				x	x	x	x	x	x								2	2	3	1
<i>Thomomys bottae desertorum</i>	Pocket Gopher					x	x	x	x	x								2	2	3	1
<i>Urocyon cinereoargenteus</i>	Common Gray Fox		1		x	x	x	x	x	x	x							3	2	3	3
<i>Ursus americanus</i>	American Black Bear		1							x	x			x	x	x		1	2	3	3
<i>Vulpes macrotis</i>	Kit Fox		1	x			x	x										2	2	2	1
<i>Apalone spinifera</i>	Spiny Softshell	x													x	x		3	3	3	3
<i>Arizona elegans eburnata</i>	Desert Glossy Snake			x	x	x	x			x	x							3	3	2	3
<i>Arizona elegans noctivaga</i>	Arizona Glossy Snake			x	x	x	x			x	x							3	3	3	3
<i>Aspidoscelis tigris</i>	Tiger Whiptail			x	x	x	x	x	x	x	x		x		x			3	3	3	3
<i>Callisaurus draconoides</i>	Zebra-tailed Lizard			x	x	x	x	x	x									2	3	3	3
<i>Charina trivirgata gracia</i>	Desert Rosy Boa		2			x				x	x							3	3	1c	3
<i>Chionactis occipitalis occipitalis</i>	Mojave Shovel-nosed Snake		2	x	x	x												3	2	1c	3
<i>Coleonyx variegatus utahensis</i>	Utah Banded Gecko		2			x				x	x							3	3	1c	3
<i>Coleonyx variegatus variegatus</i>	Desert Banded Gecko			x	x	x	x			x	x							2	3	3	2

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
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<i>Cophosaurus texanus scitulus</i>	Chihuahuan Greater Earless Lizard					x		x	x	x								2	3	3	3
<i>Crotalus atrox</i>	Western Diamond-backed Rattlesnake			x	x	x	x		x	x	x							3	3	3	3
<i>Crotalus cerastes cerastes</i>	Mojave Desert Sidewinder			x	x	x												3	2	2	3
<i>Crotalus mitchellii pyrrhus</i>	Southwestern Speckled Rattlesnake			x	x	x			x	x								3	3	3	2
<i>Crotalus oreganus lutosus</i>	Great Basin Rattlesnake					x		x	x	x	x							3	3	2	2
<i>Crotalus scutulatus scutulatus</i>	Northern Mohave Rattlesnake			x	x	x	x	x										3	3	3	2
<i>Crotaphytus bicinctores</i>	Great Basin Collared Lizard			x	x	x	x	x										3	3	2	3
<i>Diadophis punctatus regalis</i>	Regal Ring-necked Snake						x	x	x	x	x		x	x				3	2	3	2
<i>Dipsosaurus dorsalis dorsalis</i>	Northern Desert Iguana			x	x	x	x											3	3	3	3
<i>Eumeces gilberti rubricaudata</i>	Western Red-tailed Skink		2			x	x		x	x					x			1	3	3	1
<i>Gambelia wislizenii</i>	Long-nosed Leopard Lizard			x	x	x	x	x										3	3	3	3
<i>Gopherus agassizii (Mohave Population)</i>	Mohave Desert Tortoise		1			x			x	x								2	2	1a	3

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Gopherus agassizii</i> (Sonoran Population)	Sonoran Desert Tortoise		1	x	x	x				x	x							2	2	1b	3
<i>Heloderma suspectum cinctum</i>	Banded Gila Monster			x	x	x	x			x	x							1	3	2	3
<i>Hypsiglena torquata chlorophaea</i>	Sonoran Nightsnake			x	x	x	x			x	x							3	3	3	3
<i>Lampropeltis getula californiae</i>	California Kingsnake			x	x	x	x	x	x	x	x	x						2	3	3	3
<i>Lampropeltis pyromelana infralabialis</i>	Utah Mountain Kingsnake		2							x	x							3	3	1c	3
<i>Leptotyphlops humilis humilis</i>	Southwestern Threadsnake			x	x	x												3	3	3	3
<i>Leptotyphlops humilis utahensis</i>	Utah Threadsnake		2							x						x		3	3	1c	3
<i>Masticophis flagellum piceus</i>	Red Racer			x	x	x	x											3	3	3	3
<i>Masticophis taeniatus taeniatus</i>	Desert Striped Whipsnake									x	x					x		3	3	3	2
<i>Phrynosoma platyrhinos</i>	Desert Horned Lizard			x	x	x												3	2	3	3
<i>Phyllorhynchus decurtatus</i>	Spotted Leaf-nosed Snake			x	x	x												3	3	3	2
<i>Pituophis catenifer affinis</i>	Sonoran Gophersnake			x	x	x	x			x	x	x						3	3	3	3
<i>Pituophis catenifer deserticola</i>	Great Basin Gophersnake																	3	3	3	3

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type													Species status				
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mojave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Rhinocheilus lecontei lecontei</i>	Western Long-nosed Snake			x	x	x	x	x	x									3	3	3	2
<i>Salvadora hexalepis hexalepis</i>	Desert Patch-nosed Snake			x	x	x	x		x									2	3	3	3
<i>Salvadora hexalepis mojavensis</i>	Mojave Patch-nosed Snake			x	x	x	x		x									3	3	2	3
<i>Sauromalus ater</i>	Common Chuckwalla			x	x	x	x		x									2	2	2	3
<i>Sceloporus clarkii</i>	Clark's Spiny Lizard									x	x							2	3	2	3
<i>Sceloporus graciosus graciosus</i>	Northern Sagebrush Lizard									x	x	x						3	2	2	3
<i>Sceloporus magister</i>	Desert Spiny Lizard			x	x	x	x	x	x									3	3	3	3
<i>Sceloporus tristichus</i>	Plateau Lizard									x	x	x						2	3	2	2
<i>Sonora semiannulata semiannulata</i>	Variable Groundsnake			x	x	x	x	x	x	x	x							3	3	3	3
<i>Tantilla hobartsmithi</i>	Smith's Black-headed Snake					x	x	x	x	x								2	3	1c	3
<i>Trimorphodon biscutatus lambda</i>	Western Lyresnake			x	x	x	x	x	x	x								3	3	2	3
<i>Uma scoparia</i>	Mojave Fringe-toed Lizard		2	x		x												3	2	1b	3
<i>Urosaurus graciosus</i>	Long-tailed Brush Lizard			x	x	x												2	2	3	3
<i>Urosaurus ornatus</i>	Ornate Tree Lizard			x	x	x	x	x	x	x	x		x	x	x			3	2	3	3
<i>Uta stansburiana</i>	Common Side-blotched Lizard			x	x	x	x	x	x	x	x	x	x	x	x			3	2	3	3

APPENDIX J. MOHAVE DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Interior Chaparral	Great Basin Conifer Woodland	Montane Conifer Forest	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Xantusia vigilis</i>	Yucca Night Lizard			x	x	x	x		x									3	3	1c	3

APPENDIX K. MASTER SPECIES LIST FOR THE SONORAN DESERT ECOREGION

Distribution within the coregion, associated confidence in assigning distribution, and species status in 4 categories. See "Compilation of a Comprehensive List of Wildlife in Arizona (Element 1)" for how species were included on the list, Table 11 for "Distribution Confidence" scoring, and Appendix L for criteria used to assign "Species Status" scores.

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				L. Colorado River	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status			
<i>Ambystoma tigrinum mavortium</i>	Barred Tiger Salamander	x																3	3	3	3
<i>Bufo alvarius</i>	Sonoran Desert Toad			x	x		x					x	x	x	x			2	2	2	3
<i>Bufo cognatus</i>	Great Plains Toad			x	x	x	x		x				x	x				3	2	2	3
<i>Bufo debilis insidiator</i>	Western Green Toad			x	x		x						x	x				3	1	2	3
<i>Bufo microscaphus</i>	Arizona Toad		2	x	x	x	x						x	x				1	2	1b	3
<i>Bufo punctatus</i>	Red-spotted Toad			x	x	x	x	x	x				x	x				3	1	2	3
<i>Bufo retiformis</i>	Sonoran Green Toad			x	x		x						x	x				2	1	2	1
<i>Bufo woodhousii woodhousi</i>	Rocky Mountain Toad			x	x	x	x	x	x	x			x	x	x			3	2	2	3
<i>Gastrophryne olivacea</i>	Great Plains Narrow-mouthed Toad		2	x	x		x						x	x				3	2	1b	3
<i>Hyla arenicolor</i>	Canyon Treefrog			x	x	x	x	x	x				x	x				2	1	1c	3
<i>Pternohyla fodiens</i>	Lowland Burrowing Treefrog		2	x	x								x	x				2	2	1b	3
<i>Rana catesbeiana</i>	American Bullfrog	x																3	3	3	3
<i>Rana berlandieri</i>	Rio Grande Leopard Frog	x																3	3	3	3
<i>Rana yavapaiensis</i>	Lowland Leopard Frog		2	x	x		x	x	x				x	x				1	3	1b	3
<i>Scaphiopus couchii</i>	Couch's Spadefoot			x	x		x						x	x	x			3	1	2	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Spea multiplicata</i>	Mexican Spadefoot			x	x									x	x		3	2	2	3
<i>Xenopus laevis</i>	African Clawed Frog	x															3	3	3	3
<i>Accipiter cooperii</i>	Cooper's Hawk			x	x	x	x	x	x	x	x	x	x	x	x		2	1	3	3
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk		1						x	x	x						2	1	1b	3
<i>Accipiter striatus</i>	Sharp-shinned Hawk			x	x	x	x	x	x	x	x	x	x	x	x		2	1	3	2
<i>Actitis macularius</i>	Spotted Sandpiper													x	x	x	3	1	3	2
<i>Aechmophorus clarkii</i>	Clark's Grebe		1											x	x	x	3	1	1b	3
<i>Aechmophorus occidentalis</i>	Western Grebe		1											x	x	x	3	1	1c	3
<i>Aegolius acadicus</i>	Northern Saw-whet Owl			x	x				x	x	x	x	x	x	x	x	3	2	3	2
<i>Aeronautes saxatalis</i>	White-throated Swift			x	x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	2
<i>Agelaius phoeniceus</i>	Red-winged Blackbird			x	x	x	x							x	x	x	3	1	2	2
<i>Aimophila carpalis</i>	Rufous-winged Sparrow			x	x		x										3	1	2	3
<i>Aimophila cassinii</i>	Cassin's Sparrow			x			x							x			3	1	2	3
<i>Aimophila ruficeps</i>	Rufous-crowned Sparrow			x	x	x	x	x	x	x	x						3	1	3	3
<i>Aix sponsa</i>	Wood Duck		1											x	x	x	3	1	1c	3
<i>Amazilia violiceps</i>	Violet-crowned Hummingbird		2														3	1	1b	3
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow		2				x							x	x	x	3	1	1b	3
<i>Amphispiza belli</i>	Sage Sparrow			x		x	x							x			3	1	2	3
<i>Amphispiza bilineata</i>	Black-throated Sparrow			x	x	x	x	x						x			3	1	3	3
<i>Anas acuta</i>	Northern Pintail		2											x	x	x	3	1	1c	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status				
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Anas americana</i>	American Wigeon		2									x	x	x	x	3	1	1c	3
<i>Anas clypeata</i>	Northern Shoveler		2									x	x	x	x	3	1	1c	3
<i>Anas crecca</i>	Green-winged Teal											x	x	x	x	3	1	2	2
<i>Anas cyanoptera</i>	Cinnamon Teal											x	x	x	x	3	1	3	2
<i>Anas discors</i>	Blue-winged Teal		2									x	x	x	x	3	1	1c	3
<i>Anas platyrhynchos</i>	Mallard											x	x	x	x	3	1	3	2
<i>Anas strepera</i>	Gadwall											x	x	x	x	3	1	3	2
<i>Anthus rubescens</i>	American Pipit		1				x					x	x	x	x	3	1	1c	3
<i>Anthus spragueii</i>	Sprague's Pipit		2									x				3	1	1b	3
<i>Aphelocoma californica</i>	Western Scrub-Jay			x	x	x	x	x	x	x	x	x	x	x	x	3	2	3	3
<i>Aphelocoma ultramarina</i>	Mexican Jay								x	x						3	2	3	3
<i>Aquila chrysaetos</i>	Golden Eagle			x	x	x	x	x	x	x	x	x	x	x	x	1	1	2	3
<i>Archilochus alexandri</i>	Black-chinned Hummingbird			x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Ardea alba</i>	Great Egret		1									x	x	x	x	3	2	1b	3
<i>Ardea herodias</i>	Great Blue Heron											x	x	x	x	3	2	2	3
<i>Asio otus</i>	Long-eared Owl			x	x	x	x	x	x	x	x	x	x	x	x	3	2	2	3
<i>Asturina nitida maxima</i>	Northern Gray Hawk		1		x							x	x	x	x	3	1	1b	3
<i>Athene cunicularia hypugaea</i>	Western Burrowing Owl			x	x	x	x					x				2	2	2	3
<i>Auriparus flaviceps</i>	Verdin			x	x	x	x	x	x	x	x	x	x	x	x	3	3	3	3
<i>Aythya affinis</i>	Lesser Scaup											x	x	x	x	3	1	2	2
<i>Aythya americana</i>	Redhead											x	x	x	x	3	1	2	2
<i>Aythya collaris</i>	Ring-necked Duck											x	x	x	x	3	1	2	2
<i>Aythya valisineria</i>	Canvasback		2									x	x	x	x	3	1	1c	3
<i>Baeolophus ridgwayi</i>	Juniper Titmouse										x		x	x		3	2	3	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status			
<i>Baeolophus wollweberi</i>	Bridled Titmouse										x			x	x		3	2	3	3	
<i>Botaurus lentiginosus</i>	American Bittern		4											x	x	x	x	3	1	1b	3
<i>Branta canadensis</i>	Canada Goose		2											x	x	x	x	3	1	1c	3
<i>Bubo virginianus</i>	Great Horned Owl			x	x	x	x	x	x	x	x	x	x	x	x	x	2	2	3	3	
<i>Bubulcus ibis</i>	Cattle Egret		1											x	x	x	x	3	2	1c	3
<i>Buteo albonotatus</i>	Zone-tailed Hawk				x		x	x	x	x	x	x	x	x	x	x	3	1	2	3	
<i>Buteo jamaicensis</i>	Red-tailed Hawk			x	x	x	x	x	x	x	x	x	x	x	x	x	3	2	3	3	
<i>Buteo regalis</i>	Ferruginous Hawk		2				x							x			2	1	1b	3	
<i>Buteo swainsoni</i>	Swainson's Hawk				x		x							x			3	1	2	3	
<i>Buteogallus anthracinus</i>	Common Black-Hawk		1												x	x	x	2	1	1b	3
<i>Butorides virescens</i>	Green Heron													x	x	x	x	3	1	3	3
<i>Calamospiza melanocorys</i>	Lark Bunting			x	x		x							x			3	1	2	2	
<i>Calcarius mccownii</i>	McCown's Longspur		2	x										x			3	1	1c	3	
<i>Calcarius ornatus</i>	Chestnut-collared Longspur		2	x										x			3	1	2	1	
<i>Calidris minutilla</i>	Least Sandpiper													x	x	x	x	3	1	3	2
<i>Callipepla gambelii</i>	Gambel's Quail			x	x	x	x	x						x	x	x	x	3	3	2	3
<i>Callipepla squamata</i>	Scaled Quail						x										3	1	2	3	
<i>Calypte anna</i>	Anna's Hummingbird			x	x	x	x	x	x	x	x	x	x	x	x	x	3	2	3	3	
<i>Calypte costae</i>	Costa's Hummingbird			x	x	x	x	x	x					x	x	x	3	1	3	3	
<i>Camptostoma imberbe</i>	Northern Beardless-Tyrannulet				x		x		x						x	x	x	3	1	2	3
<i>Campylorhynchus brunneicapillus</i>	Cactus Wren			x	x	x	x	x						x	x	x	x	3	3	3	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status			
<i>Caprimulgus ridgwayi</i>	Buff-collared Nightjar		2		x										x			3	1	1c	3
<i>Caracara cheriway</i>	Crested Caracara		1	x	x		x						x					3	2	1b	3
<i>Cardinalis cardinalis</i>	Northern Cardinal			x	x		x						x	x	x	x		3	2	3	3
<i>Cardinalis sinuatus</i>	Pyrrhuloxia				x		x						x					3	2	3	3
<i>Carduelis pinus</i>	Pine Siskin							x	x	x	x	x	x	x	x	x		3	2	2	3
<i>Carduelis psaltria</i>	Lesser Goldfinch			x	x	x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Carpodacus cassinii</i>	Cassin's Finch		2										x	x	x			3	2	1c	3
<i>Carpodacus mexicanus</i>	House Finch			x	x	x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Cathartes aura</i>	Turkey Vulture			x	x	x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Catharus guttatus</i>	Hermit Thrush			x	x	x	x	x	x	x	x	x	x	x	x	x		3	1	2	3
<i>Catharus ustulatus</i>	Swainson's Thrush		2	x	x	x				x	x	x	x	x				3	1	1b	3
<i>Catherpes mexicanus</i>	Canyon Wren			x	x	x	x	x	x	x				x				3	1	3	3
<i>Certhia americana</i>	Brown Creeper								x	x	x		x	x				3	1	3	3
<i>Ceryle alcyon</i>	Belted Kingfisher		2										x	x	x	x		3	1	1b	3
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover		1										x		x	x		3	2	1b	3
<i>Charadrius montanus</i>	Mountain Plover		2	x									x			x		3	2	1c	3
<i>Charadrius vociferus</i>	Killdeer						x						x	x	x	x		3	1	3	3
<i>Chen caerulescens</i>	Snow Goose												x		x	x		3	1	2	3
<i>Chen rossii</i>	Ross's Goose												x		x	x		3	1	2	3
<i>Chloroceryle americana</i>	Green Kingfisher		1												x	x		3	2	1c	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Chondestes grammacus</i>	Lark Sparrow			x	x	x	x	x				x					3	1	3	3
<i>Chordeiles acutipennis</i>	Lesser Nighthawk			x	x	x	x	x				x	x	x	x		3	1	3	3
<i>Cinclus mexicanus</i>	American Dipper		2									x	x				2	1	1c	3
<i>Circus cyaneus</i>	Northern Harrier		2	x	x	x	x					x	x	x	x		2	1	1c	3
<i>Cistothorus palustris</i>	Marsh Wren		1									x	x	x	x		3	1	1c	3
<i>Coccothraustes vespertinus</i>	Evening Grosbeak		2										x	x	x		3	1	1c	3
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo		2		x								x	x	x		2	1	1a	3
<i>Colaptes auratus</i>	Northern Flicker			x	x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Colaptes chrysoides</i>	Gilded Flicker			x	x	x	x	x				x	x	x	x		3	2	3	3
<i>Columba livia</i>	Rock Pigeon	x		x	x	x	x					x		x	x		3	3	3	3
<i>Columbina inca</i>	Inca Dove			x	x							x		x			3	2	3	3
<i>Columbina passerina</i>	Common Ground-Dove			x	x		x					x	x	x	x		3	2	2	2
<i>Contopus cooperi</i>	Olive-sided Flycatcher		2	x	x	x	x	x	x	x	x	x	x	x	x		3	1	1b	3
<i>Contopus pertinax</i>	Greater Pewee		2											x			3	1	2	1
<i>Contopus sordidulus</i>	Western Wood-Pewee			x	x	x	x	x	x	x	x	x	x	x	x		3	1	3	2
<i>Coragyps atratus</i>	Black Vulture			x	x		x	x				x	x	x	x		3	1	2	3
<i>Corvus brachyrhynchos</i>	American Crow			x								x		x	x		3	1	2	2
<i>Corvus corax</i>	Common Raven			x	x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Corvus cryptoleucus</i>	Chihuahuan Raven			x			x							x			3	1	2	3
<i>Cyanocitta stelleri</i>	Steller's Jay			x	x				x	x	x	x	x	x			3	1	3	2
<i>Cyananthus latirostris</i>	Broad-billed Hummingbird				x							x	x	x	x		3	2	2	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status				
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck		1									x	x	x	x	3	2	1b	3
<i>Dendroica coronata</i>	Yellow-rumped Warbler			x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Dendroica graciae</i>	Grace's Warbler												x	x		3	1	2	3
<i>Dendroica nigrescens</i>	Black-throated Gray Warbler			x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Dendroica petechia</i>	Yellow Warbler			x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Dumetella carolinensis</i>	Gray Catbird		1										x	x	x	3	1	1b	3
<i>Egretta thula</i>	Snowy Egret		1									x	x	x	x	3	1	1b	3
<i>Empidonax oberholseri</i>	Dusky Flycatcher			x	x	x		x	x	x	x	x	x	x	x	3	1	2	3
<i>Empidonax occidentalis</i>	Cordilleran Flycatcher				x	x		x	x	x		x	x	x	x	3	1	3	3
<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher		1	x	x	x						x	x	x	x	1	1	1a	3
<i>Empidonax wrightii</i>	Gray Flycatcher		1	x	x	x		x	x	x	x	x	x	x	x	3	1	3	1
<i>Eremophila alpestris</i>	Horned Lark			x	x	x	x					x	x	x	x	3	1	2	3
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird						x					x	x	x	x	3	1	2	2
<i>Falco mexicanus</i>	Prairie Falcon			x	x	x	x	x	x	x	x	x	x	x	x	2	1	2	3
<i>Falco peregrinus</i>	Peregrine Falcon			x	x	x	x	x	x	x	x	x	x	x	x	2	1	2	3
<i>Falco peregrinus anatum</i>	American Peregrine Falcon		1	x	x	x	x	x	x	x	x	x	x	x	x	2	1	1b	3
<i>Falco sparverius</i>	American Kestrel			x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	2
<i>Fulica americana</i>	American Coot											x	x	x	x	3	2	2	3
<i>Gallinago delicata</i>	Wilson's Snipe		2									x	x	x	x	3	1	1c	3
<i>Gallinula chloropus</i>	Common Moorhen											x	x	x	x	3	2	2	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status			
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Geococcyx californianus</i>	Greater Roadrunner			x	x	x	x	x	x	x	x	x	x	x	3	2	2	3
<i>Geothlypis trichas</i>	Common Yellowthroat				x		x				x	x	x	x	3	1	3	3
<i>Glaucidium brasilianum cactorum</i>	Cactus Ferruginous Pygmy-Owl		1	x	x		x							x	2	2	1a	3
<i>Glaucidium gnoma californicum</i>	Northern Pygmy-Owl													x	3	2	2	2
<i>Grus canadensis</i>	Sandhill Crane											x		x	3	1	2	3
<i>Haliaeetus leucocephalus</i>	Bald Eagle		1									x	x	x	1	2	1a	3
<i>Himantopus mexicanus</i>	Black-necked Stilt											x	x	x	3	2	2	3
<i>Hirundo rustica</i>	Barn Swallow			x	x	x	x	x	x	x	x	x	x	x	3	1	2	2
<i>Icteria virens</i>	Yellow-breasted Chat											x	x	x	3	1	2	3
<i>Icterus bullockii</i>	Bullock's Oriole			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Icterus cucullatus</i>	Hooded Oriole			x	x	x	x				x	x	x	x	2	1	2	3
<i>Icterus parisorum</i>	Scott's Oriole			x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Ictinia mississippiensis</i>	Mississippi Kite		1									x	x	x	2	2	1b	3
<i>Ixobrychus exilis hesperis</i>	Western Least Bittern											x	x	x	2	2	2	3
<i>Junco hyemalis</i>	Dark-eyed Junco			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Lanius ludovicianus</i>	Loggerhead Shrike			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Laterallus jamaicensis coturnic</i>	California Black Rail		1											x	3	1	1b	3
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher											x	x	x	3	1	2	2
<i>Loxia curvirostra</i>	Red Crossbill											x	x	x	3	2	2	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status			
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Megascops kennicottii</i>	Western Screech-Owl			x	x	x		x	x	x	x	x	x	x	3	2	3	3
<i>Melanerpes formicivorus</i>	Acorn Woodpecker							x	x	x	x		x		3	2	3	3
<i>Melanerpes lewis</i>	Lewis's Woodpecker		1							x	x		x		3	2	1c	3
<i>Melanerpes uropygialis</i>	Gila Woodpecker			x	x	x		x				x	x	x	3	2	3	3
<i>Melospiza lincolnii</i>	Lincoln's Sparrow		1	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Melospiza melodia</i>	Song Sparrow										x	x	x	x	3	1	2	3
<i>Mergus merganser</i>	Common Merganser		1								x	x	x	x	3	1	1c	3
<i>Micrathene whitneyi</i>	Elf Owl			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Mimus polyglottos</i>	Northern Mockingbird			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Molothrus aeneus</i>	Bronzed Cowbird			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Molothrus ater</i>	Brown-headed Cowbird			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Myadestes townsendi</i>	Townsend's Solitaire				x	x		x	x	x	x	x	x		3	1	3	3
<i>Myiarchus cinerascens</i>	Ash-throated Flycatcher			x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Myiarchus tuberculifer</i>	Dusky-capped Flycatcher												x	x	3	1	2	3
<i>Myiarchus tyrannulus</i>	Brown-crested Flycatcher			x	x	x					x	x	x	x	3	1	2	3
<i>Myioborus pictus</i>	Painted Redstart								x		x	x	x	x	3	1	2	3
<i>Nucifraga columbiana</i>	Clark's Nutcracker		1					x	x	x	x	x	x	x	3	1	1c	3
<i>Numenius americanus</i>	Long-billed Curlew		1								x	x	x	x	3	1	2	1
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron										x	x	x	x	3	1	2	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status				
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Oporornis tolmiei</i>	MacGillivray's Warbler		1	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3	
<i>Oreoscoptes montanus</i>	Sage Thrasher		1	x	x	x	x				x	x			3	1	1b	3	
<i>Otus flammeolus</i>	Flammulated Owl											x		x	3	1	2	3	
<i>Oxyura jamaicensis</i>	Ruddy Duck											x	x	x	x	3	1	2	3
<i>Pandion haliaetus</i>	Osprey		1									x	x	x	x	3	1	1b	3
<i>Parabuteo unicinctus</i>	Harris's Hawk			x	x	x	x					x	x	x	x	2	2	2	3
<i>Passer domesticus</i>	House Sparrow	x										x			3	3	3	3	
<i>Passerculus sandwichensis</i>	Savannah Sparrow		1				x					x	x	x	x	3	1	1c	3
<i>Passerina amoena</i>	Lazuli Bunting			x	x	x	x	x	x	x	x	x	x	x	3	1	2	3	
<i>Passerina caerulea</i>	Blue Grosbeak			x	x	x	x					x	x	x	x	3	1	3	3
<i>Passerina cyanea</i>	Indigo Bunting		2									x	x	x	x	3	1	1c	3
<i>Passerina versicolor</i>	Varied Bunting			x	x		x					x	x	x		3	1	2	3
<i>Patagioenas fasciata</i>	Band-tailed Pigeon												x	x		3	1	2	3
<i>Pelecanus erythrorhynchos</i>	American White Pelican											x		x	x	3	1	2	2
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow			x	x	x	x					x	x	x	x	3	1	2	3
<i>Phainopepla nitens</i>	Phainopepla			x	x	x	x	x	x	x	x	x	x	x	3	2	2	3	
<i>Phalacrocorax auritus albociliatus</i>	Double-crested Cormorant		1									x		x	x	3	1	1c	3
<i>Phalacrocorax brasilianus</i>	Neotropic Cormorant											x		x	x	3	2	2	2
<i>Phalaenoptilus nuttallii</i>	Common Poorwill			x	x	x	x	x	x	x					3	1	2	3	

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Phasianus colchicus</i>	Ring-necked Pheasant	x										x		x			3	3	3	3
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak			x	x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Picoides scalaris</i>	Ladder-backed Woodpecker			x	x	x	x	x	x	x	x	x	x	x			3	2	3	3
<i>Pipilo aberti</i>	Abert's Towhee											x	x	x	x		3	3	2	3
<i>Pipilo chlorurus</i>	Green-tailed Towhee		1	x	x	x	x	x	x	x	x	x	x	x	x		3	1	1c	3
<i>Pipilo fuscus</i>	Canyon Towhee				x	x	x	x	x	x	x	x	x	x			3	2	3	3
<i>Pipilo maculatus</i>	Spotted Towhee			x	x	x	x	x	x	x	x	x	x	x			3	1	3	3
<i>Piranga ludoviciana</i>	Western Tanager			x	x	x	x	x	x	x	x	x	x	x			3	1	3	3
<i>Piranga rubra</i>	Summer Tanager											x	x	x	x		3	1	2	3
<i>Plegadis chihi</i>	White-faced Ibis		1									x	x	x	x		3	1	2	1
<i>Podiceps nigricollis</i>	Eared Grebe		2									x		x	x		3	1	1c	3
<i>Podilymbus podiceps</i>	Pied-billed Grebe											x	x	x	x		3	1	3	3
<i>Poecile gambeli</i>	Mountain Chickadee											x	x	x	x		3	1	3	3
<i>Polioptila caerulea</i>	Blue-gray Gnatcatcher			x	x	x	x	x	x	x	x	x	x	x	x		3	1	3	3
<i>Polioptila melanura</i>	Black-tailed Gnatcatcher			x	x	x	x										3	3	3	3
<i>Poocetes gramineus</i>	Vesper Sparrow			x	x	x	x					x					3	1	2	3
<i>Porzana carolina</i>	Sora											x	x	x	x		3	1	2	3
<i>Progne subis arboricola</i>	Western Purple Martin		1									x		x	x		3	1	1b	3
<i>Progne subis hesperia</i>	Desert Purple Martin		1		x							x	x	x	x		3	1	1c	3
<i>Psaltriparus minimus</i>	Bushtit			x	x	x	x	x	x	x	x	x	x	x	x		3	2	2	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status				
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Pyrocephalus rubinus</i>	Vermilion Flycatcher			x	x	x	x					x	x	x	x	3	1	2	3
<i>Quiscalus mexicanus</i>	Great-tailed Grackle			x	x	x	x					x	x	x	x	3	1	2	3
<i>Rallus limicola</i>	Virginia Rail											x	x	x	x	3	1	2	2
<i>Rallus longirostris yumanensis</i>	Yuma Clapper Rail		1									x	x	x	x	1	2	1a	3
<i>Recurvirostra americana</i>	American Avocet		1									x	x	x	x	3	1	1c	3
<i>Regulus calendula</i>	Ruby-crowned Kinglet		1	x	x	x	x	x	x	x	x	x	x	x	x	3	1	1c	3
<i>Regulus satrapa</i>	Golden-crowned Kinglet		1											x		3	2	1c	3
<i>Salpinctes obsoletus</i>	Rock Wren			x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Sayornis saya</i>	Say's Phoebe			x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Selasphorus platycercus</i>	Broad-tailed Hummingbird			x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Sialia currucoides</i>	Mountain Bluebird			x	x	x	x				x	x		x	x	3	1	2	3
<i>Sialia mexicana</i>	Western Bluebird			x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Sitta canadensis</i>	Red-breasted Nuthatch									x	x	x	x	x	x	3	2	2	3
<i>Sitta carolinensis</i>	White-breasted Nuthatch									x	x	x	x	x	x	3	2	3	3
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker		1		x	x					x	x	x	x	x	3	1	1b	3
<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker										x	x	x	x	x	3	2	2	3
<i>Spizella atrogularis</i>	Black-chinned Sparrow										x	x	x	x		3	1	2	3
<i>Spizella breweri</i>	Brewer's Sparrow			x	x	x	x	x			x	x	x	x	x	3	1	2	3
<i>Spizella passerina</i>	Chipping Sparrow			x	x	x	x	x	x	x	x	x	x	x	x	3	1	2	3
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow			x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status			
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status
<i>Tyto alba</i>	Barn Owl			x	x	x	x	x	x	x	x	x	x	x	3	2	3	3
<i>Vermivora celata</i>	Orange-crowned Warbler		1	x	x	x	x	x	x	x	x	x	x	3	1	1c	3	
<i>Vermivora luciae</i>	Lucy's Warbler			x	x	x	x	x			x	x	x	2	1	3	3	
<i>Vermivora virginiae</i>	Virginia's Warbler			x	x	x	x	x	x	x	x	x	x	3	1	2	3	
<i>Vireo gilvus</i>	Warbling Vireo			x	x	x	x	x	x	x	x	x	x	3	1	3	3	
<i>Vireo huttoni</i>	Hutton's Vireo							x	x	x	x	x	x	3	2	2	3	
<i>Vireo plumbeus</i>	Plumbeous Vireo			x	x	x	x	x	x	x	x	x	x	3	1	3	3	
<i>Vireo vicinior</i>	Gray Vireo			x	x	x	x	x	x	x		x		3	1	2	3	
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird										x	x	x	3	1	2	3	
<i>Zenaida asiatica</i>	White-winged Dove			x	x	x	x	x	x	x	x	x	x	3	1	2	3	
<i>Zenaida macroura</i>	Mourning Dove			x	x	x	x	x	x	x	x	x	x	3	1	2	3	
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow		1	x	x	x	x	x	x	x	x	x	x	3	1	1c	3	
<i>Agosia chrysogaster</i>	Longfin Dace		1								x	x	x	1	2	1b	3	
<i>Carassius auratus</i>	Goldfish	x									x		x	3	3	3	3	
<i>Catostomus clarki</i>	Desert Sucker		1								x		x	1	1	1b	3	
<i>Catostomus insignis</i>	Sonora Sucker		1								x		x	1	1	1b	3	
<i>Catostomus latipinnis</i>	Flannelmouth Sucker		1										x	3	1	1a	3	
<i>Ctenopharyngodon idella</i>	Grass Carp	x									x			3	3	3	3	
<i>Cyprinodon eremus</i>	Quitobaquito Pupfish		1									x	x	1	1	1a	3	
<i>Cyprinodon macularius</i>	Desert Pupfish		1									x		1	1	1a	3	
<i>Cyprinus carpio</i>	Common Carp	x									x		x	3	3	3	3	
<i>Dorosoma petenense</i>	Threadfin Shad	x									x		x	3	3	3	3	

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type										Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Elops affinis</i>	Machete		1											x		3	1	1c	3
<i>Gambusia affinis</i>	Mosquitofish	x										x	x	x	x	3	3	3	3
<i>Gila elegans</i>	Bonytail		1										x	x		1	1	1a	3
<i>Gila intermedia</i>	Gila Chub		1										x	x		1	1	1a	3
<i>Gila nigra</i>	Headwater Chub		1											x		1	1	1b	3
<i>Gila robusta</i>	Roundtail Chub		1										x	x		1	1	1b	3
<i>Ictalurus melas</i>	Black Bullhead	x											x	x	x	3	3	3	3
<i>Ictalurus natalis</i>	Yellow Bullhead	x											x	x	x	3	3	3	3
<i>Ictalurus punctatus</i>	Channel Catfish	x											x	x	x	3	3	3	3
<i>Ictiobus bubalus</i>	Smallmouth Buffalo	x													x	3	3	3	3
<i>Ictiobus cyprinellus</i>	Bigmouth Buffalo	x													x	3	3	3	3
<i>Ictiobus niger</i>	Black Buffalo	x													x	3	3	3	3
<i>Lepomis cyanellus</i>	Green Sunfish	x											x	x	x	3	3	3	3
<i>Lepomis gulosus</i>	Warmouth	x													x	3	3	3	3
<i>Lepomis macrochirus</i>	Bluegill	x											x	x	x	3	3	3	3
<i>Lepomis microlophus</i>	Redear Sunfish	x											x	x	x	3	3	3	3
<i>Meda fulgida</i>	Spikedace		1		x									x		1	1	1a	3
<i>Micropterus dolomieu</i>	Smallmouth Bass	x											x	x	x	3	3	3	3
<i>Micropterus salmoides</i>	Largemouth Bass	x											x	x	x	3	3	3	3
<i>Morone chrysops</i>	White Bass	x											x		x	3	3	3	3
<i>Morone mississippiensis</i>	Yellow Bass	x											x		x	3	3	3	3
<i>Morone saxatilis</i>	Striped Bass	x											x		x	3	3	3	3
<i>Mugil cephalus</i>	Striped Mullet		1											x	x	3	1	1c	3
<i>Notemigonus crysoleucas</i>	Golden Shiner	x													x	3	3	3	3
<i>Notropis lutrensis</i>	Red Shiner	x											x	x	x	3	3	3	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Oncorhynchus mykiss</i>	Rainbow Trout	x											x		x	x	3	3	3	3
<i>Perca flavescens</i>	Yellow Perch	x													x	x	3	3	3	3
<i>Pimephales promelas</i>	Fathead Minnow	x											x	x	x	x	3	3	3	3
<i>Plagopterus argentissimus</i>	Woundfin		1												x		3	1	1a	3
<i>Poeciliopsis occidentalis occidentalis</i>	Gila Topminnow		1											x	x		2	1	1a	3
<i>Pomoxis annularis</i>	White Crappie	x											x		x	x	3	3	3	3
<i>Pomoxis nigromaculatus</i>	Black Crappie	x											x		x	x	3	3	3	3
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow		1												x		1	1	1a	3
<i>Pylodictis olivaris</i>	Flathead Catfish	x											x		x	x	3	3	3	3
<i>Rhinichthys osculus</i>	Speckled Dace		1												x		1	1	1b	3
<i>Salmo trutta</i>	Brown Trout	x													x	x	3	3	3	3
<i>Stizostedion vitreum</i>	Walleye	x											x			x	3	3	3	3
<i>Tiaroga cobitis</i>	Loach Minnow		1												x		1	1	1a	3
<i>Tilapia sp.</i>	Tilapia	x											x		x	x	3	3	3	3
<i>Xyrauchen texanus</i>	Razorback Sucker		1												x	x	1	1	1a	3
<i>Anodonta californiensis</i>	California Floater		4											x	x	x	3	1	1b	3
<i>Artemia franciscana</i>	San Francisco Brine Shrimp													x	x	x	3	3	3	2
<i>Biomphalaria havanensis</i>	Ghost Rams-horn	x													x		3	3	3	3
<i>Branchinecta kaibabensis</i>	Kaibab Fairy Shrimp													x			3	3	3	2
<i>Cipangopaludina chinensis</i>	Chinese Mysterysnail	x													x	x	3	3	3	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type										Species status						
					L. Colorado River	Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Cyzicus mexicanus</i>	Mexican Clam Shrimp													x	x	x	3	3	3	2	
<i>Cyzicus setosa</i>	Bristletail Clam Shrimp														x	x	x	3	3	3	2
<i>Drepanotrema aeruginosum</i>	Rusty Rams-horn	x														x		3	3	3	3
<i>Eocyclus digueti</i>	Straightbacked Clam Shrimp														x	x	x	3	3	3	2
<i>Eubbranchipus bundyi</i>	Knobbedlip Fairy Shrimp														x	x	x	3	3	3	2
<i>Eubbranchipus serratus</i>	Ethologist Fairy Shrimp														2	x		3	3	3	2
<i>Eulimnadia antlei</i>	Fuzzy Cyst Clam Shrimp														x	x	x	3	3	3	2
<i>Eulimnadia cylindrova</i>	Cylindrical Cyst Clam Shrimp														x	x	x	3	3	3	2
<i>Eulimnadia texana</i>	Texan Clam Shrimp														x	x	x	3	3	3	2
<i>Ferrissia fragilis</i>	Fragile Ancyloid														x	x	x	3	3	3	2
<i>Ferrissia rivularis</i>	Creeping Ancyloid														x	x	x	3	3	3	2
<i>Helisoma anceps</i>	Two-ridge Rams-horn														x	x	x	3	3	3	2
<i>Helix aspersa</i>	Brown Gardensnail	x			x	x	x	x	x	x	x	x						3	3	3	3
<i>Leptestheria compleximanus</i>	Spineynose Clam Shrimp														x	x	x	3	3	3	2
<i>Lynceus brachyurus</i>	Holarctic Clam Shrimp														2		x	3	3	3	2
<i>Lynceus brevifrons</i>	Short Finger Clam Shrimp														x	x	x	3	3	3	2
<i>Melanoides tuberculatus</i>	Red-rim Melania	x														x	x	3	3	3	3
<i>Orconectes virilis</i>	Virile Crayfish	x														x	x	3	3	3	3
<i>Otala lactea</i>	Milk Snail				x	x	x		x	x	x							3	3	3	2

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/ Reservoirs	Wetlands/ Springs	Streams/ Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Physella humerosa</i>	Corkscrew Physa														x	x	3	3	2	2
<i>Physella osculans</i>	Cayuse Physa														x	x	3	3	2	2
<i>Physella virgata</i>	Protean Physa															x	3	3	3	2
<i>Planorbella tenuis</i>	Mexican Rams-horn														x	x	3	3	3	2
<i>Procambarus clarkii</i>	Red Swamp Crawfish	x													x	x	3	3	3	3
<i>Prometetus exacuus</i>	Sharp Sprite (A Planorbid Snail)														x	x	3	3	3	2
<i>Pseudosuccinea columella</i>	Mimic Lymnaea	x													x	x	3	3	3	3
<i>Pyganodon grandis</i>	Giant Floater		x														3	3	3	3
<i>Radix auricularia</i>	Big-eared Radix	x													x	x	3	3	3	3
<i>Sonorella allynsmithi</i>	Squaw Peak Talussnail		2	x													1	1	1b	3
<i>Sonorella eremita</i>	San Xavier Talussnail		2		x												1	1	1a	3
<i>Sonorella milleri</i>	Table Top Talussnail		4												x		3	3	1c	3
<i>Sonorella papagorum</i>	Papago Talussnail		3		x												1	1	1b	3
<i>Streptocephalus dorotheae</i>	New Mexico Fairy Shrimp														x	x	3	3	3	2
<i>Streptocephalus mackini</i>	Chihuahuan Desert Fairy Shrimp														x	x	3	3	3	2
<i>Streptocephalus sealii</i>	Spinytail Fairy Shrimp														x	x	3	3	3	2
<i>Streptocephalus texanus</i>	Greater Plains Fairy Shrimp														x	x	3	3	3	2
<i>Thamnocephalus mexicanus</i>	Mexican Beavertail Fairy Shrimp														x	x	3	3	3	2

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type										Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status	
<i>Thamnocephalus platyurus</i>	Beavertail Fairy Shrimp												x	x	x	3	3	3	2
<i>Triops longicaudatus</i>	Longtail Tadpole Shrimp												x	x	x	3	3	3	2
<i>Triops newberryi</i>	Desert Tadpole Shrimp												x	x	x	3	3	3	2
<i>Tryonia quitobaquiae</i>	Quitobaquito Tryonia		2	x												1	1	1a	3
<i>Vertigo berryi</i>	Rotund Vertigo		4									x	x	x	3	3	1c	3	
<i>Ammospermophilus harrisi</i>	Harris' Antelope Squirrel			x	x		x									2	3	3	3
<i>Antilocapra americana sonoriensis</i>	Sonoran Pronghorn		1	x	x											1	2	1a	3
<i>Antrozous pallidus</i>	Pallid Bat		1	x	x	x	x	x	x	x	x	x	x	x	x	2	1	3	1
<i>Canis latrans</i>	Coyote		1	x	x	x	x	x	x	x	x	x	x	x	x	3	1	3	3
<i>Castor canadensis</i>	American Beaver		1										x	x		1	1	1c	3
<i>Chaetodipus baileyi</i>	Bailey's Pocket Mouse		1	x	x											1	3	3	3
<i>Chaetodipus intermedius</i>	Rock Pocket Mouse		1	x	x	x	x									1	1	3	3
<i>Chaetodipus penicillatus</i>	Sonoran Desert Pocket Mouse			x	x											2	3	3	3
<i>Choeronycteris mexicana</i>	Mexican Long-tongued Bat		1	x	x		x	x	x	x			x	x		2	2	1b	3
<i>Corynorhinus townsendii pallescens</i>	Pale Townsend's Big-eared Bat			x	x	x	x	x	x	x			x	x	x	3	2	2	1
<i>Dipodomys deserti</i>	Desert Kangaroo Rat		1	x	x											3	1	2	1
<i>Dipodomys merriami</i>	Merriam's Kangaroo Rat		1	x	x		x									2	1	2	3
<i>Dipodomys spectabilis</i>	Banner-tailed Kangaroo Rat		1	x	x											3	1	2	3
<i>Eptesicus fuscus</i>	Big Brown Bat			x	x	x	x	x	x	x	x	x	x	x	x	3	2	2	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Equus asinus</i>	Feral Ass	x				x												3	3	
<i>Erethizon dorsatum</i>	North American Porcupine		1		x			x	x	x							1	2	3	3
<i>Euderma maculatum</i>	Spotted Bat		2	x	x		x										3	2	1b	3
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat		2	x	x	x	x	x					x				2	2	1b	3
<i>Eumops underwoodi</i>	Underwood's Mastiff Bat		2	x	x		x						x				2	2	1b	3
<i>Idionycteris phyllotis</i>	Allen's Big-eared Bat				x												3	2	2	1
<i>Lasiurus blossevillii</i>	Western Red Bat		2	x	x								x	x			3	2	1b	3
<i>Lasiurus cinereus</i>	Hoary Bat			x	x		x						x	x			3	2	2	1
<i>Lasiurus xanthinus</i>	Western Yellow Bat		2	x	x								x	x			3	2	1b	3
<i>Leptonycteris curasoae yerbabuena</i>	Lesser Long-nosed Bat		1	x	x		x	x									2	1	1a	3
<i>Lepus alleni</i>	Antelope Jackrabbit			x			x										2	3	2	3
<i>Lepus californicus</i>	Black-tailed Jackrabbit			x	x	x	x	x	x	x							3	3	3	3
<i>Lutra canadensis lataxina</i>	Southeastern River Otter		1										x		x		3	1	1c	3
<i>Lynx rufus</i>	Bobcat		1		x	x	x	x	x	x							3	2	3	1
<i>Macrotus californicus</i>	California Leaf-nosed Bat		1	x	x	x	x	x	x				x	x			1	2	1b	3
<i>Mephitis macroura</i>	Hooded Skunk		1	x	x												2	2	3	3
<i>Mephitis mephitis</i>	Striped Skunk		1	x	x	x	x	x	x	x							3	2	3	3
<i>Myotis auricolus</i>	Southwestern Myotis				x					x			x	x			2	2	3	1
<i>Myotis californicus</i>	California Myotis		1	x	x	x	x	x	x				x	x			1	2	1c	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status							
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status				
<i>Myotis ciliolabrum</i>	Western Small-footed Myotis				x													3	2	2	3	
<i>Myotis occultus</i>	Arizona Myotis		1	x	x													x	1	2	2	1
<i>Myotis thysanodes</i>	Fringed Myotis				x														3	2	2	3
<i>Myotis velifer</i>	Cave Myotis			x	x	x	x	x	x	x					x	x			3	2	2	3
<i>Myotis yumanensis</i>	Yuma Myotis			x	x	x	x	x	x	x					x	x			3	2	2	3
<i>Nasua nasua</i>	White-nosed Coati		1						x	x	x								3	2	2	3
<i>Neotoma albigula</i>	Western White-throated Woodrat		1	x	x		x												3	2	3	3
<i>Neotoma lepida</i>	Desert Woodrat			x	x	x	x				x								3	2	3	1
<i>Notiosorex crawfordi</i>	Crawford's Desert Shrew		1	x	x	x	x	x	x	x									1	3	3	3
<i>Nyctinomops femorosaccus</i>	Pocketed Free-tailed Bat			x	x	x	x	x							x	x			2	2	2	1
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat		1	x	x		x			x	x				x	x	x		2	2	1b	3
<i>Odocoileus hemionus crooki</i>	Desert Mule Deer		1	x	x	x	x	x	x	x									2	2	2	1
<i>Odocoileus virginianus couesi</i>	Coues whitetail deer		1		x					x	x	x				x			2	2	2	3
<i>Ondatra zibethicus</i>	Common Muskrat		1												x		x		2	1	1c	3
<i>Onychomys torridus</i>	Southern Grasshopper Mouse			x	x														3	2	2	1
<i>Ovis canadensis mexicana</i>	Desert Bighorn Sheep		1	x	x	x	x	x								x	x		2	2	1b	3
<i>Perognathus amplus</i>	Arizona Pocket Mouse		1	x	x														1	2	3	1
<i>Perognathus flavus</i>	Silky Pocket Mouse			x	x														3	2	2	1
<i>Perognathus longimembris</i>	Little Pocket Mouse			x															3	2	2	1
<i>Peromyscus boylii</i>	Brush Mouse		1		x		x												3	1	3	1

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Peromyscus crinitus</i>	Canyon Mouse			x	x												3	2	2	1
<i>Peromyscus eremicus</i>	Cactus Mouse			x	x	x											3	2	3	1
<i>Peromyscus leucopus</i>	White-footed Mouse				x												3	2	3	1
<i>Peromyscus maniculatus</i>	Deer Mouse		1	x	x												3	1	3	3
<i>Peromyscus merriami</i>	Mesquite Mouse		1	x	x												1	1	1b	3
<i>Pipistrellus hesperus</i>	Western Pipistrelle		1	x	x	x	x	x	x	x		x	x	x			3	2	1c	3
<i>Procyon lotor</i>	Raccoon		1		x			x	x		x	x	x	x			3	2	3	3
<i>Puma concolor</i>	Mountain Lion		1		x	x		x	x	x							3	1	3	3
<i>Reithrodontomys fulvescens</i>	Fulvous Harvest Mouse				x												3	2	2	1
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse		1	x	x												3	1	3	1
<i>Reithrodontomys megalotis megalotis</i>	Western Harvest Mouse		1	x	x												2	1	3	1
<i>Reithrodontomys montanus</i>	Plains Harvest Mouse				x												3	2	2	1
<i>Sciurus aberti</i>	Abert's Squirrel		1							x							3	2	3	3
<i>Sigmodon arizonae cienegae</i>	Arizona Cotton Rat		1	x	x												1	2	2	1
<i>Sigmodon arizonae plenus</i>	Colorado River Cotton Rat		1	x													1	2	1c	3
<i>Sigmodon hispidus</i>	Hispid Cotton Rat				x	x											3	3	2	1
<i>Sigmodon hispidus eremicus</i>	Yuma Hispid Cotton Rat		1	x													2	2	1b	3
<i>Sigmodon ochrognathus</i>	Yellow-nosed Cotton Rat					x											3	2	2	1
<i>Spermophilus tereticaudus</i>	Round-tailed Ground Squirrel		1	x	x												2	1	3	1

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type										Species status						
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Spermophilus variegatus</i>	Rock Squirrel			x	x	x	x	x	x	x							3	2	3	3
<i>Spilogale gracilis</i>	Western Spotted Skunk			x	x		x	x	x	x							3	3	3	1
<i>Sylvilagus audubonii</i>	Desert Cottontail			x	x	x	x	x	x	x							3	2	3	3
<i>Sylvilagus floridanus</i>	Eastern Cottontail				x		x	x	x	x							3	2	2	3
<i>Tadarida brasiliensis</i>	Mexican Free-tailed Bat		1	x	x	x	x	x	x	x		x	x	x			3	1	1c	3
<i>Taxidea taxus</i>	American Badger		1	x	x	x	x	x	x	x							2	1	2	1
<i>Tayassau tajacu</i>	Collared Peccary		1		x	x	x	x	x	x							2	2	2	3
<i>Thomomys bottae</i>	Botta's Pocket Gopher			x	x		x	x									2	2	3	1
<i>Thomomys bottae subsimilis</i>	Harquahala Southern Pocket Gopher		1		x												1	2	1b	3
<i>Urocyon cinereoargenteus</i>	Common Gray Fox		1		x	x	x	x	x	x							3	2	3	3
<i>Vulpes macrotis</i>	Kit Fox		1	x			x										2	2	2	1
<i>Apalone spinifera</i>	Spiny Softshell	x											x	x			3	3	3	3
<i>Arizona elegans noctivaga</i>	Arizona Glossy Snake			x	x	x	x	x	x	x							3	3	3	3
<i>Aspidoscelis flagellicauda</i>	Gila Spotted Whiptail				x		x	x	x	x			x				1	3	3	3
<i>Aspidoscelis pai</i>	Pai Striped Whiptail				x												1	2	1c	3
<i>Aspidoscelis sonorae</i>	Sonoran Spotted Whiptail				x								x				3	1	3	3
<i>Aspidoscelis tigris</i>	Tiger Whiptail			x	x	x	x	x	x	x	x		x				3	3	3	3
<i>Aspidoscelis uniparens</i>	Desert Grassland Whiptail						x						x				2	3	3	3
<i>Aspidoscelis xanthonota</i>	Red-back Whiptail		2		x		x										3	3	1b	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution	Confidence	Distribution by habitat type										Species status						
					L. Colorado River	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Callisaurus draconoides</i>	Zebra-tailed Lizard				x	x	x	x	x	x								2	3	3	3
<i>Charina trivirgata gracia</i>	Desert Rosy Boa		2			x				x	x	x						3	3	1c	3
<i>Charina trivirgata trivirgata</i>	Mexican Rosy Boa		2			x												3	3	1c	3
<i>Chelydra serpentina</i>	Snapping Turtle													x	x			3	3	3	2
<i>Chilomeniscus stramineus</i>	Variable Sandsnake				x													3	2	3	3
<i>Chionactis occipitalis annulata</i>	Colorado Desert Shovel-nosed Snake				x	x	x											2	2	3	3
<i>Chionactis occipitalis klauberi</i>	Tucson Shovel-nosed Snake				x	x												1	2	1b	3
<i>Chionactis palarostris organica</i>	Organ Pipe Shovel-nosed Snake		2		x	x												3	2	1b	3
<i>Chrysemys picta bellii</i>	Western Painted Turtle		3		x	x												3	2	1c	3
<i>Coleonyx variegatus bogerti</i>	Tucson Banded Gecko				x	x		x	x	x	x							2	3	3	2
<i>Coleonyx variegatus variegatus</i>	Desert Banded Gecko				x	x	x	x	x	x		x						2	3	3	2
<i>Cophosaurus texanus scitulus</i>	Chihuahuan Greater Earless Lizard				x	x	x	x	x	x								2	3	3	3
<i>Crotalus atrox</i>	Western Diamond-backed Rattlesnake				x	x	x	x	x	x	x							3	3	3	3
<i>Crotalus cerastes cerastes</i>	Mojave Desert Sidewinder				x	x												3	2	2	3
<i>Crotalus cerastes cercobombus</i>	Sonoran Sidewinder				x	x												2	2	3	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type										Species status						
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Crotalus cerastes laterorepens</i>	Colorado Desert Sidewinder			x	x												3	2	2	3
<i>Crotalus mitchellii pyrrhus</i>	Southwestern Speckled Rattlesnake			x	x	x		x	x	x							3	3	3	2
<i>Crotalus molossus molossus</i>	Northern Black-tailed Rattlesnake				x			x	x	x							3	3	3	2
<i>Crotalus oreganus cerberus</i>	Arizona Black Rattlesnake				x		x	x	x	x							1	3	3	3
<i>Crotalus scutulatus scutulatus</i>	Northern Mohave Rattlesnake			x	x	x	x										3	3	3	2
<i>Crotalus tigris</i>	Tiger Rattlesnake			x	x		x	x	x								3	3	3	3
<i>Crotaphytus bicinctores</i>	Great Basin Collared Lizard			x	x	x	x										3	3	2	3
<i>Crotaphytus collaris</i>	Eastern Collared Lizard			x	x	x	x	x	x	x							2	3	3	3
<i>Crotaphytus nebrius</i>	Sonoran Collared Lizard			x	x												3	3	2	3
<i>Ctenosaura pectinata</i>	Western Spiny-tailed Iguana	x			x												3	3	3	3
<i>Diadophis punctatus regalis</i>	Regal Ring-necked Snake				x		x	x	x	x		x	x				3	2	3	2
<i>Dipsosaurus dorsalis dorsalis</i>	Northern Desert Iguana			x	x	x	x										3	3	3	3
<i>Eumeces gilberti arizonensis</i>	Arizona Skink		2		x												1	3	1b	3
<i>Eumeces gilberti rubricaudata</i>	Western Red-tailed Skink		2		x			x		x			x				1	3	3	1
<i>Gambelia wislizenii</i>	Long-nosed Leopard Lizard			x	x	x	x										3	3	3	3
<i>Gopherus agassizii (Sonoran Population)</i>	Sonoran Desert Tortoise		1	x	x	x	x	x		x							2	2	1b	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status						
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status			
<i>Heloderma suspectum cinctum</i>	Banded Gila Monster			x	x	x		x										1	3	2	3
<i>Heloderma suspectum suspectum</i>	Reticulate Gila Monster			x	x		x	x										2	3	3	3
<i>Hypsiglena torquata chlorophaea</i>	Sonoran Nightsnake			x	x	x	x	x	x									3	3	3	3
<i>Kinosternon arizonense</i>	Arizona Mud Turtle			x	x								x	x	x			3	1	1b	3
<i>Kinosternon sonoriense longifemorale</i>	Sonoyta Mud Turtle		2		x								x		x			2	2	1a	3
<i>Kinosternon sonoriense sonoriense</i>	Sonora Mud Turtle		2		x								x	x				2	1	1c	3
<i>Lampropeltis getula californiae</i>	California Kingsnake			x	x	x	x	x	x	x	x							2	3	3	3
<i>Leptotyphlops humilis cahuilae</i>	Desert Threadsnake			x	x		x											3	3	2	2
<i>Leptotyphlops humilis humilis</i>	Southwestern Threadsnake			x	x	x	x											3	3	3	3
<i>Masticophis bilineatus</i>	Sonoran Whipsnake			x	x	x	x	x	x	x			x	x	x			2	2	3	3
<i>Masticophis flagellum piceus</i>	Red Racer			x	x	x	x											3	3	3	3
<i>Masticophis taeniatus taeniatus</i>	Desert Striped Whipsnake				x									x				3	3	3	2
<i>Micruroides euryxanthus euryxanthus</i>	Arizona (Sonoran) Coralsnake			x	x		x	x										2	3	3	2
<i>Phrynosoma cornutum</i>	Texas Horned Lizard		2		x													2	2	1c	3

APPENDIX K. SONORAN DESERT MASTER SPECIES LIST (CONTINUED)

Scientific Name	Common Name	Nonnative	Distribution Confidence	Distribution by habitat type											Species status					
				L. Colorado River Sonoran Desertscrub	Upland Sonoran Desertscrub	Mohave Desertscrub	Semidesert Grassland	Interior Chaparral	Madrean Evergreen Woodland	Great Basin Conifer Woodland	Human Dominated Landscapes	Lakes/Reservoirs	Wetlands/Springs	Streams/Rivers	Responsibility	Community/Focal	Vulnerability	Unknown Status		
<i>Phrynosoma mcallii</i>	Flat-tailed Horned Lizard		1	x													2	2	1a	3
<i>Phrynosoma platyrhinos</i>	Desert Horned Lizard			x	x	x											3	2	3	3
<i>Phrynosoma solare</i>	Regal Horned Lizard			x	x		x										2	3	3	2
<i>Phyllorhynchus browni</i>	Saddled Leaf-nosed Snake			x	x												2	3	3	2
<i>Phyllorhynchus decurtatus</i>	Spotted Leaf-nosed Snake			x	x												3	3	3	2
<i>Pituophis catenifer affinis</i>	Sonoran Gophersnake			x	x	x	x	x	x	x							3	3	3	3
<i>Rhinocheilus lecontei lecontei</i>	Western Long-nosed Snake			x	x	x	x	x									3	3	3	2
<i>Salvadora hexalepis hexalepis</i>	Desert Patch-nosed Snake			x	x	x	x	x									2	3	3	3
<i>Sauromalus ater</i>	Common Chuckwalla			x	x	x		x									2	2	2	3
<i>Sceloporus clarkii</i>	Clark's Spiny Lizard							x	x	x							2	3	2	3
<i>Sceloporus magister</i>	Desert Spiny Lizard			x	x	x	x	x									3	3	3	3
<i>Sonora semiannulata semiannulata</i>	Variable Groundsnake			x	x	x	x	x				x					3	3	3	3
<i>Tantilla hobartsmithi</i>	Smith's Black-headed Snake			x	x	x	x	x									2	3	1c	3
<i>Tantilla nigriceps</i>	Plains Black-headed Snake		2		x												3	3	1c	3
<i>Thamnophis cyrtopsis cyrtopsis</i>	Western Black-necked Gartersnake		2		x								x	x	x		3	2	1c	3
<i>Thamnophis eques megalops</i>	Northern Mexican Gartersnake		2										x	x	x		2	2	1b	3

APPENDIX L. CRITERIA FOR SCORING ARIZONA WILDLIFE UNDER 4 CONSERVATION CATEGORIES

For Element 1 of Arizona's Comprehensive Wildlife Conservation Strategy (CWCS), the Department must identify wildlife of conservation priority—described in Arizona as Species of Greatest Conservation Need (SGCN). However, for the CWCS to be truly comprehensive for managing Arizona's wildlife, the Department must address the full array of wildlife in the state—game species, nongame species, sport fish, natives, and nonnatives. For this purpose, all of Arizona's species of wildlife* (ranging from big game species to macroinvertebrates) will be evaluated with the process described below.

* Note: Arizona Revised Statutes Title 17 defines "wildlife" as all vertebrate species including crustaceans and mollusks—species which the Department has statutory responsibility for managing. The State Wildlife Grant (SWG) Program (developed in cooperation with the Teaming With Wildlife Committee and mandated by the U.S. Congress) identifies "wildlife" as all species of vertebrates and macroinvertebrates, including insects and spiders. While many state wildlife agencies do not have legal responsibility for insects and spiders, some of their CWCS partners—federal, tribal, and other state agencies do have jurisdiction for these macroinvertebrates.

SUMMARY OF THE FOUR RATING CATEGORIES

1) Community Focal

The rank in this category would be the lowest score for species in any of the following criteria since all these criteria indicate ties between the species and the larger landscape and/or ecosystem—defined as "community focal species."

- Keystone and strongly interactive species
- Home range size
- Habitat quality indicators

2) Responsibility

These criteria rank species for their value because their global status is largely a function of their status in Arizona, because they contribute to the unique character of wildlife in Arizona compared to other parts of the United States, or because of their unique value to sovereign nations that interact with Arizona to conserve wildlife. The 'Responsibility' category was designed to give importance to species that are uniquely represented in the United States by their Arizona populations. This may be desirable if the criteria identify species where Arizona makes agreements with Mexico or tribes concerning these species, but the species are not otherwise eligible for funding.

- Responsibility status
- Administrative protection status on tribal lands in Arizona
- Administrative protection status in Mexico

APPENDIX L. CRITERIA FOR SCORING ARIZONA WILDLIFE (CONTINUED)

3) Vulnerability

Species may arrive at a point of vulnerability in different ways, according to the stressors involved and the biology of each species in Arizona. Accordingly, the Department developed a set of criteria to capture these different types of vulnerability. Any one criterion can flag a species as vulnerable, so it does not matter whether a species ranks as 'vulnerable' on 1, 3, or all 9 criteria. Ranks are not additive. The rank is based on the following criteria:

- Endangered, threatened, candidate status or *Wildlife of Special Concern in Arizona*
- Extirpated status
- Imperiled status (Heritage global rank)
- Declining status
- Disjunct status
- Demographic status
- Concentration status
- Element occurrences (includes endemics)
- Fragmentation status

4) Unknown Status (criterion same as category; based on the criteria scores for 'Vulnerability')
Species would rank high in this category if they do not have a '1' for 'Vulnerability,' but any of the 'Vulnerability' criteria were scored '0,' indicating that there was insufficient information to consider whether this species is vulnerable.

COMPONENT CRITERIA USED TO IDENTIFY CONSERVATION PRIORITY WILDLIFE

For each of the 17 criteria, a ranking of 'H' (= High Priority), 'M' (= Medium Priority), or 'L' (= Low Priority) was assigned. Species lists (by taxonomic group: birds, mammals, fish, reptiles, amphibians, invertebrates) and evaluation scores were compiled in MS-Excel files and archived on the Department's network drive U:/Comprehensive Wildlife Conservation Strategy/Species Lists folder. Criteria scores were rated by Wildlife Management Division staff, (primarily Nongame, Game, Fisheries specialists) and reviewed by Regional staff, Development Branch staff, and external partners. The Nongame statistician compiled and sorted these evaluations by Ecoregion and statewide distribution, and by priority ranking.

Under the 'Community Focal' species category, the following 3 criteria are used:

Keystone and Strongly Interactive Species

Description: Species whose impact on a community or ecological system is disproportionately large for their presence or abundance. They contribute to ecosystem function in a unique and significant manner through their activities. Their removal initiates changes in ecosystem structure and often a loss of diversity. Beavers are an example keystone and strongly interactive species.

APPENDIX L. CRITERIA FOR SCORING ARIZONA WILDLIFE (CONTINUED)

Focal Rank	Criterion Score	Description – Keystone / Strongly Interactive
H	1	Keystone/Strongly Interactive: loss from an ecosystem would have a significant impact on the number or type of species present (biodiversity). This often reflects loss of an ecosystem function.
M	2	Important player: loss from an ecosystem would have a significant impact on the abundance of a handful of species. This often reflects loss of a key predator or prey species.
L	3	Community member: loss of this species from an ecosystem would not be reflected in loss of ecosystem function or significant changes in abundance of other species.

Home Range Size

Description: High scoring species have spatial, compositional, and functional requirements that may encompass those of other species in the region and may help address the functionality of ecological systems. These species depend on vast areas. These species include top-level predators (for example: wolves, bear, mountain lion) as well as migratory mammals, anadromous fish (having marine and freshwater life stages or migrations), birds, bats, and insects.

Focal Rank	Criterion Score	Description – Home Range Size
H	1	Extensive ranges: most individual animals in this species range over more than one ecoregion and landscape type during one year.
M	2	Wide-ranging: most individual animals in this species range over more than one landscape type during one year.
L	3	Local ranges: individual animals stay within a single landscape type throughout their lifecycle.

Habitat Quality Indicators

Description: High-ranking species are characteristic of or their presence indicates a healthy natural community. An example species would be pygmy nuthatch in ponderosa pine forests. Habitat quality indicator species are identified in U.S. Forest Service Management Indicator Species lists and Partners in Flight species lists.

APPENDIX L. CRITERIA FOR SCORING ARIZONA WILDLIFE (CONTINUED)

Focal Rank	Criterion Score	Description – Habitat Quality Indicators
H	1	Indicator species: when present, indicative of a particular [good] quality of habitat measured by specific factors that are requirements. Absence indicates degraded habitat.
M	2	Sensitive species: population tolerates a moderate range of conditions in a key factor. Able to exist at lower densities when these conditions are not optimal.
L	3	Resilient species: able to thrive under a variety of habitat qualities and conditions.

Under the ‘Responsibility’ category, the following 3 criteria are used:

Responsibility Status

Description: Species that have the core of their range within Arizona even if locally abundant. Abert’s towhee is an example of a responsibility species with 90% of its global population within Arizona.

Scoring: Note that criterion score ‘3’ may be used on species that are otherwise widespread, but the national populations are primarily in Arizona. The other scores compare Arizona population to the global extent of the species, but this one captures species where the Department may be coordinating with Mexico, and species that are unique in the United States. Use the lowest score that applies.

Responsibility Rank	Criterion Score	Description – Responsibility Status
H	1	Endemic: over 90% of the global species breeds within Arizona.
H	2	Responsibility: 70–90% of the global species breeds within Arizona.
M	3	Southwestern: 70-100% of the United States segment of the species breeds within Arizona.
L	4	Widespread: less than half of the species breeds within Arizona.

Administrative Protection Status in Mexico

Description: Species with administrative protection status in Mexico.

Scoring: Mexican Federal Endangered Species List (Proyecto de Norma Oficial Mexicana PROY-NOM-059-ECOL-2000; October 16, 2000) available through the Department’s Heritage Database Management System (HDMS).

APPENDIX L. CRITERIA FOR SCORING ARIZONA WILDLIFE (CONTINUED)

Responsibility Rank	Criterion Score	Description – Administrative Protection Status in Mexico
H	P	En Peligro de Extinción (Determined Endangered in Mexico): in danger of extinction.
M	A	Amenazada (Determined Threatened in Mexico): could become endangered if factors causing habitat deterioration or population decline continue.
L	Pr	Sujeta a Proteccion Especial (Determined Subject to Special Protection in Mexico): utilization limited due to reduced populations, restricted distribution, or to favor recovery and conservation of the taxon or associated taxa.
H	E	Probablemente extinta en el medio silvestre (Probably extinct in the wild of Mexico): A native species whose individuals in the wild have disappeared, based on pertinent documentation and studies that prove it. The only existing individuals of the species are in captivity or outside the Mexican territory.

Administrative Protection Status on Tribal Lands in Arizona

Description: Species with administrative protection status on tribal lands in Arizona.

Scoring: Currently only the Navajo Endangered Species List (2000) was available through the Department's HDMS (and <http://www.heritage.tnc.org/nhp/us/navajo/esl.html>).

Responsibility Rank	Criterion Score	Description – Administrative Protection Status on Tribal Lands in Arizona
H	1	Any species or subspecies that no longer occur on the Navajo Nation.
H	2	Any species or subspecies that is in danger of being eliminated from all or a significant portion of its range on the Navajo Nation.
M	3	A species or subspecies which is likely to become an endangered species, within the foreseeable future, throughout all or a significant portion of its range on the Navajo Nation.
L	4	Any species or subspecies for which the Navajo Fish and Wildlife Department does not currently have sufficient information to support their being listed in Group 2 or Group 3 but has reason to consider them. The Navajo Fish and Wildlife Department will actively seek information on these species to determine if they warrant inclusion in a different group or removal from the list.
L		No status

APPENDIX L. CRITERIA FOR SCORING ARIZONA WILDLIFE (CONTINUED)

Under the 'Vulnerability' category, the following 9 criteria are used:

Endangered, Threatened and Candidate Status or *Wildlife of Special Concern in Arizona* (federal or state legal status)

Description: Uses each species' legal status to evaluate management importance. High-ranking species include those that are currently listed as well as recently de-listed species that have not completed the post-delisting monitoring evaluation. U.S. Forest Service and Bureau of Land Management 'Sensitive Species' are identified using ESA status, State listed or special concern designations, and tribal listed species.

Vulnerability Rank	Criterion Score	Federal (ESA) Description	State (WSCA) Description
H	WSC		<i>Wildlife of Special Concern in Arizona</i> (3-16-1996 version)
H	LE	Listed endangered	
H	LE/XT	Endangered, experimental nonessential population	
H	LT	Listed threatened	
M	PR	Proposed or petitioned	
M	PD	Post-delisting evaluation not completed	
L	No status		

Imperiled Status

Description: Refers to Heritage/IUCN ranking. High-ranking species are G1 (imperiled) and G2 (rare) species. Sub-national scores are already captured in the Department's 'Element occurrences' criterion, which can be much more up-to-date than the sub-national scoring.

Scoring: Heritage/IUCN global scores will be used directly from HDMS.

Vulnerability Rank	Criterion score	Description – Imperiled Status (Heritage global rank)
	0	G? (rank unknown)
H	G1	Imperiled
H	G2	Rare
M	G3	Uncommon or restricted
L	G4	Apparently secure
L	G5	Demonstrably secure

Declining Status

Description: Reflects extent to which population numbers or habitats were recently, are currently, or anticipated to be in decline.

Scoring: This follows the Heritage/IUCN ranking system for "observed, estimated, inferred, or suspected degree of change" over about 10 years or 3 generations, whichever is longer (up to a

APPENDIX L. CRITERIA FOR SCORING ARIZONA WILDLIFE (CONTINUED)

maximum of 100 years) in the area of interest.” The period of time overlaps with the present, so that declines in the immediate past (whether considered ongoing or not), continuing trends, and trends projected to begin immediately are all included.

Vulnerability Rank	Criterion score	Description – Declining Status
	0	Insufficient data
H	1	Severely declining = Decline of >70%
H	2	Very Rapidly Declining = 50-70%
H	3	Substantial decline = 30-50%
M	4	Decline = 10-30%
L	5	Stable = Unchanged or within +/- 10% fluctuation
L	6	Increase of > 10%

Disjunct Status

Description: High-ranking species are represented by subpopulations that are geographically separated from the main population and vulnerable due to distance from other major population centers.

Vulnerability Rank	Criterion Score	Description – Disjunct Status
	0	Insufficient data
H	1	Disjunct population: 1 to few populations in Arizona separated by large relative distance from larger core distribution of the species.
M	2	Peripheral populations: Arizona populations at the margins of the species distribution.
L	3	Continuous: the distribution with Arizona populations is within the core of the species' range.

Demographic Status

Description: This criterion classifies the resilience of each species in light of current impacts to birth and death rates. These rates can be affected by low genetic fitness/diversity, generation time, reproductive vulnerability, demographic adaptability to environmental change, illegal harvest, disturbance, and disease. California condors are an example species with high demographic concerns.

Vulnerability Rank	Criterion Score	Description – Demographic Status
	0	Insufficient data
H	1	Demographically poor situation: Low birth rates or high death rates combined with small or declining population size. Also, this species' demographic rates are affected by disturbance, illegal harvest, genetic limitations or failure, or disease in parts of Arizona.

APPENDIX L. CRITERIA FOR SCORING ARIZONA WILDLIFE (CONTINUED)

M	2	Demographically challenging situation: Low birth rates or high death rates combined with small population size. No anticipated worsening of these rates in next 10 years.
L	3	Demographically stable situation: Birth and death rates anticipated to contribute to normal population size variation in next 10 years.
L	4	Demographic growth situation: Birth and death rates anticipated to contribute to overall population growth over next 10 years.

Element Occurrences

Description: Scoring is based on the number of 'element occurrences' which include populations and migratory groups (using Heritage sensitive elements). High scoring species may be common, but occur in a restricted range or have a limited ability to disperse. This criterion includes endemic species (found only in specific areas or a single locality). Nonnative species that are managed to have a limited number of populations are not considered 'vulnerable.'

Scoring: Populations are included in Heritage 'element occurrences,' which also include migratory groups. The categories below also match IUCN categories and use "estimated, inferred, or suspected number of occurrences believed extant for the species in the area of interest."

Vulnerability Rank	Criterion Score	Description – Element Occurrences
	-1	Extirpated (used in a separate criterion)
	0	Insufficient data
H	1	Highly vulnerable: 1 - 5 occurrences
H	2	Vulnerable: 6 - 20 occurrences
M	3	Vulnerable: 21 - 80 occurrences
L	4	Apparently secure: 81 - 300 occurrences
L	5	Secure: more than 300 occurrences

Extirpation Status

Description: Species that once occurred in Arizona.

Scoring: Extirpated species are captured by reporting '-1' for element occurrences (see above criterion).

Vulnerability Rank	Criterion Score	Description – Extirpation Status
H	-1	Extirpated (zero element occurrences and/or SX Heritage ranking)
L		Not extirpated (at least 1 element occurrence)

Fragmentation Status

APPENDIX L. CRITERIA FOR SCORING ARIZONA WILDLIFE (CONTINUED)

Description: Scoring reflects the extent to which sub-populations are separated by barriers to dispersal. In other circumstances, these species would be capable of effective dispersal. Does not address species with inherent lack of ability to disperse. Chiricahua leopard frogs are an example species with populations that are highly fragmented.

Vulnerability Rank	Criterion Score	Description – Fragmentation Status
	0	Insufficient data
H	1	Small and fragmented: within Arizona, populations small and isolated from one another.
M	2	Large and isolated: within Arizona, populations large but isolated from one another.
L	3	Continuous: within Arizona, populations regularly connected by dispersal.

Concentration Status

Description: Species that have a portion of their life history in which they are aggregated and thus more vulnerable to local threats and catastrophic events (for example, migratory stopover sites, bat roosts / maternity sites).

Vulnerability Rank	Criterion Score	Description – Concentration Status
H	1	Colonial species: found in a limited number of groups at high concentration for all of their life cycle.
M	2	Aggregating species: found in a limited number of groups at high concentration for part of their life cycle.
L	3	Diffuse species: found at low density for all of their life history.

Under the 'Unknown Status' category, the following criterion is used:

Unknown Status

Description: Whether enough information currently exists to assess the status of the species as a whole. Information may consist of population size or dynamics, or available habitat size, condition, or fragmentation.

Scoring: This criterion will be built from 'Insufficient data' scores for all other criteria that describe vulnerability. No need to score this criterion separately.

Unknown Status Rank	Criterion Score	Description – Unknown Status
H	0	Insufficient data for any of the above criteria
L	1	Sufficient data to evaluate vulnerability

APPENDIX M. ALL SGCN IN ARIZONA

Further prioritization is given by “SGCN Tier” (see “Identifying Species of Greatest Conservation Need or Unknown Status (Element 1) and for Monitoring Habitat Condition (Element 5)”). Important stressors and associated conservation actions are listed for Tier 1a and 1b species in “Conservation Actions to Address Stressors to SGCN (Elements 3, 4).” Specific information on occupied habitats is reported under each ecoregion in “Ecoregion-Specific Habitat Conditions (Element 2).”

Scientific Name	Common Name	SGCN Tier	Apache Highlands - North	Apache Highlands - South	AZ - NM Mountains	Colorado Plateau	Mohave Desert	Sonoran Desert
Amphibians								
<i>Ambystoma tigrinum nebulosum</i>	Arizona Tiger Salamander	C	X		X	X		
<i>Ambystoma tigrinum stebbinsi</i>	Sonoran Tiger Salamander	A		X				
<i>Bufo microscaphus</i>	Arizona Toad	B	X		X	X	X	X
<i>Eleutherodactylus augusti cactorum</i>	Western Barking Frog	B	X	X				
<i>Gastrophryne olivacea</i>	Great Plains Narrow-mouthed Toad	B		X				X
<i>Hyla arenicolor</i>	Canyon Treefrog	C	X	X	X	X	X	X
<i>Hyla wrightorum</i>	Mountain Treefrog	C	X	X	X			
<i>Pseudacris regilla deserticola</i>	Desert Pacific Treefrog	C					X	
<i>Pseudacris triseriata</i>	Western Chorus Frog	C	X		X			
<i>Pternohyla fodiens</i>	Lowland Burrowing Treefrog	B		X				X
<i>Rana blairi</i>	Plains Leopard Frog	B		X	X			
<i>Rana chiricahuensis</i>	Chiricahua Leopard Frog	A	X	X	X			
<i>Rana onca</i>	Relict Leopard Frog	A				X	X	
<i>Rana pipiens</i>	Northern Leopard Frog	B	X		X	X		
<i>Rana subaquavocalis</i>	Ramsey Canyon Leopard Frog	B		X				
<i>Rana tarahumarae</i>	Tarahumara Frog	B		X				
<i>Rana yavapaiensis</i>	Lowland Leopard Frog	B	X	X	X		X	X
<i>Spea intermontana</i>	Great Basin Spadefoot	C				X	X	
Birds								
<i>Accipiter gentilis apache</i>	Apache Northern Goshawk	B		X				
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk	B	X	X	X	X	X	X
<i>Aechmophorus clarkii</i>	Clark's Grebe	B	X	X	X	X	X	X
<i>Aechmophorus occidentalis</i>	Western Grebe	C	X	X	X	X	X	X
<i>Aimophila botterii</i>	Botteri's Sparrow	B		X				
<i>Aimophila quinquestriata</i>	Five-striped Sparrow	C		X				
<i>Aix sponsa</i>	Wood Duck	C	X	X	X	X	X	X
<i>Amazilia violiceps</i>	Violet-crowned Hummingbird	B		X				X

APPENDIX M. ALL SGCN IN ARIZONA (CONTINUED)

Scientific Name	Common Name	SGCN Tier	Apache Highlands - North	Apache Highlands - South	AZ - NM Mountains	Colorado Plateau	Mohave Desert	Sonoran Desert
<i>Ammodramus bairdii</i>	Baird's Sparrow	B	X	X				
<i>Ammodramus savannarum ammolegus</i>	Arizona Grasshopper Sparrow	B		X				
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow	B	X	X	X	X	X	X
<i>Anas acuta</i>	Northern Pintail	C	X	X	X	X	X	X
<i>Anas americana</i>	American Wigeon	C	X	X	X	X	X	X
<i>Anas clypeata</i>	Northern Shoveler	C	X	X	X	X	X	X
<i>Anas discors</i>	Blue-winged Teal	C	X	X	X	X	X	X
<i>Anthus rubescens</i>	American Pipit	C	X	X	X	X	X	X
<i>Anthus spragueii</i>	Sprague's Pipit	B	X	X	X	X		X
<i>Ardea alba</i>	Great Egret	B	X	X	X	X	X	X
<i>Asturina nitida maxima</i>	Northern Gray Hawk	B		X				X
<i>Aythya valisineria</i>	Canvasback	C	X	X	X	X	X	X
<i>Botaurus lentiginosus</i>	American Bittern	B	X	X	X	X	X	X
<i>Branta canadensis</i>	Canada Goose	C	X	X	X	X	X	X
<i>Bubulcus ibis</i>	Cattle Egret	C	X	X	X	X	X	X
<i>Buteo regalis</i>	Ferruginous Hawk	B	X	X	X	X	X	X
<i>Buteogallus anthracinus</i>	Common Black-Hawk	B	X	X	X		X	X
<i>Calcarius mccownii</i>	McCown's Longspur	C	X	X	X	X		X
<i>Calothorax lucifer</i>	Lucifer Hummingbird	C		X				
<i>Caprimulgus ridgwayi</i>	Buff-collared Nightjar	C		X				X
<i>Caracara cheriway</i>	Crested Caracara	B		X				X
<i>Carpodacus cassinii</i>	Cassin's Finch	C	X	X	X	X	X	X
<i>Catharus ustulatus</i>	Swainson's Thrush	B	X	X	X	X	X	X
<i>Ceryle alcyon</i>	Belted Kingfisher	B	X	X	X	X	X	X
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover	B	X	X	X	X	X	X
<i>Charadrius montanus</i>	Mountain Plover	C		X	X	X		X
<i>Chloroceryle americana</i>	Green Kingfisher	C		X				X
<i>Cinclus mexicanus</i>	American Dipper	C	X	X	X	X	X	X
<i>Circus cyaneus</i>	Northern Harrier	C	X	X	X	X	X	X
<i>Cistothorus palustris</i>	Marsh Wren	C	X	X	X	X	X	X
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	C	X	X	X	X	X	X
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo	A	X	X	X	X	X	X
<i>Colinus virginianus ridgwayi</i>	Masked Bobwhite	A		X				
<i>Contopus cooperi</i>	Olive-sided Flycatcher	B	X	X	X	X	X	X
<i>Dendragapus obscurus</i>	Blue Grouse	C			X	X		

APPENDIX M. ALL SGCN IN ARIZONA (CONTINUED)

Scientific Name	Common Name	SGCN Tier	Apache Highlands - North	Apache Highlands - South	AZ - NM Mountains	Colorado Plateau	Mohave Desert	Sonoran Desert
<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck	B	X	X				X
<i>Dumetella carolinensis</i>	Gray Catbird	B	X	X	X	X	X	X
<i>Egretta thula</i>	Snowy Egret	B	X	X	X	X	X	X
<i>Empidonax fulvifrons pygmaeus</i>	Northern Buff-breasted Flycatcher	B		X				
<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher	A	X	X	X	X	X	X
<i>Eugenes fulgens</i>	Magnificent Hummingbird	C	X	X	X	X		
<i>Falco femoralis septentrionalis</i>	Northern Aplomado Falcon	A		X				
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	B	X	X	X	X	X	X
<i>Gallinago delicata</i>	Wilson's Snipe	C	X	X	X	X	X	X
<i>Glaucidium brasilianum cactorum</i>	Cactus Ferruginous Pygmy-Owl	A		X				X
<i>Gymnogyps californianus</i>	California Condor	A				X		
<i>Haliaeetus leucocephalus</i>	Bald Eagle	A	X	X	X	X	X	X
<i>Ictinia mississippiensis</i>	Mississippi Kite	B	X	X				X
<i>Junco phaeonotus</i>	Yellow-eyed Junco	C	X	X				
<i>Lampornis clemenciae</i>	Blue-throated Hummingbird	C		X				
<i>Laterallus jamaicensis coturnic</i>	California Black Rail	B					X	X
<i>Megascops trichopsis</i>	Whiskered Screech-Owl	C		X				
<i>Melanerpes lewis</i>	Lewis's Woodpecker	C	X	X	X	X	X	X
<i>Meleagris gallopavo mexicana</i>	Gould's Turkey	C		X				
<i>Melospiza lincolni</i>	Lincoln's Sparrow	C	X	X	X	X	X	X
<i>Mergus merganser</i>	Common Merganser	C	X	X	X	X	X	X
<i>Myiodynastes luteiventris</i>	Sulphur-bellied Flycatcher	C	X	X				
<i>Nucifraga columbiana</i>	Clark's Nutcracker	C	X	X	X	X	X	X
<i>Oporornis tolmiei</i>	MacGillivray's Warbler	C	X	X	X	X	X	X
<i>Oreoscoptes montanus</i>	Sage Thrasher	B	X	X	X	X	X	X
<i>Pachyramphus aglaiae</i>	Rose-throated Becard	B		X				
<i>Pandion haliaetus</i>	Osprey	B	X	X	X	X	X	X
<i>Passerculus sandwichensis</i>	Savannah Sparrow	C	X	X	X	X	X	X
<i>Passerina cyanea</i>	Indigo Bunting	C	X	X	X	X	X	X
<i>Perisoreus canadensis</i>	Gray Jay	C			X			
<i>Phalacrocorax auritus albociliatus</i>	Double-crested Cormorant	C	X	X	X	X	X	X
<i>Pica hudsonia</i>	Black-billed Magpie	B				X		
<i>Picoides arizonae</i>	Arizona Woodpecker	C		X				
<i>Picoides dorsalis</i>	American Three-toed Woodpecker	B	X		X	X		
<i>Picoides pubescens</i>	Downy Woodpecker	C	X		X	X		

APPENDIX M. ALL SGCN IN ARIZONA (CONTINUED)

Scientific Name	Common Name	SGCN Tier	Apache Highlands - North	Apache Highlands - South	AZ - NM Mountains	Colorado Plateau	Mohave Desert	Sonoran Desert
<i>Pinicola enucleator</i>	Pine Grosbeak	B	X	X	X	X		
<i>Pipilo chlorurus</i>	Green-tailed Towhee	C	X	X	X	X	X	X
<i>Podiceps nigricollis</i>	Eared Grebe	C	X	X	X	X	X	X
<i>Poecile sclateri</i>	Mexican Chickadee	C		X				
<i>Polioptila nigriceps</i>	Black-capped Gnatcatcher	B		X				
<i>Progne subis arboricola</i>	Western Purple Martin	B	X	X	X	X	X	X
<i>Progne subis hesperia</i>	Desert Purple Martin	C		X				X
<i>Rallus longirostris yumanensis</i>	Yuma Clapper Rail	A					X	X
<i>Recurvirostra americana</i>	American Avocet	C	X	X	X	X	X	X
<i>Regulus calendula</i>	Ruby-crowned Kinglet	C	X	X	X	X	X	X
<i>Regulus satrapa</i>	Golden-crowned Kinglet	C	X	X	X	X	X	X
<i>Rhynchopsitta pachyrhyncha</i>	Thick-billed Parrot	B		X				
<i>Sialia sialis fulva</i>	Azure Bluebird	B		X				
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker	B	X	X	X	X	X	X
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl	A	X	X	X	X	X	
<i>Tachycineta bicolor</i>	Tree Swallow	C	X	X	X	X	X	X
<i>Toxostoma lecontei</i>	Le Conte's Thrasher	C					X	X
<i>Troglodytes troglodytes</i>	Winter Wren	C	X	X	X	X	X	X
<i>Trogon elegans</i>	Elegant Trogon	B		X				
<i>Tyrannus crassirostris</i>	Thick-billed Kingbird	B		X				X
<i>Tyrannus melancholicus</i>	Tropical Kingbird	B		X				X
<i>Vermivora celata</i>	Orange-crowned Warbler	C	X	X	X	X	X	X
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	C	X	X	X	X	X	X
Fish								
<i>Agosia chrysogaster</i>	Longfin Dace	B	X	X			X	X
<i>Campostoma ornatum</i>	Mexican Stoneroller	B		X				
<i>Catostomus bernardini</i>	Yaqui Sucker	B		X				
<i>Catostomus clarki</i>	Desert Sucker	B	X	X	X		X	X
<i>Catostomus discobolus</i>	Bluehead Sucker	A			X	X		
<i>Catostomus discobolus yarrowi</i>	Zuni Bluehead Sucker	A				X		
<i>Catostomus insignis</i>	Sonora Sucker	B	X	X	X			X
<i>Catostomus latipinnis</i>	Flannelmouth Sucker	A	X	X	X	X	X	X
<i>Catostomus sp.</i>	Little Colorado Sucker	B			X	X		
<i>Cyprinella formosa</i>	Beautiful Shiner	A		X				
<i>Cyprinodon eremus</i>	Quitobaquito Pupfish	A						X
<i>Cyprinodon macularius</i>	Desert Pupfish	A	X	X			X	X
<i>Elops affinis</i>	Machete	C						X

APPENDIX M. ALL SGCN IN ARIZONA (CONTINUED)

Scientific Name	Common Name	SGCN Tier	Apache Highlands - North	Apache Highlands - South	AZ - NM Mountains	Colorado Plateau	Mohave Desert	Sonoran Desert
<i>Gila cypha</i>	Humpback Chub	A				X	X	
<i>Gila ditaenia</i>	Sonora Chub	A		X				
<i>Gila elegans</i>	Bonytail	A	X			X	X	X
<i>Gila intermedia</i>	Gila Chub	A	X	X				X
<i>Gila nigra</i>	Headwater Chub	B	X					X
<i>Gila purpurea</i>	Yaqui Chub	A		X				
<i>Gila robusta</i>	Roundtail Chub	B	X	X	X	X	X	X
<i>Gila seminuda</i>	Virgin Chub	A					X	
<i>Ictalurus pricei</i>	Yaqui Catfish	A		X				
<i>Lepidomeda mollispinis mollispinis</i>	Virgin Spinedace	A					X	
<i>Lepidomeda vittata</i>	Little Colorado Spinedace	A			X	X		
<i>Meda fulgida</i>	Spikedace	A	X	X				X
<i>Mugil cephalus</i>	Striped Mullet	C						X
<i>Oncorhynchus gilae apache</i>	Apache (Arizona) Trout	A	X	X	X	X		
<i>Oncorhynchus gilae gilae</i>	Gila Trout	A	X		X			
<i>Plagopterus argentissimus</i>	Woundfin	A	X				X	X
<i>Poeciliopsis occidentalis occidentalis</i>	Gila Topminnow	A	X	X				X
<i>Poeciliopsis occidentalis sonoriensis</i>	Yaqui Topminnow	A		X				
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow	A	X	X		X	X	X
<i>Rhinichthys osculus</i>	Speckled Dace	B	X	X	X	X	X	X
<i>Tiaroga cobitis</i>	Loach Minnow	A	X	X	X			X
<i>Xyrauchen texanus</i>	Razorback Sucker	A	X	X		X	X	X
Crustaceans and Mollusks								
<i>Anodonta californiensis</i>	California Floater	B	X	X	X	X	X	X
<i>Discus shimkii cockerelli</i>	Cockerell's Striate Disc (Snail)	B			X			
<i>Oreohelix grahamensis</i>	Pinaleno Mountainsnail	B		X				
<i>Oreohelix yavapai cummingsi</i>		B	X			X		
<i>Oxyloma haydeni haydeni</i>	Niobrara Ambersnail	B				X		
<i>Oxyloma haydeni kanabensis</i>	Kanab Ambersnail	A				X		
<i>Pyrgulopsis arizonae</i>	Bylas Springsnail	B		X				
<i>Pyrgulopsis bacchus</i>	Grand Wash Springsnail	B					X	
<i>Pyrgulopsis bernardina</i>	San Bernardino Springsnail	B		X				
<i>Pyrgulopsis conica</i>	Kingman Springsnail	B					X	
<i>Pyrgulopsis deserta</i>	Desert Springsnail	B					X	

APPENDIX M. ALL SGCN IN ARIZONA (CONTINUED)

Scientific Name	Common Name	SGCN Tier	Apache Highlands - North	Apache Highlands - South	AZ - NM Mountains	Colorado Plateau	Mohave Desert	Sonoran Desert
<i>Pyrgulopsis glandulosa</i>	Verde Rim Springsnail	B	X					
<i>Pyrgulopsis montezumensis</i>	Montezuma Well Springsnail	B	X					
<i>Pyrgulopsis morrisoni</i>	Page Springsnail	A	X					
<i>Pyrgulopsis simplex</i>	Fossil Springsnail	B	X					
<i>Pyrgulopsis sola</i>	Brown Springsnail	B	X					
<i>Pyrgulopsis thompsoni</i>	Huachuca Springsnail	A		X				
<i>Pyrgulopsis trivialis</i>	Three Forks Springsnail	A			X			
<i>Sonorella allynsmithi</i>	Squaw Peak Talussnail	B						X
<i>Sonorella christenseni</i>	Clark Peak Talussnail	B		X				
<i>Sonorella eremita</i>	San Xavier Talussnail	A						X
<i>Sonorella grahamensis</i>	Pinaleno Talussnail	B		X				
<i>Sonorella imitator</i>	Mimic Talussnail	B		X				
<i>Sonorella macrophallus</i>	Wet Canyon Talussnail	A		X				
<i>Sonorella milleri</i>	Table Top Talussnail	C						X
<i>Sonorella papagorum</i>	Papago Talussnail	B						X
<i>Stygobromus arizonensis</i>	Arizona Cave Amphipod	B		X				
<i>Tryonia gilae</i>	Gila Tryonia	B		X				
<i>Tryonia quitobaquitae</i>	Quitobaquito Tryonia	A						X
<i>Vertigo berryi</i>	Rotund Vertigo	C	X	X	X	X	X	X
Mammals								
<i>Ammospermophilus leucurus tersus</i>	Prospect Valley White-tailed Antelope Squirrel	B				X		
<i>Antilocapra americana americana</i>	America Pronghorn	C	X		X	X		
<i>Antilocapra americana sonoriensis</i>	Sonoran Pronghorn	A						X
<i>Baiomys taylori</i>	Northern Pygmy Mouse	C		X				
<i>Canis lupus baileyi</i>	Mexican Gray Wolf	A			X			
<i>Castor canadensis</i>	American Beaver	C	X	X	X	X	X	X
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	C	X	X				
<i>Choeronycteris mexicana</i>	Mexican Long-tongued Bat	B		X		X		X
<i>Cynomys gunnisoni</i>	Gunnison's Prairie Dog	A	X		X	X		
<i>Cynomys ludovicianus</i>	Black-tailed Prairie Dog	A		X				
<i>Didelphis virginiana californica</i>	Mexican Opossum	C		X				
<i>Didelphis virginiana virginiana</i>	Virginia Opossum	C		X				
<i>Dipodomys microps celsus</i>	A Chisel-toothed Kangaroo Rat	C				X	X	
<i>Dipodomys microps leucotis</i>	Houserock Valley Chisel-toothed Kangaroo Rat	B				X		

APPENDIX M. ALL SGCN IN ARIZONA (CONTINUED)

Scientific Name	Common Name	SGCN Tier	Apache Highlands - North	Apache Highlands - South	AZ - NM Mountains	Colorado Plateau	Mohave Desert	Sonoran Desert
<i>Euderma maculatum</i>	Spotted Bat	B	X	X	X	X	X	X
<i>Eumops perotis californicus</i>	Greater Western Mastiff Bat	B	X	X	X	X	X	X
<i>Eumops underwoodi</i>	Underwood's Mastiff Bat	B		X				X
<i>Eutamias cinereicollis</i>	Gray-collared Chipmunk	C			X			
<i>Eutamias minimus</i>	Least Chipmunk	C			X	X		
<i>Eutamias quadrivittatus</i>	Colorado Chipmunk	C				X		
<i>Eutamias umbrinus</i>	Uinta Chipmunk	C				X		
<i>Lasiurus blossevillii</i>	Western Red Bat	B	X	X	X	X	X	X
<i>Lasiurus xanthinus</i>	Western Yellow Bat	B	X	X				X
<i>Leopardus pardalis</i>	Ocelot	A		X				
<i>Leptonycteris curasoae yerbabuena</i>	Lesser Long-nosed Bat	A		X				X
<i>Lutra canadensis lataxina</i>	Southeastern River Otter	C	X		X	X		X
<i>Lutra canadensis sonora</i>	Southwestern River Otter	B					X	X
<i>Macrotus californicus</i>	California Leaf-nosed Bat	B	X	X		X	X	X
<i>Microtus longicaudus</i>	Long-tailed Vole	C		X	X	X		
<i>Microtus longicaudus leucophaeus</i>	White-bellied Long-tailed Vole	B		X				
<i>Microtus mexicanus hualpaiensis</i>	Hualapai Mexican Vole	A	X		X	X		
<i>Microtus mexicanus mogollonensis</i>	Mogollon Vole	C	X					
<i>Microtus montanus arizonensis</i>	Arizona Montane Vole	C			X			
<i>Mustela nigripes</i>	Black-footed Ferret	A	X					
<i>Myotis californicus</i>	California Myotis	C	X	X	X	X	X	X
<i>Neotoma cinerea</i>	Bushy-tailed Woodrat	C				X		
<i>Neotoma mexicana mexicana</i>	Mexican Woodrat	C		X				
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat	B	X	X	X	X	X	X
<i>Ondatra zibethicus</i>	Common Muskrat	C	X		X	X	X	X
<i>Ovis canadensis canadensis</i>	Rocky Mountain Bighorn Sheep	C	X		X			
<i>Ovis canadensis mexicana</i>	Desert Bighorn Sheep	B	X	X	X			X
<i>Panthera onca</i>	Jaguar	A	X	X				
<i>Perognathus apache melanotis</i>	Apache Pocket Mouse	C		X				
<i>Perognathus flavus goodpasteri</i>	Springerville Pocket Mouse	B	X		X	X		
<i>Peromyscus merriami</i>	Mesquite Mouse	B		X				X
<i>Pipistrellus hesperus</i>	Western Pipistrelle	C	X	X	X	X	X	X
<i>Sciurus aberti chuscensis</i>	Abert's Chuska Squirrel	C				X		
<i>Sciurus aberti kaibabensis</i>	Kaibab Squirrel	C				X	X	
<i>Sciurus arizonensis</i>	Arizona Gray Squirrel	C	X	X				

APPENDIX M. ALL SGCN IN ARIZONA (CONTINUED)

Scientific Name	Common Name	SGCN Tier	Apache Highlands - North	Apache Highlands - South	AZ - NM Mountains	Colorado Plateau	Mohave Desert	Sonoran Desert
<i>Sciurus nayaritensis chiricahuae</i>	Chiricahua Fox Squirrel	B		X				
<i>Sigmodon arizonae jacksoni</i>	Yavapai Arizona Cotton Rat	B	X					
<i>Sigmodon arizonae plenus</i>	Colorado River Cotton Rat	C						X
<i>Sigmodon hispidus eremicus</i>	Yuma Hispid Cotton Rat	B						X
<i>Sorex arizonae</i>	Arizona Shrew	B	X	X				
<i>Sorex merriami</i>	Merriam's Shrew	C			X	X		
<i>Sorex nanus</i>	Dwarf Shrew	B			X	X		
<i>Sorex palustris</i>	Water Shrew	B			X			
<i>Spermophilus pilosoma</i>	Spotted Ground Squirrel	C	X	X	X	X		
<i>Spermophilus tridecemlineatus</i>	Thirteen-lined Ground Squirrel	B			X			
<i>Sylvilagus nuttallii grangeri</i>	North Kaibab Mountain Cottontail	C				X		
<i>Sylvilagus nuttallii pinetis</i>	A Southwestern Cottontail	C			X	X		
<i>Tadarida brasiliensis</i>	Mexican Free-tailed Bat	C	X	X	X	X	X	X
<i>Tamiasciurus hudsonicus grahamens</i>	Mt Graham Red Squirrel	A		X				
<i>Thomomys bottae subsimilis</i>	Harquahala Southern Pocket Gopher	B						X
<i>Thomomys umbrinus intermedius</i>	Southern Pocket Gopher	B		X				
<i>Vulpes vulpes</i>	Red Fox	C				X		
<i>Zapus hudsonius luteus</i>	New Mexican Jumping Mouse	B	X		X			
Reptiles								
<i>Aspidoscelis arizonae</i>	Arizona Striped Whiptail	B		X				
<i>Aspidoscelis pai</i>	Pai Striped Whiptail	C	X		X	X		X
<i>Aspidoscelis stictogrammus</i>	Giant Spotted Whiptail	B		X				
<i>Aspidoscelis xanthonota</i>	Red-back Whiptail	B		X				X
<i>Charina trivirgata gracia</i>	Desert Rosy Boa	C	X				X	X
<i>Charina trivirgata trivirgata</i>	Mexican Rosy Boa	C						X
<i>Chionactis occipitalis klauberi</i>	Tucson Shovel-nosed Snake	B						X
<i>Chionactis occipitalis occipitalis</i>	Mojave Shovel-nosed Snake	C					X	
<i>Chionactis palarostris organica</i>	Organ Pipe Shovel-nosed Snake	B						X
<i>Chrysemys picta bellii</i>	Western Painted Turtle	C			X	X		X
<i>Coleonyx variegatus utahensis</i>	Utah Banded Gecko	C				X	X	
<i>Coluber constrictor mormon</i>	Western Yellow-bellied Racer	C			X			
<i>Crotalus oreganus concolor</i>	Midget Faded Rattlesnake	C				X		
<i>Crotalus pricei pricei</i>	Western Twin-spotted Rattlesnake	B		X				
<i>Crotalus viridis nuntius</i>	Hopi Rattlesnake	C				X		

APPENDIX M. ALL SGCN IN ARIZONA (CONTINUED)

Scientific Name	Common Name	SGCN Tier	Apache Highlands - North	Apache Highlands - South	AZ - NM Mountains	Colorado Plateau	Mohave Desert	Sonoran Desert
<i>Crotalus viridis viridis</i>	Green Prairie Rattlesnake	C		X	X			
<i>Crotalus willardi obscurus</i>	New Mexico Ridge-nosed Rattlesnake	A		X				
<i>Crotalus willardi willardi</i>	Arizona Ridge-nosed Rattlesnake	B		X				
<i>Eumeces callicephalus</i>	Mountain Skink	C		X				
<i>Eumeces gilberti arizonensis</i>	Arizona Skink	B						X
<i>Gopherus agassizii (Mohave Population)</i>	Mohave Desert Tortoise	A				X	X	
<i>Gopherus agassizii (Sonoran Population)</i>	Sonoran Desert Tortoise	B	X	X			X	X
<i>Gyalopion quadrangulare</i>	Thornscrub Hook-nosed Snake	B		X				
<i>Holbrookia elegans thermophila</i>	Sonoran (elegant) Earless Lizard	C		X				
<i>Hypsiglena torquata deserticola</i>	Desert Nightsnake	C				X		
<i>Hypsiglena torquata loreala</i>	Mesa Verde Nightsnake	C				X		
<i>Kinosternon arizonense</i>	Arizona Mud Turtle	B		X				X
<i>Kinosternon flavescens</i>	Yellow Mud Turtle	B		X				
<i>Kinosternon sonoriense longifemorale</i>	Sonoyta Mud Turtle	A						X
<i>Kinosternon sonoriense sonoriense</i>	Sonora Mud Turtle	C	X	X				X
<i>Lampropeltis getula nigrita</i>	Western Black Kingsnake	C		X				
<i>Lampropeltis pyromelana infralabialis</i>	Utah Mountain Kingsnake	C				X	X	
<i>Lampropeltis triangulum celaenops</i>	New Mexico Milksnake	B		X				
<i>Lampropeltis triangulum taylori</i>	Utah Milksnake	B				X		
<i>Leptotyphlops dissectus</i>	New Mexico Threadsnake	C		X				
<i>Leptotyphlops humilis utahensis</i>	Utah Threadsnake	C				X	X	
<i>Masticophis flagellum lineatulus</i>	Lined Coachwhip	C		X				
<i>Oxybelis aeneus</i>	Brown Vinesnake	B		X				
<i>Phrynosoma cornutum</i>	Texas Horned Lizard	C		X				X
<i>Phrynosoma hernandesi hernandesi</i>	Hernandez's (Greater) Short-horned Lizard	C	X	X	X	X		
<i>Phrynosoma mcallii</i>	Flat-tailed Horned Lizard	A						X
<i>Salvadora grahamiae</i>	Eastern Patch-nosed Snake	C	X	X	X			
<i>Sceloporus slevini</i>	Slevin's Bunchgrass Lizard	B		X				
<i>Sceloporus virgatus</i>	Striped Plateau Lizard	C		X				
<i>Senticolis triaspis intermedia</i>	Northern Green Ratsnake	C		X				
<i>Sistrurus catenatus edwardsii</i>	Desert Massasauga	B		X				
<i>Tantilla hobartsmithi</i>	Smith's Black-headed Snake	C	X	X		X	X	X

APPENDIX M. ALL SGCN IN ARIZONA (CONTINUED)

Scientific Name	Common Name	SGCN Tier	Apache Highlands - North	Apache Highlands - South	AZ - NM Mountains	Colorado Plateau	Mohave Desert	Sonoran Desert
<i>Tantilla nigriceps</i>	Plains Black-headed Snake	C		X				X
<i>Tantilla wilcoxi</i>	Chihuahuan Black-headed Snake	C		X				
<i>Tantilla yaquia</i>	Yaqui Black-headed Snake	C		X				
<i>Terrapene ornata luteola</i>	Desert Box Turtle	B		X				
<i>Thamnophis cyrtopsis cyrtopsis</i>	Western Black-necked Gartersnake	C	X	X	X	X		X
<i>Thamnophis eques megalops</i>	Northern Mexican Gartersnake	B	X	X	X			X
<i>Thamnophis rufipunctatus</i>	Narrow-headed Gartersnake	B	X		X			
<i>Uma rufopunctata</i>	Yuman Desert Fringe-toed Lizard	B						X
<i>Uma scoparia</i>	Mojave Fringe-toed Lizard	B					X	X
<i>Xantusia arizonae</i>	Arizona Night Lizard	C	X					X
<i>Xantusia bezyi</i>	Bezy's Night Lizard	C	X					X
<i>Xantusia vigilis vigilis</i>	Yucca Night Lizard	C				X	X	X

APPENDIX N. DISTRIBUTION BY ECOREGION OF PRIORITY SPECIES FOR WHICH VULNERABILITY STATUS COULD NOT BE DETERMINED

Taxon	Scientific Name	Common Name	AHN	AHS	AZNM	CP	MID	SD
Amphibian	<i>Bufo retiformis</i>	Sonoran Green Toad		X				X
Bird	<i>Calcarius ornatus</i>	Chestnut-collared Longspur	X	X	X	X		X
Bird	<i>Contopus pertinax</i>	Greater Pewee	X	X	X			X
Bird	<i>Empidonax wrightii</i>	Gray Flycatcher	X	X	X	X	X	X
Bird	<i>Numenius americanus</i>	Long-billed Curlew	X	X	X	X	X	X
Bird	<i>Plegadis chihi</i>	White-faced Ibis	X	X	X	X	X	X
Bird	<i>Toxostoma bendirei</i>	Bendire's Thrasher	X	X		X	X	X
Mammal	<i>Clethrionomys gapperi</i>	Southern Red-backed Vole	X		X			
Mammal	<i>Corynorhinus townsendii pallescens</i>	Pale Townsend's Big-eared Bat	X	X	X	X	X	X
Mammal	<i>Dipodomys deserti</i>	Desert Kangaroo Rat					X	X
Mammal	<i>Idionycteris phyllotis</i>	Allen's Big-eared Bat	X	X	X	X	X	X
Mammal	<i>Myotis occultus</i>	Arizona Myotis	X	X	X	X	X	X
Mammal	<i>Neotoma mexicana</i>	Mexican Woodrat	X	X	X	X		
Mammal	<i>Neotoma stephensi</i>	Stephen's Woodrat	X		X	X		
Mammal	<i>Notiosorex cockrumi</i>	Cockrum's Desert Shrew		X				
Mammal	<i>Perognathus amplus cineris</i>	Wupatki Arizona Pocket Mouse				X		
Mammal	<i>Perognathus apache</i>	Apache Pocket Mouse		X	X	X		
Mammal	<i>Perognathus flavus</i>	Silky Pocket Mouse	X	X	X	X		X
Mammal	<i>Perognathus longimembris</i>	Little Pocket Mouse				X	X	X
Mammal	<i>Reithrodontomys montanus</i>	Plains Harvest Mouse	X	X				X
Mammal	<i>Sigmodon arizonae arizonae</i>	Camp Verde Arizona Cotton Rat	X					
Mammal	<i>Sigmodon arizonae cienegae</i>	Arizona Cotton Rat	X	X				X
Mammal	<i>Sigmodon hispidus</i>	Hispid Cotton Rat		X				X
Mammal	<i>Sigmodon ochrognathus</i>	Yellow-nosed Cotton Rat		X				X
Mammal	<i>Taxidea taxus</i>	American Badger	X	X	X	X	X	X
Mammal	<i>Thomomys talpoides</i>	Northern Pocket Gopher				X		
Mammal	<i>Vulpes macrotis</i>	Kit Fox			X	X	X	X
Reptile	<i>Eumeces gilberti rubricaudata</i>	Western Red-tailed Skink	X				X	X
Reptile	<i>Gyalopion canum</i>	Chihuahuan Hook-nosed Snake	X	X				

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude scores for stressors in the Apache Highlands North Ecoregion.										
Threat Category	Stressor	Upland Sonoran Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Chaparral	Great Basin Conifer Forest	Montane Conifer Forest	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
	<i>Streambank alteration/channelization</i>	1	1	1	1	1	1	1	3	1
	<i>Loss of keystone species</i>	2	2	2	3	3	3	2	2	1
	<i>Insect Infestation</i>	1	1	1	1	3	4	1	1	1
	<i>Domestication of wildlife/game farming</i>	1	1	1	1	1	1	1	1	1
	<i>Management for game animals and sport fish</i>	1	2	2	2	2	1	2	4	4
	<i>Soil erosion</i>	4	4	4	2	2	3	2	3	2

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Urgency scores for stressors in the Apache Highlands North Ecoregion.										
Threat Category	Stressor	Upland Sonoran Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Chaparral	Great Basin Conifer Forest	Montane Conifer Forest	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
	<i>Scientific research and collection</i>	4	1	1	1	1	4	4	4	4
	<i>Off-range recreational shooting</i>	4	4	4	4	4	4	1	1	1
	<i>Watercraft operation</i>	1	1	1	1	1	1	1	1	4
	<i>Military activities</i>	1	1	1	1	1	1	1	1	1
Pollution	<i>Lead shot/fishing line</i>	1	1	1	1	1	1	1	1	1
	<i>Illegal dumping/littering</i>	4	4	4	4	4	4	4	4	4
	<i>Heavy metals/mine tailings</i>	1	1	1	4	4	4	4	4	4
	<i>Pesticides/herbicides</i>	4	4	4	4	4	4	4	4	4
	<i>Sediment/ash flows</i>	1	1	1	4	4	4	4	4	4
	<i>Nutrients/algal blooms</i>	1	1	1	1	1	1	4	4	4
	<i>Light pollution</i>	4	4	4	4	4	4	4	4	4
	<i>Noise pollution</i>	4	4	4	4	4	4	4	4	4
	<i>Contaminants from waste water/runoff</i>	4	4	4	4	4	4	4	4	4
	<i>Highway/roadway de-icing</i>	1	1	1	1	1	4	2	2	2
Invasive Species	<i>Nuisance plants</i>	4	4	4	4	4	4	4	4	4
	<i>Nuisance animals</i>	4	4	4	4	4	4	4	4	4
	<i>Feral animals</i>	4	4	4	4	4	4	4	2	2
	<i>Hybridization</i>	2	1	1	1	1	1	1	4	4
	<i>Disease/pathogens/parasites</i>	4	4	4	4	4	4	4	4	4
	<i>Bait-bucket dumping/illegal stocking</i>	1	1	1	1	1	1	4	4	4
Climate change	<i>Shift to warmer climate</i>	4	4	4	4	4	4	4	4	4
	<i>Drought</i>	4	4	4	4	4	4	4	4	4
Changes in ecological processes	<i>Habitat fragmentation/barriers</i>	4	4	4	4	4	4	4	4	4
	<i>Habitat degradation/shrub invasions</i>	4	4	4	1	1	4	4	4	4
	<i>Unnatural fire regimes</i>	4	4	4	4	4	4	1	1	1
	<i>Altered river flow regimes</i>	1	1	1	1	1	4	1	4	1
	<i>Streambank alteration/channelization</i>	1	1	1	1	1	4	1	4	1
	<i>Loss of keystone species</i>	4	1	1	4	4	4	4	4	1
	<i>Insect Infestation</i>	4	1	1	1	4	4	4	4	4
	<i>Domestication of wildlife/game farming</i>	1	1	1	1	1	4	1	1	1

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude scores for stressors in the Apache Highlands South Ecoregion.											
Threat Category	Stressor	Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Chaparral	Madrean Evergreen Forest	Montane Conifer Forest	Subalpine Conifer Forest	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Habitat Conversion	<i>Agricultural conversion</i>	1	2	2	1	1	1	1	2	2	1
	<i>Urban growth</i>	2	2	3	4	2	1	1	4	4	4
	<i>Rural development</i>	3	3	4	3	3	2	2	4	4	3
	<i>Dams/reservoirs/impoundments</i>	1	1	1	1	1	1	1	4	4	4
	<i>Recreational sites/facilities</i>	1	1	2	1	2	2	2	4	4	4
	<i>Aquaculture</i>	1	1	1	1	1	1	1	2	2	2
	<i>Landfills/dumps</i>	1	1	1	1	1	1	1	2	2	2
	<i>Military activities</i>	2	2	1	1	2	2	1	3	3	1
	<i>Forest and woodland management</i>	1	1	1	1	1	1	1	1	1	1
<i>Livestock management</i>	4	4	4	3	4	1	1	4	4	3	
Transportation & Infrastructure	<i>Roads (for motorized vehicles)</i>	4	4	3	3	4	2	1	3	3	2
	<i>Trails (for foot, bike, or equine use)</i>	2	2	2	2	3	2	2	1	2	1
	<i>Unauthorized roads & trails</i>	4	4	3	2	4	2	1	3	3	1
	<i>Railroads</i>	1	1	1	1	1	1	1	1	1	1
	<i>Power lines/wind-harnessing turbines</i>	2	2	2	2	2	2	1	1	1	1
	<i>Telephone lines/cellphone towers</i>	2	2	2	2	1	2	1	1	1	1
	<i>Canals/pipelines</i>	1	1	1	1	1	1	1	4	4	4
	<i>Dredging</i>	1	1	1	1	1	1	1	1	1	3
	<i>Air traffic corridors/overflights</i>	1	1	1	1	2	1	1	1	1	1
<i>Right-of-way fencing along roadways</i>	4	4	4	2	3	1	1	1	1	1	
Abiotic Resource Use	<i>Mining</i>	2	3	1	1	3	1	1	4	4	4
	<i>Drilling for fuels</i>	1	1	1	1	1	1	1	1	1	1
	<i>Groundwater depletion/springhead use</i>	1	1	2	1	2	2	1	4	4	4
	<i>Water diversion/water catchments</i>	1	1	1	1	2	1	1	4	4	4
Consumptive Biological Resource Use	<i>Grazing by ungulates</i>	4	4	4	3	4	1	1	4	4	3
	<i>Forest and woodland management</i>	1	1	1	1	2	1	1	1	1	1
	<i>Harvesting/collecting animals</i>	3	3	3	1	3	2	1	2	2	2
	<i>Harvesting/collecting plants</i>	1	1	1	1	1	2	1	1	1	1
Non-	<i>Motorized recreation off-trail</i>	4	4	4	4	4	2	1	4	4	3

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude scores for stressors in the Apache Highlands South Ecoregion.											
Threat Category	Stressor	Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Chaparral	Madrean Evergreen Forest	Montane Conifer Forest	Subalpine Conifer Forest	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
consumptive Resource Use	<i>Non-motorized recreation off-trail</i>	2	2	2	2	3	2	1	2	2	2
	<i>Dispersed camping</i>	1	1	1	1	2	2	1	3	4	2
	<i>Scientific research and collection</i>	1	1	1	1	2	3	1	3	3	3
	<i>Off-range recreational shooting</i>	2	3	1	3	3	1	1	1	1	1
	<i>Watercraft operation</i>	1	1	1	1	1	1	1	1	1	4
	<i>Military activities</i>	2	2	1	1	2	2	1	3	3	1
Pollution	<i>Lead shot/fishing line</i>	1	2	2	1	2	1	1	1	3	4
	<i>Illegal dumping/littering</i>	2	2	2	2	2	1	1	2	2	2
	<i>Heavy metals/mine tailings</i>	1	2	1	3	1	1	1	3	4	4
	<i>Pesticides/herbicides</i>	1	2	1	2	1	1	1	3	4	4
	<i>Sediment/ash flows</i>	1	1	1	1	1	2	1	4	4	4
	<i>Nutrients/algal blooms</i>	1	1	1	1	1	1	1	1	3	2
	<i>Light pollution</i>	1	2	2	1	1	1	1	1	1	1
	<i>Noise pollution</i>	1	1	1	1	1	1	1	1	1	3
	<i>Contaminants from waste water/runoff</i>	1	1	1	1	1	2	1	2	2	2
	<i>Highway/roadway de-icing</i>	1	1	1	1	1	1	1	1	1	1
Invasive Species	<i>Nuisance plants</i>	2	4	4	4	4	1	1	4	4	4
	<i>Nuisance animals</i>	1	2	2	2	2	2	2	4	4	4
	<i>Feral animals</i>	1	3	2	2	3	2	1	1	1	1
	<i>Hybridization</i>	1	1	1	1	1	1	1	4	4	4
	<i>Disease/pathogens/parasites</i>	2	3	3	4	3	3	3	4	4	4
	<i>Bait-bucket dumping/illegal stocking</i>	1	1	1	1	1	1	1	4	4	4
Climate change	<i>Shift to warmer climate</i>	3	3	3	3	3	4	4	4	4	4
	<i>Drought</i>	4	4	4	4	4	4	4	4	4	4
Changes in ecological processes	<i>Habitat fragmentation/barriers</i>	3	4	4	3	3	2	1	4	4	4
	<i>Habitat degradation/shrub invasions</i>	3	4	4	3	3	1	1	4	4	4
	<i>Unnatural fire regimes</i>	2	4	3	4	4	4	4	4	3	4
	<i>Altered river flow regimes</i>	1	1	1	1	1	1	1	4	4	4
	<i>Streambank alteration/channelization</i>	3	3	1	4	2	2	1	4	4	4
	<i>Loss of keystone species</i>	2	4	4	3	2	2	1	4	4	4
	<i>Insect Infestation</i>	1	2	2	1	3	4	4	1	1	1

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude scores for stressors in the Apache Highlands South Ecoregion.											
Threat Category	Stressor	Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Chaparral	Madrean Evergreen Forest	Montane Conifer Forest	Subalpine Conifer Forest	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
	<i>Domestication of wildlife/game farming</i>	1	1	1	3	1	1	1	4	4	4
	<i>Management for game animals and sport fish</i>	1	1	1	1	1	2	2	4	4	4
	<i>Soil erosion</i>	4	4	3	3	4	4	4	4	4	4
International Border Issues	<i>Light pollution along the border</i>	4	4	4	1	2	1	1	1	1	1
	<i>Dispersed camping along the border</i>	3	4	4	1	4	4	1	4	4	2
	<i>Illegal dumping/littering along the border</i>	3	4	4	1	4	3	1	4	4	4
	<i>Feral animals along the border</i>	1	1	1	1	1	1	1	2	2	2
	<i>Unauthorized roads & trails along the border</i>	3	4	4	1	4	3	1	4	4	4
	<i>Altered fire regime as a result of border activities</i>	3	4	4	1	4	4	1	4	4	4
	<i>Poaching along the border</i>	2	2	2	1	2	1	1	1	1	1
	<i>Enforcement activities along the border</i>	3	4	4	1	4	2	1	4	4	4
	<i>Enforcement fences along the border</i>	3	4	4	1	4	1	1	2	2	2
	<i>Water use/contamination from illegal immigrants and drug smugglers</i>	3	1	1	1	1	2	1	4	4	4
	<i>Disease along the border</i>	3	1	1	1	1	1	1	3	3	3
<i>Enforcement overflights along the border</i>	2	2	2	1	2	1	1	2	2	1	

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Urgency scores for stressors in the Apache Highlands South Ecoregion.											
Threat Category	Stressor	Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Chaparral	Madrean Evergreen Forest	Montane Conifer Forest	Subalpine Conifer Forest	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
<i>consumptive Resource Use</i>	<i>Non-motorized recreation off-trail</i>	4	4	4	4	4	4	4	4	4	4
	<i>Dispersed camping</i>	4	4	4	4	4	4	4	4	4	4
	<i>Scientific research and collection</i>	1	1	1	1	1	1	1	4	4	4
	<i>Off-range recreational shooting</i>	4	4	4	4	4	1	1	2	2	2
	<i>Watercraft operation</i>	1	1	1	1	1	1	1	1	1	4
	<i>Military activities</i>	4	4	1	1	4	4	1	4	4	1
<i>Pollution</i>	<i>Lead shot/fishing line</i>	1	4	4	4	4	1	1	4	4	4
	<i>Illegal dumping/littering</i>	4	4	4	4	4	1	1	4	4	4
	<i>Heavy metals/mine tailings</i>	1	1	1	1	1	1	1	4	4	4
	<i>Pesticides/herbicides</i>	2	2	2	1	1	1	1	4	4	4
	<i>Sediment/ash flows</i>	1	1	1	1	4	4	4	4	4	4
	<i>Nutrients/algal blooms</i>	1	1	1	1	1	1	1	4	4	4
	<i>Light pollution</i>	2	3	2	2	1	1	1	1	2	3
	<i>Noise pollution</i>	1	2	1	2	1	1	1	1	1	1
	<i>Contaminants from waste water/runoff</i>	1	2	1	1	1	1	1	4	4	4
<i>Highway/roadway de-icing</i>	1	1	1	1	1	1	1	1	1	1	
<i>Invasive Species</i>	<i>Nuisance plants</i>	4	4	4	2	4	4	1	4	4	4
	<i>Nuisance animals</i>	4	4	4	2	4	4	4	4	4	4
	<i>Feral animals</i>	3	4	2	2	4	2	1	1	1	1
	<i>Hybridization</i>	1	1	1	1	1	1	1	4	4	4
	<i>Disease/pathogens/parasites</i>	2	3	4	4	4	4	4	4	4	4
	<i>Bait-bucket dumping/illegal stocking</i>	1	1	1	1	1	1	1	4	4	4
<i>Climate change</i>	<i>Shift to warmer climate</i>	4	3	2	4	4	4	4	4	4	4
	<i>Drought</i>	4	4	4	4	4	4	4	4	4	4
<i>Changes in ecological processes</i>	<i>Habitat fragmentation/barriers</i>	4	4	4	4	4	4	4	4	4	4
	<i>Habitat degradation/shrub invasions</i>	4	4	4	4	4	4	4	4	4	4
	<i>Unnatural fire regimes</i>	4	4	4	4	4	4	4	4	4	4
	<i>Altered river flow regimes</i>	1	1	1	1	1	1	1	4	4	4
	<i>Streambank alteration/channelization</i>	4	4	2	1	1	1	1	4	4	4
	<i>Loss of keystone species</i>	2	4	4	4	4	4	4	4	4	4
	<i>Insect Infestation</i>	1	2	2	1	4	4	4	4	4	4

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Urgency scores for stressors in the Apache Highlands South Ecoregion.											
Threat Category	Stressor	Chihuahuan Desertscrub	Semidesert Grassland	Plains & Great Basin Grassland	Chaparral	Madrean Evergreen Forest	Montane Conifer Forest	Subalpine Conifer Forest	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
	<i>Domestication of wildlife/game farming</i>	1	1	1	3	1	1	1	1	1	1
	<i>Management for game animals and sport fish</i>	1	1	1	1	1	4	4	4	4	4
	<i>Soil erosion</i>	4	4	4	4	4	4	4	4	4	4
International Border Issues	<i>Light pollution along the border</i>	4	4	4	1	4	4	4	4	4	4
	<i>Dispersed camping along the border</i>	4	4	4	1	4	4	4	4	4	4
	<i>Illegal dumping/littering along the border</i>	4	4	4	1	4	4	4	4	4	4
	<i>Feral animals along the border</i>	4	4	4	1	4	4	4	4	4	4
	<i>Unauthorized roads & trails along the border</i>	4	4	4	1	4	4	4	4	4	4
	<i>Altered fire regime as a result of border activities</i>	4	4	4	1	4	4	4	4	4	4
	<i>Poaching along the border</i>	4	4	4	1	4	4	4	4	4	4
	<i>Enforcement activities along the border</i>	4	4	4	1	4	4	4	4	4	4
	<i>Enforcement fences along the border</i>	4	4	4	1	4	4	4	4	4	4
	<i>Water use/contamination from illegal immigrants and drug smugglers</i>	4	4	4	1	4	4	4	4	4	4
	<i>Disease along the border</i>	4	4	4	1	4	4	4	4	4	4
	<i>Enforcement overflights along the border</i>	4	4	4	1	4	4	4	4	4	4

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude for Arizona-New Mexico Mountains Ecoregion.											
Threat Category	Stressors	Plains & Great Basin Grassland	Subalpine Grassland	Madrean Evergreen Forest	Great Basin Conifer Forest	Montane Conifer Forest	Subalpine Conifer Forest	Tundra	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Habitat Conversion	<i>Agricultural conversion</i>	2	1	1	1	1	1	1	4	4	4
	<i>Urban growth</i>	2	1	1	3	2	1	1	4	4	4
	<i>Rural development</i>	2	3	1	3	3	2	1	4	4	4
	<i>Dams/reservoirs/impoundments</i>	1	1	1	2	2	1	1	4	4	4
	<i>Recreational sites/facilities</i>	1	3	1	2	3	3	4	2	4	4
	<i>Aquaculture</i>	1	1	1	1	1	1	1	1	2	1
	<i>Landfills/dumps</i>	1	1	1	1	1	1	1	1	1	1
	<i>Military activities</i>	1	1	1	1	1	1	1	1	1	1
	<i>Forest and woodland management</i>	1	1	1	2	3	2	1	2	2	1
<i>Livestock management</i>	4	4	4	4	4	4	1	1	4	4	3
Transportation & Infrastructure	<i>Roads (for motorized vehicles)</i>	3	4	2	4	4	4	1	4	4	2
	<i>Trails (for foot, bike, or equine use)</i>	1	3	1	2	2	1	1	2	4	4
	<i>Unauthorized roads & trails</i>	3	4	2	4	4	4	4	4	4	4
	<i>Railroads</i>	1	1	1	2	2	1	1	1	1	1
	<i>Power lines/wind-harnessing turbines</i>	2	1	1	3	3	1	1	1	1	1
	<i>Telephone lines/cellphone towers</i>	1	1	1	2	2	2	1	1	1	1
	<i>Canals/pipelines</i>	1	1	1	2	2	2	1	4	4	4
	<i>Dredging</i>	1	1	1	1	1	1	1	3	2	3
	<i>Air traffic corridors/overflights</i>	1	2	1	2	2	2	1	1	2	2
<i>Right-of-way fencing along roadways</i>	2	2	1	3	2	2	1	1	1	1	
Abiotic Resource Use	<i>Mining</i>	2	1	1	3	2	1	1	1	3	1
	<i>Drilling for fuels</i>	1	1	1	3	2	1	1	1	1	1
	<i>Groundwater depletion/springhead use</i>	1	4	1	2	1	4	1	4	4	4
	<i>Water diversion/water catchments</i>	1	3	1	3	1	2	1	4	4	4
Consumptive Biological Resource Use	<i>Grazing by ungulates</i>	4	4	3	4	4	3	1	4	4	4
	<i>Forest and woodland management</i>	1	1	1	3	2	2	1	2	2	2
	<i>Harvesting/collecting animals</i>	1	1	1	1	1	1	2	3	2	1
	<i>Harvesting/collecting plants</i>	1	1	1	1	1	1	1	2	2	1

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude for Arizona-New Mexico Mountains Ecoregion.												
Threat Category	Stressors	Plains & Great Basin Grassland	Subalpine Grassland	Evergreen Forest	Madrean Conifer Forest	Great Basin Conifer Forest	Montane Conifer Forest	Subalpine Conifer Forest	Tundra	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Non-consumptive Resource Use	<i>Motorized recreation off-trail</i>	3	4	2	4	4	4	4	1	4	4	4
	<i>Non-motorized recreation off-trail</i>	1	2	1	2	1	2	4	4	4	4	4
	<i>Dispersed camping</i>	1	2	1	2	3	3	2	4	4	4	4
	<i>Scientific research and collection</i>	1	1	1	1	1	1	2	2	2	2	2
	<i>Off-range recreational shooting</i>	1	1	1	2	2	1	1	1	1	1	1
	<i>Watercraft operation</i>	1	1	1	1	1	1	1	1	1	1	4
	<i>Military activities</i>	1	1	1	1	1	1	1	1	1	1	1
Pollution	<i>Lead shot/fishing line</i>	1	2	1	2	1	1	1	1	1	4	4
	<i>Illegal dumping/littering</i>	2	1	1	3	3	1	1	2	4	4	4
	<i>Heavy metals/mine tailings</i>	1	1	1	1	1	1	1	1	2	3	3
	<i>Pesticides/herbicides</i>	1	2	1	2	2	2	1	3	3	3	3
	<i>Sediment/ash flows</i>	2	1	2	3	1	1	1	3	3	3	3
	<i>Nutrients/algal blooms</i>	1	1	1	1	1	1	1	3	3	4	4
	<i>Light pollution</i>	1	1	1	1	1	1	1	1	1	1	1
	<i>Noise pollution</i>	1	2	1	3	3	3	1	2	3	4	4
	<i>Contaminants from waste water/runoff</i>	1	1	1	1	1	1	1	3	3	3	3
<i>Highway/roadway de-icing</i>	1	1	1	2	3	2	1	3	3	3	3	
Invasive Species	<i>Nuisance plants</i>	2	3	2	3	3	3	2	4	4	4	4
	<i>Nuisance animals</i>	1	3	1	3	3	1	1	4	4	4	4
	<i>Feral animals</i>	1	1	1	3	4	2	1	4	4	3	3
	<i>Hybridization</i>	1	1	1	1	1	1	1	1	4	1	1
	<i>Disease/pathogens/parasites</i>	1	4	1	4	4	2	2	4	4	4	4
	<i>Bait-bucket dumping/illegal stocking</i>	1	1	1	1	1	1	1	2	4	4	4
Climate change	<i>Shift to warmer climate</i>	1	1	1	1	1	1	4	4	4	4	4
	<i>Drought</i>	4	4	4	4	4	4	4	4	4	4	4
Changes in ecological processes	<i>Habitat fragmentation/barriers</i>	3	2	1	4	4	3	2	3	4	1	1
	<i>Habitat degradation/shrub invasions</i>	3	4	2	4	4	2	1	4	4	4	4
	<i>Unnatural fire regimes</i>	4	2	3	4	4	2	1	4	4	4	4
	<i>Altered river flow regimes</i>	1	3	1	1	3	3	1	4	4	3	3
	<i>Streambank alteration/channelization</i>	1	1	1	4	3	3	1	4	4	3	3
	<i>Loss of keystone species</i>	2	3	1	2	3	3	1	4	4	4	4

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude for Arizona-New Mexico Mountains Ecoregion.												
Threat Category	Stressors	Plains & Great Basin Grassland	Subalpine Grassland	Evergreen Forest	Madrean Conifer Forest	Great Basin Conifer Forest	Montane Conifer Forest	Subalpine Conifer Forest	Tundra	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
	<i>Insect Infestation</i>	1	1	1	4	4	4	4	1	1	1	1
	<i>Domestication of wildlife/game farming</i>	1	1	1	2	2	1	1	1	1	4	4
	<i>Management for game animals and sport fish</i>	2	4	1	3	3	3	3	1	4	4	4
	<i>Soil erosion</i>	3	2	3	3	2	1	1	1	2	4	3

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Urgency scores for stressors in the Arizona-New Mexico Mountains Ecoregion.											
Threat Category	Stressors	Plains & Great Basin Grassland	Subalpine Grassland	Madrean Evergreen Forest	Great Basin Conifer Forest	Montane Conifer Forest	Subalpine Conifer Forest	Tundra	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Habitat Conversion	<i>Agricultural conversion</i>	4	1	1	1	1	1	1	4	4	4
	<i>Urban growth</i>	4	4	1	4	4	1	1	4	4	4
	<i>Rural development</i>	4	4	1	4	4	4	1	4	4	4
	<i>Dams/reservoirs/impoundments</i>	1	1	1	1	4	4	1	4	4	4
	<i>Recreational sites/facilities</i>	1	4	1	1	4	4	1	4	4	4
	<i>Aquaculture</i>	1	1	1	1	1	1	1	4	4	4
	<i>Landfills/dumps</i>	4	1	1	1	1	1	1	1	1	1
	<i>Military activities</i>	4	4	4	4	4	4		4	4	4
	<i>Forest and woodland management</i>	1	1	1	4	4	4	1	1	1	1
<i>Livestock management</i>	4	4	4	4	4	4	1	4	4	1	
Transportation & Infrastructure	<i>Roads (for motorized vehicles)</i>	4	4	4	4	4	4	1	4	4	4
	<i>Trails (for foot, bike, or equine use)</i>	4	4	4	4	4	4	4	4	4	4
	<i>Unauthorized roads & trails</i>	4	4	4	4	4	4	4	4	4	4
	<i>Railroads</i>	4	1	1	4	4	1	1	1	1	1
	<i>Power lines/wind-harnessing turbines</i>	4	4	1	4	4	4	1	1	4	1
	<i>Telephone lines/cellphone towers</i>	4	4	1	4	4	4	1	1	4	1
	<i>Canals/pipelines</i>	4	2	1	4	4	4	1	4	4	4
	<i>Dredging</i>	1	1	1	1	1	1	1	4	4	4
	<i>Air traffic corridors/overflights</i>	4	4	1	4	4	4	4	4	4	4
<i>Right-of-way fencing along roadways</i>	4	4	1	4	4	4	1	4	4	4	
Abiotic Resource Use	<i>Mining</i>	4	1	1	4	4	4	1	1	4	1
	<i>Drilling for fuels</i>	4	1	1	4	1	4	1	1	1	1
	<i>Groundwater depletion/springhead use</i>	4	4	4	4	4	4	1	4	4	4
	<i>Water diversion/water catchments</i>	4	4	4	4	4	4	1	4	4	4
Consumptive Biological Resource Use	<i>Grazing by ungulates</i>	4	4	4	4	4	4	1	4	4	4
	<i>Forest and woodland management</i>	1	1	1	4	4	4	1	4	4	4
	<i>Harvesting/collecting animals</i>	4	1	1	1	1	1	1	4	4	2
	<i>Harvesting/collecting plants</i>	2	1	1	1	1	4	1	1	1	1

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Urgency scores for stressors in the Arizona-New Mexico Mountains Ecoregion.												
Threat Category	Stressors	Plains & Great Basin Grassland	Subalpine Grassland	Evergreen Forest	Madrean Conifer Forest	Great Basin Conifer Forest	Montane Conifer Forest	Subalpine Conifer Forest	Tundra	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Non-consumptive Resource Use	<i>Motorized recreation off-trail</i>	4	4	4	4	4	4	4	1	4	4	4
	<i>Non-motorized recreation off-trail</i>	4	4	1	4	4	4	4	4	4	4	4
	<i>Dispersed camping</i>	4	4	1	4	4	4	4	4	4	4	4
	<i>Scientific research and collection</i>	4	4	1	1	1	4	4	4	4	1	1
	<i>Off-range recreational shooting</i>	4	1	1	4	4	1	1	1	1	1	1
	<i>Watercraft operation</i>	1	1	1	1	1	1	1	1	1	1	4
	<i>Military activities</i>	4	4	4	4	4	4	4	4	4	4	4
Pollution	<i>Lead shot/fishing line</i>	4	4	1	4	4	4	4	1	4	4	4
	<i>Illegal dumping/littering</i>	4	1	1	4	4	4	4	1	4	4	4
	<i>Heavy metals/mine tailings</i>	2	1	1	1	1	1	1	1	1	4	4
	<i>Pesticides/herbicides</i>	4	4	2	4	4	4	4	4	4	4	4
	<i>Sediment/ash flows</i>	4	1	4	4	4	4	4	1	4	4	4
	<i>Nutrients/algal blooms</i>	4	1	1	1	1	1	1	1	4	4	4
	<i>Light pollution</i>	4	1	1	2	2	1	1	1	1	1	1
	<i>Noise pollution</i>	4	4	1	4	4	4	4	1	4	4	4
	<i>Contaminants from waste water/runoff</i>	4	1	1	1	1	1	1	1	4	4	4
<i>Highway/roadway de-icing</i>	4	4	1	4	4	4	4	1	4	4	4	
Invasive Species	<i>Nuisance plants</i>	4	4	4	4	4	4	4	1	4	4	4
	<i>Nuisance animals</i>	2	4	1	4	4	2	1	1	4	4	4
	<i>Feral animals</i>	2	4	1	4	4	4	1	1	4	4	4
	<i>Hybridization</i>	2	2	1	1	2	2	1	1	4	4	4
	<i>Disease/pathogens/parasites</i>	3	3	2	3	3	3	1	1	4	4	4
	<i>Bait-bucket dumping/illegal stocking</i>	1	1	1	1	1	1	1	1	4	4	4
Climate change	<i>Shift to warmer climate</i>	4	4	4	4	4	4	4	4	4	4	4
	<i>Drought</i>	4	4	4	4	4	4	4	4	4	4	4
Changes in ecological processes	<i>Habitat fragmentation/barriers</i>	4	4	1	4	4	4	4	4	4	4	4
	<i>Habitat degradation/shrub invasions</i>	4	4	4	4	4	4	4	4	4	4	4
	<i>Unnatural fire regimes</i>	4	4	4	4	4	4	4	1	4	4	4
	<i>Altered river flow regimes</i>	1	4	4	4	4	4	4	1	4	4	4
	<i>Streambank alteration/channelization</i>	1	4	4	4	4	4	4	1	4	4	4
	<i>Loss of keystone species</i>	4	4	4	4	4	4	4	1	4	4	4

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Urgency scores for stressors in the Arizona-New Mexico Mountains Ecoregion.												
Threat Category	Stressors	Plains & Great Basin Grassland	Subalpine Grassland	Evergreen Forest	Madrean Conifer Forest	Great Basin Conifer Forest	Montane Conifer Forest	Subalpine Conifer Forest	Tundra	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
	<i>Insect Infestation</i>	2	1	2	4	4	4	4	1	1	1	1
	<i>Domestication of wildlife/game farming</i>	2	1	1	2	2	2	2	1	1	4	4
	<i>Management for game animals and sport fish</i>	4	4	4	4	4	4	4	1	4	4	4
	<i>Soil erosion</i>	4	4	4	4	4	4	4	1	4	4	1

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude scores for stressors in the Colorado Plateau Ecoregion.											
Threat Category	Stressor	Subalpine Grassland	Plains & Great Basin Grassland	Subalpine Conifer Forest	Montane Conifer Forest	Great Basin Conifer Forest	Desertscrub	Mohave	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Habitat Conversion	<i>Agricultural conversion</i>	1	1	1	1	1	1	1	1	1	3
	<i>Urban growth</i>	1	1	1	1	1	1	1	1	1	1
	<i>Rural development</i>	2	3	1	3	2	1	3	3	3	2
	<i>Dams/reservoirs/impoundments</i>	1	1	1	2	1	1	1	1	4	3
	<i>Recreational sites/facilities</i>	2	1	2	3	1	2	2	2	3	2
	<i>Aquaculture</i>	1	1	1	1	1	1	1	1	1	1
	<i>Landfills/dumps</i>	1	2	1	1	1	2	1	1	2	2
	<i>Military activities</i>	1	1	1	2	2	1	1	1	1	1
	<i>Forest and woodland management</i>	1	1	3	4	1	1	2	1	1	1
	<i>Livestock management</i>	3	3	3	4	4	3	4	4	4	1
Transportation & Infrastructure	<i>Roads (for motorized vehicles)</i>	3	4	3	4	4	1	2	2	2	4
	<i>Trails (for foot, bike, or equine use)</i>	1	1	2	2	1	1	2	2	2	2
	<i>Unauthorized roads & trails</i>	1	4	3	4	4	4	3	3	3	2
	<i>Railroads</i>	1	1	1	1	1	1	2	1	1	1
	<i>Power lines/wind-harnessing turbines</i>	1	3	1	2	2	1	1	1	1	1
	<i>Telephone lines/cellphone towers</i>	1	2	2	2	2	2	1	1	1	1
	<i>Canals/pipelines</i>	1	1	1	1	1	1	3	3	3	4
	<i>Dredging</i>	1	1	1	1	1	1	2	2	2	3
	<i>Air traffic corridors/overflights</i>	1	2	3	3	2	3	1	1	1	1
	<i>Right-of-way fencing along roadways</i>	1	3	1	3	3	1	1	1	1	1
Abiotic Resource Use	<i>Mining</i>	1	1	2	2	1	1	3	3	3	3
	<i>Drilling for fuels</i>	1	1	1	1	1	1	1	1	1	1
	<i>Groundwater depletion/springhead use</i>	1	4	1	1	4	3	4	4	4	4
	<i>Water diversion/water catchments</i>	1	2	1	2	2	3	4	4	4	4
Consumptive Biological Resource Use	<i>Grazing by ungulates</i>	3	4	3	4	4	4	2	3	3	3
	<i>Forest and woodland management</i>	1	1	3	4	1	1	2	2	2	2
	<i>Harvesting/collecting animals</i>	1	3	1	2	3	2	1	1	1	2
	<i>Harvesting/collecting plants</i>	1	1	1	2	1	2	1	1	1	1
Non-consumptive Resource Use	<i>Motorized recreation off-trail</i>	1	4	3	4	4	4	3	3	3	3
	<i>Non-motorized recreation off-trail</i>	2	1	2	2	1	1	2	2	2	1
	<i>Dispersed camping</i>	2	1	2	3	1	1	2	2	2	2
	<i>Scientific research and collection</i>	1	1	1	1	1	2	2	3	2	2

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude scores for stressors in the Colorado Plateau Ecoregion.											
Threat Category	Stressor	Subalpine Grassland	Plains & Great Basin Grassland	Subalpine Conifer Forest	Montane Conifer Forest	Great Basin Conifer Forest	Desertscrub	Mohave	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Pollution	<i>Off-range recreational shooting</i>	2	2	1	2	2	2	1	1	1	1
	<i>Watercraft operation</i>	1	1	1	1	1	1	1	1	4	4
	<i>Military activities</i>	1	1	1	2	2	1	1	1	1	1
	<i>Lead shot/fishing line</i>	3	2	1	3	2	2	3	3	3	3
	<i>Illegal dumping/littering</i>	1	2	2	2	3	2	2	2	2	2
	<i>Heavy metals/mine tailings</i>	1	1	2	2	1	1	2	3	3	3
	<i>Pesticides/herbicides</i>	2	1	1	1	1	1	2	3	4	4
	<i>Sediment/ash flows</i>	1	1	1	1	1	1	2	3	2	2
	<i>Nutrients/algal blooms</i>	1	1	1	1	1	1	2	3	3	3
	<i>Light pollution</i>	1	2	1	1	1	1	3	3	3	3
	<i>Noise pollution</i>	2	2	2	3	2	3	1	1	1	1
	<i>Contaminants from waste water/runoff</i>	2	1	1	1	1	1	2	3	4	4
<i>Highway/roadway de-icing</i>	1	1	1	1	1	1	1	1	1	1	
Invasive Species	<i>Nuisance plants</i>	2	4	2	3	4	4	4	4	4	4
	<i>Nuisance animals</i>	1	3	1	1	3	2	4	4	4	4
	<i>Feral animals</i>	1	2	1	1	2	2	2	2	1	1
	<i>Hybridization</i>	1	1	1	1	1	1	1	2	2	2
	<i>Disease/pathogens/parasites</i>	2	4	4	4	4	3	4	4	4	4
	<i>Bait-bucket dumping/illegal stocking</i>	1	1	1	1	1	1	4	4	4	4
Climate change	<i>Shift to warmer climate</i>	3	4	4	4	2	1	4	4	4	4
	<i>Drought</i>	1	4	4	4	4	2	4	4	4	4
Changes in ecological processes -	<i>Habitat fragmentation/barriers</i>	3	4	3	4	3	3	4	4	4	4
	<i>Habitat degradation/shrub invasions</i>	2	4	2	3	4	2	4	4	4	4
	<i>Unnatural fire regimes</i>	4	4	4	4	4	4	2	2	2	2
	<i>Altered river flow regimes</i>	1	4	1	1	1	1	2	4	4	4
	<i>Streambank alteration/channelization</i>	1	2	1	1	1	1	4	4	4	4
	<i>Loss of keystone species</i>	2	3	1	1	3	1	4	4	4	4
	<i>Insect Infestation</i>	1	1	4	4	3	1	1	1	1	1
	<i>Domestication of wildlife/game farming</i>	1	1	1	1	1	1	1	1	1	1
	<i>Management for game animals and sport fish</i>	3	4	3	4	4	2	2	2	2	2
	<i>Soil erosion</i>	3	4	3	3	4	3	4	4	4	4

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Urgency scores for stressors in the Colorado Plateau Ecoregion.											
Threat Category	Stressor	Subalpine Grassland	Plains & Great Basin Grassland	Subalpine Conifer Forest	Montane Conifer Forest	Great Basin Conifer Forest	Desertscrub	Mohave	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Habitat Conversion	<i>Agricultural conversion</i>	1	4	1	1	4	1	2	2	2	
	<i>Urban growth</i>	1	4	1	2	4	1	2	2	3	
	<i>Rural development</i>	2	4	2	4	4	4	2	2	2	
	<i>Dams/reservoirs/impoundments</i>	1	1	2	1	1	3	4	4	1	
	<i>Recreational sites/facilities</i>	3	2	3	4	2	3	3	4	3	
	<i>Aquaculture</i>	1	1	1	1	1	1	2	3	3	
	<i>Landfills/dumps</i>	2	4	2	2	4	2	3	3	3	
	<i>Military activities</i>	4	4	4	4	4	4	4	4	4	
	<i>Forest and woodland management</i>	1	4	4	4	2	1	2	3	2	
	<i>Livestock management</i>	3	4	4	4	4	4	3	4	4	
Transportation & Infrastructure	<i>Roads (for motorized vehicles)</i>	3	4	4	4	4	4	4	4	4	
	<i>Trails (for foot, bike, or equine use)</i>	3	4	4	4	4	3	4	4	4	
	<i>Unauthorized roads & trails</i>	4	4	4	4	4	3	4	4	4	
	<i>Railroads</i>	1	4	1	2	4	1	2	2	2	
	<i>Power lines/wind-harnessing turbines</i>	3	4	3	3	4	2	3	3	1	
	<i>Telephone lines/cellphone towers</i>	3	4	4	4	4	2	3	3	1	
	<i>Canals/pipelines</i>	2	4	4	4	4	4	3	3	2	
	<i>Dredging</i>	1	1	1	1	1	1	2	2	2	
	<i>Air traffic corridors/overflights</i>	4	4	3	3	4	2	3	4	3	
	<i>Right-of-way fencing along roadways</i>	2	4	3	4	4	3	3	3	2	
Abiotic Resource Use	<i>Mining</i>	3	4	4	4	4	4	3	3	3	
	<i>Drilling for fuels</i>	2	4	2	3	4	2	2	2	2	
	<i>Groundwater depletion/springhead use</i>	4	4	2	4	4	4	3	4	4	
	<i>Water diversion/water catchments</i>	2	4	2	2	4	4	3	4	3	
Consumptive Biological Resource Use	<i>Grazing by ungulates</i>	4	4	4	4	4	4	4	4	4	
	<i>Forest and woodland management</i>	4	4	4	4	4	1	3	2	2	
	<i>Harvesting/collecting animals</i>	2	4	2	2	4	3	3	3	2	
	<i>Harvesting/collecting plants</i>	2	4	2	1	4	3	2	2	2	
Non-consumptive Resource Use	<i>Motorized recreation off-trail</i>	4	4	4	4	4	4	4	4	4	
	<i>Non-motorized recreation off-trail</i>	4	4	4	4	4	4	4	4	4	
	<i>Dispersed camping</i>	4	4	4	4	4	1	4	4	4	
	<i>Scientific research and collection</i>	1	1	1	1	1	1	4	4	1	

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude scores for stressors in the Sonoran Desert Ecoregion.							
Threat Category	Stressor	Mohave Desertscrub	Lower Colorado Sonoran Desertscrub	Upland Sonoran Desertscrub	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Habitat Conversion	<i>Agricultural conversion</i>	1	2	1	2	4	1
	<i>Urban growth</i>	1	3	3	1	3	2
	<i>Rural development</i>	1	2	2	1	3	1
	<i>Dams/reservoirs/impoundments</i>	1	2	2	2	4	1
	<i>Recreational sites/facilities</i>	1	2	2	1	3	3
	<i>Aquaculture</i>	1	1	1	1	1	1
	<i>Landfills/dumps</i>	1	2	2	1	2	1
	<i>Military activities</i>	1	2	2	1	2	1
	<i>Forest and woodland management</i>	1	1	1	1	1	1
	<i>Livestock management</i>	4	4	4	4	4	2
Transportation & Infrastructure	<i>Roads (for motorized vehicles)</i>	1	3	3	2	3	2
	<i>Trails (for foot, bike, or equine use)</i>	1	1	1	1	1	1
	<i>Unauthorized roads & trails</i>	1	4	4	4	4	4
	<i>Railroads</i>	1	1	1	1	1	1
	<i>Power lines/wind-harnessing turbines</i>	1	2	2	1	1	1
	<i>Telephone lines/cellphone towers</i>	1	2	2	1	1	1
	<i>Canals/pipelines</i>	1	1	1	1	2	1
	<i>Dredging</i>	1	1	1	1	2	2
	<i>Air traffic corridors/overflights</i>	1	3	3	1	1	1
	<i>Right-of-way fencing along roadways</i>	1	3	3	1	1	1
Abiotic Resource Use	<i>Mining</i>	1	1	1	1	2	1
	<i>Drilling for fuels</i>	1	1	1	1	1	1
	<i>Groundwater depletion/springhead use</i>	1	2	3	3	3	2
	<i>Water diversion/water catchments</i>	1	1	1	3	3	1
Consumptive Biological Resource Use	<i>Grazing by ungulates</i>	3	4	4	4	4	3
	<i>Forest and woodland management</i>	1	1	1	1	1	1
	<i>Harvesting/collecting animals</i>	2	3	3	2	2	1
	<i>Harvesting/collecting plants</i>	1	3	3	1	1	1
Non-consumptive Resource Use	<i>Motorized recreation off-trail</i>	1	4	4	4	4	4
	<i>Non-motorized recreation off-trail</i>	1	1	1	1	1	1
	<i>Dispersed camping</i>	1	2	1	1	1	2
	<i>Scientific research and collection</i>	1	1	1	1	1	1

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude scores for stressors in the Sonoran Desert Ecoregion.							
Threat Category	Stressor	Mohave Desertscrub	Lower Colorado Sonoran Desertscrub	Upland Sonoran Desertscrub	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Pollution	<i>Off-range recreational shooting</i>	1	1	1	1	1	1
	<i>Watercraft operation</i>	1	1	1	1	4	4
	<i>Military activities</i>	2	3	3	1	2	1
	<i>Lead shot/fishing line</i>	1	1	1	1	2	2
	<i>Illegal dumping/littering</i>	1	3	3	1	2	2
	<i>Heavy metals/mine tailings</i>	1	1	1	1	2	3
	<i>Pesticides/herbicides</i>	1	2	2	1	3	2
	<i>Sediment/ash flows</i>	1	1	1	2	4	3
	<i>Nutrients/algal blooms</i>	1	1	1	1	1	2
	<i>Light pollution</i>	1	3	3	1	1	1
	<i>Noise pollution</i>	1	3	3	1	3	3
	<i>Contaminants from waste water/runoff</i>	1	1	1	1	3	2
<i>Highway/roadway de-icing</i>	1	1	1	1	1	1	
Invasive Species	<i>Nuisance plants</i>	4	4	4	4	4	4
	<i>Nuisance animals</i>	1	2	2	4	4	4
	<i>Feral animals</i>	1	3	2	2	3	3
	<i>Hybridization</i>	1	1	1	1	1	1
	<i>Disease/pathogens/parasites</i>	1	4	4	4	3	3
	<i>Bait-bucket dumping/illegal stocking</i>	1	1	1	4	4	4
Climate change	<i>Shift to warmer climate</i>	4	4	4	4	4	4
	<i>Drought</i>	4	4	4	4	4	4
Changes in ecological processes	<i>Habitat fragmentation/barriers</i>	2	4	4	1	4	1
	<i>Habitat degradation/shrub invasions</i>	1	4	4	4	4	4
	<i>Unnatural fire regimes</i>	1	1	2	4	4	4
	<i>Altered river flow regimes</i>	1	2	2	4	4	4
	<i>Streambank alteration/channelization</i>	2	2	2	1	4	1
	<i>Loss of keystone species</i>	1	1	1	1	2	1
	<i>Insect Infestation</i>	2	2	2	1	1	1
	<i>Domestication of wildlife/game farming</i>	1	1	1	1	1	1
	<i>Management for game animals and sport fish</i>	1	2	2	2	4	4
	<i>Soil erosion</i>	4	4	4	4	4	2
International Border Issues	<i>Light pollution along the border</i>	1	1	1	1	2	1
	<i>Dispersed camping along the border</i>	1	3	3	2	3	1
	<i>Illegal dumping/littering along the border</i>	1	3	3	2	3	1
	<i>Feral animals along the border</i>	1	2	2	1	2	1

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Magnitude scores for stressors in the Sonoran Desert Ecoregion.							
Threat Category	Stressor	Mohave Desertscrub	Lower Colorado Sonoran Desertscrub	Upland Sonoran Desertscrub	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
	<i>Unauthorized roads & trails along the border</i>	1	4	4	2	3	1
	<i>Altered fire regime as a result of border activities</i>	1	1	1	1	4	1
	<i>Poaching along the border</i>	1	1	1	1	2	1
	<i>Enforcement activities along the border</i>	1	4	4	2	2	1
	<i>Enforcement fences along the border</i>	1	2	2	2	1	1
	<i>Water use/contamination from illegal immigrants and drug smugglers</i>	1	2	2	1	1	1
	<i>Disease along the border</i>	1	2	2	1	1	1
	<i>Enforcement overflights along the border</i>	1	1	1	2	1	1

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Urgency scores for stressors in the Sonoran Desert Ecoregion.							
Threat Category	Stressor	Mohave Desertscrub	Lower Colorado Sonoran Desertscrub	Upland Sonoran Desertscrub	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Habitat Conversion	<i>Agricultural conversion</i>	1	4	1	2	4	1
	<i>Urban growth</i>	1	3	3	1	3	4
	<i>Rural development</i>	2	4	4	1	4	1
	<i>Dams/reservoirs/impoundments</i>	1	4	4	4	4	1
	<i>Recreational sites/facilities</i>	1	4	4	4	4	4
	<i>Aquaculture</i>	1	4	4	4	4	4
	<i>Landfills/dumps</i>	1	4	4	1	4	1
	<i>Military activities</i>	1	4	4	1	4	1
	<i>Forest and woodland management</i>	1	1	1	1	1	1
	<i>Livestock management</i>	4	4	4	4	4	4
Transportation & Infrastructure	<i>Roads (for motorized vehicles)</i>	4	4	4	4	4	4
	<i>Trails (for foot, bike, or equine use)</i>	1	4	4	1	2	1
	<i>Unauthorized roads & trails</i>	4	4	4	4	4	4
	<i>Railroads</i>	1	1	1	1	1	1
	<i>Power lines/wind-harnessing turbines</i>	1	4	4	4	4	4
	<i>Telephone lines/cellphone towers</i>	1	4	4	1	1	1
	<i>Canals/pipelines</i>	1	4	4	1	4	1
	<i>Dredging</i>	1	1	1	1	4	4
	<i>Air traffic corridors/overflights</i>	4	4	4	1	4	1
	<i>Right-of-way fencing along roadways</i>	4	4	4	1	1	1
Abiotic Resource Use	<i>Mining</i>	1	4	4	1	4	1
	<i>Drilling for fuels</i>	1	1	1	1	1	1
	<i>Groundwater depletion/springhead use</i>	2	4	4	4	4	4
	<i>Water diversion/water catchments</i>	4	4	4	4	4	4
Consumptive Biological Resource Use	<i>Grazing by ungulates</i>	4	4	4	4	4	4
	<i>Forest and woodland management</i>	4	4	4	1	1	1
	<i>Harvesting/collecting animals</i>	2	4	4	4	4	4
	<i>Harvesting/collecting plants</i>	1	4	4	4	4	4
Non-consumptive Resource Use	<i>Motorized recreation off-trail</i>	1	4	4	4	4	4
	<i>Non-motorized recreation off-trail</i>	1	4	4	4	4	4
	<i>Dispersed camping</i>	2	4	4	1	4	1
	<i>Scientific research and collection</i>	1	1	1	1	4	4
	<i>Off-range recreational shooting</i>	4	4	4	1	4	1
	<i>Watercraft operation</i>	1	1	1	1	4	4

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Urgency scores for stressors in the Sonoran Desert Ecoregion.							
Threat Category	Stressor	Mohave Desertscrub	Lower Colorado Sonoran Desertscrub	Upland Sonoran Desertscrub	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
Pollution	<i>Military activities</i>	2	4	4	4	4	4
	<i>Lead shot/fishing line</i>	1	4	4	1	4	4
	<i>Illegal dumping/littering</i>	1	4	4	1	4	4
	<i>Heavy metals/mine tailings</i>	1	1	1	4	4	4
	<i>Pesticides/herbicides</i>	1	1	1	4	4	4
	<i>Sediment/ash flows</i>	1	4	4	1	1	1
	<i>Nutrients/algal blooms</i>	1	4	4	1	4	4
	<i>Light pollution</i>	1	4	4	1	4	4
	<i>Noise pollution</i>	1	1	1	1	1	1
	<i>Contaminants from waste water/runoff</i>	4	4	4	4	4	4
	<i>Highway/roadway de-icing</i>	2	4	4	4	4	4
Invasive Species	<i>Nuisance plants</i>	3	4	4	4	4	4
	<i>Nuisance animals</i>	1	1	1	1	1	1
	<i>Feral animals</i>	4	4	4	4	4	4
	<i>Hybridization</i>	1	1	1	2	4	4
	<i>Disease/pathogens/parasites</i>	4	4	4	4	4	4
	<i>Bait-bucket dumping/illegal stocking</i>	4	4	4	4	4	4
Climate change	<i>Shift to warmer climate</i>	4	4	4	1	4	1
	<i>Drought</i>	1	4	4	4	4	4
Changes in ecological processes	<i>Habitat fragmentation/barriers</i>	2	4	4	4	4	4
	<i>Habitat degradation/shrub invasions</i>	1	4	4	4	4	4
	<i>Unnatural fire regimes</i>	4	4	4	1	4	1
	<i>Altered river flow regimes</i>	1	1	1	1	4	4
	<i>Streambank alteration/channelization</i>	1	4	4	4	4	4
	<i>Loss of keystone species</i>	1	1	1	1	1	1
	<i>Insect Infestation</i>	4	4	4	4	4	4
	<i>Domestication of wildlife/game farming</i>	4	4	4	4	4	4
	<i>Management for game animals and sport fish</i>	1	3	3	1	4	1
	<i>Soil erosion</i>	1	4	4	4	4	1
International Border Issues	<i>Light pollution along the border</i>	1	4	4	4	4	1
	<i>Dispersed camping along the border</i>	1	4	4	2	1	1
	<i>Illegal dumping/littering along the border</i>	1	4	4	4	4	1
	<i>Feral animals along the border</i>	1	4	4	2	4	1
	<i>Unauthorized roads & trails along the border</i>	1	1	1	1	1	1
	<i>Altered fire regime as a result of border activities</i>	1	4	4	4	4	1

APPENDIX O. MAGNITUDE AND URGENCY SCORES FOR EACH ECOREGION (CONTINUED)

Urgency scores for stressors in the Sonoran Desert Ecoregion.							
Threat Category	Stressor	Mohave Desertscrub	Lower Colorado Sonoran Desertscrub	Upland Sonoran Desertscrub	Wetlands/Springs	Streams/Rivers	Lakes/Reservoirs
	<i>Poaching along the border</i>	1	3	3	4	3	1
	<i>Enforcement activities along the border</i>	1	4	4	2	2	1
	<i>Enforcement fences along the border</i>	1	4	4	1	1	1
	<i>Water use/contamination from illegal immigrants and drug smugglers</i>	1	4	4	4	4	1
	<i>Disease along the border</i>	1	4	1	2	4	1
	<i>Enforcement overflights along the border</i>	1	3	3	1	3	4

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS DIRECTING ACTIVITIES BY THE
DEPARTMENT AND ITS COOPERATORS

This report generated directly from the CWCS relational database contains conservation agreements and other planning documents linked to the ecoregions, species, and stressors that the agreement/plan is meant to address. The numbers beginning each citation are document identification numbers which are used to reference these documents elsewhere in the CWCS.

21 Minckley, WL and DK Duncan. 1998. Environmental Assessment and Habitat Conservation Plan for El Coronado Ranch. US Fish and Wildlife Service. Phoenix, Arizona. 39 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Longfin Dace	Drought
	Yaqui Catfish	Livestock management
	Yaqui Chub	Nuisance animals

22 Lazy K Bar Ranch, LLC. 1998. Lazy K Bar Ranch Environmental Assessment and Habitat Conservation Plan For Cactus Ferruginous Pygmy-owl. WestLand Resources, Inc. Pima County, Arizona. 49 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Cactus Ferruginous Pygmy-Owl	Rural development

23 Salt River Project. 2002. Roosevelt Lake Habitat Conservation Plan. Salt River Project. Gila and Maricopa counties, Arizona. 341 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Bald Eagle	Altered river flow regimes
	Southwestern Willow Flycatcher	Dams/reservoirs/impoundments
	Western Yellow-billed Cuckoo	Drought
	Yuma Clapper Rail	Nuisance plants
		Recreational sites/facilities
		Watercraft operation

24 Skyranch. 2001. Skyranch Habitat Conservation Plan. Skyranch. Pima County, Arizona. 74 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Cactus Ferruginous Pygmy-Owl	Rural development

26 Sorensen, JA and CB Nelson. 2002. Interim Conservation Plan for Oxyloma (haydeni) kanabensis complex and related ambersnails in Arizona and Utah. Arizona Game and Fish Department. Phoenix, Arizona. 43 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	Kanab Ambersnail	Altered river flow regimes
	Niobrara Ambersnail	Grazing by ungulates
		Groundwater depletion and springhead use
		Recreational sites/facilities
		Roads for motorized vehicles
		Urban growth

27 US Fish and Wildlife Service (USFWS). 1995. Kanab ambersnail (Oxyloma haydeni kanabensis) recovery plan. US Fish and Wildlife Service. Denver, Colorado. 21 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
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APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

CP Kanab Ambersnail
Dams/reservoirs/impoundments
Grazing by ungulates
Recreational sites/facilities
Rural development
Soil erosion

28 Arizona Game and Fish Department and US Fish and Wildlife Service. 1998. Conservation Agreement for the San Xavier talussnail (*Sonorella eremita*). US Fish and Wildlife Service. Albuquerque, New Mexico. 17 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	San Xavier Talussnail	Non-motorized recreation off-trail Roads for motorized vehicles Scientific research and collection Urban growth

29 Arizona Game and Fish Department. 2002. Conservation Assessment and Strategy Wet Canyon talussnail (*Sonorella macrophallus*). US Forest Service, Coronado National Forest. Safford Ranger District, Arizona. 31 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Wet Canyon Talussnail	Altered fire regime as a result of border activities Habitat fragmentation/barriers Roads for motorized vehicles Soil erosion Unauthorized roads & trails Water use/contamination from illegal immigrants and drug smugglers

31 US Fish and Wildlife Service (USFWS). 1994. Yaqui Fishes Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 48 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Beautiful Shiner Yaqui Catfish Yaqui Chub Yaqui Topminnow	Hybridization Nuisance animals Soil erosion Streambank alteration/channelization Water use/contamination from illegal immigrants and drug smugglers

32 US Fish and Wildlife Service (USFWS). 2002. Bonytail (*Gila elegans*) Recovery Goals: amendment and supplement to the Bonytail Chub Recovery Plan. US Fish and Wildlife Service, Mountain-Prairie Region (6). Denver, Colorado. 54 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	Bonytail	Altered river flow regimes
MD		Dams/reservoirs/impoundments
SD		Habitat fragmentation/barriers Hybridization Management for game animals and sport fish Nuisance animals Pesticides/herbicides

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Soil erosion
Streambank alteration/channelization
Water use/contamination from illegal
immigrants and drug smugglers

33 US Fish and Wildlife Service (USFWS). 2002. Colorado pikeminnow (*Ptycholcheilus incius*) Recovery Goals: amendment and supplement to the Colorado Squawfish Recovery Plan. US Fish and Wildlife Service, Mountain-Prairie Region (6). Denver, Colorado. 53 pp.

Ecoregions Species

AHN Colorado Pikeminnow
CP
MD
SD

Stressors

Altered river flow regimes
Dams/reservoirs/impoundments
Habitat fragmentation/barriers
Management for game animals and sport fish
Nuisance animals
Pesticides/herbicides

34 Marsh, PC and DW Sada. 1993. Desert Pupfish (*Cyprinodon macularius*) Recovery Plan. US Fish and Wildlife Service. Phoenix, Arizona. 67 pp.

Ecoregions Species

AHN Desert Pupfish
AHS
SD

Stressors

Altered river flow regimes
Bait-bucket dumping/illegal stocking
Dams/reservoirs/impoundments
Forest and woodland management - habitat
conversion
Grazing by ungulates
Groundwater depletion and springhead use
Livestock management
Management for game animals and sport fish
Mining
Nuisance animals
Pesticides/herbicides
Roads for motorized vehicles
Streambank alteration/channelization
Water use/contamination from illegal
immigrants and drug smugglers

35 Weedman, DA. Gila Topminnow (*Poeciliopsis occidentalis occidentalis*) DRAFT Revised Recovery Plan - DRAFT

Ecoregions Species

AHN Gila Topminnow
AHS
SD

Stressors

Altered river flow regimes
Bait-bucket dumping/illegal stocking
Dams/reservoirs/impoundments
Forest and woodland management -
consumptive use
Grazing by ungulates
Groundwater depletion and springhead use

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Livestock management
Management for game animals and sport fish
Mining
Nuisance animals
Recreational sites/facilities
Roads for motorized vehicles
Soil erosion
Streambank alteration/channelization
Trails for foot, bike, or equine use
Unauthorized roads & trails
Water use/contamination from illegal immigrants and drug smugglers

36 US Fish and Wildlife Service (USFWS). 2003. Gila Trout Recovery Plan (3rd revision). US Fish and Wildlife Service. Albuquerque, New Mexico. 78 pp.

Ecoregions Species

AHN Gila Trout
AZNM

Stressors

Altered fire regime as a result of border activities
Disease/pathogens/parasites
Forest and woodland management - habitat conversion
Harvesting/collecting animals
Hybridization
Livestock management
Management for game animals and sport fish
Nuisance animals
Soil erosion

41 US Fish and Wildlife Service (USFWS). 2002. Humpback chub (*Gila cypha*) Recovery Goals: amendment and supplement to the Humpback Chub Recovery Plan. US Fish and Wildlife Service, Mountain-Prairie Region (6). Denver, Colorado. 71 pp.

Ecoregions Species

CP Humpback Chub
MD

Stressors

Altered river flow regimes
Bait-bucket dumping/illegal stocking
Contaminants from waste water and runoff
Dams/reservoirs/impoundments
Disease/pathogens/parasites
Groundwater depletion and springhead use
Hybridization
Management for game animals and sport fish
Nuisance animals
Pesticides/herbicides
Streambank alteration/channelization

42 US Fish and Wildlife Service (USFWS). 1998. Little Colorado River spinedace (*Lepidomeda vittata*) Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 51 pp.

Ecoregions Species

Stressors

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

AZNM	Little Colorado Spinedace	Altered river flow regimes
CP		Bait-bucket dumping/illegal stocking
		Dams/reservoirs/impoundments
		Forest and woodland management - consumptive use
		Grazing by ungulates
		Management for game animals and sport fish
		Nuisance animals
		Pesticides/herbicides
		Roads for motorized vehicles
		Soil erosion
		Streambank alteration/channelization
43 US Fish and Wildlife Service (USFWS). 1990. Loach Minnow Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 38 pp.		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Loach Minnow	Altered river flow regimes
AHS		Bait-bucket dumping/illegal stocking
AZNM		Dams/reservoirs/impoundments
SD		Grazing by ungulates
		Groundwater depletion and springhead use
		Livestock management
		Management for game animals and sport fish
		Nuisance animals
		Streambank alteration/channelization
44 US Fish and Wildlife Service (USFWS). 2002. Razorback sucker (<i>Xyrauchen texanus</i>) Recovery Goals: amendment and supplement to the Razorback Sucker Recovery Plan. US Fish and Wildlife Service, Mountain-Prairie Region (6). Denver, Colorado. 78 pp.		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Razorback Sucker	Altered river flow regimes
CP		Dams/reservoirs/impoundments
MD		Habitat fragmentation/barriers
SD		Management for game animals and sport fish
		Nuisance animals
45 US Fish and Wildlife Service (USFWS). 1992. Recovery Plan for Sonora Chub (<i>Gila ditaenia</i>). US Fish and Wildlife Service, Region 2. Albuquerque, New Mexico. 50 pp.		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Sonora Chub	Bait-bucket dumping/illegal stocking
		Contaminants from waste water and runoff
		Grazing by ungulates
		Groundwater depletion and springhead use
		Hybridization
		Livestock management
		Management for game animals and sport fish

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Mining
Nuisance animals
Pesticides/herbicides
Recreational sites/facilities
Roads for motorized vehicles
Soil erosion
Streambank alteration/channelization

46 US Fish and Wildlife Service (USFWS). 1990. Spikedace Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 38 pp.

Ecoregions Species

AHN Spikedace
AHS
SD

Stressors

Altered river flow regimes
Bait-bucket dumping/illegal stocking
Contaminants from waste water and runoff
Dams/reservoirs/impoundments
Forest and woodland management -
consumptive use
Grazing by ungulates
Groundwater depletion and springhead use
Livestock management
Management for game animals and sport fish
Mining
Nuisance animals
Pesticides/herbicides
Soil erosion
Streambank alteration/channelization

47 US Fish and Wildlife Service (USFWS). 1994. Virgin River Fishes Recovery Plan. US Fish and Wildlife Service. Salt Lake City, Utah. 45 pp.

Ecoregions Species

MD Virgin Chub
Woundfin

Stressors

Altered river flow regimes
Bait-bucket dumping/illegal stocking
Dams/reservoirs/impoundments
Management for game animals and sport fish
Nuisance animals
Streambank alteration/channelization

48 Flat-tailed Horned Lizard Interagency Coordinating Committee. 2003. Flat-tailed horned lizard rangewide management strategy, 2003 revision. Flat-tailed Horned Lizard Interagency Coordinating Committee. 78 pp.

Ecoregions Species

SD Flat-tailed Horned Lizard

Stressors

Agricultural conversion
Canals/pipelines
Landfills/dumps
Livestock management
Mining
Motorized recreation off-trail

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Nuisance plants
Pesticides/herbicides
Railroads
Recreational sites/facilities
Roads for motorized vehicles
Unnatural fire regimes
Urban growth

49 Murray, RC and V Dickinson (editors). 1996. Management plan for the Sonoran Desert population of the desert tortoise in Arizona. Arizona Interagency Desert Tortoise Team. 55 pp.

Ecoregions Species

AHN Sonoran Desert Tortoise
AHS
MD
SD

Stressors

Disease/pathogens/parasites
Habitat degradation/shrub invasions
Habitat fragmentation/barriers
Motorized recreation off-trail
Urban growth

50 Platz, JE. 1996. Conservation Agreement, Rana subaquavocalis, Ramsey Canyon leopard frog. 52 pp.

Ecoregions Species

AHS Ramsey Canyon Leopard Frog

Stressors

Disease/pathogens/parasites
Drought
Nuisance animals
Off-range recreational shooting

51 US Fish and Wildlife Service. 1985. New Mexico Ridgenose Rattlesnake Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 59 pp.

Ecoregions Species

AHS New Mexico Ridge-nosed Rattlesnake

Stressors

Disease/pathogens/parasites
Forest and woodland management -
consumptive use
Habitat fragmentation/barriers
Harvesting/collecting animals
Livestock management
Mining
Rural development
Unnatural fire regimes
Urban growth

52 US Fish and Wildlife Service. 1994. Desert tortoise (Mojave population) Recovery Plan. US Fish and Wildlife Service. Portland, Oregon. 73 pp.

Ecoregions Species

CP Mohave Desert Tortoise
MD

Stressors

Canals/pipelines
Disease/pathogens/parasites
Drought
Feral animals
Grazing by ungulates

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Habitat fragmentation/barriers
 Harvesting/collecting animals
 Livestock management
 Mining
 Motorized recreation off-trail
 Nuisance plants
 Off-range recreational shooting
 Roads for motorized vehicles
 Unnatural fire regimes

53 US Fish and Wildlife Service. 2002. Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) Recovery Plan. US Fish and Wildlife Service. Phoenix, Arizona. 67 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Sonoran Tiger Salamander	Bait-bucket dumping/illegal stocking Disease/pathogens/parasites Drought Groundwater depletion and springhead use Harvesting/collecting animals Hybridization Livestock management Management for game animals and sport fish Nuisance animals

54 Hinman, KE and TK Snow (editors). 2003. Arizona Bat Conservation Strategic Plan. Arizona Game and Fish Department. Phoenix, Arizona. 182 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Allen's Big-eared Bat	Altered river flow regimes
AHS	Arizona Myotis	Contaminants from waste water and runoff
AZNM	Big Brown Bat	Dams/reservoirs/impoundments
CP	Big Free-tailed Bat	Dispersed camping along the border
MD	California Leaf-nosed Bat	Enforcement activities along the border
SD	California Myotis	Forest and woodland management - consumptive use
	Cave Myotis	Forest and woodland management - habitat conversion
	Fringed Myotis	Grazing by ungulates
	Ghost-faced Bat	Groundwater depletion and springhead use
	Greater Western Mastiff Bat	Habitat degradation/shrub invasions
	Hoary Bat	Habitat fragmentation/barriers
	Lesser Long-nosed Bat	Heavy metals/mine tailings
	Long-eared Myotis	Light pollution
	Long-legged Myotis	Light pollution along the border
	Mexican Free-tailed Bat	Livestock management
	Mexican Long-tongued Bat	Loss of agricultural areas
	Pale Townsend's Big-eared Bat	Mining
	Pallid Bat	Non-motorized recreation off-trail
	Pocketed Free-tailed Bat	
	Silver-haired Bat	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Southwestern Myotis	Pesticides/herbicides
Spotted Bat	Power lines/wind-harnessing turbines
Underwood's Mastiff Bat	Recreational sites/facilities
Western Pipistrelle	Roost destruction
Western Red Bat	Rural development
Western Small-footed Myotis	Scientific research and collection
Western Yellow Bat	Small/localized or highly concentrated population(s)
Yuma Myotis	Streambank alteration/channelization
	Unknown
	Unnatural fire regimes
	Urban growth

55 Johnson, TB and WE Van Pelt. 1997. Conservation assessment and strategy for the jaguar in Arizona and New Mexico. Arizona Game and Fish Department. Phoenix, Arizona. 24 pp.

<u>Ecoregions</u>	<u>Species</u>
AHN	Jaguar
AHS	
SD	

<u>Stressors</u>
Altered river flow regimes
Dams/reservoirs/impoundments
Habitat fragmentation/barriers
Harvesting/collecting animals
Poaching along the border
Rural development
Scientific research and collection
Streambank alteration/channelization
Urban growth

56 Pierson, ED, MC Wackenhut, JS Altenbach, P Bradley, P Call, DL Genter, CE Harris, BL Keller, B Lengus, L Lewis, B Luce, KW Navo, JM Perkins, S Smith, and L Welch.. 1999. Species conservation assessment and strategy for Townsend's big-eared bat (*Corynorhinus townsendii townsendii* & *Corynorhinus townsendii pallescens*). Idaho Conservation Effort, Idaho Department of Fish and Game. Boise, Idaho. 42 pp.

<u>Ecoregions</u>	<u>Species</u>
AHN	Pale Townsend's Big-eared Bat
AHS	
AZNM	
CP	
MD	
SD	

<u>Stressors</u>
Forest and woodland management - consumptive use
Forest and woodland management - habitat conversion
Grazing by ungulates
Heavy metals/mine tailings
Mining
Non-motorized recreation off-trail
Pesticides/herbicides
Roost destruction
Rural development
Scientific research and collection
Small/localized or highly concentrated

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

- population(s)
Unknown
Unnatural fire regimes
Urban growth
- 57 US Fish and Wildlife Service (USFWS). 1982. Mexican Wolf Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 103 pp.**
- | <u>Ecoregions</u> | <u>Species</u> | <u>Stressors</u> |
|-------------------|-------------------|--------------------------------|
| AHN | Mexican Gray Wolf | Disease/pathogens/parasites |
| AZNM | | Habitat fragmentation/barriers |
| | | Harvesting/collecting animals |
| | | Rural development |
| | | Urban growth |
- 58 US Fish and Wildlife Service (USFWS). 1988. Black-footed Ferret Recovery Plan. US Fish and Wildlife Service. Denver, Colorado. 154 pp.**
- | <u>Ecoregions</u> | <u>Species</u> | <u>Stressors</u> |
|-------------------|---------------------|---------------------------------|
| AHN | Black-footed Ferret | Disease/pathogens/parasites |
| CP | | Habitat fragmentation/barriers |
| | | Loss of keystone species |
| | | Off-range recreational shooting |
| | | Roads for motorized vehicles |
| | | Rural development |
| | | Urban growth |
- 59 US Fish and Wildlife Service (USFWS). 1990. Listed Cats of Texas and Arizona Recovery Plan (with emphasis on the Ocelot). US Fish and Wildlife Service. Albuquerque, New Mexico. 131 pp.**
- | <u>Ecoregions</u> | <u>Species</u> | <u>Stressors</u> |
|-------------------|----------------|--------------------------------|
| AHS | Jaguar | Habitat fragmentation/barriers |
| SD | Ocelot | Rural development |
| | | Urban growth |
- 61 Arizona Game and Fish Department (AGFD), Bureau of Land Management (BLM), and California Department of Fish and Game. 1980. Topock North Habitat Management Plan. Bureau of Land Management. Yuma, Arizona. 37 pp.**
- | <u>Ecoregions</u> | <u>Species</u> | <u>Stressors</u> |
|-------------------|--------------------------|----------------------------------|
| MD | All Species | Dams/reservoirs/impoundments |
| | American Beaver | Forest and woodland management - |
| | Crissal Thrasher | consumptive use |
| | Double-crested Cormorant | Motorized recreation off-trail |
| | Great Blue Heron | |
| | Mourning Dove | |
| | White-crowned Sparrow | |
| | Yuma Clapper Rail | |
- 62 Arizona Game and Fish Department (AGFD) and Bureau of Land Management (BLM). 1980. Silver Bell - Baboquivari Habitat Management Plan. Bureau of Land Management. Baboquivari, Arizona. 96 pp.**

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Arizona Skink	Grazing by ungulates
	Black Vulture	Mining
	Coues whitetail deer	Roads for motorized vehicles
	Crested Caracara	
	Desert Bighorn Sheep	
	Desert Mule Deer	
	Gambel's Quail	
	Gila Topminnow	
	Harris's Hawk	
	Masked Bobwhite	
	Mourning Dove	
	Peregrine Falcon	
	Prairie Falcon	
	Reticulate Gila Monster	
	Sonoran Desert Tortoise	
	White-winged Dove	

63 Bureau of Land Management (BLM) and Arizona Game and Fish Department (AGFD). 1983. The Virgin River-Pakoon Basin Habitat Management Plan. Bureau of Land Management. St. George, Utah. 240 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
MD	All Species	Agricultural conversion
	American Badger	Feral animals
	American Wigeon	Grazing by ungulates
	Apache Northern Goshawk	Harvesting/collecting animals
	Bald Eagle	Mining
	Banded Gila Monster	Power lines/wind-harnessing turbines
	Banded Gila Monster	Roads for motorized vehicles
	Barn Owl	Urban growth
	Bobcat	Water diversion/water catchments
	Bufflehead	
	Cactus Ferruginous Pygmy-Owl	
	Canada Goose	
	Canvasback	
	Cinnamon Teal	
	Common Black-Hawk	
	Common Gray Fox	
	Common Merganser	
	Common Side-blotched Lizard	
	Cooper's Hawk	
	Coyote	
	Desert Bighorn Sheep	
	Desert Nightsnake	
	Desert Sucker	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Ferruginous Hawk
Flannelmouth Sucker
Golden Eagle
Green-winged Teal
Kit Fox
Lesser Scaup
Merlin
Mohave Desert Tortoise
Mountain Lion
Mourning Dove
Northern Goshawk
Northern Leopard Frog
Northern Pintail
Northern Shoveler
Osprey
Peregrine Falcon
Prairie Falcon
Red-breasted Merganser
Redhead
Ring-necked Duck
Ring-necked Pheasant
Ringtail
Rocky Mountain Mule Deer
Ruddy Duck
Sharp-shinned Hawk
Southwestern Threadsnake
Speckled Dace
Spotted Leaf-nosed Snake
Striped Skunk
Variable Groundsnake
Virgin Chub
Virgin Spinedace
Western Burrowing Owl
Woundfin
Yucca Night Lizard

64 US Dept of Navy. 2001. EA for the Integrated Natural Resources Management Plan for the US Naval Observatory. US Dept of Navy. Washington, DC. 35 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	Allen's Big-eared Bat	Drought
	American Black Bear	Forest and woodland management -
	Arizona Myotis	consumptive use
	Flammulated Owl	Nuisance plants
	Greater Western Mastiff Bat	Pesticides/herbicides
	Merriam's Turkey	Recreational sites/facilities

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Mexican Spotted Owl Soil erosion
Northern Goshawk Unnatural fire regimes
Rocky Mountain Elk
Rocky Mountain Mule Deer

65 Harris Environmental. 2001. Integrated Natural Resources Management Plan and Environmental Assessment for Florence Military Reservation. Arizona Army National Guard. Florence, Arizona. 178 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Cactus Ferruginous Pygmy-Owl	Drought
	Couch's Spadefoot	Grazing by ungulates
	Desert Banded Gecko	Mining
	Desert Mule Deer	Nuisance plants
	Desert Pupfish	Roads for motorized vehicles
	Desert Sucker	Soil erosion
	Lesser Long-nosed Bat	Trails for foot, bike, or equine use
	Longfin Dace	Water diversion/water catchments
	Saddled Leaf-nosed Snake	
	Sonora Sucker	
	Sonoran Desert Tortoise	
	Western Red Bat	
	Western Yellow-billed Cuckoo	

66 US Army Yuma Proving Ground. 1997. Integrated Natural Resources Management Plan for Yuma Proving Ground. US Department of Defense, Army. 156 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	American Peregrine Falcon	Drought
	Bald Eagle	Feral animals
	Brown Pelican	Grazing by ungulates
	California Black Rail	Management for game animals and sport fish
	Mojave Fringe-toed Lizard	
	Sonoran Desert Tortoise	Motorized recreation off-trail
	Southwestern Willow Flycatcher	Noise pollution
	Western Yellow Bat	Non-motorized recreation off-trail
	Yuma Clapper Rail	Pesticides/herbicides
		Roads for motorized vehicles
		Soil erosion
		Unauthorized roads & trails
		Water diversion/water catchments

67 Science Applications International Corporation. 1998. Davis-Monthan Air Force Base Integrated Natural Resources Management Plan and Environmental Assessment. US Army Corps of Engineers, Fort Worth. Fort Worth, Arizona. 200 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Banded Gila Monster	Contaminants from waste water and runoff
	Cooper's Hawk	Habitat fragmentation/barriers
	Great Horned Owl	Noise pollution

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Swainson's Hawk	Roads for motorized vehicles
Western Burrowing Owl	Soil erosion
	Urban growth

68 US Department of the Navy and Air Force. 2003. Draft Environmental Impact Statement and Proposed Integrated Natural Resources Management Plan for the Barry Goldwater Range. US Department of the Interior. Arizona. 500 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	All Species	Drought
	Bobcat	Feral animals
	California Leaf-nosed Bat	Grazing by ungulates
	Cave Myotis	Habitat degradation/shrub invasions
	Colorado Desert Shovel-nosed snake	Habitat fragmentation/barriers
	Couch's Spadefoot	Livestock management
	Coyote	Motorized recreation off-trail
	Desert Bighorn Sheep	Noise pollution
	Desert Mule Deer	Non-motorized recreation off-trail
	Flat-tailed Horned Lizard	Nuisance animals
	Gila Woodpecker	Nuisance plants
	Gilded Flicker	Roads for motorized vehicles
	Jaguar	Scientific research and collection
	Ladder-backed Woodpecker	Soil erosion
	Le Conte's Thrasher	Unnatural fire regimes
	Lesser Long-nosed Bat	Urban growth
	Long-tailed Brush Lizard	Water diversion/water catchments
	Northern Desert Iguana	
	Red-spotted Toad	
	Sonoran Desert Toad	
	Sonoran Desert Tortoise	
	Sonoran Pronghorn	
	Sonoran Sidewinder	
	Spotted Leaf-nosed Snake	

69 Fredlake, M, R Gerhart, D Krueper. 1993. San Pedro Habitat Management Plan. Bureau of Land Management. Safford, Arizona. 65 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	All Species	Altered river flow regimes
	Baird's Sparrow	Contaminants from waste water and runoff
	Belted Kingfisher	Dispersed camping
	Black-tailed Prairie Dog	Habitat degradation/shrub invasions
	Bobolink	Habitat fragmentation/barriers
	California Leaf-nosed Bat	Livestock management
	Chihuahuan Pronghorn	Management for game animals and sport fish
	Clark's Grebe	
	Common Black-Hawk	Motorized recreation off-trail

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Crested Caracara	Non-motorized recreation off-trail
Desert Pupfish	Nuisance animals
Ferruginous Hawk	Recreational sites/facilities
Gila Chub	Roads for motorized vehicles
Gila Topminnow	Soil erosion
Great Egret	Streambank alteration/channelization
Loach Minnow	Unnatural fire regimes
Lowland Leopard Frog	Water diversion/water catchments
Mexican Long-tongued Bat	
Mississippi Kite	
Northern Aplomado Falcon	
Northern Buff-breasted Flycatcher	
Northern Goshawk	
Northern Gray Hawk	
Northern Mexican Gartersnake	
Osprey	
Peregrine Falcon	
Razorback Sucker	
Roundtail Chub	
Snowy Egret	
Southwestern Willow Flycatcher	
Spikedace	
Spotted Bat	
Sprague's Pipit	
Thick-billed Kingbird	
Tropical Kingbird	
Western Least Bittern	
Western Snowy Plover	
Western Yellow-billed Cuckoo	

70 US Fish and Wildlife Service (USFWS). 1993. Draft Lower Colorado River National Wildlife Refuges Comprehensive Management Plan and Environmental Assessment. US Fish and Wildlife Service. Albuquerque, New Mexico. 56 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	All Species	Dams/reservoirs/impoundments
	American Wigeon	Dredging
	Arizona Bell's Vireo	Nuisance plants
	Bald Eagle	Recreational sites/facilities
	Bobcat	Soil erosion
	Bonytail	Trails for foot, bike, or equine use
	Brown Creeper	Urban growth
	California Black Rail	
	Canada Goose	
	Clark's Grebe	
	Collared Peccary	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Common Muskrat
Coyote
Desert Bighorn Sheep
Desert Bighorn Sheep
Desert Mule Deer
Double-crested Cormorant
Green-winged Teal
Humpback Chub
Indigo Bunting
Lowland Leopard Frog
Mallard
Mountain Lion
Peregrine Falcon
Razorback Sucker
Redhead
Ring-necked Duck
Ringtail
Ruddy Duck
Sandhill Crane
Scissor-tailed Flycatcher
Snowy Egret
Sonoran Desert Tortoise
Sonoran Desert Tortoise
Western Yellow-billed Cuckoo
White-faced Ibis
Willow Flycatcher
Yuma Clapper Rail

71 Bureau of Land Management (BLM) and US Fish and Wildlife Service (USFWS). 1996. Kofa National Wildlife Refuge and Wilderness and New Water Mountains Wilderness Interagency Management Plan and Environmental Assessment. Bureau of Land Management. Yuma, Arizona. 86 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	All Species	Dispersed camping
	Collared Peccary	Drought
	Desert Bighorn Sheep	Grazing by ungulates
	Desert Mule Deer	Livestock management
	Feral Ass	Mining
	Sonoran Desert Tortoise	Nuisance plants
		Recreational sites/facilities
		Roads for motorized vehicles
		Water diversion/water catchments

72 US Fish and Wildlife Service (USFWS). 2003. Buenos Aires National Wildlife Refuge Final Comprehensive Conservation Plan. US Fish and Wildlife Service. Sasabe, Arizona. 233 pp.

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	All Species	Dams/reservoirs/impoundments
	Cactus Ferruginous Pygmy-Owl	Grazing by ungulates
	Cave Myotis	Habitat fragmentation/barriers
	Chiricahua Leopard Frog	Livestock management
	Cinnamon Teal	Nuisance plants
	Ferruginous Hawk	Roads for motorized vehicles
	Jaguar	Soil erosion
	Largemouth Bass	Unnatural fire regimes
	Lesser Long-nosed Bat	
	Loggerhead Shrike	
	Mallard	
	Masked Bobwhite	
	Mexican Long-tongued Bat	
	Mosquitofish	
	Pied-billed Grebe	
	Razorback Sucker	
	Redear Sunfish	
	Sonoran Pronghorn	
	Southwestern Willow Flycatcher	
	Underwood's Mastiff Bat	
	Western Burrowing Owl	
	Western Sandpiper	
	Western Yellow-billed Cuckoo	
73 US Fish and Wildlife Service (USFWS). Cabeza Prieta National Wildlife Refuge Draft Comprehensive Conservation Plan, Wilderness Stewardship Plan and Environmental Impact Statement - DRAFT		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	All Species	Air traffic corridors/overflights
	Bobcat	Altered river flow regimes
	Cactus Ferruginous Pygmy-Owl	Disease/pathogens/parasites
	California Leaf-nosed Bat	Drought
	Common Chuckwalla	Enforcement activities along the border
	Coyote	Feral animals
	Desert Bighorn Sheep	Grazing by ungulates
	Flat-tailed Horned Lizard	Habitat fragmentation/barriers
	Le Conte's Thrasher	Livestock management
	Lesser Long-nosed Bat	Mining
	Loggerhead Shrike	Nuisance plants
	Mountain Lion	Unauthorized roads & trails created by illegal immigrants and smugglers
	Sonoran Desert Tortoise	
	Sonoran Pronghorn	

74 Pima County. 2000. Sonoran Desert Conservation Plan - Preliminary. Pima County. Tucson, Arizona. 83 pp.

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Abert's Towhee	Agricultural conversion
	All Species	Dams/reservoirs/impoundments
	Allen's Big-eared Bat	Habitat fragmentation/barriers
	Arizona Bell's Vireo	Mining
	Arizona Shrew	Nuisance animals
	Cactus Ferruginous Pygmy-Owl	Nuisance plants
	California Leaf-nosed Bat	Rural development
	Chiricahua Leopard Frog	Soil erosion
	Desert Box Turtle	
	Desert Pupfish	
	Desert Sucker	
	Gila Chub	
	Gila Topminnow	
	Lesser Long-nosed Bat	
	Longfin Dace	
	Lowland Leopard Frog	
	Mesquite Mouse	
	Mexican Long-tongued Bat	
	Northern Mexican Gartersnake	
	Organ Pipe Shovel-nosed Snake	
	Rufous-winged Sparrow	
	Sonora Sucker	
	Southwestern Willow Flycatcher	
	Swainson's Hawk	
	Tucson Shovel-nosed Snake	
	Variable Groundsnake	
	Western Burrowing Owl	
	Western Red Bat	
	Western Yellow Bat	
	Western Yellow-billed Cuckoo	

75 Harris Environmental Group, Inc. 2001. Integrated Natural Resources Management Plan - 2002-2006, Camp Navajo. Camp Navajo, Arizona Army National Guard. Tucson, Arizona. 217 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	All Species	Forest and woodland management -
	America Pronghorn	consumptive use
	Arizona Myotis	Insect Infestation
	Arizona Tiger Salamander	Livestock management
	Bald Eagle	Nuisance animals
	Band-tailed Pigeon	Nuisance plants
	Blue-winged Teal	
	Brown Trout	
	Canada Goose	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Chiricahua Leopard Frog
Cinnamon Teal
Feral Pig
Gadwall
Green-winged Teal
Mallard
Merriam's Turkey
Mexican Spotted Owl
Mountain Treefrog
Mourning Dove
Northern Goshawk
Rainbow Trout
Regal Horned Lizard
Rocky Mountain Elk
Rocky Mountain Mule Deer
Smallmouth Bass
Snow Goose
Wandering Gartersnake
Western Chorus Frog

**76 Salt River Project and the City of Phoenix. Horseshoe Lake and Bartlett Lake
Habitat Conservation Plan - DRAFT**

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Bald Eagle	Dams/reservoirs/impoundments
	Colorado Pikeminnow	Habitat degradation/shrub invasions
	Desert Sucker	Nuisance animals
	Gila Topminnow	
	Loach Minnow	
	Longfin Dace	
	Razorback Sucker	
	Sonora Sucker	
	Southwestern Willow Flycatcher	
	Speckled Dace	
	Spikedace	
	Western Yellow-billed Cuckoo	

**77 Tierra Data Systems. 1998. Integrated Natural Resources Management Gila River
Naval Space Surveillance Station. US Department of the Navy, Southwest Division. San
Diego, California. 75 pp.**

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Banded Gila Monster	Feral animals
	Feral Horse	Nuisance plants
	Regal Horned Lizard	Unnatural fire regimes
	Tiger Whiptail	

**78 Gene Stout and Associates, Jeff Trousil. 2001. Integrated Natural Resources
Management Plan and Environmental Assessment, US Army Intelligence Center and**

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Fort Huachuca, Arizona 2001-2005, Final Draft. US Army Intelligence Center and Fort Huachuca. Fort Huachuca, Arizona. 294 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	All Species	Groundwater depletion and springhead use
	America Pronghorn	Habitat degradation/shrub invasions
	American Black Bear	Habitat fragmentation/barriers
	Bluegill	Nuisance animals
	Collared Peccary	Nuisance plants
	Coues whitetail deer	Soil erosion
	Desert Mule Deer	Unnatural fire regimes
	Gould's Turkey	
	Huachuca Springsnail	
	Largemouth Bass	
	Lesser Long-nosed Bat	
	Mexican Spotted Owl	
	Mountain Lion	
	Peregrine Falcon	
	Rainbow Trout	
	Ramsey Canyon Leopard Frog	
	Redear Sunfish	
	Sonoran Tiger Salamander	
	Southwestern Willow Flycatcher	

80 Arizona Game and Fish Department (AGFD), Region IV. 1997. Alamo Wildlife Area Alamo Lake State Park Joint Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 55 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	All Species	Altered river flow regimes
	Largemouth Bass	Feral animals
		Grazing by ungulates
		Livestock management
		Mining
		Motorized recreation off-trail
		Rural development

81 Arizona Game and Fish Department (AGFD), Region I. 1997. Allen Severson Memorial Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 17 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	All Species	Altered river flow regimes

82 Arizona Game and Fish Department (AGFD), Region I. 1997. Apache Trout Management Areas Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 15 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Apache (Arizona) Trout	Grazing by ungulates
AZNM		

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

CP

83 Arizona Game and Fish Department (AGFD), Region V. 1997. Arivaca Lake Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 11 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Black Crappie	Heavy metals/mine tailings
	Bluegill	
	Channel Catfish	
	Largemouth Bass	
	Redear Sunfish	

84 Arizona Game and Fish Department (AGFD), Region VI. 1997. Arlington Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 12 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Canada Goose	Altered river flow regimes
	Mourning Dove	Grazing by ungulates
	White-winged Dove	Groundwater depletion and springhead use
	Yuma Clapper Rail	Harvesting/collecting animals
		Nuisance plants
		Streambank alteration/channelization

85 Arizona Game and Fish Department (AGFD), Region VI. 1997. Base and Meridian Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 17 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	All Species	Altered river flow regimes
		Harvesting/collecting animals
		Illegal dumping/littering
		Landfills/dumps
		Motorized recreation off-trail
		Nuisance plants
		Off-range recreational shooting
		Pesticides/herbicides
		Roads for motorized vehicles

86 Arizona Game and Fish Department (AGFD), Region I. 1997. Bear Springs Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 10 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	All Species	Grazing by ungulates
		Habitat degradation/shrub invasions

87 Arizona Game and Fish Department (AGFD), Region I. 1997. Becker Lake Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 13 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	America Pronghorn	Altered river flow regimes
	Apache (Arizona) Trout	Disease/pathogens/parasites
	Brown Trout	
	Canada Goose	

88 Arizona Game and Fish Department (AGFD), Region I. 1997. Black River Lands

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

(PS and Fite ranches) Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 10 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	Merriam's Turkey Rocky Mountain Elk Rocky Mountain Mule Deer	Grazing by ungulates Habitat fragmentation/barriers Nuisance plants Soil erosion Streambank alteration/channelization

89 Arizona Game and Fish Department (AGFD), Region V. 1997. Bog Hole Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 18 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	All Species	Altered river flow regimes Bait-bucket dumping/illegal stocking Hybridization Motorized recreation off-trail

90 Arizona Game and Fish Department (AGFD). 1997. Canyon Creek Hatchery Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 12 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Page Springsnail	Forest and woodland management - consumptive use Grazing by ungulates Recreational sites/facilities

91 Arizona Game and Fish Department (AGFD), Region I. 1997. Chevelon Creek Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 15 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	All Species	Nuisance plants

92 Arizona Game and Fish Department (AGFD), Region I. 1997. Chevelon Ranches (Dye, Vincent, Duran, Tillman and Wolfe) Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 10 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	Merriam's Turkey Rocky Mountain Elk Rocky Mountain Mule Deer	Rural development Soil erosion

93 Arizona Game and Fish Department (AGFD), Region V. 1997. Cluff Ranch Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 20 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Desert Cottontail Desert Mule Deer Gambel's Quail Mourning Dove White-tailed Deer White-winged Dove	Altered river flow regimes Dispersed camping Habitat degradation/shrub invasions Rural development

94 Arizona Game and Fish Department (AGFD), Region III. 1997. Colorado River

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Nature Center Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 11 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
MD	All Species	Harvesting/collecting animals Harvesting/collecting plants Illegal dumping/littering Motorized recreation off-trail Urban growth

95 Arizona Game and Fish Department (AGFD), Region I. 1997. Concho Lake Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 10 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	All Species	Urban growth

96 Arizona Game and Fish Department (AGFD), Region VI. 1997. Cunningham Tracts Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 8 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Desert Mule Deer Gould's Turkey	Forest and woodland management - consumptive use Grazing by ungulates Motorized recreation off-trail

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

97 Arizona Game and Fish Department (AGFD), Region I. 1997. Fool Hollow Lake Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 11 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	All Species	Dispersed camping Illegal dumping/littering Nutrients/algal blooms Rural development Streambank alteration/channelization

98 Arizona Game and Fish Department (AGFD), Region VI. 1997. Gila River Lands (PLO 1015, Green, GSA Properties) Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 11 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	All Species	Dispersed camping Illegal dumping/littering Nuisance plants Pesticides/herbicides

99 Arizona Game and Fish Department (AGFD), Region I. 1999. Grasslands Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 19 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	Ferruginous Hawk Little Colorado Spinedace Mountain Plover Northern Leopard Frog Rocky Mountain Elk Rocky Mountain Mule Deer	Livestock management Motorized recreation off-trail

100 Arizona Game and Fish Department (AGFD), Region II. 1997. House Rock Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 24 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	America Pronghorn Rocky Mountain Mule Deer	Unnatural fire regimes

101 Arizona Game and Fish Department (AGFD), Region I. 1997. Jacques Marsh Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 1997 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	All Species	Rural development

102 Arizona Game and Fish Department (AGFD), Region II. 1997. Lamar Haines Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 14 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	Allen's Big-eared Bat Arizona Myotis Flammulated Owl Fringed Myotis	Forest and woodland management - consumptive use Grazing by ungulates Livestock management

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Long-eared Myotis	Recreational sites/facilities
Long-legged Myotis	Unauthorized roads & trails
Mexican Spotted Owl	Urban growth
Navajo Mexican Vole	
Northern Goshawk	
Northern Leopard Frog	
Pale Townsend's Big-eared Bat	
Rocky Mountain Elk	
Rocky Mountain Mule Deer	
Southwestern Willow Flycatcher	
Spotted Bat	
Western Small-footed Myotis	
Yuma Myotis	

103 Arizona Game and Fish Department (AGFD), Region I. 1997. Luna Lake Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 10 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	Bald Eagle	Feral animals
	Brook Trout	
	Canada Goose	
	Cutthroat Trout	
	Merriam's Elk	
	Rainbow Trout	

104 Arizona Game and Fish Department (AGFD), Region V. 1997. Manhattan Claims Property Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 9 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Collared Peccary	Habitat fragmentation/barriers
	Fringed Myotis	Rural development
	Greater Western Mastiff Bat	
	Lesser Long-nosed Bat	
	Mexican Long-tongued Bat	
	White-tailed Deer	

105 Arizona Game and Fish Department (AGFD), Region V. 1997. Wilcox Playa Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 15 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Black-crowned Night-Heron	Agricultural conversion
	Sandhill Crane	Groundwater depletion and springhead use
		Rural development
		Water use/contamination from illegal immigrants and drug smugglers

106 Arizona Game and Fish Department (AGFD), Region V. 1997. Whitewater Draw Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 28 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Bald Eagle	Agricultural conversion

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Plains Leopard Frog Groundwater depletion and springhead use
Sandhill Crane

107 Arizona Game and Fish Department (AGFD), Region I. 1996. Wenima Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 22 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	Little Colorado Spinedace	Rural development Streambank alteration/channelization

108 Arizona Game and Fish Department (AGFD), Region III. 1997. Upper Verde River Property Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 13 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	All Species	Altered river flow regimes Rural development Streambank alteration/channelization

109 Arizona Game and Fish Department (AGFD) Fisheries. 1997. Tonto Creek Hatchery Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 10 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Arizona Toad Desert Sucker Mexican Spotted Owl Northern Goshawk	Altered river flow regimes Groundwater depletion and springhead use

110 Arizona Game and Fish Department (AGFD), Region V. 1997. Three-Bar Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 8 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	All Species Collared Peccary Desert Mule Deer Gambel's Quail	Altered river flow regimes Dams/reservoirs/impoundments Dispersed camping along the border Unauthorized roads & trails Unauthorized roads & trails created by illegal immigrants and smugglers Watercraft operation

111 Arizona Game and Fish Department (AGFD), Region IV. 1997. Texas Hill Property Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 9 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Gambel's Quail Mourning Dove Rocky Mountain Mule Deer White-winged Dove	Altered river flow regimes

112 Arizona Game and Fish Department (AGFD), Region II. 1997. Sunflower Flat Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 10 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
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APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

AHN Green-winged Teal Drought
Mallard
Ring-necked Duck

113 Arizona Game and Fish Department (AGFD) Fisheries. 1997. Sterling Springs Hatchery Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 9 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	Mexican Spotted Owl	Altered river flow regimes
	Narrow-headed Gartersnake	Groundwater depletion and springhead use
	Peregrine Falcon	

114 Arizona Game and Fish Department (AGFD), Region I. 1997. Springerville Marsh Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 12 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	All Species	Contaminants from waste water and runoff

115 Arizona Game and Fish Department (AGFD), Region I. 1997. Sipes White Mountain Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 29 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	Bluehead Sucker	Drought
	Desert Mule Deer	Unnatural fire regimes
	Little Colorado Spinedace	
	Merriam's Turkey	
	Rocky Mountain Elk	
	Speckled Dace	

116 Arizona Game and Fish Department (AGFD) Fisheries. 1997. Silver Creek Hatchery Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 12 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	Little Colorado Spinedace	Altered river flow regimes Urban growth

117 Arizona Game and Fish Department (AGFD), Region I. 1997. Show Low Lake Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 8 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	All Species	Dams/reservoirs/impoundments Roads for motorized vehicles

118 Arizona Game and Fish Department (AGFD), Region VI. 1997. Santa Rosa Wash Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 7 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Black-tailed Jackrabbit	Agricultural conversion
	California Quail	
	Collared Peccary	
	Eastern Cottontail	
	Mourning Dove	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

119 Arizona Game and Fish Department (AGFD), Region II. 1997. Ryan Field Station Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 9 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	Northern Goshawk	Recreational sites/facilities
	Peregrine Falcon	

120 Arizona Game and Fish Department (AGFD), Region V. 1997. Roper Lake Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 8 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	All Species	Nuisance plants

121 Arizona Game and Fish Department (AGFD), Region VI. 1997. Roosevelt Lake Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 6 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Bald Eagle	Dams/reservoirs/impoundments
	Canada Goose	Nuisance plants
	Southwestern Willow Flycatcher	

122 Arizona Game and Fish Department (AGFD), Region VI. 1997. Robbins Butte Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 21 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Gambel's Quail	Contaminants from waste water and runoff
	Mourning Dove	Groundwater depletion and springhead use
	White-winged Dove	Nuisance plants

123 Arizona Game and Fish Department (AGFD), Region II. 1997. Raymond Ranch Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 6 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	All Species	Drought
		Grazing by ungulates
		Groundwater depletion and springhead use
		Habitat fragmentation/barriers
		Nuisance plants
		Shift to warmer climate
		Soil erosion

124 Arizona Game and Fish Department, Region I. 1997. Rainbow Lake Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 9 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	All Species	Enforcement fences along the border
		Illegal dumping/littering along the border
		Nutrients/algal blooms

125 Arizona Game and Fish Department (AGFD), Region IV. 1996. Quigley Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 26 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
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APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

SD Southwestern Willow Flycatcher Pesticides/herbicides
 Yuma Clapper Rail

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

126 Arizona Game and Fish Department (AGFD), Region V. 1997. Powers Butte Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 12 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Desert Cottontail Gambel's Quail Mourning Dove White-winged Dove	Pesticides/herbicides

127 Arizona Game and Fish Department (AGFD), Region IV. 1997. Painted Rock Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 10 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Desert Cottontail Gambel's Quail Mourning Dove White-winged Dove	Grazing by ungulates Pesticides/herbicides

128 Arizona Game and Fish Department (AGFD) Fisheries. 1997. Page Springs Hatchery Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 12 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Common Black-Hawk Desert Sucker Gila Topminnow Lowland Leopard Frog Narrow-headed Gartersnake Northern Mexican Gartersnake Page Springsnail Roundtail Chub Sonora Sucker Western Yellow-billed Cuckoo	Recreational sites/facilities

129 Arizona Game and Fish Department (AGFD), Region III. 1997. Packard Ranch/Tavasci Marsh Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 14 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Bald Eagle Colorado Pikeminnow Razorback Sucker Spikedace Willow Flycatcher	Agricultural conversion Grazing by ungulates Rural development

131 Arizona Game and Fish Department (AGFD), Region IV. 1997. Nelsson Property Management Plan. Arizona Game and Fish Department. Phoenix Arizona. 6 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	California Black Rail Mourning Dove	Drought Management of cultural/historical resources

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

White-winged Dove Motorized recreation off-trail
 Yuma Clapper Rail Water diversion/water catchments

132 Arizona Game and Fish Department (AGFD), Region IV. 1997. Mittry Lake Wildlife Area Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 37 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	American Coot	Altered river flow regimes
	American White Pelican	
	Black-crowned Night-Heron	
	Bluegill	
	California Black Rail	
	Channel Catfish	
	Common Carp	
	Common Moorhen	
	Double-crested Cormorant	
	Flathead Catfish	
	Great Blue Heron	
	Largemouth Bass	
	Northern Harrier	
	Osprey	
	Pied-billed Grebe	
	Snowy Egret	
	Sora	
	Threadfin Shad	
	Tilapia	
	Western Least Bittern	
	Yuma Clapper Rail	

133 Arizona Game and Fish Department (AGFD), Region V. 1997. May Memorial Wildlife Property Management Plan. Arizona Game and Fish Department. Tucson, Arizona. 11 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	American Badger	Grazing by ungulates Groundwater depletion and springhead use
	American Black Bear	
	Arizona Striped Whiptail	
	Black-tailed Jackrabbit	
	Bobcat	
	Chihuahuan Greater Earless Lizard	
	Chihuahuan Spotted Whiptail	
	Chiricahua Leopard Frog	
	Collared Peccary	
	Common Gray Fox	
	Coues whitetail deer	
	Coyote	
	Desert Cottontail	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Gambel's Quail
Greater Roadrunner
Huachuca Earless Lizard
Lesser Long-nosed Bat
Mexican Hog-nosed Snake
Mexican Long-tongued Bat
Mountain Lion
Mourning Dove
Northern Black-tailed Rattlesnake
Northern Green Ratsnake
Ringtail
Rocky Mountain Mule Deer
Scaled Quail
Sonoran (elegant) Earless Lizard
Speckled Earless Lizard
Western Diamond-backed Rattlesnake
Western Red Bat
Western Yellow-billed Cuckoo
White-nosed Coati

134 Arizona Game and Fish Department (AGFD) and Bureau of Land Management (BLM). 1997. East Harcuvar Mountains Interdisciplinary Management Plan. Arizona Game and Fish Department. Phoenix. 53 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Arizona Pocket Mouse	Dispersed camping
	Banded Gila Monster	Drought
	California Leaf-nosed Bat	Feral animals
	Collared Peccary	Grazing by ungulates
	Common Chuckwalla	Livestock management
	Desert Bighorn Sheep	Mining
	Desert Mule Deer	Motorized recreation off-trail
	Desert Rosy Boa	Telephone lines/cellphone towers
	Sonoran Desert Tortoise	
	Spotted Bat	
	Western Burrowing Owl	

135 Arizona Game and Fish Department (AGFD) and Bureau of Land Management (BLM). 1996. Black Mountain Ecosystem Management Plan and Environmental Assessment. US Dept of Interior, Bureau of Land Management. Kingman Resource Area, Kingman, Arizona. 150 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
MD	All Species	Dispersed camping
	Black-tailed Jackrabbit	Drought
	Bobcat	Feral animals
	Cactus Wren	Grazing by ungulates
	Common Chuckwalla	Habitat fragmentation/barriers

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Common Gray Fox	Livestock management
Coyote	Motorized recreation off-trail
Desert Bighorn Sheep	Non-motorized recreation off-trail
	Recreational sites/facilities
Desert Cottontail	Roads for motorized vehicles
Desert Mule Deer	Telephone lines/cellphone towers
Feral Ass	Unnatural fire regimes
Gambel's Quail	
Golden Eagle	
Kit Fox	
Merriam's Kangaroo Rat	
Mountain Lion	
Mourning Dove	
Northern Desert Iguana	
Prairie Falcon	
Ringtail	
Southwestern Speckled Rattlesnake	
Western White-throated Woodrat	
White-winged Dove	

136 Arizona Game and Fish Department (AGFD) Region II and Bureau of Land Management (BLM). 1994. Black Rock Habitat Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 102 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	American Peregrine Falcon	Drought
	Banded Gila Monster	Grazing by ungulates
	Black-crowned Night-Heron	Livestock management
	California Quail	Mining
	Chukar	Unnatural fire regimes
	Desert Bighorn Sheep	
	Desert Mule Deer	
	Merriam's Turkey	
	Mountain Lion	
	Sonoran Desert Tortoise	

137 Arizona Game and Fish Department (AGFD) Region IV and Bureau of Land Management (BLM). 1986. Buckskin Mountain/Cactus Plain Habitat Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 21 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	American Pronghorn	Feral animals
	American Peregrine Falcon	Grazing by ungulates
	Desert Bighorn Sheep	Livestock management
	Desert Mule Deer	Mining
	Feral Ass	Motorized recreation off-trail
	Feral Horse	Unnatural fire regimes

138 Arizona Game and Fish Department (AGFD) Region II. 1979. Clayhole Habitat

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 49 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	America Pronghorn	Drought
	Desert Cottontail	Livestock management
	Gambel's Quail	Loss of keystone species
	Rocky Mountain Mule Deer	Motorized recreation off-trail
		Nuisance plants

139 Arizona Game and Fish Department (AGFD) Region III. 1987. Hualapai Habitat Management Plan. Arizona Game and Fish Department. Kingman, Arizona. 147 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Abert's Squirrel	Altered river flow regimes
	All Species	Feral animals
	America Pronghorn	Grazing by ungulates
	American Badger	Livestock management
	American Black Bear	
	Arizona Mountain Kingsnake	
	Bald Eagle	
	Banded Gila Monster	
	Band-tailed Pigeon	
	Black-tailed Jackrabbit	
	Bobcat	
	Cactus Wren	
	Canada Goose	
	Collared Peccary	
	Common Gray Fox	
	Desert Cottontail	
	Desert Nightsnake	
	Feral Ass	
	Gambel's Quail	
	Golden Eagle	
	Hualapai Mexican Vole	
	Kit Fox	
	Longfin Dace	
	Merriam's Turkey	
	Mexican Spotted Owl	
	Mountain Lion	
	Mourning Dove	
	Prairie Falcon	
	Raccoon	
	Ringtail	
	Rocky Mountain Elk	
	Rocky Mountain Mule Deer	
	Sonoran Desert Tortoise	
	White-winged Dove	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Zone-tailed Hawk

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

140 Arizona Game and Fish Department (AGFD), Bureau of Land Management (BLM), US Fish and Wildlife Service (USFWS). 1996. Kofa National Wildlife Refuge and Wilderness and New Water Mountains Wilderness Interagency Management Plan and Environmental Assessment. US Department of Interior. Yuma, Arizona. 84 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Desert Bighorn Sheep	Dispersed camping
	Desert Mule Deer	Drought
	Feral Ass	Feral animals
	Sonoran Desert Tortoise	Livestock management
		Mining
		Motorized recreation off-trail
		Non-motorized recreation off-trail
		Nuisance plants
		Unnatural fire regimes

141 Arizona Game and Fish Department (AGFD) Region IV. 1987. Laguna-Martinez Habitat Management Plan. Arizona Game and Fish Department. Phoenix, Arizona. 50 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	All Species	Altered river flow regimes
	American Badger	Bait-bucket dumping/illegal stocking
	American Beaver	Contaminants from waste water and runoff
	American Peregrine Falcon	Feral animals
	Barn Owl	Grazing by ungulates
	Black Crappie	Groundwater depletion and springhead use
	Bluegill	Lead shot/fishing line
	Bobcat	Livestock management
	Bonytail	Motorized recreation off-trail
	Botta's Pocket Gopher	Nuisance animals
	Brown Pelican	Nuisance plants
	Channel Catfish	Watercraft operation
	Colorado Pikeminnow	
	Common Carp	
	Common Gray Fox	
	Common Muskrat	
	Coyote	
	Desert Bighorn Sheep	
	Desert Cottontail	
	Desert Mule Deer	
	Elf Owl	
	Feral Ass	
	Feral Horse	
	Ferruginous Hawk	
	Flathead Catfish	
	Flat-tailed Horned Lizard	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Gambel's Quail
Gila Topminnow
Golden Eagle
Great Horned Owl
Harris's Hawk
Hispid Cotton Rat
Kit Fox
Largemouth Bass
Least Tern
Lowland Leopard Frog
Mojave Fringe-toed Lizard
Mosquitofish
Mountain Lion
Mourning Dove
Razorback Sucker
Red-tailed Hawk
Sonoran Desert Tortoise
Striped Bass
Striped Mullet
Striped Skunk
Western Burrowing Owl
Western Yellow-billed Cuckoo
White-winged Dove
Yuma Clapper Rail

142 Arizona Game and Fish Department (AGFD) Region IV and Bureau of Land Management (BLM). 1981. Lake Havasu Habitat Management Plan. Arizona Game and Fish Department. Yuma, Arizona. 76 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Channel Catfish	Feral animals
	Desert Bighorn Sheep	Motorized recreation off-trail
	Desert Mule Deer	Nuisance plants
	Desert Pupfish	Watercraft operation
	Feral Ass	
	Feral Horse	
	Great Blue Heron	
	Largemouth Bass	
	Razorback Sucker	

143 Bureau of Land Management (BLM), Yuma Resource Area. 1995. Lechuguilla-Mohawk Habitat Management Plan. Bureau of Land Management, Yuma Resource Area. Yuma, Arizona. 42 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	California Leaf-nosed Bat	Disease/pathogens/parasites
	Collared Peccary	Dispersed camping
	Desert Bighorn Sheep	Drought

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Desert Mule Deer	Forest and woodland management -
Flat-tailed Horned Lizard	consumptive use
Gambel's Quail	Grazing by ungulates
Greater Western Mastiff Bat	Harvesting/collecting animals
Lesser Long-nosed Bat	Livestock management
Mountain Lion	Motorized recreation off-trail
Mourning Dove	
Sonoran Desert Tortoise	
Sonoran Pronghorn	
Spotted Bat	
White-winged Dove	
Yuman Desert Fringe-toed Lizard	

144 Bureau of Land Management (BLM), AGFD Region IV. 1980. Lower Gila South Habitat Management Plan. Bureau of Land Management. Yuma, Arizona. 66 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Collared Peccary	Canals/pipelines
	Desert Bighorn Sheep	Disease/pathogens/parasites
	Desert Mule Deer	Drought
	Feral Ass	Forest and woodland management -
	Gambel's Quail	consumptive use
	Giant Spotted Whiptail	Harvesting/collecting animals
	Great Plains Narrow-mouthed Toad	Mining
	Lowland Burrowing Treefrog	Roads for motorized vehicles
	Mountain Lion	Rural development
	Mourning Dove	
	Sonoran Desert Tortoise	
	Sonoran Pronghorn	
	Sonoran Whipsnake	
	White-tailed Deer	
	White-winged Dove	

145 Arizona Game and Fish Department (AGFD), Region V. 1981. Middle Gila Habitat Management Plan. Arizona Game and Fish Department. Tucson, AZ. 133 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	American Black Bear	Dams/reservoirs/impoundments
	American Peregrine Falcon	Drought
	Collared Peccary	Livestock management
	Common Black-Hawk	Mining
	Desert Mule Deer	Motorized recreation off-trail
	Desert Pupfish	Power lines/wind-harnessing turbines
	Gambel's Quail	
	Gila Topminnow	
	Golden Eagle	
	Mississippi Kite	
	Mosquitofish	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Mountain Lion
Mourning Dove
Reticulate Gila Monster
Sonoran Desert Tortoise
Western Red-tailed Skink
White-tailed Deer
White-winged Dove
Yucca Night Lizard
Zone-tailed Hawk

146 Bureau of Land Management (BLM), Arizona Strip District. 1992. Mt Trumbull Habitat Management Plan. Bureau of Land Management. Phoenix, Arizona. 71 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	American Peregrine Falcon	Disease/pathogens/parasites
	Apache Northern Goshawk	Drilling for fuels
	Feral Pig	Forest and woodland management - consumptive use
	Kaibab Squirrel	Grazing by ungulates
	Merriam's Turkey	Habitat degradation/shrub invasions
	Mexican Spotted Owl	Harvesting/collecting animals
	Northern Goshawk	Livestock management
	Rocky Mountain Mule Deer	Mining
		Motorized recreation off-trail
		Unnatural fire regimes

147 Bureau of Land Management (BLM), Tucson Field Office. 1997. Muleshoe Ecosystem Management Plan and Environmental Assessment. Bureau of Land Management. Tucson, Arizona. 184 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	American Black Bear	Altered river flow regimes
	American Peregrine Falcon	Livestock management
	Arizona Myotis	Motorized recreation off-trail
	Baird's Sparrow	Non-motorized recreation off-trail
	California Leaf-nosed Bat	Nuisance animals
	Cave Myotis	Unnatural fire regimes
	Collared Peccary	
	Common Black-Hawk	
	Desert Bighorn Sheep	
	Desert Mule Deer	
	Desert Sucker	
	Giant Spotted Whiptail	
	Gila Chub	
	Greater Western Mastiff Bat	
	Lesser Long-nosed Bat	
	Loggerhead Shrike	
	Longfin Dace	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Lowland Leopard Frog
 Mexican Long-tongued Bat
 Mexican Spotted Owl
 Mountain Lion
 Northern Gray Hawk
 Northern Mexican Gartersnake
 Pale Townsend's Big-eared Bat
 Sonora Sucker
 Sonoran Desert Tortoise
 Southwestern Willow Flycatcher
 Speckled Dace
 Spotted Bat
 Western Red Bat
 Western Yellow Bat
 Western Yellow-billed Cuckoo
 White-tailed Deer
 Yellow-nosed Cotton Rat

148 Arizona Game and Fish Department (AGFD) Region IV and Bureau of Land Management (BLM) Yuma District. Palomas Plain Habitat Management Plan - DRAFT

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	All Species	Drilling for fuels
	California Leaf-nosed Bat	Drought
	Collared Peccary	Forest and woodland management -
	Common Chuckwalla	consumptive use
	Desert Bighorn Sheep	Harvesting/collecting animals
	Desert Cottontail	Livestock management
	Desert Mule Deer	Mining
	Gambel's Quail	Motorized recreation off-trail
	Greater Western Mastiff Bat	
	Lesser Long-nosed Bat	
	Loggerhead Shrike	
	Mourning Dove	
	Pale Townsend's Big-eared Bat	
	Sonoran Desert Tortoise	
	Sonoran Pronghorn	
	Spotted Bat	
	White-winged Dove	
	Yuma Myotis	

158 Arizona Game and Fish Department (AGFD), Region III and Bureau of Land Management (BLM) AZ Strip District. 1982. Parashaunt Habitat Management Plan. Bureau of Land Management. Kingman, AZ. 155 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	American Black Bear	Drilling for fuels
	Apache Northern Goshawk	Drought

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Banded Gila Monster	Feral animals
Band-tailed Pigeon	Forest and woodland management - consumptive use
Bobcat	Grazing by ungulates
Chukar	Groundwater depletion and springhead use
Common Gray Fox	Habitat degradation/shrub invasions
Desert Bighorn Sheep	Livestock management
Desert Cottontail	Mining
Feral Ass	Motorized recreation off-trail
Gambel's Quail	Unnatural fire regimes
Kaibab Squirrel	
Merriam's Turkey	
Mountain Lion	
Northern Goshawk	
Rocky Mountain Mule Deer	
Sonoran Desert Tortoise	

159 US Fish and Wildlife Service. 1991. Hualapai Mexican Vole Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 28 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Hualapai Mexican Vole	Drought
CP		Groundwater depletion and springhead use
		Livestock management
		Mining
		Nuisance animals
		Recreational sites/facilities
		Roads for motorized vehicles
		Unnatural fire regimes

160 US Fish and Wildlife Service (USFWS). 1993. Mount Graham Red Squirrel Recovery Plan. US Fish and Wildlife Service, Arizona Ecological Services State Office. Phoenix, Arizona. 172 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Mt Graham Red Squirrel	Forest and woodland management - consumptive use
		Forest and woodland management - habitat conversion
		Habitat fragmentation/barriers
		Harvesting/collecting plants
		Recreational sites/facilities
		Roads for motorized vehicles
		Rural development
		Urban growth

161 US Fish and Wildlife Service (USFWS). 1995. Lesser Long-nosed Bat Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 45 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Lesser Long-nosed Bat	Dispersed camping along the border

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

SD		Enforcement activities along the border Livestock management Non-motorized recreation off-trail Rural development Scientific research and collection Small/localized or highly concentrated population(s) Unauthorized roads & trails created by illegal immigrants and smugglers Unknown Urban growth
162 US Fish and Wildlife Service (USFWS). 1998. Final Revised Sonoran Pronghorn Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 70 pp.		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Sonoran Pronghorn	Drought Habitat fragmentation/barriers Rural development Urban growth
163 Van Pelt, WE. 1999. The Black-tailed Prairie Dog Conservation Assessment and Strategy. Arizona Game and Fish Department. Phoenix, Arizona. 55 pp.		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Black-tailed Prairie Dog	Agricultural conversion Disease/pathogens/parasites Feral animals Habitat degradation/shrub invasions Habitat fragmentation/barriers Off-range recreational shooting Urban growth
164 US Fish and Wildlife Service (USFWS). 1998. Biological Opinion on the effects of construction and operation of various facilities in Kearny, Arizona on Southwestern Willow Flycatchers. US Fish and Wildlife Service. Albuquerque, New Mexico. 37 pp.		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Southwestern Willow Flycatcher	Air traffic corridors/overflights Contaminants from waste water and runoff Recreational sites/facilities Streambank alteration/channelization Urban growth Water diversion/water catchments
165 US Fish and Wildlife Service (USFWS). 2002. Southwestern Willow Flycatcher Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 210 pp.		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Southwestern Willow Flycatcher	Agricultural conversion
SD		Altered river flow regimes Dams/reservoirs/impoundments

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Disease/pathogens/parasites
Drought
Feral animals
Groundwater depletion and springhead use
Habitat degradation/shrub invasions
Habitat fragmentation/barriers
Harvesting/collecting animals
Livestock management
Nuisance animals
Nuisance plants
Pesticides/herbicides
Recreational sites/facilities
Roads for motorized vehicles
Rural development
Scientific research and collection
Streambank alteration/channelization
Trails for foot, bike, or equine use
Unnatural fire regimes
Urban growth
Watercraft operation

166 Good, RE, RM Nielson, HH Sawyer, and LL McDonald. Population level survey of golden eagles in the western United States - DRAFT

Ecoregions Species

AHN Golden Eagle
CP
SD

Stressors

Habitat degradation/shrub invasions
Loss of keystone species
Nuisance plants
Unnatural fire regimes
Urban growth

167 Keddy-Hector, DP. 1990. Northern Aplomado Falcon Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 56 pp.

Ecoregions Species

AHS Northern Aplomado Falcon

Stressors

Agricultural conversion
Contaminants from waste water and runoff
Habitat degradation/shrub invasions
Livestock management
Pesticides/herbicides
Streambank alteration/channelization
Unnatural fire regimes
Urban growth

168 Klute, DS, LW Ayers, MT Greene, WH Howe, SL Jones, JA Shaffer, SR Sheffield, and TS Zimmerman. 2003. Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States. US Department of Interior, Fish and Wildlife Service. Washington, DC. 108 pp.

Ecoregions Species

Stressors

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

AHS	Western Burrowing Owl	Agricultural conversion
CP		Habitat fragmentation/barriers
SD		Harvesting/collecting animals
		Loss of keystone species
		Pesticides/herbicides
		Rural development
		Urban growth

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

169 Latta, MJ, CJ Beardmore and TE Corman. 1999. Arizona Partners in Flight Bird Conservation Plan. Version 1.0. Arizona Game and Fish Department. Phoenix, Arizona. 331 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	American Bittern	Altered river flow regimes
AHS	American Three-toed Woodpecker	Dams/reservoirs/impoundments
AZNM	Apache Northern Goshawk	Drought
CP	Arizona Grasshopper Sparrow	Forest and woodland management -
MD	Azure Bluebird	consumptive use
SD	Baird's Sparrow	Forest and woodland management - habitat
	Band-tailed Pigeon	conversion
	Black-throated Gray Warbler	Grazing by ungulates
	Botteri's Sparrow	Groundwater depletion and springhead use
	Brewer's Sparrow	Livestock management
	Cactus Ferruginous Pygmy-Owl	Motorized recreation off-trail
	California Black Rail	Recreational sites/facilities
	Cassin's Sparrow	Rural development
	Common Black-Hawk	Streambank alteration/channelization
	Cordilleran Flycatcher	Trails for foot, bike, or equine use
	Costa's Hummingbird	Unnatural fire regimes
	Desert Purple Martin	Urban growth
	Elegant Trogon	
	Ferruginous Hawk	
	Gilded Flicker	
	Golden-crowned Kinglet	
	Gray Flycatcher	
	Gray Vireo	
	Juniper Titmouse	
	Le Conte's Thrasher	
	Lucy's Warbler	
	MacGillivray's Warbler	
	Mexican Spotted Owl	
	Montezuma Quail	
	Northern Aplomado Falcon	
	Northern Buff-breasted Flycatcher	
	Northern Goshawk	
	Olive-sided Flycatcher	
	Pine Grosbeak	
	Pinyon Jay	
	Red-faced Warbler	
	Red-naped Sapsucker	
	Rufous-winged Sparrow	
	Rufous-winged Sparrow	
	Sage Sparrow	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Sage Thrasher
Southwestern Willow Flycatcher
Swainson's Hawk
Swainson's Thrush
Western Burrowing Owl
Western Purple Martin
Western Yellow-billed Cuckoo
Yuma Clapper Rail

170 US Fish and Wildlife Service (USFWS). 1996. California Condor Recovery Plan. US Fish and Wildlife Service. Portland, Oregon. 62 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	California Condor	Harvesting/collecting animals Lead shot/fishing line Pesticides/herbicides Power lines/wind-harnessing turbines

171 Johnson, TB and BA Garrison. 1996. California Condor Reintroduction Proposal for the Vermilion Cliffs, northern Arizona. Arizona Game and Fish Department. Phoenix, Arizona. 102 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	California Condor	Harvesting/collecting animals Pesticides/herbicides Power lines/wind-harnessing turbines

172 Arizona Condor Review Team. 2002. A review of the first five years of the California condor reintroduction program in northern Arizona. US Fish and Wildlife Service. Sacramento, California. 62 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	California Condor	Contaminants from waste water and runoff Disease/pathogens/parasites Harvesting/collecting animals Lead shot/fishing line

201 Lead Exposure Reduction Steering Committee. 2003. A report from the California Condor Lead Exposure Reduction Steering Committee. California Condor Lead Exposure Reduction Steering Committee. 17 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	California Condor	Lead shot/fishing line

203 US Fish and Wildlife Service (USFWS). 2002. Southwestern Willow Flycatcher Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 210 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Southwestern Willow Flycatcher	Disease/pathogens/parasites
SD		Groundwater depletion and springhead use Urban growth

204 US Fish and Wildlife Service (USFWS). 1995. Recovery plan for the Mexican spotted owl. US Fish and Wildlife Service. Albuquerque, New Mexico. 164 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
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APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

AHN	Mexican Spotted Owl	Forest and woodland management -
AHS		consumptive use
AZNM		Grazing by ungulates
CP		Habitat degradation/shrub invasions
SD		Unnatural fire regimes
205 US Fish and Wildlife Service (USFWS). Cactus ferruginous pygmy-owl (<i>Glaucidium brasilianum cactorum</i>) Draft Recovery Plan - DRAFT		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Cactus Ferruginous Pygmy-Owl	Disease/pathogens/parasites
SD		Drought
		Forest and woodland management -
		consumptive use
		Habitat degradation/shrub invasions
		Unnatural fire regimes
		Urban growth
206 US Fish and Wildlife Service (USFWS) and Rocky Mt/Southwestern Peregrine Falcon Recovery Team. 1984. American peregrine falcon, Rocky Mountain and Southwest populations, Recovery Plan. US Fish and Wildlife Service & Rocky Mountain/Southwest Peregrine Falcon Recovery Team. Washington, DC. 105 pp.		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Peregrine Falcon	Contaminants from waste water and runoff
AHS		Drought
AZNM		Forest and woodland management -
CP		consumptive use
MD		Habitat fragmentation/barriers
SD		Unnatural fire regimes
207 US Forest Service (USFS). 1991. Management guidelines for the northern goshawk in the Southwestern Region. US Forest Service. 8 pp.		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Apache Northern Goshawk	Drought
AHS	Northern Goshawk	Forest and woodland management -
AZNM		consumptive use
CP		Grazing by ungulates
		Unnatural fire regimes
208 US Fish and Wildlife Service (USFWS). 2004. Final revised environmental assessment, management plan, and implementation guidance: Take of nestling American peregrine falcons in the contiguous United States and Alaska for use in falconry. US Fish and Wildlife Service. 68 pp.		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Peregrine Falcon	Harvesting/collecting animals
AHS		
AZNM		
MD		
MD		

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

SD

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

209 US Fish and Wildlife Service (USFWS). 2003. Monitoring Plan for the American peregrine falcon, a species recovered under the Endangered Species Act. US Fish and Wildlife Service. Portland, Oregon. 53 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Peregrine Falcon	Contaminants from waste water and runoff
AHS		
AZNM		
CP		
MD		
SD		

210 US Fish and Wildlife Service (USFWS). 1983. Yuma Clapper Rail Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 51 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Yuma Clapper Rail	Habitat degradation/shrub invasions Loss of keystone species

211 Driscoll, JT. Conservation assessment and strategy for the bald eagle in Arizona - DRAFT

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Bald Eagle	Altered river flow regimes
AHS		Contaminants from waste water and runoff
AZNM		Dams/reservoirs/impoundments
SD		Disease/pathogens/parasites Dispersed camping Drought Grazing by ungulates Groundwater depletion and springhead use Habitat degradation/shrub invasions Heavy metals/mine tailings Insect Infestation Lead shot/fishing line Livestock management Loss of keystone species Management for game animals and sport fish Motorized recreation off-trail Non-motorized recreation off-trail Off-range recreational shooting Pesticides/herbicides Power lines/wind-harnessing turbines Recreational sites/facilities Rural development Sediment/ash flows Streambank alteration/channelization Trails for foot, bike, or equine use Unnatural fire regimes

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

- Urban growth
Water diversion/water catchments
Watercraft operation
- 212 US Fish and Wildlife Service (USFWS) and US Forest Service (USFS). Potential Conservation Strategy for the Three Forks springsnail (*Pyrgulopsis trivialis*) - DRAFT**
- | <u>Ecoregions</u> | <u>Species</u> | <u>Stressors</u> |
|-------------------|-------------------------|---|
| AZNM | Three Forks Springsnail | Bait-bucket dumping/illegal stocking
Dispersed camping
Grazing by ungulates
Nuisance animals |
- 213 Malcom, JW, WR Radke, BK Lang. 2003. San Bernardino springsnail (*Pyrgulopsis bernardina*) population ecology and habitat needs. Arizona Game and Fish Department. Phoenix, Arizona. 21 pp.**
- | <u>Ecoregions</u> | <u>Species</u> | <u>Stressors</u> |
|-------------------|----------------------------|---|
| AHS | San Bernardino Springsnail | Contaminants from waste water and runoff
Drought
Groundwater depletion and springhead use
Livestock management |
- 214 Arizona Game and Fish Department. DRAFT Candidate Conservation Agreement with Assurances for the Page Springsnail (*Pyrgulopsis morrisoni*) - DRAFT**
- | <u>Ecoregions</u> | <u>Species</u> | <u>Stressors</u> |
|-------------------|------------------|--|
| AHN | Page Springsnail | Drought
Groundwater depletion and springhead use
Habitat degradation/shrub invasions
Habitat fragmentation/barriers
Harvesting/collecting animals
Livestock management
Nuisance animals
Nuisance plants |
- 215 Hurt, C and P Hedrick. 2004. Genetic variation in Arizona springsnails. Arizona Game and Fish Department. Phoenix, Arizona. 33 pp.**
- | <u>Ecoregions</u> | <u>Species</u> | <u>Stressors</u> |
|-------------------|----------------------------|--|
| AHN | Brown Springsnail | Contaminants from waste water and runoff |
| AHS | Bylas Springsnail | Drought |
| AZNM | Desert Springsnail | Grazing by ungulates |
| CP | Fossil Springsnail | Groundwater depletion and springhead use |
| MD | Grand Wash Springsnail | Livestock management |
| | Huachuca Springsnail | |
| | Kingman Springsnail | |
| | Montezuma Well Springsnail | |
| | Page Springsnail | |
| | San Bernardino Springsnail | |
| | Three Forks Springsnail | |
| | Verde Rim Springsnail | |

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

216 Woods, LJ, J MacAller, JL Smeltzer, RC Averill-Murray, P Rosen, C Schwalbe, T Hare, and contributors. Habitat management guidelines for amphibians and reptiles of the arid southwest - DRAFT

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Arizona (Sonoran) Coralsnake	Contaminants from waste water and runoff
AHS	Arizona Alligator Lizard	Groundwater depletion and springhead use
AZNM	Arizona Black Rattlesnake	Habitat degradation/shrub invasions
CP	Arizona Glossy Snake	Habitat fragmentation/barriers
MD	Arizona Mountain Kingsnake	Nuisance animals
SD	Arizona Mud Turtle	Nuisance plants
	Arizona Night Lizard	Roads for motorized vehicles
	Arizona Ridge-nosed Rattlesnake	Trails for foot, bike, or equine use
	Arizona Skink	Unnatural fire regimes
	Arizona Striped Whiptail	
	Arizona Tiger Salamander	
	Arizona Toad	
	Banded Gila Monster	
	Banded Rock Rattlesnake	
	Bezy's Night Lizard	
	Big Bend Patch-nosed Snake	
	Brown Vinesnake	
	California Kingsnake	
	Canyon Treefrog	
	Chihuahuan Black-headed Snake	
	Chihuahuan Greater Earless Lizard	
	Chihuahuan Hook-nosed Snake	
	Chihuahuan Spotted Whiptail	
	Chiricahua Leopard Frog	
	Clark's Spiny Lizard	
	Colorado Desert Shovel-nosed Snake	
	Colorado Desert Sidewinder	
	Common Chuckwalla	
	Common Side-blotched Lizard	
	Couch's Spadefoot	
	Desert Banded Gecko	
	Desert Box Turtle	
	Desert Glossy Snake	
	Desert Grassland Whiptail	
	Desert Horned Lizard	
	Desert Kingsnake	
	Desert Massasauga	
	Desert Nightsnake	
	Desert Pacific Treefrog	
	Desert Patch-nosed Snake	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Desert Rosy Boa
Desert Spiny Lizard
Desert Striped Whipsnake
Desert Threadsnake
Eastern Collared Lizard
Eastern Patch-nosed Snake
Flat-tailed Horned Lizard
Giant Spotted Whiptail
Gila Spotted Whiptail
Grand Canyon Rattlesnake
Great Basin (Western) Skink
Great Basin Collared Lizard
Great Basin Gophersnake
Great Basin Rattlesnake
Great Basin Spadefoot
Great Plains Narrow-mouthed Toad
Great Plains Skink
Great Plains Toad
Green Prairie Rattlesnake
Hernandez's (Greater) Short-horned
Lizard
Hopi Rattlesnake
Huachuca Earless Lizard
Lined Coachwhip
Long-nosed Leopard Lizard
Long-tailed Brush Lizard
Lowland Burrowing Treefrog
Lowland Leopard Frog
Marcy's Checkered Gartersnake
Mesa Verde Nightsnake
Mexican Hog-nosed Snake
Mexican Rosy Boa
Mexican Spadefoot
Midget Faded Rattlesnake
Mohave Desert Tortoise
Mojave Desert Sidewinder
Mojave Fringe-toed Lizard
Mojave Patch-nosed Snake
Mojave Shovel-nosed Snake
Mountain Skink
Mountain Treefrog
Narrow-headed Gartersnake
New Mexico Milksnake
New Mexico Ridge-nosed Rattlesnake

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

New Mexico Threadsnake
New Mexico Whiptail
Northern Black-tailed Rattlesnake
Northern Desert Iguana
Northern Green Ratsnake
Northern Leopard Frog
Northern Mexican Gartersnake
Northern Mohave Rattlesnake
Northern Sagebrush Lizard
Organ Pipe Shovel-nosed Snake
Ornate Tree Lizard
Pai Striped Whiptail
Plains Black-headed Snake
Plains Leopard Frog
Plains Spadefoot
Plateau Lizard
Plateau Striped Whiptail
Prairie Lizard
Ramsey Canyon Leopard Frog
Red Racer
Red-back Whiptail
Red-spotted Toad
Regal Horned Lizard
Regal Ring-necked Snake
Relict Leopard Frog
Reticulate Gila Monster
Rocky Mountain Toad
Round-tailed Horned Lizard
Saddled Leaf-nosed Snake
Slevin's Bunchgrass Lizard
Smith's Black-headed Snake
Snapping Turtle
Sonora Mud Turtle
Sonoran (elegant) Earless Lizard
Sonoran Coachwhip
Sonoran Collared Lizard
Sonoran Desert Toad
Sonoran Desert Tortoise
Sonoran Gophersnake
Sonoran Green Toad
Sonoran Nightsnake
Sonoran Sidewinder
Sonoran Spotted Whiptail
Sonoran Tiger Salamander

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Sonoran Whipsnake
Sonoyta Mud Turtle
Southwestern Speckled Rattlesnake
Southwestern Threadsnae
Southwestern Woodhouse's Toad
Speckled Earless Lizard
Spotted Leaf-nosed Snake
Striped Plateau Lizard
Tarahumara Frog
Texas Horned Lizard
Thornscrub Hook-nosed Snake
Tiger Rattlesnake
Tiger Whiptail
Trans-Pecos Threadsnae
Tucson Banded Gecko
Tucson Shovel-nosed Snake
Utah Banded Gecko
Utah Milksnake
Utah Mountain Kingsnake
Utah Threadsnae
Variable Groundsnake
Variable Sandsnake
Variable Skink
Wandering Gartersnake
Western Barking Frog
Western Black Kingsnake
Western Black-necked Gartersnake
Western Chorus Frog
Western Diamond-backed Rattlesnake
Western Green Toad
Western Long-nosed Snake
Western Lyresnake
Western Painted Turtle
Western Red-tailed Skink
Western Twin-spotted Rattlesnake
Western Yellow-bellied Racer
Yaqui Black-headed Snake
Yarrow's Spiny Lizard
Yellow Mud Turtle
Yucca Night Lizard
Yuman Desert Fringe-toed Lizard
Zebra-tailed Lizard

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Chiricahua Leopard Frog	Contaminants from waste water and runoff Disease/pathogens/parasites Drought Groundwater depletion and springhead use Livestock management Mining Nuisance animals Recreational sites/facilities Shift to warmer climate Unnatural fire regimes Urban growth Water diversion/water catchments
218 Relict Leopard Frog Conservation Team. Conservation Agreement and Rangewide Conservation Assessment and Strategy for the Relict Leopard Frog (<i>Rana onca</i>) - DRAFT		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
MD	Relict Leopard Frog	Agricultural conversion Disease/pathogens/parasites Habitat degradation/shrub invasions Hybridization Livestock management Nuisance animals Roads for motorized vehicles Unnatural fire regimes
219 Ramsey Canyon Leopard Frog Conservation Team. Ramsey Canyon Leopard Frog Conservation Assessment and Strategy - DRAFT		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Ramsey Canyon Leopard Frog	Agricultural conversion Disease/pathogens/parasites Grazing by ungulates Groundwater depletion and springhead use Habitat fragmentation/barriers Harvesting/collecting animals Hybridization Mining Nuisance animals Roads for motorized vehicles Trails for foot, bike, or equine use Unnatural fire regimes
222 Arizona Game and Fish Department (AGFD) and US Fish and Wildlife Service (USFWS). Draft Safe Harbor Agreement for the Chiricahua Leopard Frog in Arizona - DRAFT		
<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Chiricahua Leopard Frog	Contaminants from waste water and runoff

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Disease/pathogens/parasites
Groundwater depletion and springhead use
Habitat fragmentation/barriers
Nuisance animals

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

223 Arizona Game and Fish Department (AGFD). Draft Statewide ranid frog management plan. - DRAFT

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	American Bullfrog	Disease/pathogens/parasites
AHS	Chiricahua Leopard Frog	Habitat degradation/shrub invasions
AZNM	Lowland Leopard Frog	Nuisance animals
CP	Northern Leopard Frog	
MD	Plains Leopard Frog	
SD	Ramsey Canyon Leopard Frog	
	Relict Leopard Frog	
	Rio Grande Leopard Frog	
	Tarahumara Frog	

230 Arizona Trout Recovery Team. 1983. Arizona Trout (Apache Trout) Recovery Plan. US Fish and Wildlife Service (USFWS). Albuquerque, New Mexico. 25 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Apache (Arizona) Trout	Altered river flow regimes
AZNM		Drought
		Forest and woodland management - consumptive use
		Heavy metals/mine tailings
		Hybridization
		Livestock management
		Management for game animals and sport fish
		Recreational sites/facilities
		Roads for motorized vehicles
		Unnatural fire regimes

231 Utah Department of Natural Resources, Division of Wildlife Resources. 2004. Range-wide Conservation Agreement for Roundtail Chub *Gila robusta*, Bluehead Sucker *Catostomus discobolus*, and Flannelmouth Sucker *Catostomus latipinnis*. Colorado River Fish and Wildlife Council. Salt Lake City, Utah. 14 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Bluehead Sucker	Nuisance animals
AZNM	Flannelmouth Sucker	
CP	Roundtail Chub	
MD		
SD		

234 Field, K.J, M.J. Sredl, R.C. Averill-Murray and T.B. Johnson. 2004. A Proposal to Re-establish Tarahumara Frogs (*Rana tarahumarae*) into Big Casa Blanca Canyon, Arizona. Arizona Game and Fish Department. Phoenix, Arizona. 67 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Tarahumara Frog	Altered river flow regimes
		Bait-bucket dumping/illegal stocking
		Disease/pathogens/parasites
		Drought

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Management for game animals and sport fish
 Nuisance animals

235 Arizona Game and Fish Department. DRAFT Safe Harbor Agreement for topminnow and pupfish in Arizona - DRAFT

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Desert Pupfish	Bait-bucket dumping/illegal stocking
AHS	Gila Topminnow	Grazing by ungulates
SD	Quitobaquito Pupfish	Groundwater depletion and springhead use
	Yaqui Topminnow	Management for game animals and sport fish

237 The Nature Conservancy, Arizona Chapter and Arizona Ecological Services Office, US Fish and Wildlife Service. 2005. Safe Harbor Agreement for Gila topminnow and desert pupfish on lands owned by The Nature Conservancy within the Aravaipa Creek watershed. US Fish and Wildlife Service. Phoenix, Arizona. 36 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
SD	Desert Pupfish	Livestock management
	Gila Topminnow	Nuisance animals

238 Arizona Game and Fish Department (AGFD). Statewide Small Mammal Conservation Plan - DRAFT

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN		Agricultural conversion
AHS	A Chisel-toothed Kangaroo Rat	Drilling for fuels
AZNM	Antelope Jackrabbit	Forest and woodland management -
	Apache Pocket Mouse	consumptive use
CP		
MD	Apache Pocket Mouse	Grazing by ungulates
SD	Arizona Cotton Rat	Habitat fragmentation/barriers
	Arizona Montane Vole	Rural development
	Arizona Pocket Mouse	Urban growth
	Arizona Shrew	
	Bailey's Pocket Mouse	
	Banner-tailed Kangaroo Rat	
	Black-footed Ferret	
	Black-tailed Jackrabbit	
	Black-tailed Prairie Dog	
	Botta's Pocket Gopher	
	Brush Mouse	
	Bushy-tailed Woodrat	
	Cactus Mouse	
	Camp Verde Arizona Cotton Rat	
	Canyon Mouse	
	Cliff Chipmunk	
	Cockrum's Desert Shrew	
	Colorado Chipmunk	
	Colorado River Cotton Rat	

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Crawford's Desert Shrew
Deer Mouse
Desert Kangaroo Rat
Desert Woodrat
Dusky Shrew
Dwarf Shrew
Fulvous Harvest Mouse
Golden-mantled Ground Squirrel
Gray-collared Chipmunk
Great Basin Pocket Mouse
Gunnison's Prairie Dog
Harquahala Southern Pocket Gopher
Harris' Antelope Squirrel
Hispid Cotton Rat
Hispid Pocket Mouse
Houserock Valley Chisel-toothed
Kangaroo Rat
Hualapai Mexican Vole
Least Chipmunk
Little Pocket Mouse
Long-tailed Pocket Mouse
Long-tailed Vole
Mearns' Southern Pocket Gopher
Merriam's Kangaroo Rat
Merriam's Shrew
Mexican Opposum
Mexican Woodrat
Mexican Woodrat
Mogollon Vole
Mt Graham Red Squirrel
Navajo Mexican Vole
New Mexican Jumping Mouse
New Mexico Banner-tailed Kangaroo
Rat
Northern Grasshopper Mouse
Northern Pocket Gopher
Northern Pygmy Mouse
Ord's Kangaroo Rat
Plains Harvest Mouse
Pocket Gopher
Prospect Valley White-tailed Antelope
Squirrel
Rock Mouse
Rock Pocket Mouse

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Rock Squirrel
 Round-tailed Ground Squirrel
 Silky Pocket Mouse
 Sonoran Desert Pocket Mouse
 Southern Grasshopper Mouse
 Southern Pocket Gopher
 Southern Red-backed Vole
 Spotted Ground Squirrel
 Springerville Pocket Mouse
 Stephen's Woodrat
 Tawny-bellied Cotton Rat
 Thirteen-lined Ground Squirrel
 Uinta Chipmunk
 Virginia Opossum
 Water Shrew
 Western Harvest Mouse
 Western Harvest Mouse
 Western White-throated Woodrat
 White-bellied Long-tailed Vole
 White-footed Mouse
 White-nosed Coati
 White-tailed Antelope Squirrel
 Wupatki Arizona Pocket Mouse
 Yavapai Arizona Cotton Rat
 Yellow-nosed Cotton Rat
 Yuma Hispid Cotton Rat

239 Cantrell, C and T Hedricks. DRAFT Arizona Statewide Conservation Agreement for roundtail chub, headwater chub, flannelmouth sucker, Little Colorado River sucker, bluehead sucker, and Zuni bluehead sucker - DRAFT

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Bluehead Sucker	Altered river flow regimes
AHS	Flannelmouth Sucker	Dams/reservoirs/impoundments
AZNM	Headwater Chub	Disease/pathogens/parasites
CP	Little Colorado Sucker	Grazing by ungulates
MD	Roundtail Chub	Groundwater depletion and springhead use
SD	Zuni Bluehead Sucker	Habitat fragmentation/barriers

240 Arizona Game and Fish Department (AGFD),US Fish and Wildlife Service (USFWS), and Bureau of Land Management. State Conservation Agreement and Strategy for the Sonoran Desert Tortoise - DRAFT

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
MD	Sonoran Desert Tortoise	Canals/pipelines
SD		Disease/pathogens/parasites
		Drought
		Feral animals

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

Grazing by ungulates
Harvesting/collecting animals
Heavy metals/mine tailings
Mining
Motorized recreation off-trail
Nuisance plants
Poaching along the border
Roads for motorized vehicles
Unauthorized roads & trails
Unauthorized roads & trails created by illegal
immigrants and smugglers
Unnatural fire regimes
Urban growth

241 Arizona Game and Fish Department (AGFD), US Fish and Wildlife Service (USFWS), and National Park Service. Quitobaquito/ Rio Sonoyta Conservation Agreement and Strategy - DRAFT

Ecoregions Species

SD Quitobaquito Pupfish
Quitobaquito Tryonia
Sonoyta Mud Turtle

Stressors

Agricultural conversion
Altered river flow regimes
Drought
Grazing by ungulates
Groundwater depletion and springhead use
Livestock management
Nuisance animals
Nuisance plants
Urban growth

246 U.S. Fish and Wildlife Service. 1990. Bonytail Chub Recovery Plan. US Fish and Wildlife Service. Denver, Colorado. 35 pp.

Ecoregions Species

CP Bonytail
MD
SD

Stressors

Altered river flow regimes
Dams/reservoirs/impoundments
Nuisance animals

247 Utah Department of Natural Resources, Division of Wildlife Resources. 1995. Conservation Agreement and Strategy for Virgin Spinedace (*Lepidomeda mollispinis mollispinis*). US Fish and Wildlife Service. Denver, Colorado. 44 pp.

Ecoregions Species

MD Virgin Spinedace

Stressors

Dams/reservoirs/impoundments
Recreational sites/facilities

248 US Fish and Wildlife Service. 1990. Humpback Chub Recovery Plan. US Fish and Wildlife Service. Denver, Colorado. 43 pp.

Ecoregions Species

CP Humpback Chub
MD
SD

Stressors

Altered river flow regimes
Dams/reservoirs/impoundments
Nuisance animals

APPENDIX P. CONSERVATION AND PLANNING DOCUMENTS (CONTINUED)

249 US Fish and Wildlife Service. 1983. Gila and Yaqui Topminnow Recovery Plan. US Fish and Wildlife Service. Albuquerque, New Mexico. 56 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Gila Topminnow	Groundwater depletion and springhead use
AHS	Yaqui Topminnow	Nuisance animals
SD		

250 US Fish and Wildlife Service. 1990. Colorado Squawfish Recovery Plan. US Fish and Wildlife Service. Denver, Colorado. 56 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHS	Colorado Pikeminnow	Altered river flow regimes
CP		Dams/reservoirs/impoundments
MD		Habitat fragmentation/barriers
SD		Nuisance animals

251 US Fish and Wildlife Service. 1998. Razorback sucker (*Xyrauchen texanus*) Recovery Plan. US Fish and Wildlife Service. Denver, Colorado. 81 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
CP	Razorback Sucker	Altered river flow regimes
MD		Contaminants from waste water and runoff
SD		Dams/reservoirs/impoundments
		Nuisance animals

252 US Fish and Wildlife Service. 2003. Safe Harbor Agreement with James W. Crosswhite for voluntary enhancement and restoration activities benefitting the Southwestern Willow Flycatcher and Little Colorado Spinedace in Nutrioso Creek, Arizona. US Fish and Wildlife Service. Phoenix, Arizona. 17 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AZNM	Little Colorado Spinedace	Grazing by ungulates
	Southwestern Willow Flycatcher	

253 O'Neill, DM. 2006. White-tailed prairie dog and Gunnison's prairie dog conservation strategy. Western Association of Fish and Wildlife Agencies. Laramie, Wyoming. 21 pp.

<u>Ecoregions</u>	<u>Species</u>	<u>Stressors</u>
AHN	Gunnison's Prairie Dog	Agricultural conversion
AZNM		Disease/pathogens/parasites
CP		Drought
		Grazing by ungulates
		Habitat degradation/shrub invasions