

**ARIZONA'S
COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY:
PROCESSES (COMPANION DOCUMENT A)**



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ARIZONA’S COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY: PROCESSES (COMPANION DOCUMENT A)

Arizona Game and Fish Department

INTRODUCTION

The Arizona Game and Fish Commission (Commission) and Department (Department) serve the people of Arizona as steward 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.

As a funding requirement of the State Wildlife Grants (SWG) 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 efforts are being collaborated through the Teaming With Wildlife (TWW) Committee and the International Association of Fish and Wildlife Agencies at a national and regional level. To remain eligible for SWG funding, State strategies need to be submitted to the National Advisory Acceptance Team by October 1, 2005, for evaluation and approval.

This companion document covers the processes used to develop Arizona’s CWCS: Department infrastructure, coordination with external partners, outreach and soliciting public involvement, the multi-scale approach for landscape classification, evaluating threats to wildlife and natural habitats, identifying species of priority conservation, identifying landscapes of greatest conservation need, development of the CWCS database, identifying and prioritizing conservation strategies and actions/opportunities, information needs, monitoring and adaptive management concepts.

DEPARTMENT CWCS INFRASTRUCTURE AND COORDINATION

This section describes the various workgroups, teams, and stakeholder meetings that were used to help 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 on a monthly basis to provide direction and vision on development of CWCS (March 2004 through March 2005).

Specific tasks for this committee:

- Identify potential partners and interested parties (Appendix A);

- 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 conservation priority, 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; typically a Habitat or Wildlife Program Manager or Nongame Specialist), 5 Nongame Program Managers (representing taxonomic groups for native birds, mammals, reptiles/amphibians, fish, and invertebrates) 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 B.

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 conservation priority;
- 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 Review Team: A group of external, recognized experts (university academics, agency professionals, independent scientists, and non-governmental organization specialists) assisted the Department in 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. Participation in this team was voluntary. Individuals on the team were involved in the CWCS review process in April and May 2005 (Appendix C).

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 A). 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 landscape 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 A. 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.											

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.

The Department will use its existing annual performance reports for Federal Aid projects and SWG funds to document progress on CWCS-related activities. Currently, Program Managers within the Department’s various work units are responsible for documenting project activities in the Field Operations Division’s activity reporting database (Appendix D). This database is being refined and is undergoing testing in 2005 for reporting activities under Federal Aid projects. Eventually, this database will be linked to the CWCS database (Appendix E) where all CWCS related activities will be tracked. Fund administrators and Project Leaders (that is, work unit chiefs and managers) can use database queries to develop annual reports on project results and activities relating to CWCS strategies.

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. For the CWCS development, 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 B lists external partners in both the Ecoregion Workgroup and with Wildlife Summits that helped assist in developing Arizona’s CWCS.

Table B. Department partners and interested parties that assisted in developing the CWCS (with the Ecoregion Workgroup or Wildlife Summits). Agency acronyms are included.			
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

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. These agreements are tracked by the Department’s Funds/Planning section and are linked to the CWCS Database (Appendix E) for use in evaluating stressors, priority species, conservation actions and partners within each ecoregion.

SOLICITING BROAD PUBLIC PARTICIPATION IN DEVELOPING 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—2 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 (or statutory roles); 2) identify and rank important stressors/threats affecting wildlife and natural habitats statewide; and 3) identify and rank important criteria for determining species of conservation priority. 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 the Idea Sciences website, 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 surveys (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 2004a).
- 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 A) 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. Over  CWCS-related comments were received from the Department’s CWCS webpage between July 2004 and May 2005.

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.  constituents and members of the general public participated in these meetings, and provided ~~XX~~ comments.

All relevant comments received were considered in developing Arizona's CWCS. Department managers and the Commission reviewed all CWCS-related comments during the development phase of the CWCS in late 2004 and early 2005.

MULTI-SCALE APPROACH

DEVELOPING ARIZONA'S CWCS BASED ON A LANDSCAPE FORMAT

One traditional focus of conservation efforts has been on protecting populations of rare, threatened, or endangered species (White and others 1997). 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 cost and effort involved in rescuing a few species can quickly grow out of proportion to the contribution of those species to overall biodiversity and may not be the most efficient or effective use of limited resources. In addition, this approach does nothing to assure the continuing well-being of other, more common species which are also under Department stewardship.

Conservation of areas with high biodiversity better addresses the needs of many species by conserving the underlying resources upon which they depend. The Department 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 very diverse wildlife population across a state that is rapidly becoming more influenced by human activities.

As the human population of Arizona continues to grow at an increasing rate (U.S. 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),

that will allow the Department and its partners to concentrate efforts on a landscape scale, benefiting many species, while continuing ongoing species-specific actions as necessary. This approach is proactive by benefiting both vulnerable and common species by managing for the resources upon which wildlife depend. In order to accomplish those goals, a number of processes were designed so that one can determine the level of vulnerability for a given species, the threat level of any number of stressors, and the landscapes of high conservation priority (Fig. 2). Other factors influence priority decision-making: policies and legal requirements, stakeholder values, multi-use directives, partnership opportunities, available funding and personnel, and feasibility.

The left side of Figure 1 is the landscape focus approach that results in development of wide ranging actions meant to benefit a large number of species through habitat conservation. 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). Often times, a vegetation type or aquatic system is used as a proxy for habitat. Many animal species are closely associated with specific vegetation types or aquatic systems. This oversimplified definition of habitat 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 heterogeneous 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 a spatial pattern, which are in a state of constant change (Pickett and Cadenasso 1995; Koehler 2000). This heterogeneity (= mixed diversity) 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 habitat 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.

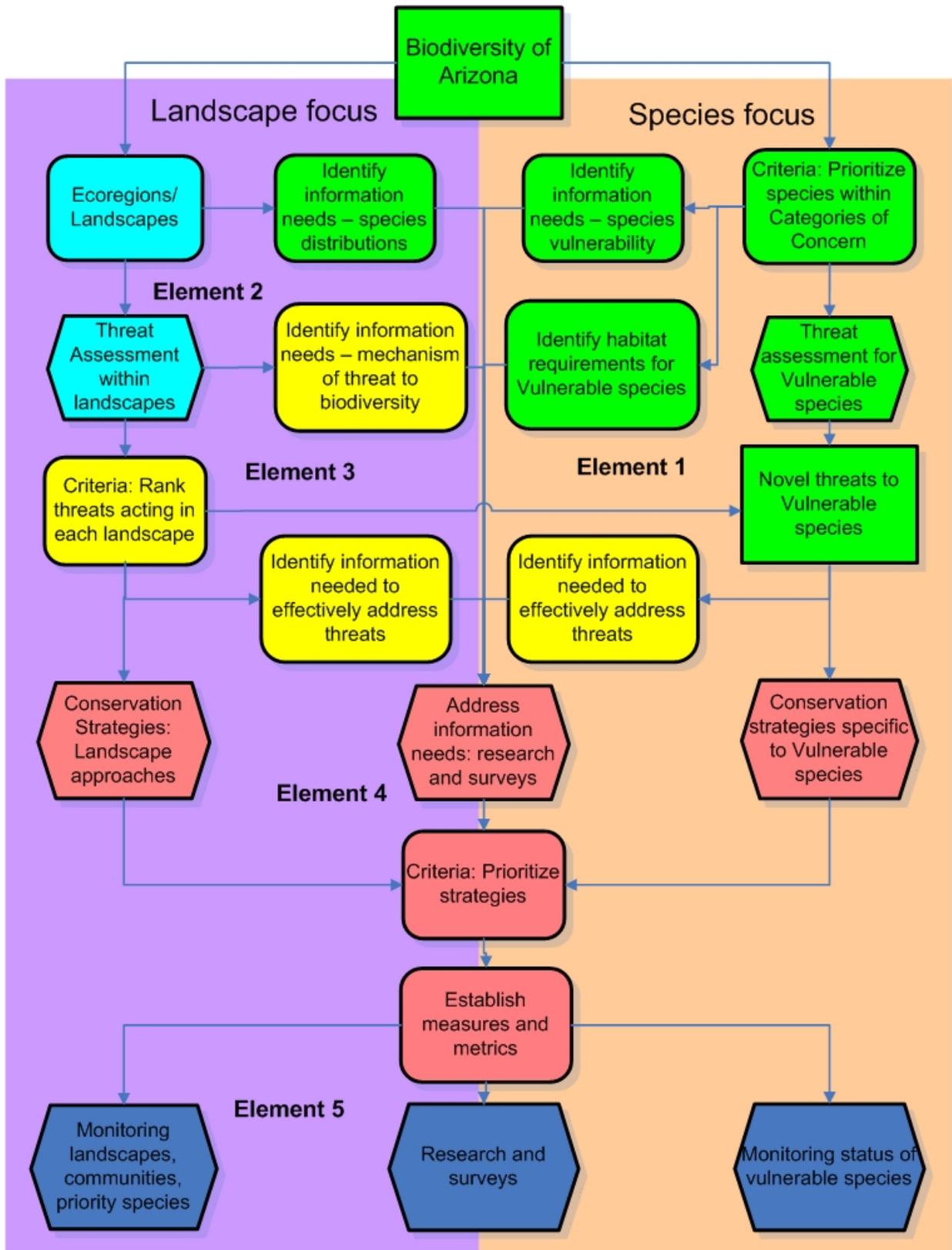


Figure 1. Two-pronged approach to wildlife conservation planning in Arizona’s CWCS.

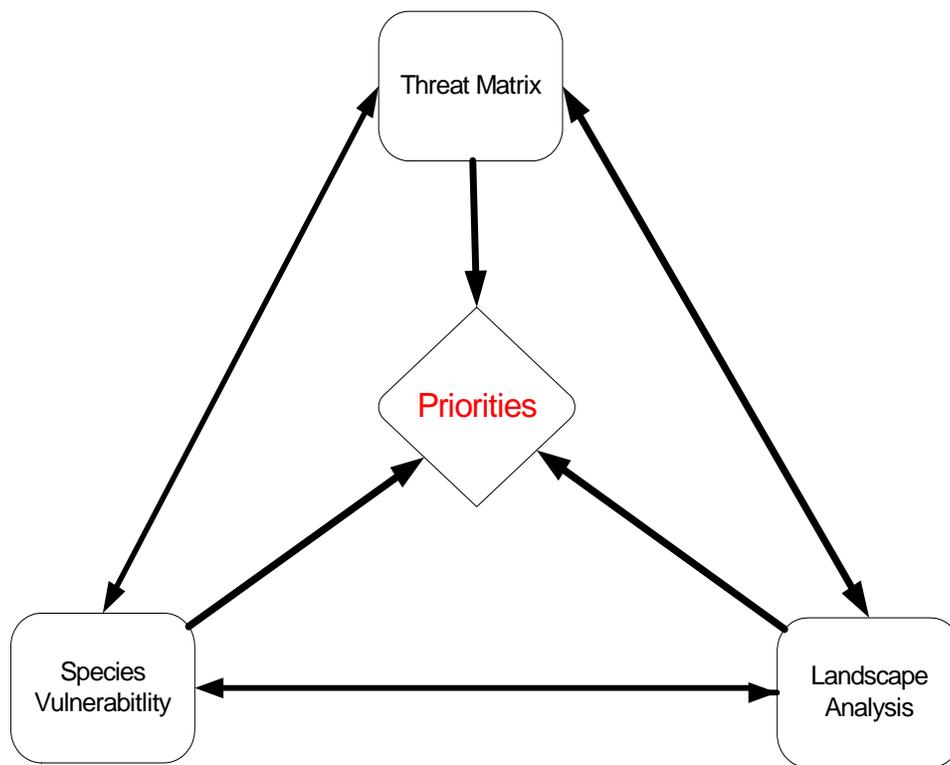


Figure 2. The interaction of 3 processes used in identifying CWCS priorities. Additional social, economic, and administrative factors influence the setting of priorities.

At some scale, many organisms rely on landscape heterogeneity 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, 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). 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.

Given the complexity of defining habitat for a single species, defining habitat for the approximately 21,000 species of wildlife in Arizona would be nearly impossible. For Arizona’s CWCS, types of vegetation community or riparian/aquatic systems are used as a proxy for habitat, understanding that within any one landscape there are many different habitats at multiple

scales. By conserving as much of a given habitat as possible and advocating management of those landscapes to assure heterogeneity and connectivity, the Department hopes to benefit all of the species that inhabit that landscape.

To facilitate conservation of many species acting at different scales, Arizona’s CWCS uses a multi-scale approach to classifying landscapes within Arizona. Specifically, there are 4 levels of 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 U.S. Forest Service ECOMAP framework (Bailey 1994, 1995, 1998). Table A delineates the close association between TNC’s ecoregions and Bailey’s provinces. At this level, wide, regional collections of species and the resources upon which they depend are addressed. 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:

Apache Highlands North	Apache Highlands South
Sonoran Desert	Mohave Desert
Colorado Plateau	Arizona-New Mexico Mountains
3. **Landscapes** - This level is defined by the 14 vegetation communities delineated by Brown and Lowe (1974) and 3 riparian/aquatic systems. This level addresses stressors/threats 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 landscape features, such as—snags, nesting cavities, and caves—which are necessary for the well being of many species.

Table A. Landscape classification schemes in Arizona: a crosswalk of TNC’s Ecoregions and Bailey’s Sections. All relationships are approximate since TNC edited the boundaries of Bailey’s Sections in Arizona for their ecoregional assessments.	
TNC’s Ecoregions	Bailey’s Sections
Apache Highlands--North (AHN)	Tonto Transition
Apache Highlands--South (AHS)	Basin and Range
Arizona-New Mexico Mountains (AZNM)	White Mountain – San Francisco Peaks
Colorado Plateau (CP)	Grand Canyon Lands, Navajo Canyon Lands, Painted Desert
Mojave Desert (MD)	Mojave Desert
Sonoran Desert (SD)	Sonoran Colorado

PROCESSES IN DEVELOPING ARIZONA’S CWCS

PROCESS FOR IDENTIFYING SPECIES OF CONSERVATION PRIORITY (ELEMENT 1)

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. In working with other cooperators on regional, national, or international efforts, the Department relies on collaborative plans to address broad, taxon-related conservation needs—for example: Partners in Flight North American Landbird Conservation Plan (Rich and others 2004), U.S. Shorebird Conservation Plan (Brown and others 2001), and Arizona Bat Conservation Strategic Plan (Hinman and Snow 2003).

Much of the previous funding for nongame species depended on the legal protective status of wildlife (ESA-listed threatened or endangered, candidates, or of State special concern). The 1988 *Threatened Native Wildlife in Arizona* (TNW; 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 in prep) identifies wildlife in Arizona that are regarded from a state perspective as either 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 will build upon these previous efforts, and function in a broader scope—identifying management actions that benefit all species under species-specific or landscape-level (= wildlife community) scales.

The complete list of wildlife in Arizona’s CWCS is designated as the ‘Master Species List.’ It includes the wildlife identified from the previously mentioned lists and compilations of resident and migratory species in Arizona by external partners and academics. The master list was further refined by Department taxon leads 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.

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 exotic 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. The extensive list of macroinvertebrates (insects and arachnids) is currently not included in the species criteria

evaluation due to insufficient data to adequately assess their management needs—in the interim, habitats may be used as a proxy for managing these species in a wildlife community context.

Criteria Used to Evaluate Species for Conservation Priority (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). Arizona’s Title 17 language describes “wildlife” as all vertebrate species plus crustaceans and mollusks—those species which the Department has statutory responsibility for managing. The SWG Program (developed in cooperation with the TWW Committee and mandated by the U.S. Congress) identifies “wildlife” as all species of vertebrates and macroinvertebrates, including insects and arachnids. While many state wildlife agencies 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 taxa. 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, and exotics.

This evaluation process is designed to be flexible in regards to funding opportunities, legal requirements, and priorities of the Department, partners, and constituents. For this reason, a large subset of identified wildlife of conservation priority is expected—and necessary—to allow flexibility in using various funding sources (SWG monies in combination with existing federal grants through ESA Section 6 funds, Wildlife Restoration and Sport Fish Restoration appropriations, Landowner Incentive Program monies, and state-matched funding through the Arizona Heritage Fund, Wildlife Conservation Fund, Wildlife Check-off and other donations).

Arizona’s CWCS uses 5 categories (Table B) that reflect separate, independent ways in which a species might warrant priority conservation designation. Within the 5 categories, there are 17 specific criteria that were evaluated for each wildlife species in Arizona. These specific criteria were adapted from a list of WGCN concepts to consider by the TWW Committee (TWW 2003b), stakeholder input through Arizona’s Wildlife Summit workshops (Gunn 2005a) and online summit survey (Gunn 2005b), Department staff, and external land management and natural resource regulatory agencies and tribes (Appendix F). Species of conservation priority in the CWCS should be representative of the diversity and health of the State’s wildlife populations.

Table B. Categories for describing conservation status of all species in Arizona. Species were rated using the associated criteria under each category.	
Category: Community Focal	Keystone species
	Home range size
	Habitat quality indicators
Category: Responsibility	Responsibility status
	Administrative protection status on tribal lands in Arizona
	Administrative protection status in Mexico
Category: Vulnerability	Federal or state legal status (ESA and WSCA)
	Extirpated status
	Imperiled status (Heritage global rank)
	Declining status

Table B. Categories for describing conservation status of all species in Arizona. Species were rated using the associated criteria under each category.	
	Disjunct status
	Demographic status
	Concentration status
	Element occurrence (includes endemics)
	Fragmentation status
Category: Social and Economic Value	Social and economic value
Category: Data Sufficiency	All criteria used to score “Vulnerability” category—priority species are those for which there is not sufficient information to rate this species for ‘Vulnerability’

Relationships of Criteria, Category Scores, and Conservation Status: Species were prioritized within categories, but not among categories. That is, “Community Focal” species have no inherent priority over “Vulnerability” species, because the Department needs to address both of these categories in managing Arizona’s wildlife. **Priority species are those that scored high (a ‘1’ rating) among 3 status levels (1=high, 2=medium, 3=low) for at least one of the 5 categories** (Appendix F). Priority species in the first 4 categories are important targets of conservation; those in the ‘Data Sufficiency’ category are priorities for baseline surveys.

Many of the 17 criteria overlap in conservation concepts or previous evaluative efforts (ESA listings or candidate reviews, WSCA, interagency sensitive species lists, and Heritage/IUCN assessments). Department taxon leads also solicited input from agency staff and outside experts to generate ratings of species for the other criteria.

Wildlife Summit participants also suggested that “future threats to wildlife and natural habitats” and “potential for recovery and conservation success” are factors that should be considered in identifying wildlife of conservation priority (Gunn 2005a, 2005b). Both of those concepts are imbedded in the CWCS conservation goals and strategies section, operational plans for species and habitat management, and decision-making processes of the Department and its partners for funding wildlife-related projects.

The Department manages species at either the species level or subspecies level, depending on various factors such as: 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 not therefore correspond exactly to counts on other Department species lists or narratives.

Connecting Species to CWCS Landscapes: Using the ecoregion and biotic communities established for Arizona’s CWCS, Department taxon leads recorded which landscapes were important in the species annual lifecycle. When possible, it was noted if existing species use these landscapes for breeding or non-breeding activities, or which landscapes were previously occupied by extirpated species. Information used to establish species distributions ranged in quality, so evaluators also scored levels of confidence in their understanding the distribution of species (Table C).

Wildlife of conservation priority for each ecoregion are listed in the CWCS State of the State (Companion Document B - Appendix).

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

Evaluating Habitat Requirements and Information Needs for Priority Species: Presently, the Department does not have detailed habitat requirements for all priority species. Most research and baseline information for wildlife in Arizona is lacking information on habitat needs (or thresholds) for survival, but rather most documentation identifies suitable or preferred habitats. Arizona’s Natural Heritage Program (Arizona’s HDMS) abstracts, in use by most of the States, cooperating agencies, and tribes, are the most logical place to document habitat and stressor/threat information. HDMS abstracts for Arizona wildlife are available through the Department website (http://azgfd.gov/w_c/edits/species_concern.shtml).

At this time, approximately a third of all Arizona CWCS priority species have written HDMS abstracts. Some of these abstracts and related GIS data are outdated. Also, current standards for information to include in the abstracts are not yet directly related to information needs and objectives of the CWCS. The initial years for implementing the CWCS represent an opportunity for the Department to develop consistent reporting guidelines, and use the resulting HDMS abstracts directly in the CWCS planning and reporting procedures.

Taxon experts were asked to evaluate their confidence in the Department’s ability to gain an accurate and complete description of habitat requirements for each of the priority species identified (ratings as in Table C). This rating process was also used to evaluate confidence in understanding the most significant stressors/threats to each priority species.

ASSESSING STRESSORS/THREATS TO ARIZONA’S WILDLIFE (ELEMENT 3)

Arizona’s biodiversity—the number and types of species, processes, and genetic resources—is the result of the geological 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 our ability to integrate human activities into the landscapes in a way that least disturbs the structures and patterns that hold together the ecosystems of Arizona and the wildlife embedded in these ecosystems. Not all human activities are equally disruptive of the natural processes in this State, so the most effective conservation will address stressors/threats that have the largest impact, and those that are emerging in the next decade.

Generating a Comprehensive List of Stressors/Threats in Arizona: To develop a list of potential stressors/threats to wildlife and natural habitats in Arizona, Department staff adapted national

conventions for describing categories and classes of threats (CMP 2004). 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 D).

It should be recognized that many identified stressors/threats in Arizona’s threat assessment are based on legal and accepted recreational or economic pursuits, national security actions, or for public safety/use.

Table D. National convention of threat categories and classes (modified from CMP 2004) used in the 2004 CWCS threat assessment. All threat classes were evaluated, but not all were included in conservation strategies for the first iteration of Arizona’s CWCS.

Threat Category	Threat Class
Habitat Conversion - Intentional conversion of natural habitat that is detrimental to wildlife use and survival; causes loss or 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
	Military activities
Transportation and Infrastructure - Development of corridors/passages for transportation use, movement of resources, and relaying communications; increases wildlife mortality and fragmentation of wildlife habitat.	Roads
	Railroads
	Overhead utility lines and towers
	Shipping Lanes
Abiotic Resource Use - Extraction or use of rock, minerals, metals, fuels, and water; causes direct or indirect impacts to wildlife habitat.	Drilling
	Mining
	Water use
Consumptive Use of Biological Resources - Harvest or use of plant and animal populations that impacts wildlife distribution and fitness, or ecosystem processes.	Hunting, trapping, and fishing
	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
	Military activities
	Scientific research
Pollution - 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
	Sonic pollution
	Light pollution
Invasive Species - Introduction and/or spread of unwanted exotic and native organisms into ecosystems; increases wildlife predation, competition, and reduced fitness or loss of wildlife habitat and	Invasive plants
	Invasive animals

Table D. National convention of threat categories and classes (modified from CMP 2004) used in the 2004 CWCS threat assessment. All threat classes were evaluated, but not all were included in conservation strategies for the first iteration of Arizona’s CWCS.

Threat Category	Threat Class
competition, and reduced fitness or loss of wildlife habitat and available forage.	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 will include a class for ‘Recreational sites and facilities,’ but only some States (none of them in the Southeast) will highlight ‘ski resorts’ as a specific stressor.

A detailed threat assessment was used to identify and evaluate a list of stressors/threats to wildlife and natural habitats in Arizona. In addition, for stressors/threats acting at the landscape scale, the assessment: 1) described the extent to which each stressor/threat is an issue now or is expected to become an issue in the near future (for instance, wildlife diseases may have larger future than current impacts); and 2) described the extent of understanding how these stressors/threats act through ecosystem processes and structures to impact biological systems by affecting species diversity, species resilience, and primary productivity.

During the 2004 threat assessment, Ecoregion Workgroup participants identified stressors that were unique or of greater influence to borderland areas in both the Sonoran Desert and Apache Highlands South ecoregions. “Border Issues” include direct or indirect impacts to wildlife and wildlife habitat from illegal immigration or smuggling traffic and enforcement efforts.

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/threat is identified in the fashion it is most easily understood. For instance, 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/threats 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/threats to be described as they are perceived by resource managers, there should be no expectation that individual stressors/threats are mutually exclusive.

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

Interactions between potential stressors/threats 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 instance, “non-native plant invasion,” “road building,” and “altered fire regimes” present risks to wildlife that could be addressed collectively.

Evaluating Stressors / Threats in Arizona’s Landscapes: 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 (Table A) where they provided local expertise in evaluating stressors/threats. To ensure a 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 B).

Each group was asked to evaluate impacts from each stressor/threat in terms of the individual components: **Magnitude**, **Urgency**, and **Reversibility**, using the ratings low, medium, high, or extreme (Table E). Participants were asked to score these 3 components for each vegetation community or riparian/aquatic system within in each ecoregion. All together, these components describe the extent to which ecosystem processes and associated wildlife are perturbed by these stressors/threats. After the August 2004 meetings, the assessments were completed in smaller groups after having established which cooperators were concerned about stressors in different regions of the State.

Table E. Rating criteria for components used to estimate the importance of each stressor/threat (adapted from Salafsky and others [2003]).			
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%)	

Table E. Rating criteria for components used to estimate the importance of each stressor/threat (adapted from Salafsky and others [2003]).		
Low (1)	Long-term (>10 yrs)	Low probability or None (0-9%)
Component: Reversibility		
Rating:	Degree to which effects of threats can be reversed:	
Extreme (4)	Irreversible	
High (3)	Reversible with difficulty and high expense/effort	
Medium (2)	Reversible with some difficulty and moderate expense/effort	
Low (1)	Easily reversible at low expense/effort	

Analysis of Important Threats at Various Landscape Levels: Once individual stressors/threats were scored, the importance of each stressor per landscape was rated as low, medium, high, or severe based on the Magnitude, Urgency, and Reversibility components. The ratings were translated into scores of 1, 2, 3, or 4, respectively. Next, values for the 3 components were multiplied together, and their cube-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.

After identifying the relative importance of each stressor/threat in each landscape, further analysis revealed the number of landscapes in an ecoregion where that stressor was significant. These assessments were not used to describe the level (or summation) of stressors experienced in any one landscape. In a large and complex landscape with a wide range of dissimilar and interacting threats and effects, few measurements are strictly additive or linear. For example, there is little meaning in adding or multiplying pollution rankings to a rank expressing the threat from introduced nuisance plants. However, it is useful to know that a particular landscape has extreme impacts from both pollution contaminant and introduced nuisance plants.

Identifying Important Species-level Stressors/Threats: Some stressors/threats to wildlife in Arizona are direct, while others act indirectly through changes to the landscapes, ecosystems, and communities that these species occur in. There are over 800 vertebrate, crustacean, and mollusk taxa in Arizona; to evaluate each taxon by associated stressors and their respective life histories was not feasible task. Instead, the evaluation of stressors on ecosystem processes and structures was completed first, rather than considering the magnitude of each stressor to all 800+ individual taxa. Any stressors/threats deemed to be significant at the landscape level then become a greater priority for conservation actions and opportunities, with an anticipated reduction in risk to whole communities of species.

The teams that assessed the importance for each stressor/threat per ecoregion also evaluated their understanding of the mechanisms by which these stressors/threats act through the landscape to impact wildlife populations. This connection, which may be captured in a conceptual model of effects, illustrates the links in the effect chain that might be most amenable to conservation activities. These conceptual models can highlight where information is lacking about specific mechanisms or about the magnitude and directness of particular steps in the process. For each stressor/threat that was rated as important, a comprehensive list of immediate effects in the

landscape class was developed, but complete conceptual models were not built to tie these effects to community characteristics such as productivity, biodiversity, species assemblages, etc. Building complete conceptual models may be a valuable exercise in the future, but was not necessary at this stage to put together Arizona’s first CWCS.

Other stressors/threats may not have severe or widespread effects across Arizona’s landscapes, but they may represent important threats to priority species. The next part of the threat assessment asked whether additional stressors/threats require attention in the near future due to probable impacts to important species. This evaluation followed the designation of priority species and is not complete at the time of this written draft.

A CWCS relational database was created (Appendix E) to compile species-specific information on stressors/threats extracted from species recovery plans, conservation planning documents, and HDMS species abstracts. This database also links species to specific ecoregions and landscapes, to better evaluate whether the list of stressors/threats identified at the landscape level also address threats to all priority species in that landscape. Stressors/threats were flagged for consideration if they were identified as significant to landscapes and landscape processes or to priority species within that landscape. New stressors/threats may be added if they are recognized in the process of assessing threats to priority species. This is part of the adaptive improvement of this process, and would result in new stressors/threats being assessed in future iterations.

DEVELOPING CONSERVATION STRATEGIES AND IDENTIFYING INFORMATION NEEDS (ELEMENT 4)

For each stressor/threat that was identified as important in at least one landscape 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.”

Hundreds of proposed conservation actions and opportunities were used as the basis for developing conservation strategies under this plan. Conservation strategies were developed by rolling up similar conservation actions identified by the list of important stressors/threats (Appendix H). Information needs were identified at each stage in the CWCS planning process. Like the conservation actions, the information needs were also rolled up into similar groups.

Conservation strategies are considered where feasible and appropriate, subject to applicable environmental compliance review, and in cooperation with key land managers. CWCS strategies 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 I).

Each conservation strategy 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. Strategic planning occurs within each of the 4 programs: Wildlife Management, Watercraft, Off-Highway Vehicle, and Business Administration. Each of these programs develops strategies in each of the following 6 focal areas: Conservation, Recreation, Information and Education, Laws

and Law Enforcement, Research, and Administration. The same focal areas are used to categorize operational plans at the subprogram level. Appendix J identifies Department programs and focal areas under which each CWCS conservation strategy might be considered.

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 database for tracking progress on various Department implementation plans (the “Implementation Matrix”; Appendix D) is currently under development; incorporation of CWCS reporting will be accomplished by linking this database to the CWCS database.

IDENTIFYING LANDSCAPES OF GREATEST CONSERVATION NEED (ELEMENT 2)

The extreme variability inherent in the Arizona landscape results in a complex, multi-scale mosaic of habitats. This complexity hinders attempts to define key habitat at a statewide level. In addition, the information available is often limited. For example, distribution and habitat requirements of many species are ill-defined or completely lacking, available GIS layers are often outdated, imprecise, or available at very rough resolutions. Due to these drawbacks and time constraints, the Department chose not to perform a comprehensive habitat analysis at this time, preferring to expand effort on identifying relative stressors/threats, species of conservation priority, and information gaps. However, as a result of the processes described in this chapter, the Department was able to identify 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. Delineating the data gaps facilitated planning to fill those gaps. Many data gaps can be filled through cooperation with the Department’s partners to consolidate information, some will require GIS-based modeling to fill, still others will require active data gathering.

Concentrating on the other aspects of the plan first enabled the Department to clearly 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 conservation priority. 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

In the meantime, the Department has identified 2 sources of information to be used in lieu of a comprehensive statewide landscape analysis. The first is the 147 conservation priority areas in

Arizona (Fig. 3) identified in ecoregional analyses (Marshall and others 2000, 2003; TNC 1999, 2001, 2004, 2005; Tuhy and others 2002; www.azconservation.org) by TNC in collaboration with the Department, numerous land managers, resource agencies, species experts, and international cooperators. The resulting map shows areas with the greatest strategic value for protecting ecosystems and viable populations of native species of animals and plants. The analyses were built around more than 270 animal species and an equal number of plants. As such, the TNC analyses provide a good starting point to identify key conservation areas but lacks detailed information on corridor use or core habitat areas for the other species in Arizona.

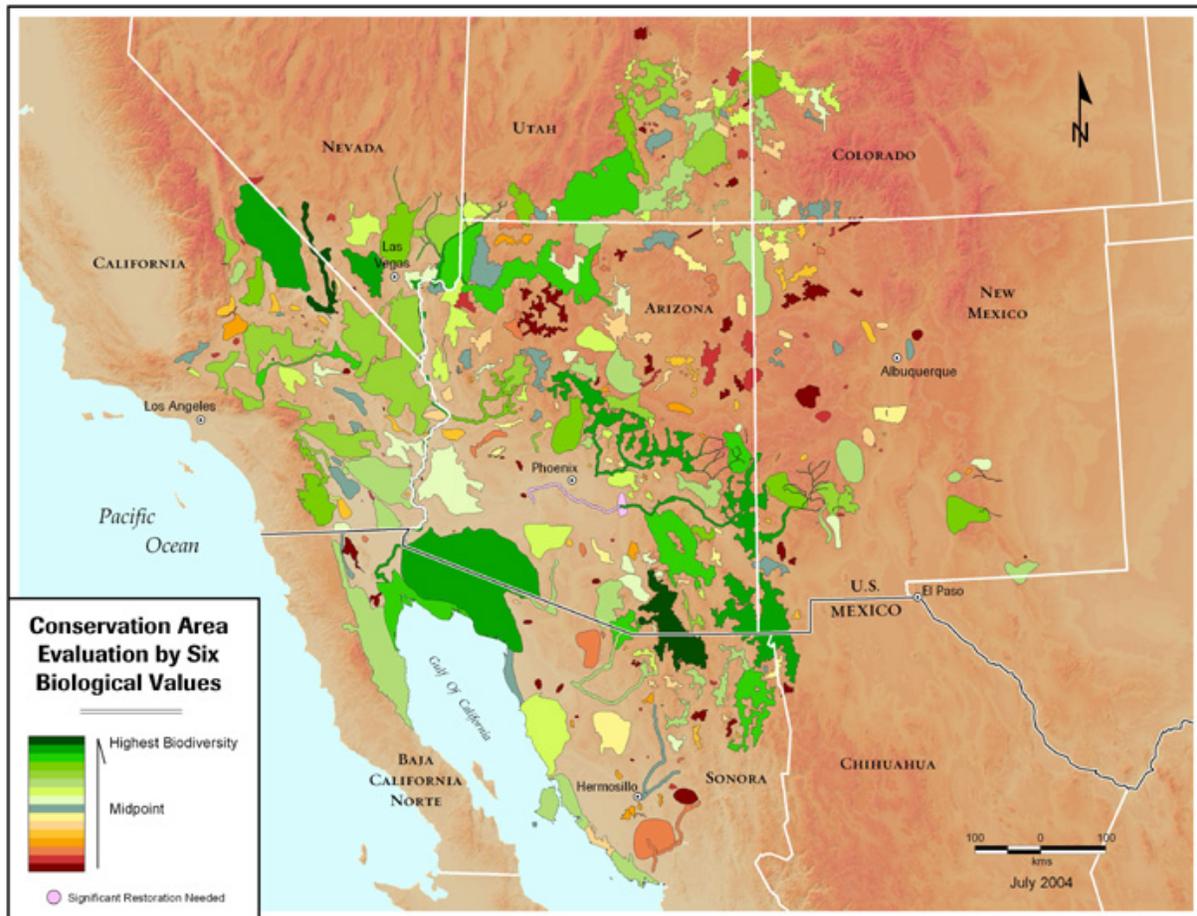
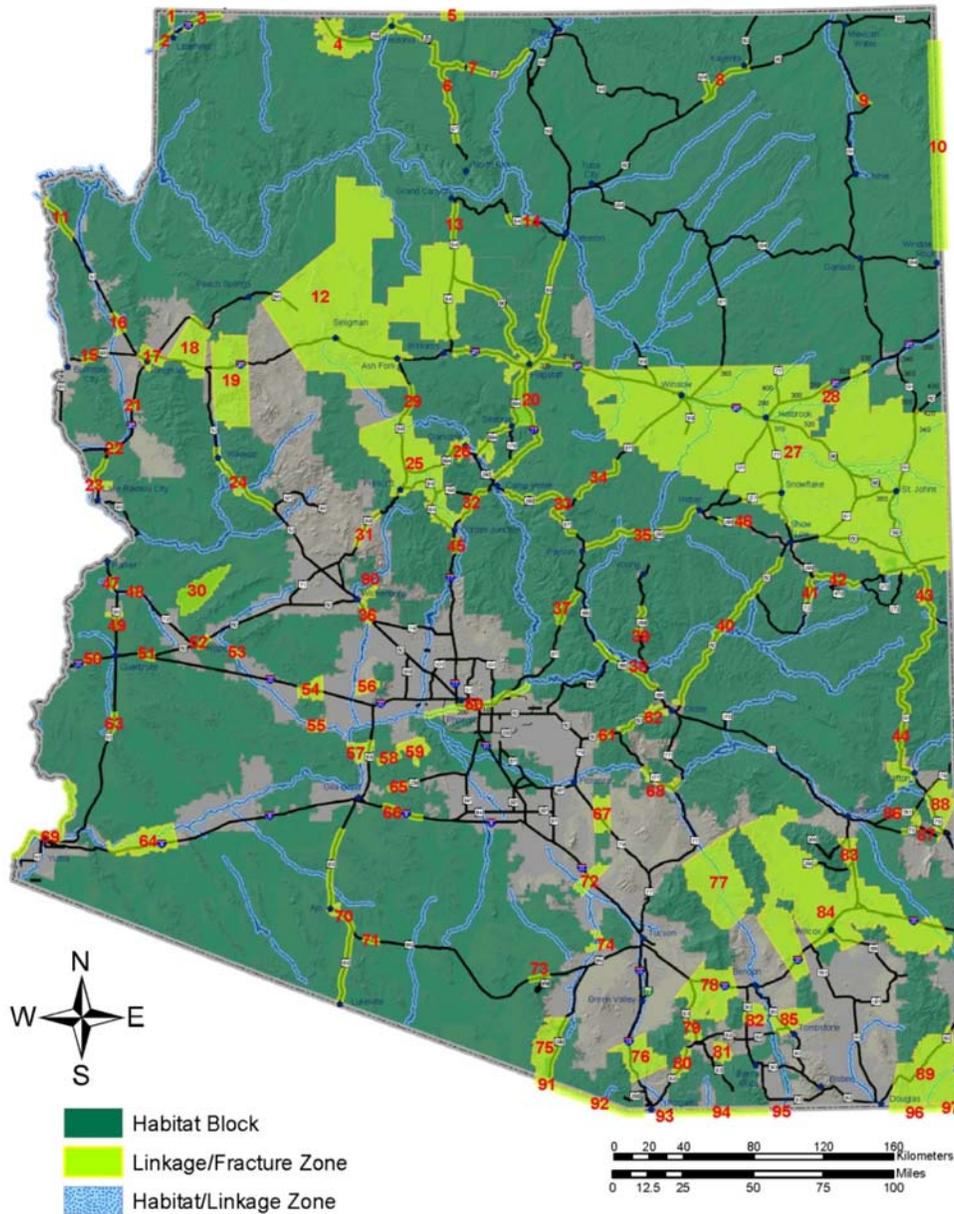


Figure 3. TNC Conservation Areas identified for ecoregions in Arizona and extending into neighboring States, tribes, and Mexico. Six biological values were used to identify conservation areas in this assessment: 1) plant and animal species occurring at each location; 2) species present that are globally 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, invertebrates, reptiles, amphibians, and plants); and 6) aquatic/riparian species present.

The TNC analysis is complemented by a cooperative analysis between the Department and numerous non-profit, private, and public sector organizations to address wildlife habitat fragmentation. This effort, known as the Arizona Wildlife Habitat Linkages, is developing a

statewide map identifying wildlife movement corridors between core habitat areas. The map (Fig. 4) is intended to provide a visual tool to guide future planning, engineering projects, and mitigation actions, and is due for release in June 2005. This effort provides a starting point for consideration of both core habitat areas and landscape connectivity.

DRAFT ARIZONA WILDLIFE LINKAGES



02/10/2005 SEN

Figure 4. DRAFT Arizona Linkages map. Numbers indicate individual “Linkages/Fracture Zones” identified (these are not in order of priority). Note: an updated version of this map will be used for the final CWCS plan.

Both TNC conservation areas and the Arizona Wildlife Habitat Linkages provide convenient proxies for statewide landscape analyses, but each has design limitations that do not fully meet the needs of the CWCS. TNC conservation areas identify priority locations for protecting the full array of native species and ecosystems, using a regional approach that extends beyond the state’s borders in all directions. These analyses were based on the distribution of 270 animal species within Arizona—a representation of game and nongame species, rare and common, wide-ranging and local endemics, and community focal species. They also were based on the distribution of all vegetation communities and a variety of native plant species, but did not consider non-native fish and game species. TNC conservation areas do not identify many public lands as priorities for conservation—lands which the Department considers important wildlife habitat. The Department is not a major land management agency, and relies on cooperation with other agencies to ensure continuing support for wildlife. This effort provides valuable insight into areas of high conservation priority. Future efforts will expand on the work done by TNC.

The Arizona Wildlife Habitat Linkages took a very different approach to planning. Their effort was geared towards defining areas of contiguous habitat, regardless of species, and areas of high landscape connectivity value. This important effort is being lead by the Arizona Department of Transportation, the Department, and several other federal agencies, universities, and non-governmental organizations. The group is already planning to expand this analysis in the future. With the help of the CWCS, future efforts will be more data driven to precisely define core habitat and corridors. Identifying sensitive habitats and species distributions, analyzing landscape connectivity and wildlife corridors, and modeling future urban and rural growth will form the basis of the CWCS landscapes of greatest conservation need classification.

IMPLEMENTING THE CWCS (ELEMENT 5)

The CWCS processes provide the first tier of prioritization—grouping hundreds of potential actions and opportunities under broad, partner-based conservation strategies. Next, strategies are prioritized within each of the 4 Department programs: Wildlife Management, Watercraft, Off-Highway Vehicle, and Business Administration. Before this strategic level of planning is finalized, the Department’s Executive Staff reviews the proposed strategies for implementation.

Once adopted, conservation and information strategies will be used for operational planning, the second tier of the Department’s approved 3-tier planning process (AGFD 2004b). Each of the 4 Department programs passes approved strategies to the following 6 focal areas found among these programs: 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.

ADAPTIVE MANAGEMENT AND CONSERVATION

The landscape focus outlined throughout this plan depends on health of landscapes to provide for healthy populations of wildlife. Landscapes are composed of dynamic patches, the result of

dynamic underlying processes. Ecosystems and associated processes react to driving factors such as drought, climate change, natural and human-derived disturbances. The ability to conserve wildlife will depend on understanding how processes create, connect, and modify patches in the landscape. The best information on how biological processes operate comes from experimentation; in recent decades, resource managers have used large-scale management projects as experiments. Under this approach, management activities can be changed after considering new information on underlying states and conditions. Management and conservation within dynamic ecosystems requires a flexible and adaptive approach.

“Adaptive management” is an experimental approach to landscape management that incorporates existing knowledge of the system (wildlife, wildlife habitat, climate, stressors, human values, etc.) into management activities while keeping the flexibility to adopt new management strategies over time (Walters 1997; Brown and Ford 2002). Feedback loops among monitoring, research, and management actions can accommodate uncertainty that is inherent to 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, thereby improving likelihood of achieving conservation goals.

“Adaptive conservation” (PRBO Conservation Science 2005) has 2 components: adaptive management applied to local, site-specific projects, plus coordination across adaptive management projects so that there is shared learning and coordinated planning of large-impact projects. Adaptive conservation describes the process that is being implemented through recent initiatives to benefit North American birds and their ecosystems. These initiatives include: Partners in Flight (Rich and others 2004);  U.S. Shorebird Conservation Plan (Brown and others 2001); the North American Waterfowl Management Plan regional Joint Ventures (Kushlan and others 2002); and the North American Bird Conservation Initiative (NABCI; www.nabci-us.org). Although these initiatives are comprised of local conservation plans, the local plans tie together through coordinated actions, standardized protocols, and established procedures to evaluate regional impacts and improve strategies as the process develops. State CWCS plans are anticipated to be designed as adaptive conservation plans.

The 8 elements in the States’ CWCS plans ensure that these strategies are data-driven and subject to review and evaluation. CWCS plans will need to be updated by addressing information needs and incorporating results from ongoing projects. This is the nature of adaptive management. In this spirit, Arizona’s CWCS is not meant to be a fixed set of conservation goals and strategies; the CWCS is a series of processes that can be used to develop comprehensive priorities for wildlife conservation.

Effectiveness of adaptive conservation relies on a number of processes. Adaptive management processes are put in place for specific projects (modified from PRBO Conservation Science 2005; insets describe implementation in Arizona’s CWCS.):

1) Set management goals;

The Department identified species and stressors that reflect issues for conserving biodiversity in Arizona (CWCS State of the State—Companion Document B). This was done in coordination with land management partners, private landowners, non-

- governmental organizations, other state CWCS planners, and the interested public (Appendix A in this document);
- 2) Identify assumptions and information needs to implement effective conservation actions. Information needs were identified in the process of prioritizing species for conservation in the process of listing important threats to Arizona's wildlife and wildlife habitat (described in this document and the CWCS Core Plan);
 - 3) Develop a set of conservation actions to achieve goals; The Department and its land management and resource regulatory partners identified conservation strategies and information needs related to specific species and to most effectively address stressors/threats (Table D and the CWCS Core Plan);
 - 4) Implement specific actions (Department's 3-tiered planning approach);
 - 5) Monitor at all relevant scales to analyze response to implemented conservation actions;
 - 6) Revise management, goals, or monitoring regime as indicated by feedback loops between monitoring and actions with frequent updating of information; and
 - 7) Repeat the process.

The following adaptive conservation processes are put in place to benefit conservation efforts directly, and to report on progress and effectiveness of efforts relative to larger conservation goals (modified from PRBO Conservation Science 2005):

- 1) Synthesize findings from multiple adaptively-managed projects;
- 2) Develop adaptive conservation plans focused on species, habitat, and/or ecosystem of interest. Incorporate findings from adaptive management as well as peer-reviewed literature, gray literature, and expert opinion;
- 3) Communicate plan recommendations to policy leaders and cooperators;
- 4) Reassess and revise components of 3-tiered planning process and associated adaptive conservation plans; and
- 5) Repeat the process.

The processes above allow the Department and its partners to assess conditions of species, landscapes, and stressors in individual landscapes or throughout the state. Careful monitoring and review of results from conservation actions provide a feedback mechanism by which new stressors, newly vulnerable species, information accrual, and landscape-level changes are documented. The Department can alter priorities and strategies as conditions change or as understanding improves.

ADAPTIVE CONSERVATION UNDER CWCS

This document has described how species are prioritized for conservation attention, threats are prioritized within ecosystems in Arizona, and conservation strategies are prioritized to address these concerns. To make the CWCS adaptive, the plan must identify information needs, relevant monitoring targets to assess the responses of wildlife and wildlife habitat to conservation actions, and procedures for incorporating updated information and results into future strategic planning.

Information and research needs. Information on wildlife populations and stressors/threats can be used to guide both conservation actions and broader adaptive strategies. These information needs can be addressed by the following categories of activity (refer to CWCS Core Plan, Table E):

- Determine status and distribution
- Compile data, programs, and information
- Research biology
- Research ecosystem states and conditions
- Research stressors/threats
- Develop conservation, research, and monitoring tools

In order for this information to be used for adaptive conservation, it must be collected consistently, in accordance with standards that are understood and applied in other projects in Arizona and throughout North America. This sort of standardization is an active area of work in wildlife conservation, and much of it is still in development. Implementation projects for Arizona's CWCS will need to document and follow current best practices for:

- Monitoring impacts of conservation projects to specific targets of the project (species, habitats, and/or ecosystem processes) and their trends (Gibbs and others 1998; MacKenzie and others 2003; Dinsmore and others 2002; Schoonmaker and Luscombe 2005) and/or productivity;
- Monitoring impacts of conservation projects to overall landscape and community structure. This guarantees that the non-targeted impacts are also documented and can be assessed during the summary and review process;
- Research to clarify magnitude and pathways by which stressors influence wildlife and wildlife habitat. This research will inform future iterations of the CWCS threat assessment.

Monitoring effectiveness of CWCS. Because the CWCS is a comprehensive, multi-year adaptive conservation plan, monitoring must be instituted to describe the overall effects of all adaptive management activities in Arizona, whether pursued by the Department or by cooperators. For example, has the set of activities in the Sonoran Desert Ecoregion impacted biodiversity in different landscape types? Has the impact from various stressors been reduced or increased over the period under scrutiny? Does the patchiness and dynamics of the landscapes more closely resemble an intact ecosystem?

The following are a subset of measures adapted from Rich and others (2004) to evaluate effectiveness of their adaptive conservation approach:

- Population monitoring
- Number of priority species in the Vulnerable category
- Number of Vulnerable category priority species on track for meeting 30-year population objectives
- Number of habitat improvement projects initiated
- Number of hectares of habitat considered protected and restored, by ecoregion and landscape type
- Number of priority species remaining in Data Sufficiency category

- Number of peer-reviewed research publications addressing priority conservation issues
- Number of agreements in place to meet population and habitat objectives
- Number of land management and regulatory agency plans into which Arizona CWCS objectives have been incorporated.

In order to fill gaps in existing monitoring projects and to implement best monitoring practices, the Department will want to coordinate monitoring projects with external, existing programs such as the NABCI (www.nabci-us.org), The Wildlands Project (www.twp.org), North American Bat Conservation Plan (www.batcon.org/nabcp/newsite/rwg.html), and Partners in Amphibian and Reptile Conservation (www.parcplace.org). Some of these initiatives have been further developed for application in Arizona (Latta and others 1999; Hinman and Snow 2003). Department experts involved in selection of species that become targets of monitoring should consider the species that have been identified through CWCS processes as priorities from the perspective of regional responsibility, vulnerability, ecosystem function, and/or social/economic importance. A sample of these species across the range of taxa and in each priority category be should be monitored to report on the effectiveness of the CWCS process in addressing conservation of species.

The Department is still in the process of identifying priority habitats and landscapes. Several governmental agencies and non-governmental organizations have already developed plans for monitoring landscape condition, which under the CWCS they can participate active partners in shaping and sharing this monitoring. This level of monitoring is anticipated to focus Department efforts on identifying and securing partners for information gathering.

Monitoring, assessing, and revising the CWCS process. In order to move the CWCS into the future, the Department will need to set up infrastructure and procedures for updating goals and priorities. The Department has established a relational database to facilitate planning of projects, collection of data, and evaluation of conservation actions implemented under the CWCS. The CWCS database will function as a communication tool among Department work units, and become the centralized place to store data relevant to the CWCS. In its present form, the database consists of a number of related tables (Appendix E) linking existing recovery plans and teams to species, threats, strategies, partners, and landscapes addressed in the plan. A user-friendly form incorporates a number of drop-down menus to query the data by priority species, stressor, partners, conservation strategies, or ecoregions.

Currently, the Department monitors activities through a number of unrelated databases. Funds/Planning maintains a database of all active contracts. Field Operations Division monitors activity on all planned actions by programs and sub-programs for each regional office, and the Habitat Branch maintains a Project Evaluation Program database to coordinate environmental review and analysis for internal and external projects submitted to and through the Department. Although each of these databases performs specific functions, they all address actions taken by the Department and its partners that are directly related to threats, species and strategies identified by the CWCS. Synchronization of these databases with the CWCS database would provide a centralized location for data storage that will be used to monitor conservation actions, facilitate communication and coordination within the Department and between the Department

and partners, encourage data and resource sharing of pertinent information while protecting sensitive information, track the magnitude of threats in various regions through time, provide a means of monitoring changing priorities necessary for adaptive management, and facilitate reporting.

The CWCS database is still under development. While most of the Department's Nongame and Habitat Branch agreements and management plans have been integrated into the CWCS database, many more CWCS-related documents in other work units and those of external partners need to be added to the database. Links to existing databases in Funds/Planning, Field Operations, and Habitat branches need to be established. In addition, new fields, automated procedures, and reports will be developed to support CWCS implementation. Finally, linking the data to GIS base layers will allow users to answer spatial questions, and provide a valuable resource for future planning efforts. Spatially-linked projects include, but are not limited to, rural development, fire and forest projects, habitat restoration work, Border Patrol projects and activities, and ACOE mitigation projects. The ability to evaluate spatial relationships among these activities will allow the Department to better address cumulative impacts. This ability would assist in monitoring the magnitude of stressors/threats in Arizona, as well as how those factors change over time.

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APPENDIX A: CWCS CONTACT LIST

CWCS Contact List—Agencies, Tribes, Local Governments, Non-Governmental Organizations, Constituency Groups, Industry Affiliations, Universities, and Special Interests.		
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
Arizona Public Service	Coconino County	City of Williams

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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
Tempe Garden Club	AZ State Assoc of 4WD Clubs	Ducks Unlimited, local chapters

CWCS Contact List—Agencies, Tribes, Local Governments, Non-Governmental Organizations, Constituency Groups, Industry Affiliations, Universities, and Special Interests.		
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 B: ECOREGION WORKGROUP PARTICIPANTS

Appendix B. Ecoregion Workgroup Participants 2004-05. ‘*’ Denotes Border Issues Group.									
Name	Agency	Threat Assessment Teams						Species Criteria	Conservation Actions
		AHN	AHS	AZNM	CP	MD	SD		
Linda Allison*	AGFD		X	X				X	X
Joyce Francis*	AGFD				X		X	X	X
Jeff Sorensen*	AGFD				X		X	X	X
Joan Scott*	AGFD		X				X	X	X
Dennis Darr	AGFD			X	X			X	X
Tom Hildebrandt	AGFD		X					X	X
Sharen Adams	AGFD			X				X	X
Dave Dorum	AGFD			X				X	X
Jeff Pebworth	AGFD	X				X	X	X	X
Lin Piest*	AGFD						X	X	X
Sabra Schwartz	AGFD					X		X	X
Tony Robinson	AGFD	X						X	X
Scott Blackman	AGFD								X
Rob Magill	AGFD				X	X	X	X	X
Troy Corman	AGFD							X	X
Rob Bettaso	AGFD	X	X	X	X	X	X		
Amanda Hervatin	AGFD	X				X		X	X
Trina Hedrick	AGFD							X	X
Jeremy Voeltz	AGFD							X	X
Deb O’Neill	AGFD		X	X				X	X
Bill Van Pelt	AGFD							X	
Angie McIntire	AGFD							X	X
Roy Averill-Murray	AGFD							X	
Kim Field	AGFD	X	X			X		X	X
Darren Bolen	AGFD		X					X	X
Dan Cox	AGFD								X
Gene Sturla	AGFD		X						X
Ric Bradford	AGFD								X
Rebecca Davidson	AGFD								X
Kelly Huckins	AGFD								X
Evelyn Erlandsen	AGFD								X
Sal Palazzolo	AGFD								X
Josh Avey	AGFD								X
MariAnn Koloszar	AGFD								X
Tom Cadden	AGFD								X
Tice Supplee	AGFD							X	X
Mike Ingraldi	AGFD			X					
Todd Pringle	AGFD		X						X
Kirk Young	AGFD								X
Mike Rabe	AGFD								X
Kevin Bergersen	AGFD								X
Dale Turner*	TNC						X	X	X
Carolyn Enquist	TNC		X						X
Siobham Nordhaugen	ADOT	X				X			X
Melissa Maiefski	ADOT								X
Larry Laing	NPS		X						

APPENDIX C: CWCS SCIENTIFIC REVIEW TEAM

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
- Dr 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 Services

APPENDIX D: FIELD OPERATIONS DIVISION ACTIVITY REPORTING DATABASE

Developed by Eric Gardner and James Manalac (Arizona Game and Fish Department) 2004. MS-Access database filename: Implementation Matrix.mdb. This database was developed to bridge the gap between how the Department plans activities with a statewide implementation planning process, and how to document those activities for reporting purposes. Each of the Department regional offices and several headquarters work units will be using the same version of this database for data entry and report queries. The database administrator has the capability of synchronizing each of the regional databases with the central file at headquarters. This capacity allows multiple users to review the same data statewide, ensures central archiving, and sets standardizations for use and updates. This database tracks activities at various levels: fiscal year, specific work unit, fund, project cost account codes, Department programs, focal areas (sub-programs), and sub-projects (including cross projects). Drop-down menus offer users the ability to describe reporting mechanisms, detailed activity descriptions, and activity updates.

Implementation Matrix - [Activity Information...]

File Forms Reports Tools

Fiscal Year: 2005-2006 Activity ID: 0503094506

Activity Title: Limnological Surveys

Detailed Description:

Work Unit: R2 Enhancement vs. Base: Base

Regional Priority: High Program Cost Account (PCA): 06198

Program Priority: High Program: Wildlife Management

Project Status: Ongoing Sub-Program: Sportfish Management

Target Start Date: Sub-Project: Fisheries Game

Target Completion Date: Cross Sub-Project: Fisheries Nongame Project Lead:

Reporting Mechanisms
Balanced Score Card Customer 1. Improve internal relations and adhere... Improve employee satisfaction.
Fisheries - F7M Annual

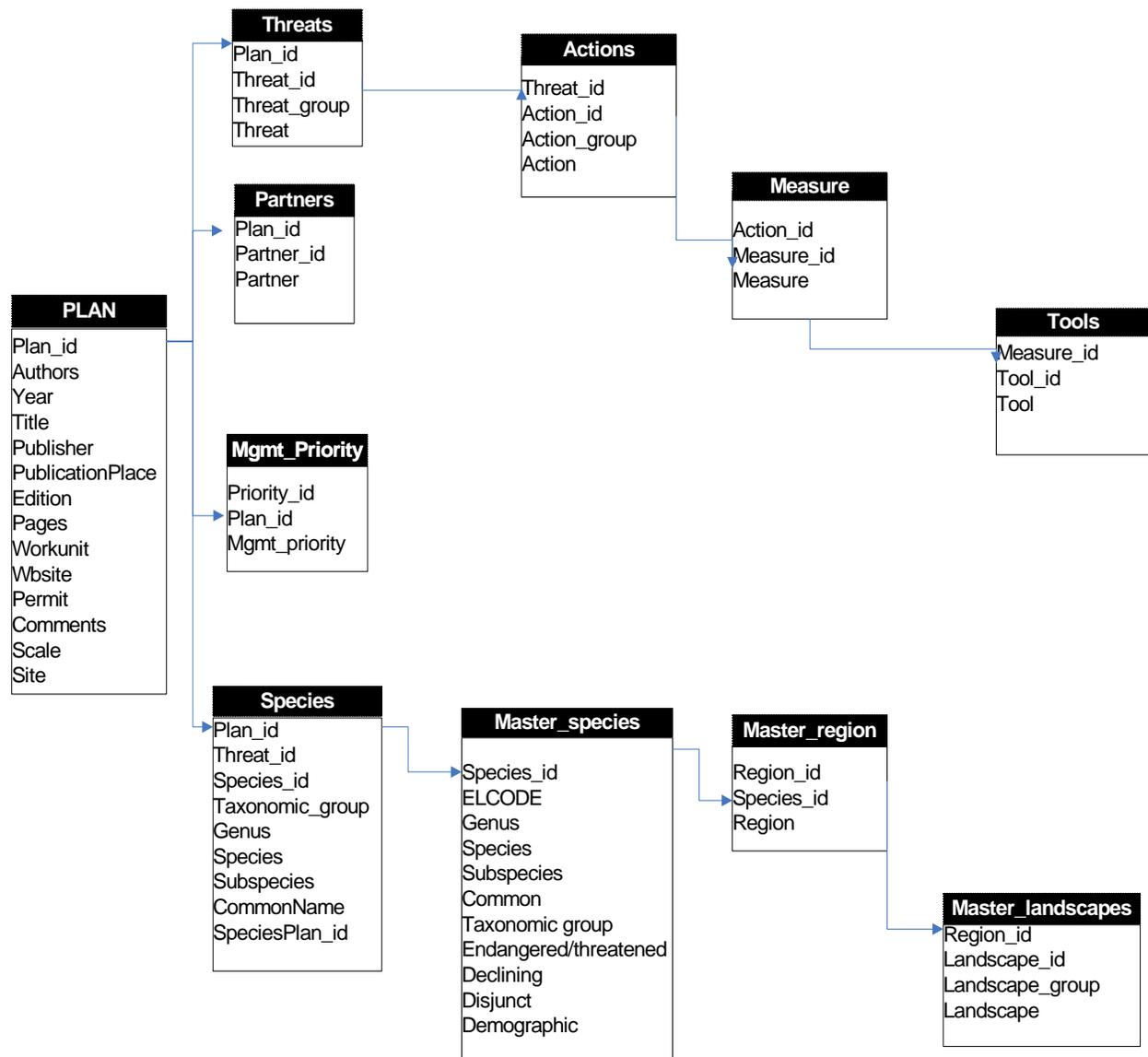
Activity Updates:

Last Update: 3/9/2005

Add Del Save Undo Edit Search Reporting Mechanism Print Close

APPENDIX E: CWCS DATABASE RELATIONAL FIELDS AND INSTRUCTIONS

Developed by Joyce Francis and Tom Hildebrandt (Arizona Game and Fish Department) 2004. MS-Access database filename: CWCS Documents Database.20050212.mdb. Currently contains agreements, management plans, and related documents for Arizona’s CWCS. The CWCS threat assessment, master and priority species lists, ecoregions and landscape classifications, and potential partners fields are available as drop-down menus for user selection and queries. The conservation actions, measures, tools, and management priority fields will be updated later in 2005.

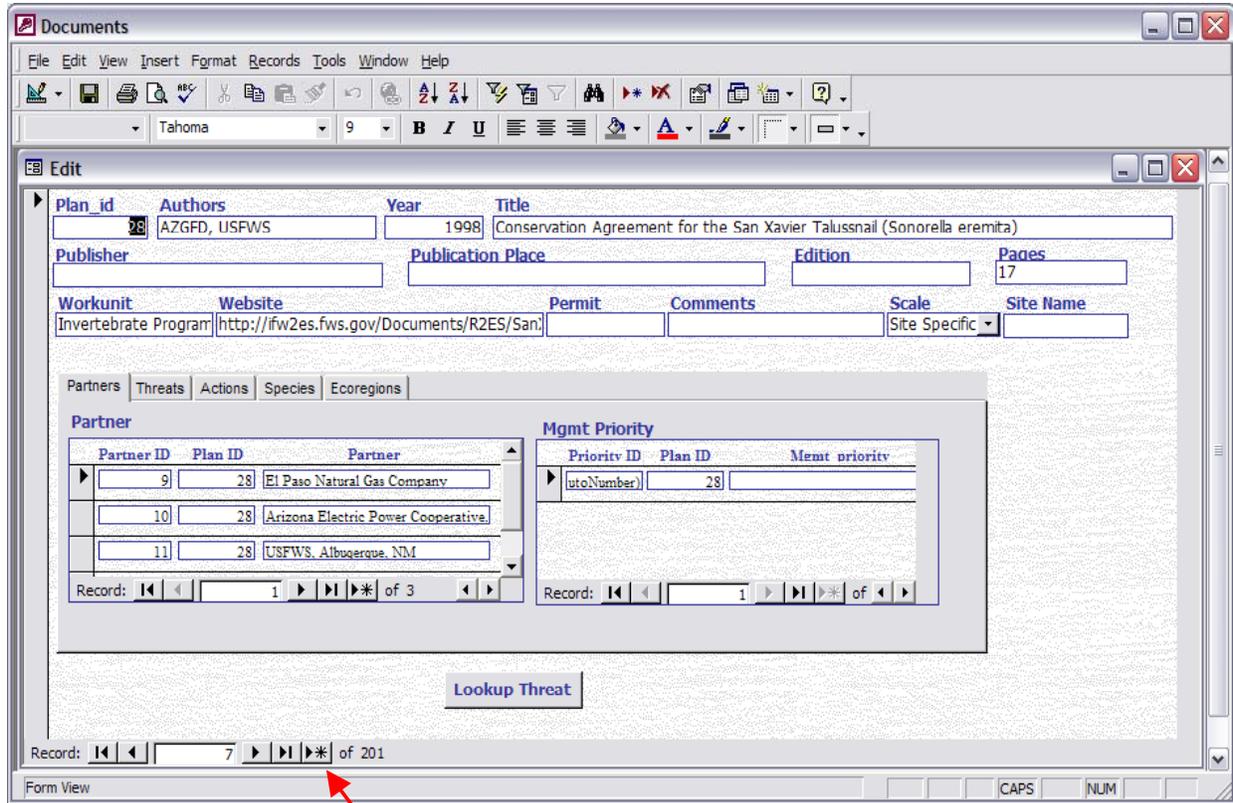


CWCS Database Description and Instructions (21 December 2004)

The CWCS Database is located in:

U:\Comprehensive Wildlife Conservation Strategy\Documents Database\Documents.mdb

Upon opening the database, the following form will appear--



To enter a new plan, click on the arrow with an * at the very bottom of the screen. This will create a new record for the document and all associated tables. Simply type in the requested information. See below for an explanation of each field. The tabs in the center are attached to tables for data entry of items in multiples (for example: Partners) that are associated with a single plan. Please be careful not to type over the 1st record (Plan_id 20). Where practical, the fields are filled by dropdown tables to ease data entry and assure clean input. Browse through entered data by clicking on the arrows at the bottom of the form.

Fields:	Description:
Plan_id:	A number that is generated automatically as soon as any other data is entered for this record
Work Unit:	Work Unit in which hard copies of the document are housed
Website:	Associated with document
Scale:	This describes the geographic extent of actions covered by the plan or agreement. The CWCS Plan uses ecoregions and landscapes mapped in “U:\Comprehensive Wildlife Conservation Strategy\Documents Database\Ecoregions_color.jpg” to describe geographic extents. Possible

Fields:	Description:
	entries for this field are: <i>Statewide, Ecoregion, Landscape, Multiple Ecoregions, Multiple Landscapes, or Site Specific</i>
Site Name:	Used only if the entry for ‘Scale’ was “ <i>Site Specific</i> ”
Citation Information in the following fields: (Authors, Year, Title, Publisher, Publication Place, Edition, Pages)	

Center Tabs:	Description:
Partners	Include all partners associated with the plan, including the Department if appropriate
Management Priority	(To be determined later)
Threats	Use arrow under Threat to access look up list of available threats. This list also gives any definitions and examples that have been developed
Actions	(To be determined later)
Species	Use the arrow at left to access lookup table for species. Available species are sorted by taxonomic group. The rest of the fields in this table will autofill
Ecoregions	The CWCS Plan uses ecoregions mapped in “U:\Comprehensive Wildlife Conservation Strategy\Documents Database\Ecoregions_color.jpg” (larger maps can be obtained from Joyce Francis). Please fill in any appropriate to the plan

APPENDIX F: CRITERIA FOR IDENTIFYING WILDLIFE OF CONSERVATION PRIORITY IN ARIZONA

For Element 1 of Arizona’s Comprehensive Wildlife Conservation Strategy (CWCS), the Department must identify wildlife of conservation priority—described nationally as “Wildlife of Greatest Conservation Need” (WGCN). 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 exotics. For this purpose, all of Arizona’s species of wildlife* (ranging from big game species to insects and spiders) will be evaluated with the process described below. Over 600 species (a subset of the 21,000 plus known wildlife species in Arizona) were identified as wildlife of conservation priority.

* Note: Arizona’s Title 17 language describes “wildlife” as all vertebrate species including crustaceans and mollusks—those 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.

For Arizona’s CWCS, the Department used 17 criteria (described on page 3 of this appendix) to identify species of conservation priority. These criteria were identified by Wildlife Summit participants, Department staff and interagency partners with the Ecoregion Workgroup, and from the Teaming With Wildlife memo on WGCN concepts (TWW 2003d). Species of conservation priority in the CWCS should be representative of the health of the State’s wildlife populations.

This evaluation process is designed to be flexible in regards to funding opportunities, legal requirements, and priorities of the Department, partners, and constituents. **For this reason, a large subset of identified wildlife of conservation priority is expected—and necessary—to allow flexibility in using various funding sources** (SWG monies in combination with existing federal grants through ESA Section 6 funds, Wildlife Restoration and Sport Fish Restoration appropriations, Landowner Incentive Program monies, and state-matched funding through the Arizona Heritage Fund). Many of the 17 criteria overlap in conservation concepts or previous evaluative efforts (that is: ESA listings or candidate reviews, *Wildlife of Special Concern in Arizona*, sensitive species lists, and Heritage/IUCN assessments).

Wildlife Summit participants also suggested that “future threats to wildlife and natural habitats” and “potential for recovery and conservation success” are factors that should be considered in identifying wildlife of conservation priority. Both of those concepts are imbedded in the CWCS conservation goals and strategies section, operational plans for species and habitat management, and decision-making processes of the Department and its partners for funding wildlife-related projects.

To simplify this evaluation process, these 17 criteria are collapsed into 5 priority categories (described below). These 5 priority categories will not be further compared or ‘rolled up’; instead, each one represents a priority area for developing conservation strategies. Thus, species are prioritized within categories, but not among categories. That is, ‘Vulnerable’ species have no inherent priority over ‘Responsibility’ species, or any of the other categories—all 5 categories are weighted equally.

SUMMARY OF THE FIVE PRIORITY CATEGORIES

1) Community Focal

The rank in this category would be the lowest score for this species in any of the following criteria, since all of these criteria indicate ties between the species and the larger landscape and/or ecosystem—defined as “community focal species.”

- Keystone status
- 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

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) Social and Economic Value (criterion same as category)

5) Data Sufficiency (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 Status

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 species.

Focal Rank	Criterion Score	Description – Keystone Status
H	1	Keystone: 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.

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.

Responsibility Rank	Criterion Score	Description – Responsibility Status
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).

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 Protección 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

Responsibility Rank	Criterion Score	Description – Administrative Protection Status on Tribal Lands in Arizona
		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

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

Vulnerability Rank	Criterion score	Description – Imperiled Status (Heritage global rank)
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 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.
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). **Non-native 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

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 ‘Social and Economic Value’ category, the following criterion is used:

Social and Economic Value

Description: Harvested populations and ‘watchable wildlife.’ Also, some species of special economic value, such as striped bass, respond tightly to population densities of their prey species, threadfin shad. The latter species is therefore rated for its indirect economic value.

Scoring: Use the lowest applicable score. For instance, mountain lions are of special hunting value as a big game species (‘1’), and are also predators on other species of special value (‘2’). Score mountain lions as ‘1’ (= ‘H’).

Social & Economic Rank	Criterion Score	Description – Social and Economic Value
H	1	Species is of special value for the hunting, fishing, or watching public.
M	2	Species is of direct but not special value for hunting, fishing, or watching <u>OR</u> species is an important predator or prey to species of high special value for hunting, fishing, or watching.
L	3	Species is not currently harvested, not considered ‘watchable wildlife,’ or an important predator or prey for species of special economic value

Under the ‘Data Sufficiency’ category, the following criterion is used:

Data Sufficiency

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.

Data Sufficiency Rank	Criterion Score	Description – Data Sufficiency
H	0	Insufficient data for any of the above criteria
L	1	Sufficient data to evaluate vulnerability

APPENDIX G: OTHER STRESSORS THAT WERE EVALUATED

Stressors that were evaluated in the CWCS threat assessment that scored lower in importance in terrestrial landscapes, aquatic/riparian systems, or both, within all Arizona ecoregions (2004).		
Stressor/Threat	Terrestrial Landscapes	Aquatic/Riparian Systems
Insect Infestation		X
Light pollution		X
Power lines/wind-harnessing turbines		X
Right-of-way fencing along roadways		X
Telephone lines/cellphone towers		X
Timber harvesting		X
Timber harvesting		X
Bait-bucket dumping/illegal stocking	X	
Dams/reservoirs/impoundments	X	
Heavy metals/mine tailings	X	
Canals/pipelines	X	
Pesticides/herbicides	X	
Nutrients/algal blooms	X	
Dispersed camping	X	
Hybridization	X	
Lead shot/monofilament line	X	
Domestication of wildlife/game farming	X	
Dredging	X	
Landfills/dumps	X	
Air traffic corridors/overflights	X	
Scientific research and collection	X	
Aquaculture	X	X
Drilling for fuels	X	X
Harvesting/collecting plants	X	X
Off-range recreational shooting	X	X
Railroads	X	X

APPENDIX H: CONSERVATION STRATEGIES THAT ADDRESS SPECIFIC STRESSORS/THREATS

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.

- Urban/Rural growth
- Agricultural conversion
- Livestock management
- Sediment/ash flows
- Habitat fragmentation/barriers
- Unnatural fire regimes
- Altered river flow regimes
- Soil erosion
- Streambank alteration
- Loss of key species

Perform landscape classification analyses to identify sensitive habitats, core wildlife areas, and important wildlife corridors.

- Urban/Rural growth
- Canals/pipelines
- Noise pollution
- Light pollution (for nocturnal species)
- Nuisance animals
- Enforcement activities on border

Acquire ecologically important lands, access agreements, conservation easements, and/or water rights.

- Urban/Rural growth
- Agricultural conversion
- Livestock management
- Habitat fragmentation/barriers

Support State planning efforts to address drought issues as they relate to wildlife resources.

- Climate change
- Drought

Promote maintenance and restoration of habitat connectivity by removing or modifying barriers, protecting corridors and riparian areas, and using wildlife-friendly roadway bridges and culverts.

- Agricultural conversion
- Dams/reservoirs/impoundments
- Roads (for motorized vehicles)
- Habitat fragmentation/barriers

Promote maintenance and restoration of habitat connectivity by removing unneeded fences, by using wildlife-friendly barriers in future projects and when replacing old fences.

- Urban/Rural growth
- Livestock management
- Right-of-way fencing

Develop standards for new road, utility and power lines construction, and modification of existing structures and corridors to reduce impacts to wildlife.

- Roads (for motorized vehicles)
- Right-of-way fencing
- Utility lines & towers
- Soil erosion

Promote implementation of recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources.

- Urban/Rural growth
- Utility lines & towers

- Dispersed camping
- Nuisance animals
- Feral animals
- Disease/pathogens/parasites
- Hybridization
- Loss of key species
- Game farming
- Manage so as to sustain or enhance sport fish and native fish populations.
- Dams/reservoirs/impoundments
- Canals/pipelines
- Nuisance animals
- Loss of key species
- Mgmt for game and sport fish

Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.

- Canals/pipelines
- Sediment/ash flows
- Unnatural fire regimes

Maintain and construct new wildlife water developments. Encourage conversion of livestock waters so they are also continuously usable by wildlife.

- Livestock management
- Drought

Collaborate with partners to evaluate sampling techniques, reduce duplication of effort, and develop pathogen decontamination protocols to limit impacts to wildlife.

- Scientific research and collection

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.

- Pesticides/herbicides
- Disease/pathogens/parasites

Evaluate, update, and enforce existing Department regulations to address evolving concerns about hybridization, nuisance animals, illegal stocking, and spread of animals used for bait.

- Nuisance animals
- Hybridization
- Illegal stocking/bait-bucket

Reduce/eliminate the effects of feral animal populations in sensitive habitats or near wildlife populations of concern.

- Feral animals

Educate the public about the impacts of free-ranging or feral animals, release of exotic 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 exotic animals into the wild.

- Urban/Rural growth
- Recreational sites/facilities
- Feral animals
- Illegal stocking/bait-bucket

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.

- Recreational sites/facilities
- Roads (for motorized vehicles)
- Watercraft Operation
- Illegal dumping/littering
- Nuisance animals

Increase public awareness of how water conservation and ensuring instream flow can benefit wildlife.

- Urban/Rural growth
- Groundwater depletion/springhead use
- Drought
- Streambank alteration/water diversion

Encourage the use of native plants and other low water use plants in landscaping.

- Urban/Rural growth
- Groundwater depletion/springhead use
- Nutrients/algal blooms
- Nuisance plants
- Drought
- Unnatural fire regimes

Educate the public regarding identification of contaminants, release prevention, and impacts to wildlife and habitats. Promote alternatives that reduce release of contaminants.

- Heavy metals/mine tailings
- Pesticides/herbicides
- Nutrients/algal blooms
- Contaminants from waste water/runoff

Encourage cooperative clean up efforts of wildlife habitats.

- Watercraft Operation
- Lead shot/monofilament line
- Illegal dumping/littering

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.

- Urban/Rural growth
- Roads (for motorized vehicles)
- Motorized recreation off-trail
- Watercraft Operation
- Non-motorized recreation off-trail
- Dispersed camping
- Lead shot/monofilament line
- Habitat fragmentation/barriers

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.

- Harvesting/collecting animals

Support prevention and suppression of accidental or arson-caused wildfire through information and education and enforcement of appropriate regulations.

- Recreational sites/facilities
- Roads (for motorized vehicles)
- Unnatural fire regimes

Educate the public on the importance of community focal species (including predators, prey, wide-ranging species, keystone species, etc.) for ecosystem health.

- Livestock management
- Loss of key species

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.

- Unauthorized Roads & Trails
- Grazing by herbivores
- Motorized recreation off-trail
- Sediment/ash flows
- Unnatural fire regimes
- Altered river flow regimes
- Soil erosion

Cooperate with state, federal, tribal, and local government partners to develop and implement watershed management plans that incorporate wildlife and habitat values.

- Groundwater depletion/springhead use
- Contaminants from waste water/runoff
- Sediment/ash flows
- Hybridization
- Drought
- Soil erosion
- Streambank alteration/water diversion

Prevent loss and degradation of sensitive habitats through involvement of planning efforts with local governments, private landowners, and agency/tribal land managers.

- Urban/Rural growth
- Agricultural conversion
- Dams/reservoirs/impoundments

Promote restoration of natural fire regimes for improving rangeland and forest health.

- Sediment/ash flows
- Habitat degradation/shrub invasion
- Unnatural fire regimes
- Soil erosion
- Insect Infestation
- Altered fire regime on border

Promote adoption of sustainable forage management standards and guidelines for livestock and wildlife.

- Livestock management
- Grazing by herbivores
- Habitat degradation/shrub invasion
- Unnatural fire regimes
- Loss of key species

Promote conservation of sensitive areas and habitats for wildlife.

- Livestock management
- Recreational sites/facilities
- Unauthorized Roads & Trails
- Utility lines & towers

- Grazing by herbivores
- Motorized recreation off-trail
- Watercraft Operation
- Non-motorized recreation off-trail
- Altered river flow regimes
- Streambank alteration/water diversion
- Dispersed camping on border
- Illegal dumping on border
- Unauthorized roads on border

Encourage development and implementation of standards and guidelines for mining and landfill operations that consider the needs of wildlife resources.

- Mining

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.

- Roads (for motorized vehicles)
- Harvesting of forest products
- Motorized recreation off-trail
- Watercraft Operation
- Non-motorized recreation off-trail
- Drought
- Habitat fragmentation/barriers
- Unauthorized roads on border

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.

- Recreational sites/facilities
- Watercraft Operation
- Non-motorized recreation off-trail

Coordinate to reduce impacts to wildlife along the US-Mexico border.

- Light pollution along the border
- Dispersed camping on border
- Illegal dumping on border
- Unauthorized roads on border
- Altered fire regime on border
- Enforcement activities on border
- Enforcement fences on border
- Water use by illegal immigrants
- Disease along the 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.

- Dams/reservoirs/impoundments
- Canals/pipelines
- Habitat fragmentation/barriers
- Altered river flow regimes
- Streambank alteration/water diversion

Promote programs for eliminating or limiting the spread of invasive plants and animals, and the recovery or reintroduction of native populations.

- Livestock management
- Recreational sites/facilities
- Roads (for motorized vehicles)
- Harvesting of forest products
- Watercraft Operation
- Nuisance plants
- Nuisance animals
- Illegal stocking/bait-bucket

- Disease/pathogens/parasites
- Hybridization
- Habitat degradation/shrub invasion
- Unnatural fire regimes
- Game farming

Limit the spread of invasive plants and promote the restoration of native vegetation in disturbed areas.

- Livestock management
- Roads (for motorized vehicles)
- Canals/pipelines
- Mining
- Sediment/ash flows
- Nuisance plants
- Feral animals
- Soil erosion

Support land management and regulatory agencies in enforcing Best Management Practices to prevent the introduction of toxins into ecosystems.

- Roads (for motorized vehicles)
- Contaminants from waste water/runoff

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.

- Dams/reservoirs/impoundments
- Canals/pipelines
- Heavy metals/mine tailings
- Nutrients/algal blooms
- Contaminants from waste water/runoff
- Altered river flow regimes

Cooperate with land management agencies and municipalities on waste management plans to minimize impacts to wildlife resources.

- Watercraft Operation
- Illegal dumping/littering
- Contaminants from waste water/runoff

APPENDIX I: CWCS CONSERVATION STRATEGIES AND KEY PARTNERS FOR IMPLEMENTATION																		
Emphasis	Conservation Strategy	Land and Resource Management Agencies	Transportation Authorities	Regulatory Agencies	Neighboring Governments	State, County and Local Government	Law Enforcement Entities	Stakeholder Committees or Workgroups	Power and Utility Companies	Non-Governmental Organizations	Academic and Research Entities	Local business and Industry	Mine Operators	Agricultural Agencies and Groups	Private Landowners and Permittees	Recreational Industry	Recreational User Groups	Others
	Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.	X						X										
	Maintain and construct new wildlife water developments. Encourage conversion of livestock waters so they are also continuously usable by wildlife.	X								X				X	X		X	
	Collaborate with partners to evaluate sampling techniques, reduce duplication of effort, and develop pathogen decontamination protocols to limit impacts to wildlife.	X								X	X							
	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.	X	X	X	X	X	X	X		X	X	X		X	X	X	X	
	Evaluate, update, and enforce existing Department regulations to address evolving concerns about hybridization, nuisance animals, illegal stocking, and spread of animals used for bait.	X					X											
	Reduce/eliminate the effects of feral animal populations in sensitive habitats or near wildlife populations of concern.	X		X				X		X				X				
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 exotic 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 exotic animals into the wild.	X		X		X	X	X				X		X	X	X		

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Emphasis	Conservation Strategy	Land and Resource Management Agencies	Transportation Authorities	Regulatory Agencies	Neighboring Governments	State, County and Local Government	Law Enforcement Entities	Stakeholder Committees or Workgroups	Power and Utility Companies	Non-Governmental Organizations	Academic and Research Entities	Local business and Industry	Mine Operators	Agricultural Agencies and Groups	Private Landowners and Permittees	Recreational Industry	Recreational User Groups	Others	
	Educate the public on the importance of community focal species (including predators, prey, wide-ranging species, keystone species, etc.) for ecosystem health.	X								X	X								
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.	X	X		X	X		X		X	X			X	X		X		
	Cooperate with state, federal, tribal, and local government partners to develop and implement watershed management plans that incorporate wildlife and habitat values.	X			X	X		X		X	X				X		X		
	Prevent loss and degradation of sensitive habitats through involvement of planning efforts with local governments, private landowners, and agency/tribal land managers.	X			X	X		X		X	X			X	X		X		
	Promote restoration of natural fire regimes for improving rangeland and forest health.	X			X	X		X		X	X			X	X				
	Promote adoption of sustainable forage management standards and guidelines for livestock and wildlife.	X			X	X		X		X	X			X	X				
	Promote conservation of sensitive areas and habitats for wildlife.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Encourage development and implementation of standards and guidelines for mining and landfill operations that consider the needs of wildlife resources.	X			X			X		X			X	X					
	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.	X					X		X	X	X				X	X	X	X	

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Emphasis	Conservation Strategy	Land and Resource Management Agencies	Transportation Authorities	Regulatory Agencies	Neighboring Governments	State, County and Local Government	Law Enforcement Entities	Stakeholder Committees or Workgroups	Power and Utility Companies	Non-Governmental Organizations	Academic and Research Entities	Local business and Industry	Mine Operators	Agricultural Agencies and Groups	Private Landowners and Permittees	Recreational Industry	Recreational User Groups	Others	
	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.	X		X		X		X		X	X	X				X	X		
Representing wildlife values in other processes	Coordinate to reduce impacts to wildlife along the US-Mexico border.	X			X	X	X	X		X					X		X		
	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.	X		X	X	X		X	X	X	X		X	X	X		X		
	Promote programs for eliminating or limiting the spread of invasive plants and animals, and the recovery or reintroduction of native populations.	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		
	Limit the spread of invasive plants and promote the restoration of native vegetation in disturbed areas.	X	X	X	X	X		X		X	X	X		X	X	X	X		
	Support land management and regulatory agencies in enforcing Best Management Practices to prevent the introduction of toxins into ecosystems.	X			X	X	X	X	X	X		X	X	X	X				
	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.	X			X	X	X		X	X	X	X	X	X	X				
	Cooperate with land management agencies and municipalities on waste management plans to minimize impacts to wildlife resources.	X			X		X		X		X			X	X				

APPENDIX J. CWCS CONSERVATION STRATEGIES LINKED TO DEPARTMENT PROGRAMS AND FOCAL AREAS											
Emphasis	Conservation Strategy	Programs			Focal Areas						
		Wildlife Management	Watercraft	Off-Highway Vehicle	Business Administration	Conservation	Recreation	Information & Education	Laws & Law Enforcement	Research	Administration
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.	X	X	X		X		X	X		
	Perform landscape classification analyses to identify sensitive habitats, core wildlife areas, and important wildlife corridors.	X				X				X	
	Acquire ecologically important lands, access agreements, conservation easements, and/or water rights.	X			X	X					X
	Support State planning efforts to address drought issues as they relate to wildlife resources.	X				X					
Maintaining and re-establishing habitat and landscape connectivity	Promote maintenance and restoration of habitat connectivity by removing or modifying barriers, protecting corridors and riparian areas, and using wildlife-friendly roadway bridges and culverts.	X				X				X	
	Promote maintenance and restoration of habitat connectivity by removing unneeded fences, by using wildlife-friendly barriers in future projects and when replacing old fences.	X				X					
	Develop standards for new road, utility and power lines construction, and modification of existing structures and corridors to reduce impacts to wildlife.	X				X				X	
Wildlife Management	Promote implementation of recovery plans, habitat conservation plans, and other cooperative agreements for sustaining wildlife resources.	X			X	X					X
	Manage so as to sustain or enhance sport fish and native fish populations.	X				X	X			X	
	Develop contingency plans for rapid salvage of wildlife populations threatened with extirpation in situations of imminent habitat loss.	X				X					
	Maintain and construct new wildlife water developments. Encourage conversion of livestock waters so they are also continuously usable by wildlife.	X				X					
	Collaborate with partners to evaluate sampling techniques, reduce duplication of effort, and develop pathogen decontamination protocols to limit impacts to wildlife.	X				X				X	
	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.	X	X	?		X	X	X		X	

APPENDIX J. CWCS CONSERVATION STRATEGIES LINKED TO DEPARTMENT PROGRAMS AND FOCAL AREAS											
Emphasis	Conservation Strategy	Programs			Focal Areas						
		Wildlife Management	Watercraft	Off-Highway Vehicle	Business Administration	Conservation	Recreation	Information & Education	Laws & Law Enforcement	Research	Administration
	Evaluate, update, and enforce existing Department regulations to address evolving concerns about hybridization, nuisance animals, illegal stocking, and spread of animals used for bait.	X				X			X		
	Reduce/eliminate the effects of feral animal populations in sensitive habitats or near wildlife populations of concern.	X				X					
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 exotic 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 exotic animals into the wild.	X				X		X			
	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.	X				X	X	X			
	Increase public awareness of how water conservation and ensuring instream flow can benefit wildlife.	X				X		X			
	Encourage the use of native plants and other low water use plants in landscaping.	X						X			
	Educate the public regarding identification of contaminants, release prevention, and impacts to wildlife and habitats. Promote alternatives that reduce release of contaminants.							X			
	Encourage cooperative clean up efforts of wildlife habitats.							X			
	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.	X	X	X				X	X		
	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.				X			X			X
	Support prevention and suppression of accidental or arson-caused wildfire through information and education and enforcement of appropriate regulations.						X	X			
	Educate the public on the importance of community focal species (including predators, prey, wide-ranging species, keystone species, etc.) for ecosystem health.	X					X	X			

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Emphasis	Conservation Strategy	Programs			Focal Areas					
		Wildlife Management	Watercraft	Off-Highway Vehicle	Business Administration	Conservation	Recreation	Information & Education	Laws & Law Enforcement	Research
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.	X			X	X		X		X
	Cooperate with state, federal, tribal, and local government partners to develop and implement watershed management plans that incorporate wildlife and habitat values.	X				X				
	Prevent loss and degradation of sensitive habitats through involvement of planning efforts with local governments, private landowners, and agency/tribal land managers.	X				X				
	Promote restoration of natural fire regimes for improving rangeland and forest health.	X				X				
	Promote adoption of sustainable forage management standards and guidelines for livestock and wildlife.									
	Promote conservation of sensitive areas and habitats for wildlife.	X				X				
	Encourage development and implementation of standards and guidelines for mining and landfill operations that consider the needs of wildlife resources.	X				X				
	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.	X				X	X			X
	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.	X				X	X			X
Representing wildlife values in other processes	Coordinate to reduce impacts to wildlife along the US-Mexico border.	X				X				
	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.	X				X				
	Promote programs for eliminating or limiting the spread of invasive plants and animals, and the recovery or reintroduction of native populations.	X	X	?		X	X	X		X
	Limit the spread of invasive plants and promote the restoration of native vegetation in disturbed areas.	X				X				

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Emphasis	Conservation Strategy	Programs			Focal Areas						
		Wildlife Management	Watercraft	Off-Highway Vehicle	Business Administration	Conservation	Recreation	Information & Education	Laws & Law Enforcement	Research	Administration
	Support land management and regulatory agencies in enforcing Best Management Practices to prevent the introduction of toxins into ecosystems.	X				X					
	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.	X				X					
	Cooperate with land management agencies and municipalities on waste management plans to minimize impacts to wildlife resources.	X				X					