



Arizona Game and Fish Department

# Sport Fish Stocking Program



## Draft Environmental Assessment

March 2011

Prepared by EcoPlan Associates, Inc.,  
for the U.S. Fish and Wildlife Service and  
the Arizona Game and Fish Department





## **HOW TO COMMENT ON THIS DRAFT ENVIRONMENTAL ASSESSMENT**

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The Draft Environmental Assessment (EA) is available for review on-line at [www.fws.gov/southwest/federal\\_assistance/index.html](http://www.fws.gov/southwest/federal_assistance/index.html) and [www.azgfd.gov/fishea](http://www.azgfd.gov/fishea), or by CD via regular mail upon request to Ms. Brie Darr or Mr. Dave Weedman, as listed below.

In addition, hard copies of the Draft EA may be viewed at the AGFD Phoenix Headquarters and AGFD field offices statewide.

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Written comments may be submitted via mail, fax, or in person (Monday through Friday 8 a.m. to 5 p.m.). Comments may also be submitted by e-mail to [fw2fa@fws.gov](mailto:fw2fa@fws.gov) or [fishaz@azgfd.gov](mailto:fishaz@azgfd.gov). Please refer to Arizona Game and Fish Department Sport Fish Stocking Draft EA in the Subject line.

Electronic comments to the above links may be submitted in Word (.doc or .docx), Rich Text Format (.rtf), text (.txt), or HyperText Markup Language (.html). To expedite the review of submitted comments, please indicate what part of the document (page number, heading, subheading, etc.) your comment relates to.

Questions or written comments may be directed to:

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Additional information about the sport fish stocking program can be found at the Arizona Game and Fish Department website: [www.azgfd.gov/fishea](http://www.azgfd.gov/fishea).

**Comments will be accepted through 5 p.m. April 11, 2011.**

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## ACRONYMS

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ADEQ	Arizona Department of Environmental Quality
AESO	Arizona Ecological Services Office (FWS)
AFS	American Fisheries Society
AGFD	Arizona Game and Fish Department
AGFD Commission	Arizona Game and Fish Department Commission
AISAC	Arizona Invasive Species Advisory Council
ARS	Arizona Revised Statute
ASU	Arizona State University
AUD	angler use day
BA	Biological Assessment
BCO	Biological and Conference Opinion
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act
BLM	U.S. Department of the Interior Bureau of Land Management
BMPs	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO <sub>2</sub>	carbon dioxide
EA	Environmental Assessment
ESA	Endangered Species Act
FIN	Fishing in the Neighborhood
Fisheries Commission	U.S. Commission of Fish and Fisheries
FS	U.S. Department of Agriculture Forest Service
FWS	U.S. Department of the Interior Fish and Wildlife Service
HACCP	Hazard Analysis and Critical Control Points
HDMS	Heritage Data Management System
HUC	Hydrologic Unit Code
MBTA	Migratory Bird Treaty Act
NEPA	National Environmental Policy Act of 1969
O&M	operations and maintenance
PAC	Protected Activity Center
Reclamation	U.S. Department of the Interior Bureau of Reclamation
SFRA	Sport Fish Restoration Act
SRP	Salt River Project
USGS	U.S. Department of the Interior U.S. Geological Survey
WSCA	Wildlife Species of Special Concern in Arizona
WSFR	Wildlife and Sport Fish Restoration Program (FWS)

## **1.0 INTRODUCTION**

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The Arizona Game and Fish Department (AGFD), the applicant, is proposing to continue its Sport Fish Stocking Program for a 10-year period by continuing to operate AGFD hatcheries and stock sport fish<sup>1</sup> in selected rivers, streams, lakes, reservoirs, ponds, and tanks in the state. The Sport Fish Stocking Program includes operations and maintenance of five AGFD fish hatcheries that rear and supply a majority of the fish used in the stocking program, the acquisition of fish from outside sources, and the stocking of those fish into waters of the state of Arizona. The U.S. Fish and Wildlife Service (FWS) Wildlife and Sport Fish Restoration Program (WSFR) proposes to continue to provide funding for the Sport Fish Stocking Program under the Dingell-Johnson Sport Fish Restoration Act of August 9, 1950, as amended (16 U.S. Code 777–777n) (SFRA). SFRA directs the FWS to provide federal aid to states for the “material value in connection with sport or recreation in the marine and/or fresh waters of the United States.” With the provision of federal funding, the AGFD Sport Fish Stocking Program is subject to compliance with the National Environmental Policy Act of 1969 (NEPA), as well as other applicable environmental laws and regulations. The FWS is the lead federal agency responsible for NEPA compliance; the AGFD is the cooperating agency.

This Draft Environmental Assessment (EA) has been prepared in accordance with NEPA, Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500–1508), U.S. Department of the Interior Regulations (43 CFR 46), the FWS NEPA Reference Handbook updated October 1998, and the FWS NEPA Guidance to States Participating in the Federal Aid Program updated in October 2000.

### **1.1 Applicable Funding**

The WSFR program is part of the FWS and has the authority to approve grants and provide SFRA funds to states for sport fish management and restoration, and other activities. Funds distributed to the states under SFRA are derived from a 10 percent excise tax on certain items of sport fishing tackle; a 3 percent excise tax on fish finders and electric trolling motors; import duties on fishing tackle, yachts, and pleasure craft; a portion of motorboat fuel tax revenues and small engine fuel taxes; and interest earned on the account. Non-federal matching funding sources for the AGFD Sport Fish Stocking Program include revenues from the sale of fishing licenses and trout stamps, wildlife conservation funds, Heritage Program (Arizona state lottery) funds, contract funding from municipalities for urban fishing waters, and private donations.

### **1.2 Purpose and Need**

SFRA directs the Fish and Wildlife Service to provide federal aid to states for the management and restoration of fish having “material value in connection with sport or recreation in the marine and/or fresh waters of the United States.” To fulfill this legislative mandate, the FWS proposes to fund, in part, the AGFD’s Sport Fish Stocking Program.

The purpose of the proposed activity is to meet the current and future need and demand for angling opportunities through the continued use of SFRA funds to rear sport fish at

<sup>1</sup> As used throughout this Draft EA, sport fish is defined as aquatic, gill-breathing, vertebrate animals bearing paired fins and having material value for sport or recreation.

AGFD hatcheries, acquire sport fish from outside sources, and stock sport fish into selected waters of Arizona, thereby fulfilling the SFRA legislative mandate and continuing to support the AGFD Mission.

In Arizona, hundreds of thousands of residents and non-residents take advantage of recreational fishing opportunities each year. Based on 2006 numbers, there were 4,156,000 angler use days (AUDs)<sup>2</sup> of fishing in Arizona, with a total annual economic impact of \$1.3 billion (Southwick Associates 2007). The AGFD estimated a resident demand of 6 million AUDs through 2012, with some growth anticipated in nonresident demand (AGFD 2008). Demand for angling opportunities in Arizona is anticipated to further increase given current trends in population growth and projected growth models, especially for those areas in close proximity to urban area boundaries.

### **1.3 Proposed Action**

The WSFR proposes to fund, in part, the AGFD Sport Fish Stocking Program, including operations and maintenance of AGFD fish hatcheries that rear and supply a majority of the fish used in the stocking program, the acquisition of fish from outside sources, and the stocking of those fish into waters of the state of Arizona to provide opportunities for recreational fishing. The Proposed Action would include a total of 167 stocking sites: 58 with a cold-water fishery objective, 23 with a warm-water fishery objective, and 86 with a cold- and warm-water fishery objective (Section 3.2 describes the Proposed Action in detail).

The Proposed Action would incorporate the Sport Fish Stocking Conservation and Mitigation Program, which would be implemented to avoid, reduce, offset, or otherwise minimize environmental impacts associated with the Proposed Action.

### **1.4 Decision to Be Made**

The responsible official for this Draft EA is the FWS Regional Director, Region 2. This official must decide whether to approve a grant of SFRA funds to the AGFD for the continued implementation of the Sport Fish Stocking Program.

### **1.5 Scoping**

The FWS and the AGFD sought early involvement and consultation with federal, state, and local governmental agencies, Native American tribes, interested community organizations, and the public at large as part of an agency and public scoping process. The scoping outreach is described in Chapter 7.0.

#### ***1.5.1 Agency Responses to Scoping***

Responses to the scoping process were received from the following agencies: the U.S. Department of Agriculture Forest Service (FS) Apache-Sitgreaves National Forests and Coconino National Forest, the U.S. Department of the Interior Bureau of Reclamation (Reclamation) Phoenix Area Office and Upper Colorado Regional Office, the National Park

<sup>2</sup> An AUD is one angler fishing one day, regardless of the length of time spent that day.

Service Grand Canyon National Park and Glen Canyon National Recreation Area, and the Pima County Office of Conservation Science and Environmental Policy.

The agency scoping comments received concerned one primary overarching issue—the impacts of nonnative fish stocking on the survival and recovery of native fish, amphibians, and semi-aquatic reptiles. Competition between native and nonnative species, predation of native species by nonnative species, and genetic alteration/hybridization were cited as some of the potential effects of nonnative fish stocking. Other potential effects noted were the escapement of nonnative fish to unintended water bodies and the introduction/movement of diseases, parasites, and other undesirable organisms. Examples of undesirable organisms cited include crayfish, Asiatic clams, mud snails, and other nonnative organisms, including plants (e.g., *Salvinia*).

Agencies offered suggestions related to their concerns: to emphasize native sport fish management over nonnative sport fish management, to expand the management of native aquatic species in isolation from nonnative species, to devote entire drainages or subdrainages to the exclusive management of natives, and to construct fish barriers and remove nonnative fishes to restore native assemblages of aquatic species. To address the issue of the escapement of stocked fish, one agency suggested that stocked fish could be tagged and monitored for any escapement from suspect waters.

Some agency responses recommended that fish stocking activities strike a balance between recreational opportunities and other resource needs. Agencies also noted that fish stocking should be consistent with adaptive management and existing conservation plans. The Glen Canyon Dam Adaptive Management Program strategic plan and the Pima County draft Multi-Species Conservation Plan were examples cited.

### **1.5.2 Public Responses to Scoping**

Approximately 130 responses were received related to this proposed activity from members of the public. A large number of responses stated general support for the sport fish stocking program, while a few responses included no real statement of support or opposition. Comments in support referenced the social/recreational importance of fishing; the importance of fish stocking in the urban lakes to families, inner city youth, and anyone without access to rural fishing areas; and the importance of fishing to the local economy and state revenues.

Public comments in opposition to the sport fish stocking program focused on the impacts of nonnative fish stocking on the survival and recovery of native fish, amphibians, and semi-aquatic reptiles, similar to the concerns noted in the agency responses. Specific objection was stated regarding the stocking of nonnative fishes in habitats occupied by, or designated for management of, state special status species or federally listed species, including any stocking that would conflict with threatened and endangered species recovery actions. Competition between native and nonnative species, predation of native species by nonnative species, and increasing predator diversity were cited as some of the potential effects of nonnative fish stocking. Other potential effects noted were the escapement of nonnative fish to unintended water bodies, and the introduction/movement of diseases, parasites, and other undesirable organisms. A few responses requested that consideration be given to the potential cumulative effects of climate change on imperiled species, including the effects of stream flow reductions and increases in water temperatures on native aquatic wildlife.

Some letters did not explicitly state support or opposition but asked for disclosure or discussion of information on self-sustainable fish populations, particular fish species to be stocked or transferred between waters, temperature thresholds and predation effects on seasonal stockings of cool-water fish, water quality trends, implications of a No Action alternative, funding sources, funding allocations and expenditures, use of funding to stock a specific area, and use of revenues collected from sales taxes on fishing equipment on sport fish versus non-sport fish stocking and habitat restoration. Many of the responses included specific suggestions or questions such as those related to fishing regulations and enforcement, species and sizes stocked, stocking locations, stocking levels, license fees, site management, stocking schedule, sources for fish, seasonal closures, conservation of native fish, and the aquatic wildlife stocking permit program.

The input received during the scoping process was important in the development of alternatives to the Proposed Action. Along with the results of the preliminary analysis, scoping input was used to focus the environmental analysis of the Proposed Action and its alternatives.

## 2.0 BACKGROUND

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The AGFD is the principal state agency responsible for the management and protection of wildlife resources and their habitats in Arizona, including fisheries. For many years, the AGFD and other agencies have supplemented recreational angling<sup>3</sup> opportunities by stocking state waters with sport fish species. The following two sections provide a brief history of fish hatcheries and stocking practices in Arizona and an overview of the existing AGFD Sport Fish Stocking Program and its components based on recent years of operation.

### 2.1 History of Fish Hatcheries and Stocking Practices in Arizona

The history of legally stocking fish across the landscape dates to 1872, when the U.S. Commission of Fish and Fisheries (Fisheries Commission) was tasked by Congress to supplement declining “native stocks of coastal and lake food fish through fish propagation” and the National Fish Hatchery System was formed (FWS 2010a). Federal hatcheries were created that same year and operated in most states (Stein 2010). The Fisheries Commission was renamed the U.S. Bureau of Fisheries in 1903 and, as the federal hatchery system grew, fish were transported and stocked across the country using fish cars via the railroad system (1871–1933).

In 1913, the Arizona Legislature created an agency called the Department of State Game Warden. Its name was subsequently changed to the Arizona Game and Fish Commission. The State of Arizona enacted legislation to manage fish in state waters, and in 1922, began construction of the first state-operated fish hatchery. Since the 1920s, the AGFD has been rearing and stocking fish in Arizona to compensate for the limited opportunities provided by native sport fisheries.

In 1940, the FWS was created, and the Bureau of Fisheries merged with it. Stocking programs continued and increased to offset the decline of fish resulting from the creation of dams and other federal water projects (FWS 2010b).

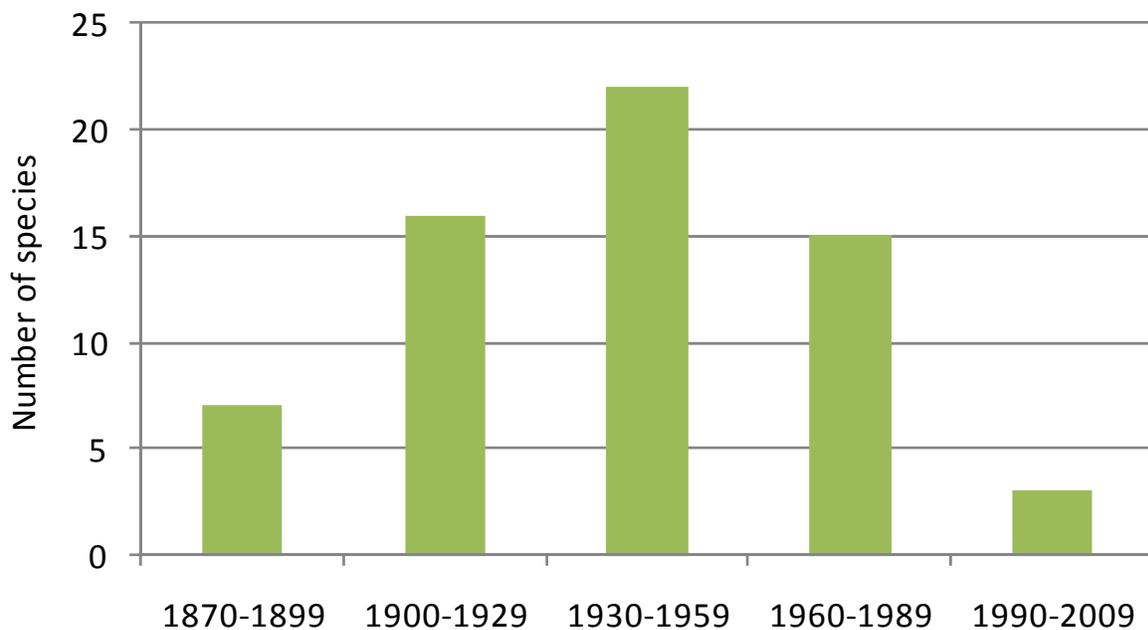
In August 1950, the Dingell-Johnson Federal Aid to Fisheries Act (original name) was signed into law (Public Law 81-681) to provide federal funds to states for fisheries restoration and management programs. Subsequent amendments authorized funding for aquatic education, wetlands restoration, and boating safety. The excise taxes that had been collected on fishing tackle and equipment were then earmarked and put into a special account for apportionment to the states for sport fish restoration programs, effective July 1, 1951. The SFRA became a cooperative effort between the FWS and state fish and wildlife agencies to invest anglers’ tax dollars in state sport fishing development projects. As a result, stocking efforts and the development of fishery management programs, including but not limited to hatcheries, expanded and intensified due to the availability of funds. Stocking records in Arizona from federal and state-operated hatcheries were sparse in early years due to the initial lack of stipulations for types of projects and the lack of clarity for reporting requirements under the SFRA.

In Arizona during the 1940s, emphasis on raising and stocking fish shifted to cold-water species, primarily trout (Bassett et al. 1998) to increase fishing opportunities. The availability of SFRA

<sup>3</sup> Fishing with a hook and line and usually a rod.

funds and continued growing demand for fishing prompted the creation of a lake development program within the AGFD in the 1950s, 1960s, and early 1970s and instigated the creation of many lakes within the state. The creation of these lakes greatly increased the number of stockings and the number of species stocked during this period. Most of these lakes provided substantial recreational opportunities to the public as well as food on their tables. Threadfin shad were initially harvested from the lower Colorado River to stock in warm-water lakes as a forage base for bass and crappie populations. Trout stockings in Arizona and across the western United States were most numerous in the 1960s for several reasons: increased funding, the improvement of existing hatcheries, the creation of new hatcheries, and improved propagation techniques (Schade and Bonar 2005), as well as growth in human population and recreational interest.

The greatest number of new introductions of fish species (authorized and unauthorized) occurred between 1940 and 1960 (Figure 1). The AGFD and the Fisheries Commission/FWS were responsible for stocking the majority of nonnative fish into the state during this period, primarily for human consumption (Appendix A, Tables A and B). Sixty-five species of nonnative fish have been introduced into Arizona through a variety of pathways, primarily by these authorized stockings. Of these, 19 species (30 percent) were likely unauthorized or unintentional introductions, primarily from releases of baitfish and fish from aquaria or ornamental ponds (Appendix A, Table C). Six of the 19 species are considered sport fish and were stocked primarily between 1937 and 1950 when fish were stocked across North America to provide food.



**Figure 1.** The number of fish first introduced in Arizona, including authorized and unauthorized introductions, using data from the U.S. Commission of Fish and Fisheries, newspaper records, and AGFD stocking records.

The number of new species introduced for the first time into Arizona waters decreased after 1960, particularly after 1990, perhaps based on a few developments such as the adoption of baitfish regulations in 1976, the enactment of the Endangered Species Act (ESA) in 1973, and the incorporation of native fish work into the AGFD beginning in the 1960s and 1970s. Another contributing factor may be that most of the likely suitable or potentially suitable species of sport fish had been introduced across the landscape by that time. More specifically, the introduction of fish from aquaria or ornamental pond releases, as well as from baitfish releases of fish not approved for use as bait in Arizona, has been substantially reduced since 1960. Between 1990 and 2010, only three fish species (i.e., gizzard shad, inland silverside, and alligator gar) were newly documented in Arizona; none of these species introductions was attributed to fish stocking by the AGFD.

The AGFD created a database in 1985 that stores a comprehensive record of sport fish stockings conducted by the AGFD since the mid-1950s and a portion of those conducted by the FWS.

## **2.2 Existing AGFD Sport Fish Stocking Program Overview**

The mission of the AGFD is to conserve, enhance, and restore Arizona's diverse wildlife resources and habitats through aggressive protection and management programs, and to provide wildlife resources and safe watercraft and off-highway vehicle recreation for the enjoyment, appreciation, and use by present and future generations. Achieving this mission requires the AGFD to balance the needs of native species that are not pursued for sport by the recreating public with the public demand for recreational opportunities. The AGFD also recognizes that the ability to continue to provide sport fishing opportunities is closely tied to the continued conservation of native aquatic species. To balance these needs, the AGFD has implemented (and continues to implement) wildlife conservation actions targeted to federally listed and other sensitive species. Actions include planning, statewide species monitoring, implementation of recovery and conservation projects, assistance to other organizations and individuals in wildlife conservation, and funding for conservation activities through the Heritage Fund Program and the Wildlife Conservation Fund Program. Appendix A, Table D lists conservation actions that have been implemented by the AGFD that target consultation and other special status species considered in this Draft EA.

The following overview of the existing AGFD Sport Fish Stocking Program is provided as background to the reviewer and outlines the general approach that would be used if either of the action alternatives described in Chapter 3 is implemented.

### **2.2.1 Statutory and Regulatory Authority**

Authority to manage and regulate wildlife, including fish, in Arizona is provided under Arizona Revised Statute (ARS) Title 17. Pertinent to the AGFD Sport Fish Stocking Program, ARS Title 17 outlines AGFD and Arizona Game and Fish Commission (AGFD Commission) roles and responsibilities related to funding, the taking, handling, and management of wildlife (including regulations and licenses), fish hatching, and fish culture.

### **2.2.2 AGFD Sport Fish Program Goals and Objectives**

The goals for the AGFD Sport Fish Program as approved by the AGFD Commission are to (1) maintain, manage, and enhance the quality, abundance, availability, and diversity of sport

fish opportunities while contributing to the conservation of Arizona's native fishes; (2) develop integrated, watershed-based fisheries management approaches for watersheds and identify reaches or zones for management for sport fishes and native fishes; (3) increase public awareness of Arizona's sport fishing resources and opportunities; and (4) develop and implement actions to increase angler recruitment and retention.

The objectives of the AGFD Sport Fish Program are to (1) annually provide sport fishing opportunities to accommodate 1.6 million cold-water and 4.4 million warm-water AUDs by 2012 and (2) achieve a 10 percent increase in satisfaction rating among Arizona's angling public by 2012. The AGFD Sport Fish Stocking Program plays an integral role in the ability of the AGFD to meet Sport Fish Program goals and objectives.

### **2.2.3 AGFD Sport Fish Stocking Program Approach**

Water bodies in the state are managed by the AGFD under various management approaches and objectives. In general, AGFD manages sport fishing resources as cold-water fisheries (supporting cold-water species of fish), warm-water fisheries (supporting warm-water species of fish), or both. These terms refer to the temperature tolerances of stocked species, with cold-water species identified as trout and Arctic grayling, and warm-water species as largemouth bass, channel catfish, bluegill and redear sunfish, and others.<sup>4</sup>

A number of water bodies, including urban lakes, can be managed as warm-water fisheries year-round and as seasonal cold-water fisheries in winter months. AGFD stocking activities fall into four basic categories:

- *Regularly Planned*—Stocking at regular intervals to support intensive fisheries or to augment fisheries with insufficient production
- *Opportunistic*—Stocking in response to unique or seasonal opportunities
- *Catastrophic*—Augmentation of an existing fishery in response to full or partial loss due to a catastrophic event such as an algae bloom or lethal water temperatures
- *New Fishery*—Establishment of a new fishery with the intent for it to be self-sustaining

Stocking management approaches for cold-water and warm-water fisheries can be grouped into three categories:

- *Put-and-Take*—An approach used for intensive use (high use) fisheries. Fish are stocked into waters at catchable size (adults, usually in excess of 1 year in age; 9.5 inches or longer for trout), with a short duration between release and capture by anglers (typically, a few days to 4 weeks). The goal is to enhance stocks on a regular basis exclusively for the capture and removal of fish by anglers.
- *Put-Grow-and-Take*—Fish are stocked into waters as juveniles (subcatchables and fingerlings) to grow on natural food. Adults are captured later by anglers. The approach is dependent on the

<sup>4</sup> Walleye and perch are considered cool-water species. For ease of presentation in this Draft EA, walleye and perch have been grouped with the warm-water species.

natural productivity of the water body and the ability of a given species of fish to survive all seasons (due to water temperature, water availability, etc.).

- *Sustained Yield*—The catch and harvest by anglers (fishing pressure) occurs over time without decreasing the ability of the fish population to support the continuation of this level of yield. Stocking, if needed, occurs infrequently and at low levels.

#### **2.2.4 Program Components**

The following sections describe the fish sources used by the AGFD, the sport fish stocking subprograms under which the existing program is managed, and an additional sport fish stocking subprogram to be incorporated into the action alternatives, if implemented.

##### **Fish Sources**

The AGFD obtains fish for its sport fish stocking program from two primary sources: existing AGFD-operated fish hatcheries and contract vendors (commercial sources). The AGFD sometimes receives fish from other federal or state facilities (outside Arizona).

##### AGFD Hatcheries

There are currently six AGFD-operated hatcheries in Arizona, though historically (1920s through 1950s) there were many more small-scale hatchery operations. Five of AGFD's six hatcheries supply fish for the AGFD Sport Fish Stocking Program; the sixth facility, the Bubbling Ponds Hatchery, is primarily a native fish facility supported by state funding. AGFD hatcheries supply more than 80 percent of the fish stocked under the existing AGFD Sport Fish Stocking Program:

- *Tonto Creek Hatchery*—East of Payson, Gila County
- *Silver Creek Hatchery*—East of Show Low, Navajo County
- *Canyon Creek Hatchery*—Southwest of Heber, northeast Gila County
- *Sterling Springs Hatchery*—Oak Creek Canyon, Coconino County
- *Page Springs Hatchery*—Page Springs, northeast Yavapai County

The AGFD acquires eggs from vendors for fish production in its hatcheries.

##### Contract Vendors

Because AGFD-operated hatcheries are currently operating at maximum production capacities and primarily produce trout species, additional fish are supplied through contract vendors. Contracted fish are primarily warm-water species; however, some trout are also purchased. The Urban Sport Fish Stocking Subprogram is the primary recipient of contract-purchased fish, accepting 89 percent of all contract-purchased fish, according to AGFD stocking records. However, if funding is available, several waters within the Statewide Sport Fish Stocking Subprogram may be stocked with fish supplied by vendors to increase statewide fishing opportunities. Stocked warm-water fish create a different and/or seasonal opportunity when rainbow trout cannot be stocked and, at several waters, provide opportunity during warmer months. Fish purchased from contract vendors must meet strict health certification requirements (Section 2.2.6).

## **AGFD Sport Fish Stocking Subprograms**

As part of the existing program, AGFD stocking sites are managed under two subprograms: the Statewide Sport Fish Stocking Subprogram and the Urban Sport Fish Stocking Subprogram. The AGFD is proposing to add a third category—the Fishing in the Neighborhood (FIN) Subprogram.

### *Statewide Sport Fish Stocking Subprogram*

The Statewide Sport Fish Stocking Subprogram includes waters to be stocked across the state. Some of these waters (e.g., Tempe Town Lake and Watson Lake) fall within urban areas (within municipal boundaries). The identification of suitable stocking sites and the stocking regime (species, quantities, and timing/season) at particular sites are based on water quality, quantity, and consistency; existing aquatic communities; species biology; impacts to native species; angler use and access; fish availability; partnership commitments and needs; and social demand.

The majority of fish stocked in the Statewide Sport Fish Stocking Subprogram are cold-water species, including rainbow, Apache, brook, cutthroat, and brown trout. These stocked trout comprise the majority of the angler trout catch in Arizona, with naturally reproducing or wild trout being only a minor component of total angling opportunity. In most Arizona cold-water streams, natural trout production is insufficient to meet angling needs. Trout generally will reproduce in streams if adequate spawning conditions are present; however, most Arizona streams have marginal spawning conditions. Trout generally do not reproduce in Arizona lakes. Arizona has limited opportunities for native sport fish angling due to the lack of suitable waters and habitat. Furthermore, the demand for recreational angling cannot be met alone by the three native sport species in Arizona (Apache trout, Gila trout, roundtail chub).

In contrast to the cold-water species, most of the warm-water species in the state—especially those in the larger impoundments such as Roosevelt Lake—come from natural reproduction. Only 0.8 percent of fish stocked in the Statewide Sport Fish Stocking Subprogram are warm-water species. For the Statewide Sport Fish Stocking Subprogram waters, the majority of AUDs related to warm-water fishes is maintained through natural reproduction and recruitment of sport fish populations and not by the stocking program. The timing and frequency of stocking, as well as the number of fish stocked, varies by geographic area and fishery type.

### *Urban Sport Fish Stocking Subprogram*

The current Urban Sport Fish Stocking Subprogram includes designated lakes in urban cities/communities. These lakes are all in municipal public parks and urban recreation areas and provide convenient, affordable, and accessible fishing for anglers of all ages and abilities.

These lakes are intensively stocked 20–24 times per year with trout, catfish, and bluegill sunfish. Other fish species would be stocked opportunistically. Fishing clinics and educational programs are held at urban lakes. These events emphasize youth participation, which represents 25 percent of the subprogram participation.

### *Proposed Fishing in the Neighborhood Subprogram*

In support of its goal for recruitment and retention of anglers in Arizona, the AGFD is proposing to implement the new FIN Subprogram with 15 proposed waters. The aim of FIN is to recruit

new anglers and retain existing anglers by targeted activities at established lakes in urban areas designated as part of this subprogram. These activities include (1) fishing derbies and similar events, (2) supplemental stockings to augment low natural reproduction and increase fishing success, and (3) stockings to restart the fish population after a catastrophic event (e.g., golden algae kills) or lake draining. The level of angling use at FIN Subprogram lakes is moderate to high compared with Urban Sport Fish Stocking Subprogram lakes, where angling use is extremely high and intensive. In consideration of this difference, the stockings under the FIN Subprogram would generally be less frequent and less intensive.

### **2.2.5 Rules and Regulations**

Under the authority provided by ARS Title 17, the AGFD Commission enacts orders, rules, and regulations related to wildlife and fisheries management in the state. These regulations are published in summary form every two years in the Fishing Regulations booklet, available free of charge at all AGFD offices, on-line via the AGFD website, authorized fishing licensed vendors, and often at stores or facilities near popular angling locations (e.g., marina stores). A summary follows of current rules and regulations that potentially reduce or eliminate interrelated impacts to native species and the aquatic ecosystems in general caused by sport fish stockings: incidental catch and possession of threatened and endangered species, transmission of diseases, transport and introduction of live sport fish by the public, and use and introduction of baitfish or other organisms.

#### **Incidental Catch and Possession of Listed Species of Fish**

As identified in AGFD Commission rule R12-4-406 and as summarized in the AGFD Fishing Regulations, all native fish, including federally listed, candidate, and proposed species per the ESA, except those designated as sport fish (i.e., Apache trout, Gila trout, and roundtail chub), are protected statewide, are illegal to possess and, if caught, should immediately be released alive and unharmed.

#### **Transmission of Diseases**

Regulations that address potential transmission of fish diseases are identified at R12-4-410 for aquatic wildlife stocking permit holders and at R12-4-411 for live bait dealer's license holders and require originating facilities to be able to demonstrate, through annual fish health inspections, that they are free of restricted fish diseases and their causative agents. Operational protocols and procedures (outside the current rules and regulations) that address potential transmission of diseases are discussed in the following sections.

#### **Transport and Introduction of Live Sport Fish by the Public**

R12-4-405 prohibits the importing, purchasing, and transporting of live wildlife without an Arizona license or permit. Under ARS § 17-306 and R12-4-402, the transport and introduction of fish or other organisms to Arizona waters is prohibited, except as expressly authorized (e.g., Title 3, Chapter 16, relating to licensed aquaculture). R12-4-315 prohibits the transport of live fish from Arizona waters, except as allowed under R12-4-316, which is described in the following section.

## **Use and Transport of Live Baitfish and Other Organisms**

R12-4-316 governs possession, transportation, importation, and use of live baitfish, crayfish, and waterdogs. Baitfish may be purchased at authorized dealers or captured and used on-site where legal to do so. Not all waters of Arizona are open to all bait species; the AGFD has designated specific areas for use of certain species of baitfish. Baitfish are not allowed at any site in Apache, Cochise, Coconino, Navajo, or Pima counties. In the other counties, the use of baitfish is allowed at specific sites. The species currently permitted for use in Arizona are fathead minnow, mosquitofish, red shiner, threadfin shad, golden shiners, goldfish, sunfish, carp, and tilapia. Other than using baitfish for fishing as allowed, it is illegal to release live baitfish into any Arizona waters. These restrictions assist in protecting native and sport species and their habitat from the introduction of new nonnative species or diseases that may be carried by those species.

### **2.2.6 Fish Health and Best Management Practices**

This section describes the operational protocols used in the AGFD Sport Fish Stocking Program, specifically those related to hatcheries and stocking operations. AGFD fish health inspections follow established American Fisheries Society (AFS) Blue Book procedures for the detection and identification of certain finfish and shellfish pathogens (American Fisheries Society 2007). Samples for routine hatchery inspections are collected once per calendar year, and samples for diagnostic cases at the hatcheries are collected as needed, such as when there is unusual mortality or a suspected fish health concern.

Certain pathogens are considered reportable to the World Organization for Animal Health, including epizootic haematopoietic necrosis, Infectious haematopoietic necrosis, spring viraemia of carp, viral haemorrhagic septicaemia, infectious pancreatic necrosis, infectious salmon anaemia, epizootic ulcerative syndrome, bacterial kidney disease (*Renibacterium salmoninarum*), Gyrodactylosis (*Gyrodactylus salaris*), and red sea bream iridoviral disease. None of these reportable pathogens has been discovered at AGFD hatcheries.

To assess AGFD hatcheries, the AGFD Fish Health Lab conducts testing for viruses, bacteria, and parasites. Inspections are conducted annually at all state hatcheries. These hatchery inspections include tissue necropsies and use microscopy to check for internal and external parasites per AFS Blue Book procedures. For virology and bacteriology, AGFD protocols use cell culture and biochemical testing per AFS Blue Book procedures. If samples show positive symptoms, tissue samples are sent to a qualified laboratory equipped to run detailed histology and/or molecular testing. If any reportable pathogens or pathogens of concern were to be detected, the fish testing positive would not be stocked, and treatment and disinfection options would be considered once final testing results were available.

In natural resource work, equipment and/or organisms are often moved from one location to another. The specific equipment or organism being moved is called the target. Targets include fish for stocking to meet recreational demands or conservation requirements. Fish stocking may require the use of equipment such as trucks, sampling tools/gear such as nets or traps, and people. Transporting targets provides a potential vector for the spread of nontarget organisms that could potentially invade new habitats. Nontarget organisms are the plants, animals, diseases, pathogens, and parasites that are not intended to be moved.

The management of potential pathways to control the movement of nontarget organisms has been standard business practice with the food production industry and the military for decades and is known as Hazard Analysis and Critical Control Points (HACCP). Within the past 5–10 years, HACCP processes have been designed specifically for natural resource applications, such as hatchery operations. HACCP planning is a management tool that provides a structured method to identify risks by applying detailed focus on procedures.<sup>5</sup>

Three hatchery activity areas warrant development and practice of HACCP procedures for hatchery operations:

- Products (i.e., fish or eggs) coming into a hatchery,
- Products (i.e., fish) leaving a hatchery, and
- Equipment being transferred between facilities.

Currently, AGFD hatcheries maintain no brood stock for egg production. Trout eggs are obtained from external sources, and the AGFD requires that the facility of origin have current documentation that fish have been certified free of bacteria, viruses, and parasites. Though contract facilities are currently not subject to the HACCPs or Best Management Practices (BMPs) or operational protocols of AGFD hatcheries, the AGFD plans to coordinate with vendors to require HACCPs or BMPs or protocols in the near future for all contract facilities. Moreover, the AGFD treats/disinfects imported fish eggs upon arrival. The AGFD hatcheries have developed HACCP plans to cover fish distribution as well as equipment transfers (<http://haccp-nrm.org/liststateplans.asp?State=AZ>). Each hatchery facility has a HACCP plan because each facility is unique (water source, infrastructure, risks/hazards present, etc.) and each has slightly different means of operations. HACCP plans were developed using guidance provided by the FWS (2004) and focus on the three previously mentioned hatchery activity areas.

The HACCPs cover a broad range of organisms (i.e., vertebrates, invertebrates, plants, and other organisms) rather than listing species-specific threats. The AGFD provides training to hatchery staff and field resource managers with the specific goal to maintain and implement HACCP plans and associated procedures for all essential risk-bearing hatchery activities. HACCP plans focus efforts on “Critical Control Points” to control nontarget organisms. Detection of nontarget organisms can occur during a number of operational/procedural steps. For example, detection can occur while inspecting spring water sources, cleaning raceways, feeding and observing fish, conducting fish health assessments, monitoring water quality and quantity, removing mortalities, inventory and/or harvesting of fish, and transferring fish among rearing units. The procedures provide opportunities to detect nontarget organisms and fish disease. Should a nontarget organism or fish health issue of concern be discovered, it would be investigated to determine the source and analyze the threat to the hatchery. Thereafter, options would be reviewed to determine the best approach to address and/or remove the nontarget organism or threat.

<sup>5</sup> Additional information is available at <http://haccp-nrm.org/>.

With the exception of the Silver Creek Hatchery, all AGFD hatcheries have secure water sources protected by spring boxes or other exclusionary devices, such as fencing or underground pipes. The Silver Creek Hatchery water source is proposed to be renovated in 2011 and protected by pipe and earthen encasement.

Water discharged from AGFD hatcheries must be in compliance with provisions of the federal Clean Water Act and State Water Quality Standards (Arizona Administrative Code Title 18, Chapter 11, Article 1). The Clean Water Act gives the Environmental Protection Agency the authority to set effluent limits on an industrywide and water quality basis that ensures protection of the receiving water(s). The Arizona Department of Environmental Quality (ADEQ) has primacy and administers this program in Arizona. The AGFD holds ADEQ permits for Page Springs Hatchery, Canyon Creek Hatchery, and Tonto Creek Hatchery. Silver Creek Hatchery and Sterling Springs Hatchery do not have discharge permits because they are currently exempt under 40 CFR 122.24, which does not require discharge permits for cold-water facilities that produce less than 9,090 harvest weight (approximately 20,000 pounds) of aquatic animals per year and feed less than 2,272 kilograms (approximately 5,000 pounds) of food during the calendar month of maximum feeding. Water-quality testing frequency is established by the ADEQ and generally is required on a monthly basis.

The permit system is used to protect the designated beneficial uses of waters through numeric and narrative water quality standards. The beneficial uses for Arizona waters include:

- Aquatics and wildlife (cold water)
- Aquatics and wildlife (warm water)
- Fish consumption
- Full-body contact
- Partial-body contact
- Drinking water source
- Agricultural irrigation
- Agricultural livestock watering

All state hatchery facilities are in compliance with permit requirements. Designated beneficial uses are supported at all waters where permitted hatchery operations occur. To ensure adequate water quality, BMPs were developed in 2004–2005 for all hatchery facilities and address facility operations, water source, treatment systems, cleaning procedures, maintenance procedures, solids controls, material storage, structural maintenance, recordkeeping, and training of staff. BMPs are updated, as needed, due to changes in operational procedures or new infrastructure, such as clarifiers. Examples of BMPs include minimum frequencies for inspecting and/or cleaning tanks or raceway screens, storing chemicals away from rearing units, and harvesting protocols.

## **3.0 ALTERNATIVES**

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This chapter describes the range of reasonable alternatives considered in detail for the project—the Proposed Action, an additional action alternative that represents the proposed activity at a reduced level (i.e., Reduced Stocking Alternative), and No Action. Two additional alternative concepts were initially considered for the proposed activity but were eliminated from detailed study (Section 3.5).

### **3.1 Development of Alternatives**

The missions of the FWS and the AGFD include mandates related to the provision of sport fishing opportunities as well as the conservation of native fish and wildlife resources. Consideration was given to both mandates in the development of sport fish stocking alternatives for this Draft EA.

From the 1920s (when the AGFD began rearing and stocking fish) to the present, the AGFD has provided or enhanced recreational angling opportunities by stocking state waters with sport fish species reared at hatcheries or purchased from commercial suppliers. Historically, the AGFD Sport Fish Stocking Program was considerably different than it is today (Section 2.1). A turning point in the stocking program occurred in the early 1990s, when a number of previously stocked sites and species were eliminated from the stocking program in response to conservation concerns, viability, environmental variability, economics, and cost benefit. At roughly the same time, the AGFD began to expand the stocking of urban lakes and ponds. The dual mandates of the AGFD played a notable role in bringing about the changes in the stocking program over the past 15–20 years. The existing stocking program reflects these changes and formed the basis for the development of the Proposed Action. In consideration of agency and public comments received during the scoping process, three additional action alternatives were developed (Sections 3.3 and 3.5). As is customary in a NEPA process, the No Action alternative was also considered (Section 3.4).

### **3.2 Proposed Action**

The FWS proposes to fund, in part, the AGFD Sport Fish Stocking Program, including operations and maintenance of five AGFD fish hatcheries that rear and supply a majority of the fish used in the stocking program, the acquisition of fish from outside sources, and the stocking of those fish into 167 waters of the state of Arizona to provide opportunities for recreational fishing. The Proposed Action incorporates the Sport Fish Stocking Conservation and Mitigation Program.

For the Proposed Action, the current AGFD stocking program was used as a baseline, and potential new angling opportunities were added for the agency’s consideration. The expanded list was then modified by removing several sites and some species based on stocking feasibility. During subsequent analysis and ESA Section 7 consultation with the FWS Arizona Ecological Services Office (AESO), two additional sites were removed from the Proposed Action. Mormon Lake and Stoneman Lake were removed to eliminate potential impacts on the Northern leopard frog at these sites and because these lakes are not expected to provide substantial recreational opportunity due to repeated and prolonged drying. To further reduce potential impacts on native aquatic species, channel catfish and largemouth bass were removed from the species proposed for stocking in Fagen Tank and Mormon Lodge Pond.

The Proposed Action would continue the rearing of fish at the five existing previously referenced AGFD hatcheries (Section 2.2.4). Fish for stocking would be supplied primarily from the existing AGFD hatcheries and commercial vendors, with some fish supplied by federal or other state (outside Arizona) hatcheries. The transfer of fish between waters would not be part of the Proposed Action.

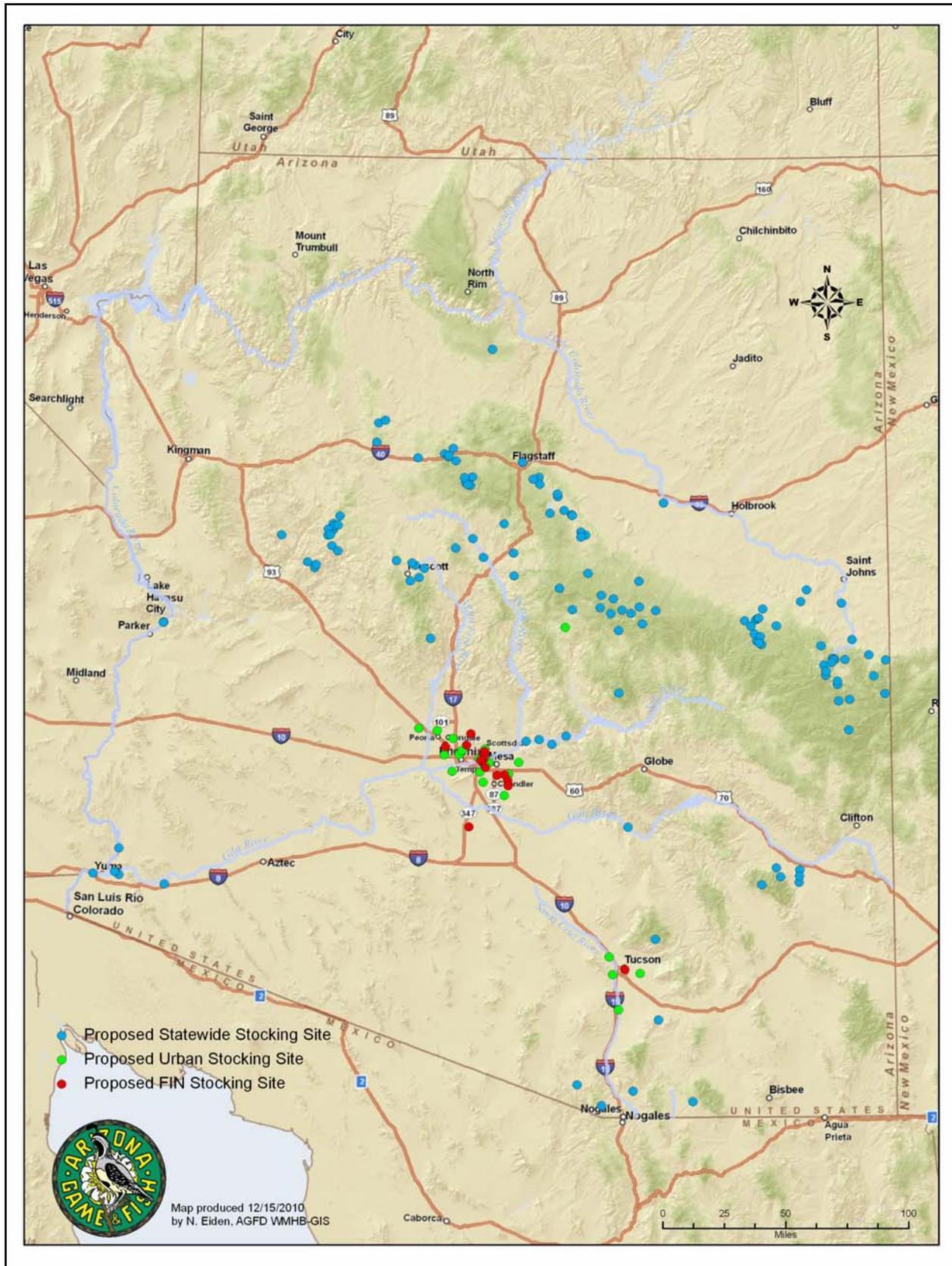
### **3.2.1 Sport Fish Stocking**

Table E (Appendix A) presents the AGFD Proposed Action and includes all sport fish stockings for which it is currently seeking environmental approval. This table identifies the sites that would be included, the species that would be stocked at each site, and the associated management objective (i.e., cold-water fishery, warm-water fishery, or cold- and warm-water fishery). Twenty-two of the stocking sites proposed have not been stocked in recent years by the AGFD. Based on available records, 11 of these have been stocked at some time in the past; the other 11 have never been stocked. Table E (Appendix A) identifies these sites. The Proposed Action also provides contingencies at some high-use angling sites for responding to catastrophic events, such as toxic algae blooms or lethal water temperatures that have resulted in a full or partial loss of a fishery. Those species proposed for a given site that would only be stocked in response to a catastrophic event are also noted in Table E.

Under the Proposed Action, the actual number of sites and species stocked in a given year would fluctuate due to demand, opportunity, environmental conditions, fish supply, or other variables. Some sites would receive regular stockings annually, some would be stocked less frequently (e.g., every two or three years), and other sites and some species may be stocked to provide additional opportunity if and when environmental conditions or fish supplies allow. Some species, as noted in Table E (Appendix A), would only be stocked if needed in response to a partial or complete loss of the fishery due to catastrophic events. All of these sites and species (regularly stocked and others) have been included within the NEPA process and are being analyzed through the ESA consultation process. Under the Proposed Action, the sites and species stocked in any given year would be the same as, or a subset of, those identified in Table E (Appendix A).

The Proposed Action would include a total of 167 stocking sites: 58 with a cold-water fishery objective, 23 with a warm-water fishery objective, and 86 with a cold- and warm-water fishery objective. A total of 131 of these sites would be managed under the Statewide Sport Fish Stocking Subprogram (22 of which are in urban areas), 21 of the sites would be managed under the Urban Sport Fish Stocking Subprogram, and 15 of the sites would be managed under the proposed FIN Subprogram (Section 2.2.4). Table E (Appendix A) identifies the subprogram under which each site would be managed. Figure 2 depicts the statewide, urban, and FIN stocking sites that would compose the Proposed Action.

Eighteen fish species would be used for stocking under the Proposed Action (Table 1). The approach to stocking under the Proposed Action, including BMPs and fisheries management, would be consistent with that of the existing program (Section 2.2).



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**Figure 2. Stocking sites under Proposed Action.**

**Table 1. Species stocked under the Proposed Action and the Reduced Stocking Alternative.**

Common Name	Scientific Name	Alternatives Applicable
Apache trout	<i>Oncorhynchus apache</i>	Proposed Action (PA), Reduced Stocking Alternative (RSA)
Arctic grayling	<i>Thymallus arcticus</i>	PA, RSA
Black crappie	<i>Pomoxis nigromaculatus</i>	PA, RSA
Bluegill sunfish	<i>Lepomis macrochirus</i>	PA, RSA
Brook trout	<i>Salvelinus fontinalis</i>	PA, RSA
Brown trout	<i>Salmo trutta</i>	PA, RSA
Channel catfish	<i>Ictalurus punctatus</i>	PA, RSA
Cutthroat trout	<i>Oncorhynchus clarkii</i>	PA, RSA
Gila trout	<i>Oncorhynchus gilae</i>	PA, RSA
Largemouth bass	<i>Micropterus salmoides</i>	PA, RSA
Rainbow trout	<i>Oncorhynchus mykiss</i>	PA, RSA
Redear sunfish	<i>Lepomis microlophus</i>	PA, RSA
Smallmouth bass	<i>Micropterus dolomieu</i>	PA, RSA
Threadfin shad	<i>Dorosoma petenense</i>	PA
Walleye	<i>Sander vitreus</i>	PA, RSA
White amur (grass carp)	<i>Ctenopharyngodon idella</i>	PA, RSA
White crappie	<i>Pomoxis annularis</i>	PA, RSA
Yellow perch	<i>Perca flavescens</i>	PA, RSA

Fish are generally transported to the stocking site in fiberglass or aluminum tanks mounted on large trucks or trailers. Stocking trucks use existing roadways to gain access to stocking sites. Other methods include the use of horses, backpack cans, all-terrain vehicles, or helicopters to stock remote locations not accessible by an existing road. No new roadways or associated disturbances are created for the stocking activities.

### 3.2.2 Proposed Hatchery Operations and Maintenance

Hatchery production goals and objectives for trout would be established by Regional Fish Program Managers to support site-specific fishery management goals based on angler demand and productivity and/or capacity of receiving waters. As with the current program, trout production at the five AGFD hatchery facilities would include the culture of five salmonid species (rainbow trout, brown trout, cutthroat trout, Apache trout, and brook trout).

Hatchery operations would include rearing fish from egg or fry stage to advanced sizes (fingerling, subcatchable, or catchable). This would include, but would not be limited to, incubating eggs, feeding, removing mortalities, medicating or conducting therapeutic treatments as needed; disinfecting equipment, rearing units, and/or vehicles; cleaning rearing units and equipment; collecting and disposing of waste from sludge basins; segregating, sample-counting, and transferring fish among rearing units or facilities; acquiring featured sport fish species; operating motor vehicles; holding captive broodstock for propagation; site security, administrative support, procuring supplies and equipment, staff training, fish health diagnostics, and facility certification; continued implementation and periodic review of HACCP plans; and public visitation, recording information/data, monitoring/measuring water quality and quantity, and monitoring for invasive species or nontarget organisms.

Hatchery operation (fish rearing and transport) would be guided by the principles of fish hatchery management included in guidance from the American Fisheries Society (American Fisheries Society 2001) and the FWS (FWS 1982), as well as the principles of HACCP planning for natural resource pathways from the FWS National Conservation Training Center (FWS 2004).

Hatchery maintenance could include, but would not be limited to, conducting repairs and/or maintenance and/or modifications on vehicles, buildings, storage units, employee residences, water collection and conveyance structures, rearing units, support equipment, septic facilities, fencing and predator barriers, gates, roadways, communications equipment, and parking areas. It could also include groundskeeping, snow removal, painting, trash/waste removal, and procuring needed equipment, supplies, and services.

### ***3.2.3 Sport Fish Stocking Conservation and Mitigation Program***

As part of the Proposed Action, the AGFD will implement mitigation measures to avoid, reduce, or otherwise minimize environmental impacts associated with the Proposed Action. The Sport Fish Stocking Conservation and Mitigation Program would be enacted to oversee the expenditure of \$5 million over 10 years for:

- Implementation of substantial mitigation measures targeting other special status species as identified in Chapter 5.0, including removal of stressors from aquatic systems and watershed planning.
- Implementation of substantial mitigation measures targeting draft Biological and Conference Opinion (BCO) species, as identified in Chapter 5.0, including transition to production and stocking of triploid rainbow trout and securing or establishing populations and other actions.
- Implementation of additional conservation measures identified in Appendix P as funding allows.

Mitigation and conservation measures employ a watershed management approach that would benefit aquatic communities in general.

### **3.3 Reduced Stocking Alternative**

With the Reduced Stocking Alternative, the FWS would fund, in part, the AGFD Sport Fish Stocking Program at a reduced number of stocking sites. This alternative includes operations and maintenance of five AGFD fish hatcheries that rear and supply a majority of the fish used in the stocking program, the acquisition of fish from outside sources, and the stocking of those fish into 101 waters of the state of Arizona to provide opportunities for recreational fishing. The Reduced Stocking Alternative incorporates the Sport Fish Stocking Conservation and Mitigation Program.

A number of comments received during the agency and public scoping process relayed concern about the effects of nonnative fish stocking on native fish and other aquatic species, including effects on federally listed threatened, endangered, and candidate species. The Reduced Stocking Alternative was developed in response to these concerns. The intent is to analyze an alternative that would reduce or minimize the potential for impacts to these sensitive species. This alternative would eliminate some of the stocking sites included in the Proposed Action. The Reduced Stocking Alternative would continue the rearing of fish at the five existing

previously referenced AGFD hatcheries, as described under the Proposed Action (Section 3.2.2). Fish for stocking would be supplied primarily from the existing AGFD hatcheries and commercial vendors, with some fish supplied by federal or other state (outside Arizona) hatcheries. As with the Proposed Action, the transfer of fish between waters would not be part of this action.

### **3.3.1 Sport Fish Stocking**

The sites eliminated from the Proposed Action to create the Reduced Stocking Alternative were those that could result in the stocking of sport fish into waters known to support one or more threatened, endangered, or candidate species of fish, amphibians, or semi-aquatic reptiles (i.e., garter snakes). Inclusion of these sites would have the potential to result in the greatest likelihood of exposure between the stocked species and threatened, endangered, and/or candidate species of fish, amphibians, or semi-aquatic reptiles. Sites were also eliminated where stocking had a potential to result in overlap of species with threatened, endangered, and/or candidate species of fish, amphibians, or semi-aquatic reptiles from movement of the stocked species out of the stocking area or the protected species into the stocking area.<sup>6</sup> As a result of the screening process, 66 of the sites from the Proposed Action would be eliminated under the Reduced Stocking Alternative. For the purpose of this analysis, only stocking sites were eliminated with the Reduced Stocking Alternative; species were not selectively removed from sites. For the remaining sites, the management objectives and species to be stocked would be the same as under the Proposed Action. Table E (Appendix A) identifies the sites that would be stocked under the Reduced Stocking Alternative. Figure 3 depicts the statewide, urban, and FIN stocking sites included in the Reduced Stocking Alternative. For easy comparison, the Proposed Action sites that would not be stocked as part of this alternative are depicted with a different symbol.

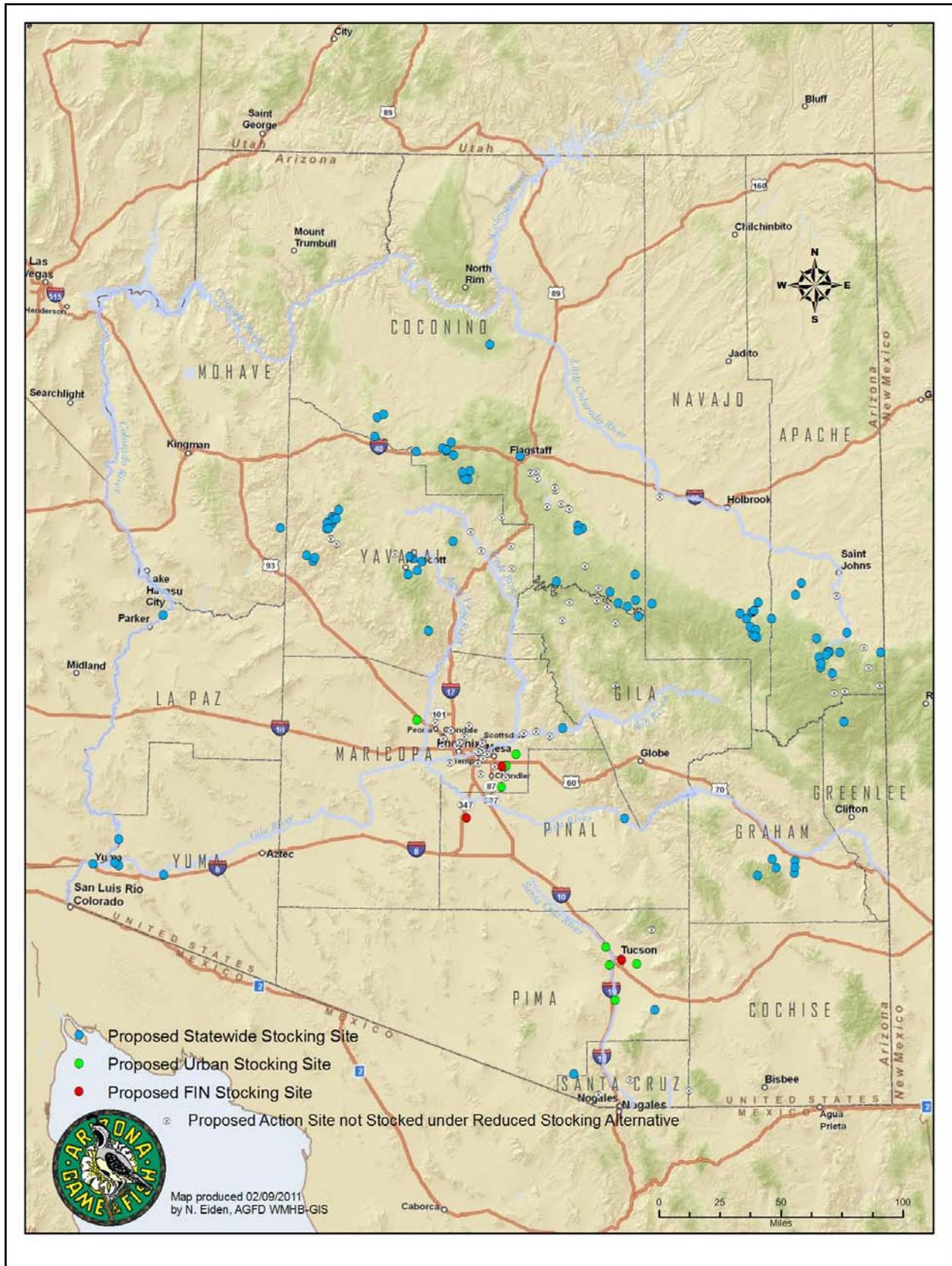
Under the Reduced Stocking Alternative, 101 sites would be stocked: 32 with a cold-water fishery objective, 20 with a warm-water fishery objective, and 49 with a cold- and warm-water fishery objective. The Statewide Sport Fish Stocking Subprogram would account for 90 of these sites; eight would be part of the Urban Sport Fish Stocking Subprogram, and three would be included in the proposed FIN Subprogram.

Seventeen fish species would be used for stocking under the Reduced Stocking Alternative, as noted in Table 1.

### **3.3.2 Proposed Hatchery Operations and Maintenance**

Hatchery operations and maintenance for the Reduced Stocking Alternative would be the same as that described for the Proposed Action (Section 3.2.2).

<sup>6</sup> The selection of stocking sites to be included in the Reduced Stocking Alternative was based on information in the Biological Assessment. The development of this alternative preceded the issuance of the draft Biological Conference Opinion.



W/09-279/NEPA/EA/Fig4

**Figure 3. Stocking sites under Reduced Stocking Alternative.**

### 3.3.3 Sport Fish Stocking Conservation and Mitigation Program

If the Reduced Stocking Alternative is selected, reinitiation of Section 7 consultation would be necessary to determine required mitigation measures, based on the reduced impacts. It is likely that the funding available and the resultant mitigation and conservation measures would be reduced from what is identified in the Sport Fish Stocking Conservation and Mitigation Program associated with the Proposed Action.

### 3.4 No Action

A No Action alternative is customarily used in an environmental document to provide the baseline or benchmark for comparison of environmental effects of the action alternatives. There are two common interpretations of No Action: “no change” from current management and “no implementation” of the proposed activity. The No Action alternative in this Draft EA represents a condition where the proposed activity would not be implemented. This interpretation was selected over the “no change” interpretation because a “no stocking” alternative would provide a broader range of alternatives for comparison. Furthermore, no federal funding would likely result in no stocking by the AGFD.

Under the No Action alternative, the FWS would not approve use of SFRA funding by the AGFD for stocking of sport fish. As a result, this alternative assumes that the AGFD would not engage in the stocking of sport fish, including Apache and Gila trout stocked for recreation, in Arizona. The federal funding would be used elsewhere by the AGFD. Under this alternative, the existing fish hatcheries used for the sport fish stocking program (Section 2.2.4) could be idled or decommissioned (i.e., operations terminated, fish removed, and equipment relocated), used for other federal aid-eligible projects, or sold to reimburse SFRA funds.

Table 2 compares the primary components of the alternatives and the current AGFD Sport Fish Stocking Program (i.e., existing condition). The fiscal year 2009/2010 approved stocking program is used in this table to represent the existing condition.

**Table 2. Comparison of alternatives and AGFD current sport fish stocking program.**

Characteristics/ Components	Existing Condition/ Current Program*	Alternatives Under Consideration		
		Proposed Action (PA)	Reduced Stocking Alternative (RSA)	No Action
Total stocking sites	134	167	101	None
Statewide sites	113	131	90	None
Urban sites	21	21	8	None
FIN sites	None	15	3	None
Number of species stocked	22	18	17	None
Catastrophic stockings	Not included in current program	Included in PA	Included in RSA but at fewer sites than PA	Not included

\*Values used for the current program reflect approved stockings for fiscal year 2009/2010.

### 3.5 Alternatives Considered But Eliminated

#### 3.5.1 Expanded Stocking Alternative

Many comments received in support of sport fish stocking referenced the social/recreational and economic importance of fishing. Many of the responses stated support for a more “robust” stocking program than the existing program or Proposed Action and suggested additional sites be stocked. The concept of an expanded stocking alternative (more reminiscent of pre-1990

stocking intensities) was considered to address this public input. This expanded alternative would provide maximal recreational opportunity by stocking many more sites around the state than are being stocked under the current AGFD Sport Fish Stocking Program or would be stocked under the Proposed Action or the Reduced Stocking Alternative. The expanded stocking alternative would incorporate those sites included in the Proposed Action as well as sites that have been stocked historically by the AGFD (based on available records) but are no longer being stocked. The review of available records identified 219 sites (not including those on Indian reservations) that were stocked historically but are no longer stocked. Combining the 167 sites of the Proposed Action with these 219 “additional” sites results in an expanded stocking alternative of up to 386 sites.

In consideration of the costs and benefits of appropriate conservation measures, legal requirements (e.g., the ESA), native fish population viability, and return on investment (recreationally and economically), this expanded stocking alternative was not considered feasible and prudent and was eliminated from further consideration.

### ***3.5.2 Minimal Stocking Alternative***

The Minimal Stocking Alternative was developed in an attempt to eliminate the potential for effects on consultation and other special status aquatic and semi-aquatic species. Compared with the Reduced Stocking Alternative, however, the Minimal Stocking Alternative would eliminate all stocking sites with any potential effects to these species, including sites considered to have only low potential effects. Stocking locations with low potential effects are those where exposure of consultation and other special status aquatic and semi-aquatic species to stocked fish would be limited in probability or probable exposure, would have limited potential biological impacts to other special status species, and would not likely result in population declines. This alternative would eliminate 148 of the 167 stocking sites in the Proposed Action. Stocking would occur only at the remaining 19 sites. This alternative was eliminated from further consideration because it does not meet the purpose and need for the project, which is to meet the current and future need and demand for angling opportunities in Arizona.



## 4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The resources identified during agency and public scoping and preliminary analysis and incorporated into this chapter are biological resources, recreation, and socioeconomics. A number of resources and issues were eliminated from further analysis because the proposed activity would have minimal or no effects on them. Resources eliminated from further analysis are listed in alphabetical order in Table 3, with rationale for their elimination.

**Table 3. Resources and issues eliminated from further analysis.**

Resource Issue	Rationale for Elimination
Access	The alternatives would not affect public or private access.
Aesthetics	The alternatives would not result in any ground disturbance or change in landscape characteristics and, therefore, would not affect aesthetics.
Air quality	Air quality impacts of the action alternatives are limited to vehicle emissions associated with stocking truck operation, and indirectly from anglers' vehicles traveling to and from stocking sites. These effects are below de minimis levels and do not differ substantially among the alternatives.
Coastal zone and coastal wetlands	All stocking sites are located within the state of Arizona and do not occur in or adjacent to coastal areas.
Cultural resources	The proposed project is not considered to be an undertaking under Section 106 of the National Historic Preservation Act because it would have no potential to affect cultural resources.
Energy/mineral resources	The alternatives would not affect energy or mineral resources.
Farmland	The alternatives would not affect farmlands.
Floodplain effects	Stocking sites are generally located within floodplain areas. The alternatives would not result in any ground disturbance within designated floodplains.
Greenhouse gases/climate change	The CEQ has proposed an annual reference threshold of 25,000 metric tons of direct carbon dioxide (CO <sub>2</sub> )–equivalent greenhouse gas emissions as a useful indicator for agencies to consider when analyzing potential action-specific greenhouse gas emissions in NEPA documents (CEQ 2010). <sup>7</sup> The primary source for the generation of greenhouse gas emissions with the AGFD Sport Fish Stocking Program would be the operation of motor vehicles to transport fish and support hatchery operations and management, less than 200 metric tons per year of CO <sub>2</sub> -equivalent greenhouse gas emissions. The annual emission of CO <sub>2</sub> -equivalent greenhouse gases from the alternatives would be substantially below the threshold proposed by the CEQ as relevant to the decision-making process. The alternatives would be considered to have little to no effect on climate change. Refer to Chapter 6.0 for cumulative effects of the alternatives and climate change on federally listed, candidate, potential candidate, and other special status aquatic and semi-aquatic species.

<sup>7</sup> Executive Order 13514 directs federal agencies to promote pollution prevention and reduce emissions of greenhouse gases from actions under their control.

**Table 3. Resources and issues eliminated from further analysis.**

Resource Issue	Rationale for Elimination
International effects	All stocking activities would be restricted to the state of Arizona. Sport fish stocked into the lower reaches of the Colorado River have the potential to cross into Mexico. However, there is only one open stocking site on the lower Colorado River, and most flow in the river is diverted before the international border, making the likelihood that stocked fish would travel to the border unlikely. There is only one proposed stocking site (Parker Canyon Lake) upstream of the Santa Cruz River before it enters Mexico. Most of the drainage downstream of this site to the international border is ephemeral and would not sustain fish species proposed for stocking. Furthermore, flows from this drainage are intercepted by agricultural fields before its confluence with the Santa Cruz River in Mexico.
Land use	The alternatives would not affect land use.
Public use	The alternatives would not affect public use patterns, except as they relate to recreational opportunities. These effects are described in the Recreation portion of Section 4.2.3.
Vegetation	Impacts to vegetation are analyzed in the context of other special status plant species in Section 4.1. Effects to other vegetation resources were not identified as an issue during scoping or preliminary analysis and are not considered further.
Water quality	Potential water quality effects from the action alternatives are minimal and are addressed through the issuance of Arizona Pollutant Discharge Elimination System permits administered by the Arizona Department of Environmental Quality and the U.S. Environmental Protection Agency. Refer to Sections 2.2.4 and 3.2 for more detail on hatchery operations and maintenance.
Wetlands	The alternatives would not result in the placement of dredged or fill material in wetlands. Indirect effects of stocking include trampling by anglers and disturbance/soil compaction by vehicles but would be expected to be limited in extent and would not represent a change from current conditions.
Wild and Scenic Rivers	Designated Wild and Scenic Rivers in the state are limited to 16.8 miles of Fossil Creek from the confluence of Sand Rock and Calf Pen canyons to its confluence with the Verde River and 40.5 miles of the Verde River from near Beasley Flat to the confluence of Red Creek. Several proposed stocking sites are below Beasley Flats on the Verde River; however, the alternatives would not involve any ground disturbance. Recreational opportunities created by stocking generally do not conflict with management directives for Wild and Scenic Rivers.
Wilderness areas	The alternatives do not include stocking sites within designated wilderness areas.
Wildlife resources	Impacts to wildlife resources are described in the context of Section 7 consultation and other special status species in Section 4.1. Effects to other wildlife resources were not identified as an issue during scoping or preliminary analysis and are not considered further.

#### **4.1 Biological Resources—Consultation and Other Special Status Species**

The action alternatives considered have the potential to affect consultation species (federally listed threatened and endangered species and their designated or proposed critical habitat, candidate species, and proposed candidate species considered in the ESA Section 7 consultation) and other special status species (sensitive species and species of special or conservation concern). Scoping and preliminary analysis identified potential effects on aquatic and semi-aquatic species, as well as terrestrial species associated with aquatic, wetland, and/or riparian habitats. A primary

issue identified is the potential effect of the AGFD Sport Fish Stocking Program on native fish fauna, either directly through predation, competition, or hybridization or indirectly through the introduction of diseases, parasites, and other nontarget organisms, as well as reduced access to habitats/resources and/or indirectly through changes in trophic (food-web) structure.<sup>8</sup> Most of these types of effects may also apply to amphibians and semi-aquatic reptiles. Potential effects on terrestrial species relate primarily to the indirect effects of angler activity/access at or near stocking sites (e.g., noise disturbance, trampling of habitat, fishing debris) or the effects of sport fish stocking on available food resources (e.g., providing forage for piscivorous [fish-eating] birds such as bald eagles and ospreys).

Effects to consultation species are summarized from the draft BCO. Due to the number of stocking sites and species involved, the analysis of environmental consequences for all other special status species is organized by functional groupings of species that are anticipated to experience the same or similar effects. Due to their identification as the main group of concern during scoping, effects on other special status aquatic and semi-aquatic species are also summarized by individual stocking sites and species. Other contextual factors that influence the occurrence or intensity of effects on certain species or functional groups are also discussed.

The analysis of impacts on consultation and other special status species differs between the ESA and NEPA. The terms used within both acts are not synonymous. The ESA looks at effects of an action and how they would contribute to jeopardy of the species as a whole, as defined within the act. A Biological Assessment (BA) and subsequent BCO evaluate impacts to individuals and populations of the species. In contrast, the EA analysis standard is that of significance to the human environment and evaluates any impacts (for a range of alternatives) that would affect it.

FWS lists of endangered, threatened, and candidate species for all Arizona counties were reviewed by representatives of the AGFD and the FWS to determine which listed species should be evaluated in the ESA Section 7 consultation and this Draft EA. The WSFR and the AGFD (as a designated Non-federal Representative<sup>9</sup>), in cooperation with the FWS AESO, have prepared a BA that evaluates the potential impacts of the Proposed Action (FWS 2011a). The AESO has provided the WSFR and the AGFD with a draft BCO. This Draft EA includes the findings of the draft BCO and incorporates as mitigation those conservation measures that AGFD commits to implement, as well as reasonable and prudent measures and associated terms and conditions required by the draft BCO. At the end of the formal consultation period, the AESO will issue a final BCO.

#### **4.1.1 Regulatory Setting**

Consultation and other special status species are those species that have status under, and are protected by, federal and/or state laws, regulations, and policies.

<sup>8</sup> A complex of interrelated food chains in an ecological community. Also called food cycle.

<sup>9</sup> A designated Non-federal Representative refers to a person, agency, or organization designated by the federal agency as its representative to conduct informal consultation and/or to prepare a BA (50 CFR 402.08).

## **Federal Endangered Species Act**

The ESA protects species that are endangered or threatened throughout all or a significant portion of their range and designated critical habitat. Section 9 of the ESA prohibits the “take” of endangered species and most threatened species without federal authorization. “Take” is defined as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in such conduct.” “Harm” is defined to mean an act that actually kills or injures fish or wildlife. Harm is further defined by the FWS to include significant habitat modifications or degradations that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.

Take may include significant habitat modification or degradation that results in the death or injury of fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Section 7 of the ESA requires federal agencies to consult with the FWS or the National Marine Fisheries Service, or both, before performing any action (including actions such as funding a program or issuing a permit) that may affect listed species or critical habitat. The incidental take (death or injury incidental to otherwise lawful activities and not the purpose of such activities) of listed species can be authorized under Section 7 or Section 10 of the ESA. Because the WSFR program of the FWS has the federal action of contributing funding to the stocking program, WSFR representatives initiated an intra-agency Section 7 consultation with the AESO (FWS), in cooperation with AGFD, as an applicant and non-federal representative, for the effects of that stocking program on threatened and endangered species and their critical habitat. Four candidate species and two likely candidate species were also included in the Section 7 consultation due to the potential for their listing in the next 10 years, the lifespan of the consultation.

## **Migratory Bird Treaty Act**

The federal Migratory Bird Treaty Act (MBTA) protects all migratory birds and their parts (including eggs, nests, and feathers) and prohibits the capture, pursuit, hunting, and killing of migratory birds. The FWS maintains a listing of bird species protected under the MBTA, which includes most bird species (including non-migratory species) and excludes only a relatively small number of introduced exotic species.

## **Fish and Wildlife Conservation Act**

The Fish and Wildlife Conservation Act authorizes financial and technical assistance to the states for the development, revision, and implementation of conservation plans and programs for nongame fish and wildlife. An amendment approved in 1988 mandates the FWS to “identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973.” To comply with this mandate, the FWS publishes lists of Birds of Conservation Concern, by region, that identify the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the highest conservation priorities. This is a subset of the species listed under the MBTA.

## **Bald and Golden Eagle Protection Act**

The Bald and Golden Eagle Protection Act (BGEPA) protects bald and golden eagles by prohibiting, except under certain specified conditions, the take, possession, and commerce of

such birds. A new permit program is being established to provide a regulatory permitting mechanism for limited take of these species when associated with other lawful activities. A take permit under the BGEPA would be required if an activity results in agitation or bothering of an eagle or alteration of areas around eagle nest sites outside the breeding season that would interfere with breeding, feeding, or sheltering.

## **Other Federal and State Regulations or Policies**

### *Sensitive Species*

The FS and the U.S. Department of the Interior Bureau of Land Management (BLM) maintain lists of species considered sensitive when occurring on public lands. These species are not legally protected under the ESA, but these agencies require that these species be analyzed as part of the NEPA process when projects occur on public lands and require FS or BLM approval or authorization.

### *Wildlife of Special Concern in Arizona*

The AGFD maintains a list of Wildlife Species of Special Concern in Arizona (WSCA), based on the 1988 threatened native wildlife in Arizona list developed by the Nongame Branch of the AGFD. This list includes those species whose occurrences in Arizona are or may be in jeopardy or with known or perceived threats or population declines, as described by the AGFD listing of WSCA. This designated list does not provide legal protection under the ESA or state law against take of these species or modification of their habitat.

### *Protected Native Plants*

The Arizona Department of Agriculture administers the Arizona Native Plant Law. The law categorizes certain plant species as Highly Safeguarded, Salvage Restricted, Salvage Assessed, and Harvest Restricted, and regulates their collection, transport, transplantation, and destruction.

## **4.1.2 Analysis Approach**

The analysis of effects of the Proposed Action on consultation species is based on determinations of jeopardy and adverse modification of critical habitat made in the draft BCO. These determinations take into account the status of each species across its geographic range.

The analysis of effects from the Proposed Action and its alternatives on other special status species is conducted at one or more of three spatial scales of resolution: individual stocking site, subcatchment, and regional scale. These represent a range of geographic scales at which direct effects generally have the most potential to occur (stocking site) to those where potential effects are progressively more separated in time and space (i.e., indirect effects) from proposed stocking activities (subcatchment and regional).

For the purpose of the analysis on other special status species, a stocking site for reservoirs, lakes, and ponds is defined as the entire water body and for streams is defined as the physical reach where stocking is proposed. For this EA analysis, subcatchments are defined as the U.S. Department of the Interior U.S. Geological Survey (USGS) Hydrologic Unit Code (HUC) 10 subwatersheds that surround individual stocking sites and the HUC 12 level subwatersheds downstream of those stocking sites to the confluence of a major water body that supports a self-sustaining community of several nonnative aquatic species. (e.g., lower Salt River, Alamo Lake,

Colorado River, and middle Gila River). Few individuals, if any, would be expected to reach these downstream locations due to the long distances from the stocking locations and intervening habitat and stream conditions that often are not conducive to stocked fish survival (e.g., high drops over waterfalls, high water temperatures, and poor water quality during flooding events). The potential addition of a few individuals would not substantially add to existing populations of nonnative species or substantially contribute the natural recruitment in these large systems, and, therefore, would not substantially add to effects on native species downstream of these major water bodies. The smaller-scale HUC 12 subwatersheds were used rather than a larger-scale HUC because any stocked fish transported downstream from stocking locations would not likely be able to move upstream into headwater areas of tributaries due to the limited hydrological connection between the main stem channels and headwater areas. Analyzing effects beyond an intervening major water body that supports nonnative species (such as Alamo Lake) would not be biologically meaningful because the established nonnative species would be more likely to reach other special status species than stocked fish from the proposed stocking sites. Effects of stocking on other special status species outside the defined subcatchments would be minimal because movement of stocked fish would diminish over long distances and any additional contribution of stocked species to the existing nonnative species assemblage of downstream major water bodies would be negligible.

Figure 4 shows the location and extent of subcatchments in the state (portions of subcatchments on tribal lands are not shown). Maps of the individual subcatchments and the stocking sites within them under the Proposed Action and the Reduced Stocking Alternative are provided in Appendix B.

The regional scale is all of the waters of Arizona, and this level of analysis is mostly appropriate when considering the potential transfer or dispersal of disease and nontarget organisms (e.g., New Zealand mud snails, quagga mussels).

To facilitate analysis, other special status species are organized into functional groups that are based on taxonomy and the types of effects to which the species are susceptible. Species within each functional group may generally experience the same types of potential effects due to similarities in life history traits. The spatial scale at which effects may occur varies based on the characteristics of the group. For example, native fishes, amphibians, semi-aquatic reptiles, and aquatic invertebrates are grouped together because they are generally susceptible to direct and indirect effects across multiple spatial scales. Riparian plants, non-piscivorous riparian or aquatic nesting birds, terrestrial riparian invertebrates, and ground-dwelling riparian mammals and reptiles are grouped together because these species are generally susceptible only to localized indirect effects (habitat alterations or disturbance by angler activity). Piscivorous riparian and aquatic nesting birds are grouped separately because these species may experience some direct beneficial effects from stocking activities as well as some indirect negative effects. Differential effects on functional groups of species, relevant spatial scales of analysis, and consideration of relevant contextual factors are described in greater detail under environmental consequences (Section 4.1.4).



### **4.1.3 Affected Environment**

This section describes the existing conditions in the action area relevant to biological resources—in this case, consultation and other special status species—and past actions that have influenced the present condition. The action area refers to the area that would be affected by the three alternatives. This section serves as the environmental baseline against which the environmental effects of the alternatives are compared under Environmental Consequences. Consultation and other special status species evaluated in greater detail and those eliminated from further analysis are identified. Due to the number of consultation and other special status species considered, detailed life history descriptions of each species are not included, but the habitats with which they are associated are summarized in table format based on available sources, which are incorporated by reference.

#### **Description of the Action Area**

The action area encompasses the geographic extent of the state of Arizona and a variety of water bodies, including streams, rivers, natural ponds and lakes, and impoundments, including urban lakes. The Proposed Action includes a total of 14 subcatchments and 167 individual stocking sites. The BA prepared for the project (FWS 2011a) provides detailed descriptions of stocking sites, including physical geography, site characteristics, landownership/management status, historic and current water body management, hydrologic connectivity between stocking sites, potential for fish movement, and descriptions of the existing aquatic communities. Table F (Appendix C) summarizes the elevational range and general vegetation types of each subcatchment and of each individual stocking site. Vegetation types are based on a generalized classification for Arizona (Brown 1994) at the biome level and represent the predominant types within which the subcatchments and sites occur (not the riparian, wetland, or aquatic plant communities that may immediately surround individual stocking sites).

#### **Present Condition and Effects of Past Actions**

The present condition of aquatic, riparian, and wetland habitats within the action area has been notably influenced by the actions of the European immigrants over the past 100 to 150 years. Historic changes to waterways in the region include a period of arroyo formation or cutting between 1865 and 1915. Prior to 1865, streams were described as supporting high water tables, abundant river bed marshes (cienegas), tall grasses, beaver ponds, and fish habitat (Vogt 2003). During the ensuing period, arroyo cutting resulted in broad, incised channels bordered by high, barren cut banks, drying of stream channels, draining of cienegas, and associated changes in flora and fauna (Minckley and Marsh 2009, Vogt 2003). The timing and widespread occurrence of arroyo cutting in the western United States and evidence for its occurrence prior to settlement of the region by western Europeans suggest that it was caused primarily by climate change (cycles of relatively wet periods followed by drought), though human activities such as livestock grazing and beaver trapping are thought to have contributed to or exacerbated this phenomenon (Minckley and Marsh 2009, Vogt 2003). Woodcutting in upland areas for mine timbers and smelter fuels and cutting of riparian forests for riverboat fuel are also thought to have altered stream channels and associated riparian communities (Minckley and Marsh 2009).

Other human activities that have affected aquatic environments in the recent past include damming of streams and rivers and pumping of groundwater. With increasing human population growth in the region, reservoirs were created to control flooding and to provide water storage and

delivery for agricultural irrigation and domestic water supplies. This resulted in the elimination of stream habitats, blocking of fish migration routes, and disruption of ecological connectivity between stream reaches upstream and downstream of reservoirs. Groundwater pumping for agricultural, domestic, and other purposes has lowered water tables and dried springs, negatively affecting native fish fauna through loss of habitat (Minckley et al. 1991).

Introduction, establishment, and management of nonnative species have affected aquatic communities in the action area. The history of fish stocking in Arizona is summarized in Chapter 2.0. Management of the sport fish program has changed over the past several decades, partly to address impacts to native fish and other aquatic and semi-aquatic species. As described in Section 2.1, new introductions of species into Arizona have decreased since about 1960 and have been substantially curtailed or eliminated since 1990. Since 1994, the scope of sport fish stocking in Arizona has generally been reduced to address considerations such as effects on native species, suitability of stocking sites based on water availability and quality, availability of fish for stocking, and funding constraints. Section 2.2 describes the current AGFD Sport Fish Stocking Program.

Other management activities that affected aquatic communities included the introduction of bait and other species such as threadfin shad, fathead minnow, bullfrog, crayfish, and mosquitofish. Aquatic habitats were also influenced, and continue to be affected, by unauthorized introductions of sport and baitfish such as golden shiner and the incidental introduction and spread of other aquatic invasive animals such as the Asian snail, Asiatic clam, quagga mussel, and aquatic invasive plants such as giant salvinia and Brazilian parrotfeather.

Recreational activities not strictly related to sport fishing, such as boating, hiking, camping, and off-highway vehicle use, have likely contributed to some level of effects on aquatic habitats in the past (e.g., spread of aquatic invasive species) and may contribute to past and current indirect (e.g., habitat disturbance) effects on terrestrial species associated with aquatic, riparian, or wetland habitats.

The published and grey literature describing the effects of introduction of nonnative aquatic species on native aquatic species in the western/southwestern United States is extensive and presents a compelling case for the negative effects of such interactions on the current status of the native aquatic fauna. Concomitant with changes in habitat availability and quality resulting from human development of cienegas, streams, and rivers for anthropogenic purposes (Miller 1961, Minckley and Deacon 1968, Moyle 2002), the deliberate or inadvertent introduction of nonnative fish, amphibians, and invertebrates (crayfish, snails, clams) is responsible for considerable declines and extirpations of native fish species in the Colorado River Basin, including Arizona (ANS Task Force 1994, Carlson and Muth 1989, Clarkson et al. 2005, Courtenay 1993, Deacon et al. 1964, Marsh and Pacey 2005, Miller 1961, Miller et al. 1989, Minckley et al. 1991, Moyle et al. 1986, Olden and Poff 2005). Nonnative aquatic species now dominate much of the aquatic habitats found in Arizona and have been recorded in 132 of the 167 stocking sites considered in the Proposed Action. Habitat losses and resident nonnative aquatic species constitute primary stressors influencing consultation and other special status species.

Of 36 native fish species known or thought to have occurred in Arizona, 20 are currently listed as threatened or endangered and one is extinct. Eight of the listed species no longer occur as wild populations in the state, but survive elsewhere. Of the remaining 15 native fish species, 14 have been designated as special status species by the AGFD and/or federal land management agencies, including three that are considered candidates for listing. Only one native fish species (Rio Grande sucker) does not have special status designation at this time (AGFD 2010a, Minckley and Marsh 2009). Furthermore, there are currently two listed, two candidate, and seven other special status amphibian species and two candidate and two other special status semi-aquatic reptiles in the state (AGFD 2010a).

### **Species Analyzed and Those Eliminated from Further Analysis**

As noted previously, the FWS lists of endangered, threatened, proposed, and candidate species for all Arizona counties were reviewed by representatives of the AGFD and the FWS to determine which listed species should be evaluated. FWS made the final determination on which species to include in the Section 7 consultation and the BCO. For other special status species (those not listed under the ESA or identified as candidate species), the statewide list from the Heritage Data Management System (HDMS) was reviewed to identify species potentially affected by the alternatives. Species initially identified for analysis were those associated with aquatic, wetland, and/or riparian habitats. This list was further refined by reviewing species abstract information and distribution maps to identify those species known to occur near proposed stocking locations, in the subcatchment (downstream or upstream) where stocking is proposed, and/or in areas of access/use through recreational angling. The primary source used to determine other special status species distribution included the AGFD HDMS (AGFD 2010b). HDMS records data were supplemented with other available databases, including the Nongame and Endangered Wildlife Program's Fisheries Database and the Ranid Frog Database, as well as Lower Colorado River Basin Aquatic Geographic Applications for Planning Analysis Project information. In some cases, the HDMS data were supplemented with recent records of other special status species (primarily aquatic and semi-aquatic species) known to occur at or near stocking sites that had not yet been entered into the HDMS database.

To identify migratory birds, the FWS 2008 lists of Birds of Conservation Concern (FWS 2008a) were reviewed. Three Bird Conservation Regions (BCRs) cover the state of Arizona: BCR 16 (Southern Rockies/Colorado Plateau), BCR 33 (Sonoran and Mojave deserts), and BCR 34 (Sierra Madre Occidental). Species associated with aquatic, wetland, and/or riparian habitats and known to breed near proposed stocking locations, downstream or upstream of where stocking is proposed, and/or in areas of access/use through recreational angling were identified as potentially affected by the alternatives under consideration. Because the HDMS does not track these species, the Arizona Breeding Bird Atlas (Corman and Wise-Gervais 2005) was used to determine the approximate distribution of these species. Four riparian-associated passerine species were identified for further analysis: Bell's vireo, Lucy's warbler, yellow warbler, and veery. The remainder of the species on these lists were eliminated from further analysis because (1) they do not typically nest in aquatic/wetland/riparian habitats, (2) they are transient species that do not breed regularly in the state, or (3) their known breeding distribution does not overlap stocking sites, upstream and downstream areas, or areas affected by angling activity/access.

Table G (Appendix D) lists consultation and other special status species identified for further analysis, their status designation, and general habitat characteristics. Table H (Appendix E) lists

consultation and other special status species eliminated from further analysis and the rationale for their elimination.

#### **4.1.4 Environmental Consequences**

This section describes the direct and indirect environmental effects of each alternative on consultation species and other special status species. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the actions but are farther removed in distance and occur later in time. Indirect effects must be reasonably foreseeable (i.e., likely to occur within the 10-year duration of the project). Cumulative effects to consultation and other special status species are discussed in Chapter 6.0.

#### **Effects of Hatchery Operations and Maintenance**

Potential effects of hatchery operations and maintenance (O&M) on special status species were considered with regard to (1) effects on water quality and introduction of diseases and nontarget organisms, (2) noise and disturbance, and (3) escapement of hatchery fish into downstream water bodies. Effects of hatchery O&M on listed and candidate species were evaluated in a separate Section 7 consultation. No listed or candidate species have been recorded within 2 miles<sup>10</sup> of the Canyon Creek, Silver Springs, or Tonto Creek fish hatcheries. Roundtail chub, Page springsnail, yellow-billed cuckoo, and northern Mexican garter snake, all candidate species, have been recorded within 2 miles of the Page Springs Hatchery. The Sterling Springs Hatchery occurs within the boundary of a Protected Activity Center (PAC) for the threatened Mexican spotted owl.

The analysis that follows pertains to the Proposed Action. Under the Reduced Stocking Alternative, all five hatcheries would continue to operate and, therefore, effects would be the same as under the Proposed Action. Under the No Action alternative, these hatcheries could be idled or decommissioned (i.e., operations terminated, fish removed, and equipment relocated), used for other federal aid-eligible projects, or sold to reimburse SFRA funds and, therefore, would not affect consultation or other special status species.

#### **Water Quality and Introduction of Disease and Nontarget Organisms**

Effects on water quality and effects related to the introduction of diseases and nontarget organisms are discussed in Section 2.2.6. Based on water quality permitting requirements and implementation of BMPs (including HACCPs), hatchery O&M would not result in adverse changes in water quality or in the spread of disease or nontarget organisms under either the Proposed Action or the Reduced Stocking Alternative. HACCPs developed for each of the five hatcheries can be reviewed at <http://haccp-nrm.org/liststateplans.asp?State=AZ>. The Page Springs Hatchery (where roundtail chub and Page springsnail have been recorded within 2 miles), is regulated under Arizona Permit AZ00121245 and is subject to effluent standards for the maintenance of all designated uses, including Aquatic and Wildlife. This hatchery also

<sup>10</sup> Two miles is the AGFD standard used for this type of activity (i.e., O&M of existing facilities). This distance was used instead of the 5-mile radius around stocking sites because activities associated with hatchery O&M are mostly restricted to the hatchery grounds themselves.

operates under a Candidate Conservation Agreement with Assurances for Page springsnail, and all O&M activities would be consistent with this agreement.

### Noise and Disturbance

Noise and disturbance related to hatchery O&M may result from human presence and activity (hatchery workers and visitors), vehicular traffic to and from hatcheries, and operation of heavy equipment or vehicles involved in maintenance or repair activities. Noise-related disturbance would primarily affect terrestrial species, such as birds nesting in the vicinity. Because these hatcheries have been in existence and operation for a number of decades, neither the Proposed Action nor the Reduced Stocking Alternative would result in new noise disturbance effects. Hatchery O&M may result in displacement of individuals or avoidance of the immediately surrounding areas but would be unlikely to affect the population status, or jeopardize the continued existence, of any consultation species.

A candidate yellow-billed cuckoo was recorded in 2004 in the vicinity of the Page Springs Hatchery, but no nesting was recorded. At the Sterling Springs Hatchery, O&M activities could result in disturbance of Mexican spotted owls at the nest site or in roosting or foraging areas within the PAC during the breeding season. However, activity associated with this one-person operation and the limited number of tours inside the hatchery and around the raceways would not cause a large disturbance effect and would not adversely affect primary constituent elements, key habitat components, and/or restricted and protected habitat for the Mexican spotted owl. Moreover, the hatchery sits immediately adjacent to State Highway 89 and is subject to significant road noise from vehicular traffic. Because the hatchery has been in operation since the 1920s, there would be no new disturbance in the PAC from hatchery O&M. O&M activities at the Page Springs Hatchery could impact individuals of the Northern Mexican garter snake through direct mortality or habitat disturbance. These impacts would be minimized through continued implementation of measures to protect this species and its habitat. BMPs were developed in March 2010 to address snake impacts on hatchery property and included low vehicle speed limits, maintenance of minimal water levels in fallow ponds, and restraint of pet animals on the hatchery grounds.

### Fish Escapement

Hatchery O&M has the potential to result in the incidental release or escapement of hatchery fish into downstream waters. The extent to which this could affect special status aquatic and semi-aquatic species in receiving waters is discussed in the following paragraphs for each of the five AGFD hatcheries that supply fish for the AGFD Sport Fish Stocking Program. This analysis is based, in part, on the analysis of stocking effects on consultation species completed in the draft BCO (FWS 2011b) and the analysis of stocking effects on other special status species in downstream reaches, both of which are discussed in detail in the subsequent sections of this Draft EA. All hatcheries except Page Springs occur upstream of stocked water bodies; Page Springs is within the lower portion of the Oak Creek stocking reach. Therefore, effects to consultation and other special status species associated with these hatcheries would generally be the same or similar to those from stocking of those waters, which are described in the following sections, except that escapement from hatcheries would likely involve only a small number of fish and, therefore, the effects would be of much smaller magnitude.

All of the fish hatcheries included as part of the Proposed Action incorporate features and measures to minimize the potential for fish escapement. All hatcheries have screening at the outlet of rearing units for indoor and outdoor raceways. Moreover, the hatcheries employ water-treatment features that have screening installed at the outlets. Hatchery staff members also visually inspect the tailbox areas of raceways prior to cleaning. If fish are present, they are relocated above the screens.

#### *Canyon Creek Hatchery*

This hatchery is directly upstream of the reach of Canyon Creek proposed for stocking under the Proposed Action. Canyon Creek Hatchery currently produces rainbow and cutthroat trout and has the potential to produce brown, brook, or Apache trout. The Proposed Action would stock primarily rainbow trout but would also stock brown trout (most likely from Page Springs or Sterling Springs hatcheries sources), if needed, to recover the naturally reproducing population that is currently found in this reach of Canyon Creek.

Escapement or incidental release of hatchery fish would result in the addition of relatively few fish to a reach that would already be stocked with rainbow trout, and potentially brown trout. This would not result in effects substantially different in type from those related to stocking of this reach. It has been determined that stocking of this reach may affect roundtail chub (a candidate species) and narrow-headed garter snakes (a potential candidate species) and would have a low effect on longfin dace, Sonora suckers, desert suckers, and speckled dace (other special status aquatic and semi-aquatic species). The Apache, cutthroat, brook, and brown trout would not be sterile triploid trout and would have the potential to reproduce. Cutthroat trout have never been documented as present or reproducing in Canyon Creek despite being raised at this hatchery and, therefore, survival and establishment of cutthroat trout would not be expected to occur. Reproduction of Apache or brook trout would not likely occur due to the already established population of brown trout that would likely prey on and outcompete these two trout species. Brown trout could survive and reproduce, but the small numbers of escaped trout would not likely substantially contribute to the already established brown trout population.

#### *Silver Creek Hatchery*

This hatchery is directly upstream of the reach of Silver Creek proposed for stocking under the Proposed Action. The Silver Creek Hatchery currently raises rainbow and Apache trout and has the potential to produce brown, cutthroat, or brook trout. The Proposed Action would stock these same species (i.e., rainbow and Apache trout) into Silver Creek.

Escapement of hatchery fish would result in the addition of relatively few fish to a reach that would already be stocked. The types of effects would therefore be similar to the proposed stocking activity, but at a much smaller scale. Proposed stocking of this reach may affect the endangered humpback chub and the threatened Little Colorado spinedace and would have a moderate effect on the speckled dace, the bluehead sucker, and the Little Colorado sucker (other special status aquatic and semi-aquatic species). Stocking in this reach may also affect threatened Apache trout, but this would be only to the Apache trout being stocked and, therefore, is not a concern for recovery of the species. The Apache, cutthroat, brook, and brown trout would not be sterile triploid trout and would have the potential to reproduce. However, trout spawning and recruitment have not been documented in Silver Creek despite several surveys, likely due to the

high summer water temperatures. Therefore, none of the trout species would be expected to start new populations.

#### *Tonto Creek Hatchery*

This hatchery is directly upstream of the reach of Tonto Creek proposed for stocking under the Proposed Action. The Tonto Creek Hatchery currently raises rainbow, brook, and Apache trout and has the potential to produce brown and cutthroat trout. The Proposed Action would stock rainbow trout in Tonto Creek.

Escapement of hatchery fish would result in the addition of relatively few fish to a reach that would already be stocked with rainbow trout and inhabited by an established population of brown trout. The types of effects, therefore, would be similar to the proposed stocking activity, but at a much smaller scale. Proposed stocking of this reach may affect the threatened spinedace critical habitat and the Chiricahua leopard frog, the candidate headwater chub and the Northern Mexican garter snake, and the potential candidate narrow-headed garter snake and would have moderate effects on the longfin dace and the desert sucker and low effects on the Sonora sucker and the speckled dace. The Apache, cutthroat, brook, and brown trout would not be sterile triploid trout and would have the potential to reproduce. Reproduction of Apache, cutthroat, or brook trout would be unlikely to occur due to the already established population of brown trout that would likely prey on and outcompete these other trout species. Apache trout have not been detected during fishery surveys conducted in 2005 and 2008 in Tonto Creek, indicating that they do not escape the hatchery or do not establish populations if they do. Brook trout were stocked into Tonto Creek from 1936 to 1986 but have not been detected in Tonto Creek during routine fishery surveys since 1984, indicating that brook trout did not maintain a reproducing population and, therefore, would not likely establish populations in the future if escapement were to occur. Brown trout could survive and reproduce, but the small numbers of escaped trout would be unlikely to substantially contribute to the already established brown trout population.

#### *Page Springs Hatchery*

This hatchery is along the lower reaches of Oak Creek, which is proposed for stocking with rainbow trout under the Proposed Action. The Page Springs Hatchery currently raises rainbow and brown trout and has the potential to raise Apache, brook, and cutthroat trout.

Escapement of fish from the Page Springs Hatchery would result in the addition of relatively few fish to a reach that would already be stocked with rainbow trout. The types of effects would therefore be similar to those of the proposed stocking activity, but at a much smaller scale. Proposed stocking in Oak Creek may affect the endangered Gila chub and the razorback sucker, the threatened loach minnow and spinedace critical habitat, the candidate Northern Mexican garter snake and the roundtail chub, and the potential candidate narrow-headed garter snake, would have a moderate effect on the longfin dace and the desert sucker, a low effect on the Sonora sucker and the speckled dace, and a high effect on the lowland leopard frog. The Apache, cutthroat, brook, and brown trout would not be sterile triploid trout and would have the potential to reproduce. Reproduction of Apache, cutthroat, or brook trout would not be expected to occur due to the warm water temperatures in the section of Oak Creek near the hatchery. If escaped trout were to reach areas in upper Oak Creek where the water temperatures are suitable for spawning, the already established population of brown trout would likely prey on and

outcompete these other trout species. Brown trout would have the potential to reproduce in this upstream area and add to this established population but the small (if any) numbers of escaping trout that would make it upstream would not have a meaningful effect on the established population of brown trout

### *Sterling Springs Hatchery*

This hatchery is in the upper reach of Oak Creek, several miles upstream of the reach proposed for stocking under the Proposed Action. Sterling Springs Hatchery is primarily an egg-hatching facility where eggs are received, incubated, hatched, and grown to a large enough size to be stocked (fingerling and subcatchable) or transferred to one of the other four cold-water hatcheries. Currently, Sterling Springs Hatchery hatches rainbow and brown trout, both of which occur as naturally reproducing populations in the upper reaches of Oak Creek. Sterling Springs Hatchery may also produce Apache, cutthroat, and brook trout in the future under the Proposed Action.

Escapement of fish from the Sterling Springs Hatchery would result in the addition of relatively few fish to a short reach that is not proposed for stocking under the Proposed Action. Some fish could end up farther downstream, in the reach that would be stocked with rainbow trout and that currently supports naturally reproducing populations of rainbow and brown trout. The types of effects, therefore, would be the same or similar to the proposed stocking activity, but substantially reduced in magnitude. Proposed stocking in Oak Creek may affect the endangered Gila chub and the razorback sucker, the threatened loach minnow and spinedace critical habitat, the candidate Northern Mexican garter snake and the roundtail chub, and the potential candidate narrow-headed garter snake and would have a moderate effect on the longfin dace and the desert sucker, a low effect on the Sonora sucker and the speckled dace, and a high effect on the lowland leopard frog. Fish potentially escaping from Sterling Springs Hatchery would be small and would be prone to predation by native and nonnative species in Oak Creek. Any fish that survived to adult size could result in effects similar in type to those from stocking under the Proposed Action, but these would be much reduced in scale due to the small number of surviving escapees. The Apache, cutthroat, brook, and brown trout would not be sterile triploid trout and would have the potential to reproduce. Reproduction of Apache, cutthroat, or brook trout is not likely to occur due to the already established population of brown trout that would likely prey on and outcompete these other trout. Escapement of brown trout may contribute a few individuals to the existing reproducing population but would not be expected to substantially increase the numbers of brown trout in the stream.

### **Stocking Effects on Consultation Species**

Potential effects to consultation species from stocking were analyzed in the BA (FWS 2011a) and the draft BCO (FWS 2011b). The BA provided information to FWS AESO to aid development of the draft BCO, including spill history for impoundments, water connectivity between stocking sites and consultation species, aquatic communities present at stocking sites, survey data, distance between stocking sites and known occurrences of consultation species, and potential impacts.

The analyses of effects on consultation species were conducted on two different scales: the area-wide scale and a species site-specific scale. The area-wide scale had a wider perspective and

focused on the indirect, interrelated, and interdependent effects of the proposed action that are difficult to evaluate on a site-by-site basis. This analysis addressed three general areas: inadvertent transport of unwanted aquatic organisms either directly through stocking actions or from persons legally pursuing stocked sport fish; illegal movement of unwanted aquatic organisms that could be associated with the stocking actions; and physical effects to aquatic or riparian habitat from anglers pursuing stocked sport fish. The species site-specific scale evaluated effects attributable to the proposed stocking of sport fish into the stocking sites relative to the presence of consultation species at or near those sites and how that stocking would affect those species. It also addressed site-specific effects to species from anglers accessing the stocking sites. The analysis took into consideration the environmental baseline, which includes the presence, at many of the stocking sites, of nonnative fishes and other introduced taxa such as crayfish, which act as stressors on aquatic and semi-aquatic consultation species as well as aquatic communities in general. The environmental baseline, cumulative effects (effects due to future non-federal actions reasonably certain to occur), and the area-wide and site-specific effects of the action were collectively evaluated to determine if a consultation species would be jeopardized or critical habitat would be adversely modified.

The following information was summarized by drawing from the draft BCO (FWS 2011b) and the BA (FWS 2011a). The conclusions were based on implementation of the project as proposed (Proposed Action), including mitigation measures. The extent to which potential adverse effects would occur varies by species and by stocking site based on existing conditions, fish species proposed for stocking, and other factors. The draft BCO does not evaluate the Reduced Stocking Alternative or the No Action alternative. For a number of species included in the consultation, the draft BCO concurred with findings of “Not Likely to Adversely Affect” (Table 4). Appendix J provides rationale for the effect findings on these species, which are not discussed further in this document. Information about these species can be found at the FWS AESO website: <http://www.fws.gov/southwest/es/arizona/reading.htm>.

**Table 4. Consultation species for which the draft BCO made a finding of “Not Likely to Adversely Affect.”**

Consultation Species	Status
Arizona treefrog Huachuca/Canelo Distinct Population Segment	C
Colorado pikeminnow	E, S, WSCA
Desert pupfish	E*, WSCA
Mexican spotted owl	T*, WSCA
Mexican wolf	E, WSCA
Page springsnail	C, S
Quitobaquito pupfish	E*, WSCA
Sonora chub	T*, WSCA
Sonoyta mud turtle	C
Three Forks springsnail	C, S
Woundfin	E*, WSCA
Yellow-billed cuckoo	C, S, WSCA
Yuma clapper rail	E, WSCA

\* = Proposed or Designated Critical Habitat  
 C = FWS Candidate  
 E = FWS Endangered  
 S = USFS and/or BLM Sensitive  
 T = FWS Threatened  
 WSCA = Wildlife of Special Concern in Arizona

### *Section 7 Consultation Species Area-wide Analysis Summary*

This section summarizes the area-wide analysis for consultation species completed in the draft BCO (FWS 2011b).

The continuing introduction and spread of unwanted aquatic species via the routes described in the draft BCO analysis are threats to all consultation species, whether from the Proposed Action or from cumulative effects. The environmental baseline contains substantial adverse effects from the introduction of these nonnative species, and those effects would continue into the future.

Conservation programs in place to address the impacts of unwanted aquatic organisms on native species provide benefits to native species through establishment of secure populations and other directed activities. Furthermore, mitigation measures that are part of the Proposed Action (Chapter 5) would first address the effects of the proposed sport fish stocking, and, through reductions of stressors, would reduce the baseline effects on consultation species. Improved public outreach on the dangers of illegal transport may also assist in reducing the scope of the problem.

The Proposed Action is not likely to jeopardize the continued existence of any consultation species or result in destruction or adverse modification of designated or proposed critical habitat for the following reasons:

- Sufficient operational protocols would be in place to reduce/minimize the risk of inadvertent transport of unwanted aquatic organisms via stocking operations associated with the Proposed Action.
- For other legal importations of aquatic species, while the operational protocols are not quite as effective, commitments to improve oversight of these routes that are part of the Proposed Action would contribute to reducing the risks below current levels.
- For inadvertent transport of unwanted aquatic organisms, operational protocols for AGFD field employees and existing public education programs would contribute to reducing risks below current levels.
- For incremental effects associated with deliberate transport of unwanted aquatic organisms, these actions are already illegal under Arizona law and regulation. The AGFD provides educational materials in the Fishing Regulations booklet concerning those laws and, as part of the Proposed Action, the display of those topics in the booklet would be improved to provide easier access for the public. Other programs to educate the public are ongoing, and additional efforts to expand those programs are part of the Proposed Action. Because the members of the public most likely to engage in illegal transport are likely aware that it is illegal, continuing enforcement will be required. This level of illegal activity would not be expected to increase substantially over the 10-year period covered by this consultation because the Proposed Action is primarily the ongoing stocking of existing sites and species, with relatively few new species or locations. If the present rate of illegal transport continues, there will be additional adverse effects to consultation species. The jeopardy analysis considered these additional effects in context with species status and determined that the Proposed Action would be unlikely to result in jeopardy.

- The Proposed Action contains mitigation measures that include the reduction of stressors in their habitats. Some of the stressors to be addressed would be unwanted aquatic organisms, and removal of these at specific sites would improve the status of the consultation species.
- The Proposed Action contains mitigation measures, including information and education outreach intended to reduce effects.
- Ongoing conservation efforts are continuing to benefit the baseline status of many of the consultation species.

### *Section 7 Consultation Species Site-specific Analysis Summaries*

This section summarizes the species site-specific analysis for consultation species completed in the draft BCO (FWS 2011b).

#### Apache Trout (Threatened)

Under the Proposed Action, there would be no jeopardy to Apache trout. Apache trout may be affected by stocking in the following complexes<sup>11</sup> and stocking sites: Black River complex (Ackre Lake, Big Lake, and East and West Forks of the Black River) and Little Colorado River (Becker Lake, White Mountain Reservoir, Mexican Hay Lake, Lee Valley Lake, Bunch Reservoir, River Reservoir, Tunnel Reservoir, Little Colorado River Greer, Little Colorado River, Sheep's Crossing, Little Ortega Lake, Silver Creek, Show Low Lake, and Fool Hollow Lake).

At many of these sites, Apache trout are one of the species proposed for stocking for the purpose of recreational fishing and the potential effects would be to these stocked Apache trout. Apache trout stocked for recreational purposes as part of the Proposed Action are considered excess to the survival and recovery of the species. The stocking of Apache trout for recreational fishing was included as a compatible action that contributes to the conservation of the species in the 1975 downlisting rule for Apache trout (FWS 1975). The following considerations factored into the determination of effects on the Apache trout:

- With one exception, recreational fishing populations of Apache trout are physically removed from the recovery populations that are the primary conservation focus for the species. However, in that one exception, the effects of recreational fishing on the recovery population would not be substantial enough to degrade the conservation value of that population.
- There would be a risk of contamination of Apache trout recovery populations by nonnative fish when such species are stocked below the barriers in recovery streams. Barrier failure is well documented and currently exists at two streams near proposed stocking sites. Contamination of Apache trout recovery populations by nonnative fish following barrier failure would have a short-term impact on the Apache trout in those streams but would not permanently degrade the sites or prevent recovery. Apache trout recovery plan implementation would result in remedying any barrier failure or contamination of recovery populations by nonnative fish, including stocked fish.

<sup>11</sup> A complex is a grouping of stocking sites that are hydrologically connected. Appendix A, Table E lists complexes and subcatchments within which proposed stocking sites occur.

- Apache trout from the recovery populations are not the source of fish for the recreational populations; therefore, there would be no additional pressure on recovery streams to produce fish for recreational purposes. All recreational fish are bred in hatcheries. These hatcheries occasionally provide fish for recovery streams; however, production capacity would be adequate to meet both needs.

Under the Reduced Stocking Alternative, three stocking locations in the Black River complex that could affect Apache trout would be eliminated: Big Lake, East Fork Black River, and West Fork Black River. All other sites that may affect Apache trout would be stocked with this alternative.

#### Bonytail Chub (Endangered) and Critical Habitat

There would be no jeopardy to the bonytail chub and no adverse modification to critical habitat under the Proposed Action. Bonytail chub may be affected by the Proposed Action in stocking sites along the lower Colorado River (La Paz County Park Pond, La Paz County Park Lagoon, Hidden Shores Golf Course, and Yuma West Wetlands), lower Gila River (Fortuna Pond, Redondo/Yuma Lake, and Wellton Golf Course) and the lower Salt River (Apache Lake, Canyon Lake, Saguaro Lake, Salt River Lower, Phoenix Urban and Special Urban Lakes, and Tempe Town Lake). The following considerations factored into the determination of effects on the bonytail chub:

- Stocking into the La Paz County Park Lagoon would provide limited opportunity for adverse effects to the bonytail chub through competition for food and space with stocked fish. The length of exposure, the number of bonytail chub potentially exposed to the stocked fish, and the amount of competition would be low due to the placement of a barrier net immediately prior to stocking, a short (approximately 2-week) stocking period, and the relatively rapid capture and removal of most of the sport fish by anglers due to the intensity of this fishery when it is stocked. The overall effect of proposed stocking to the bonytail chub in the Parker Strip area of the Colorado River would be low. No effects to bonytail chub are anticipated from proposed stockings at Hidden Shores, La Paz County Park Pond, or Yuma West Wetlands because these sites are not connected to the river and fish stocked there would not reach the river.
- It is highly unlikely that any bonytail chub stocked into the Colorado River for conservation purposes would access the river at the confluence of the Gila River and encounter either a stocked fish or its progeny (offspring) derived from Fortuna Pond. With the exception of rainbow trout, all species proposed for stocking into Fortuna Pond maintain robust, self-sustaining populations in the Colorado River below Laguna Dam, and the additive effect of any fish from Fortuna Pond to the extant populations of non-native fish would be minor. No effects to the bonytail chub are anticipated from proposed stockings at Redondo/Yuma Lake and Wellton Golf Course pond because these sites are not connected to the Gila River.
- Access by fish stocked into the Salt River lakes and the lower Salt River to the Arizona State University (ASU) Research Park via the Salt River Project Western Canal would have a low likelihood of occurrence. The water flow to the ponds is via a buried pipeline. Because Salt River Project (SRP) stocks white amur into the canals to remove aquatic vegetation, diversions are screened to keep these fish in the canal. This screening system would also reduce the opportunity for stocked fish in the canals to access the ASU Research Park ponds. The water

source for the Karsten Golf Course ponds is the SRP canal system, and the same conclusion applies. Though non-native stocked fish may reach the ponds, the effects to native species would be minor and discountable, based on the potential for effects.

Under the Reduced Stocking Alternative, five statewide stocking locations (La Paz County Park Lagoon in the Lower Colorado, Canyon Lake, Saguaro Lake, Salt River Lower, and Tempe Town Lake) and 24 of the Phoenix Urban and Special Urban Lakes that could affect the bonytail chub or critical habitat would be eliminated.

#### Chiricahua Leopard Frog (Threatened)

Under the Proposed Action, there would be no jeopardy to the Chiricahua leopard frog. The Chiricahua leopard frog may be affected by stocking in the following complexes and stocking sites: Luna Lake (Luna Lake), Black River (Ackre Lake, Big Lake, and East and West Forks of the Black River), Lower Verde River (East Verde River Fork), Santa Cruz River (Fagen Tank, Parker Canyon Lake, and Peña Blanca Lake), and Tonto Creek (Christopher Creek, Haigler Creek, and Tonto Creek). The following considerations factored into the determination of effects on the Chiricahua leopard frog:

- The change to sterile triploid rainbow trout in these stocking sites would eliminate any support that stocking might provide to wild populations of rainbow trout. Triploid fish are bred to be sterile and unable to breed, so any survivors that would remain after the fishing season would be unlikely to establish or augment a reproducing population.
- Adverse effects to natural Chiricahua leopard frog populations in the San Francisco River near Reserve, New Mexico, could occur if the rainbow trout populations established there would be supported by rainbow trout proposed for stocking in Luna Lake. Available information suggests that the rainbow trout in the San Francisco River near Reserve may be self-sustaining or could be coming from other sources nearby. The change to sterile triploid rainbow trout at these stocking sites would eliminate any augmentation of wild populations from stocking.
- Adverse effects to the Chiricahua leopard frog in natural and reestablishment populations in the Black River, East Verde River, Tonto Creek, and Parker Canyon Lake would be expected to occur if dispersing Chiricahua leopard frogs move out of the secure habitats and into stream reaches containing stocked trout species or, in the case of Parker Canyon Lake, channel catfish and sunfishes. Successful establishment of populations in secure reestablishment sites would lead to larger numbers of Chiricahua leopard frogs leaving the area to locate new habitats, with a concomitant increase in potentially adverse interactions with stocked fish or other dangers. However, these losses would not impinge on the success of the reintroduced population in the secure area, so these effects would not be meaningful.
- Adverse effects to the metapopulation around Peña Blanca Lake from the stocking of rainbow trout would not likely be sufficient to eliminate Chiricahua leopard frogs from the lake because the trout would not be present through the entire Chiricahua leopard frog breeding season and the high amount of cover in the lake that provides protection for egg masses and tadpoles.
- The risks of contamination of Chiricahua leopard frog sites with chytrid fungus, waterdogs, and other nonnative aquatic species, diseases, or parasites due to stocking actions and angler pursuit of stocked sport fish would exist, and procedures to reduce the risk would not entirely eliminate it. For the sites considered in this analysis, under the current environmental baseline,

this risk would not be substantial except at Peña Blanca Lake, where a metapopulation may be forming. Additional consideration of these issues is provided in the area-wide analysis for this species.

Under the Reduced Stocking Alternative, the following stocking sites that could affect the Chiricahua leopard frog would be eliminated: Big Lake and East Fork and West Fork of the Black River; Luna Lake; Parker Canyon Lake and Peña Blanca Lake; and Christopher Creek, Haigler Creek, and Tonto Creek.

#### Gila Chub (Endangered) and Critical Habitat

There would be no jeopardy for the Gila chub and no adverse modifications to critical habitat under the Proposed Action. Gila chub may be affected by stocking in the following complexes and sites: Agua Fria River (Fain Lake and Lynx Lake), Big Chino Wash (Granite Basin Lake), Middle Verde River (Oak Creek and Wet Beaver Creek), and Santa Cruz River (Rose Canyon Lake and Fagen Tank). The following considerations factored into the determination of effects on the Gila chub:

- At all locations, stocked sport fish would have to leave the stocking area to reach occupied habitats of the Gila chub. It is not anticipated that the number of such fish reaching occupied habitat over the 10-year period covered by this consultation would represent a substantial effect to the status of the Gila chub populations. The movement of stocked sport fish to occupied Gila chub habitats in the Agua Fria drainage would likely be a rare event, and effects to Gila chub in the vulnerable Silver Creek population would be additive to that from existing nonnative species present. Rainbow trout stocked in Oak Creek and Wet Beaver Creek would be more likely to reach occupied habitats in Spring Creek and Red Tank Draw. However, rainbow trout would not persist in these areas due to high temperatures and, therefore, their effect on young Gila chub would be of limited duration and not sufficient to affect recruitment, particularly because it may not occur every year. Stocked trout from Rose Canyon Lake would also be rare in Gila chub habitat in Bear Canyon and Sabino Canyon and would be unlikely to affect the main population in Sabino Creek.
- Spills from Granite Basin Lake could introduce largemouth bass to the limited Gila chub habitat present in Williamson Valley Wash. Largemouth bass have not been documented in, and would be unlikely to reach, Williamson Valley Wash. If largemouth bass were to reach the occupied habitat, there could be substantial adverse effects to Gila chub. However, the potential for loss of this population under the Proposed Action would be limited due to the low exposure potential.
- Gila chub could be exposed to stocked sport fish if they move out of occupied habitats into areas where the sport fish might be found. This would most likely occur in Oak Creek and Wet Beaver Creek, where the stocking site would be near the occupied habitats. The effects of trout on Gila chub would be limited in duration. Though trout can be predators on fish, the additive contribution of this predation over that which occurs in these streams due to warm-water fish, frog, and crayfish predation would not be sufficient to alter the recruitment potential for Gila chub. Gila chub that move out of the Agua Fria tributary habitats would be at risk of exposure during the limited time stocked sport fish might be present; however, the additive predation on young Gila chub would not be sufficient to alter the recruitment potential in the Agua Fria River.

- The low likelihood and short-term presence of stocked sport fish in Gila chub critical habitats at Red Tank Draw, Sabino Creek, and Spring Creek would be unlikely to alter physical and biological factors such that the critical habitat could no longer function to provide conservation benefits to the species. The invasion events would likely be few, with few fish involved, and would be of short duration due to summer temperatures that would eliminate the trout. Largemouth bass have not been documented in, and would be unlikely to reach, Williamson Valley Wash. The potential effects to this critical habitat unit under the Proposed Action would be limited due to the low exposure potential, as described in the BA.

The following sites would not be stocked under the Reduced Stocking Alternative: Granite Basin Lake in the Big Chino Wash complex; Oak Creek and Wet Beaver Creek in the Middle Verde River subcatchment; and Rose Canyon Lake in the Santa Cruz River subcatchment.

#### Gila Topminnow (Endangered)

Under the Proposed Action, there would be no jeopardy to the Gila topminnow. Gila topminnow may be affected in the following complexes and stocking sites: Agua Fria River (Fain Lake and Lynx Lake), Lower Salt River (Canyon Lake and Saguaro Lake), Middle Verde River (Verde River Middle), Lower Verde River (East Verde River), and Upper Santa Cruz (Parker Canyon Lake, Patagonia Lake, and Peña Blanca Lake). The following considerations factored into the determination of effects on the Gila topminnow:

- Conservation populations are all isolated from proposed stocked sport fish moving upstream into occupied habitat. Though there would be a risk to any Gila topminnow that moves downstream from the secure habitat to be exposed to a stocked sport fish or its progeny, that risk would be low. Furthermore, Gila topminnow that move out of the secure habitat cannot reaccess the habitat and are assumed lost to the conservation population. This loss is not likely important to the stability and success of the conservation population.
- The risks of exposure to stocked sport fish or their progeny at the three stocking sites with natural Gila topminnow populations nearby would be low at Parker Canyon Lake, and somewhat more likely for Peña Blanca Lake and Patagonia Lake. The seasonality of rainbow trout stocking at these two lakes, and the physical conditions at the Gila topminnow-occupied sites during the period of exposure would limit the potential for adverse interactions. Particularly below Patagonia Lake, there would be opportunity for exposure to Gila topminnow from escaped rainbow trout. The number of such potential encounters would likely be low and would not result in substantial adverse effects to the Gila topminnow populations.

Under the Reduced Stocking Alternative, Gila topminnow could be affected from stocking only in the Agua Fria River complex. All other stocking sites that could affect Gila topminnow would be eliminated with this alternative.

### Gila Trout (Threatened)

There would be no jeopardy to Gila trout under the Proposed Action. Gila trout may be affected by stocking in the following subcatchments and stocking sites: Agua Fria River drainage (Fain and Lynx lakes) and the Upper Gila River drainage (Frye Mesa Lake). The following considerations factored into the determination of effects on the Gila trout:

- The Grapevine Creek and Frye Creek conservation populations were created to meet recovery goals for the Gila trout and, as such, their success or failure does not factor into any jeopardy determination.
- The potential for adverse effects to the conservation populations that could influence the successful establishment of the populations would be low because stocked nonnative fish species would be unlikely to move into the reintroduction areas to adversely affect the Gila trout.
- The number of Gila trout lost to the conservation populations through downstream movement is considered in the planning for the reintroductions and would not be considered significant to the population status. Establishing the population is a benefit to the species.
- The number of Gila trout lost to the conservation populations through downstream movement is considered in the planning for the reintroductions and is not considered significant to the population status. Gila trout dispersing to the Agua Fria River from Grapevine Creek would not persist in the river due to summer temperatures and flow conditions. Gila trout from the Frye Creek conservation population that disperse downstream to Frye Mesa Lake become part of the fishable population under the ESA with a special (4[d]) rule that provides for angling of the species as long as the angling comports with the laws of the state of Arizona. Establishing the conservation populations is a substantial benefit to the species even if small numbers are lost downstream.

Under the Reduced Stocking Alternative, all three stocking locations that may affect Gila trout would be stocked.

### Headwater Chub (Candidate)

There would be no jeopardy to headwater chub under the Proposed Action. Headwater chub may be affected by stocking in the Lower Verde River complex (East Verde River and Green Valley Lake) and the Tonto Creek complex (Christopher Creek, Haigler Creek, and Tonto Creek). The following considerations factored into the determination of effects on the headwater chub:

- Of the 23 waters occupied by the headwater chub, five (East Verde River, Webber Creek, Tonto Creek, Haigler Creek, and Marsh Creek) would likely be directly impacted by the Proposed Action.
- The overall status of the headwater chub is not clearly understood. Recent survey data for most populations in Arizona are lacking, and trends in New Mexico show declines in those populations. Recently discovered populations in the East Verde River drainage and the Verde River drainage have not been assigned to headwater chub because these populations have not yet been verified by genetic and morphometric evaluations.

- Past and ongoing conservation efforts include the Fossil Creek renovation, development of the six-species conservation plan, some limited surveys in Arizona, and surveys in the Upper Gila River in New Mexico (through at least 2008).
- Stocking of rainbow trout into the occupied habitat in the East Verde River could increase competition for food and space and increase predation risk to young chub in the East Verde River and lower Webber Creek. Furthermore, proposed stocking would increase the angling pressure at those locations and, based on anecdotal reports, would result in bycatch (fish unintentionally caught while fishing for another species) of chub by anglers and some level of post-catch mortality. Though state regulations require the immediate release of headwater chub, the extent to which this requirement is followed is unknown.
- It is uncertain to what extent the stocking of rainbow trout into Tonto, Christopher, and Haigler creeks would support the extant wild trout populations in headwater chub-occupied areas downstream. There is documented reproduction of rainbow trout in each of these creeks, so these populations may be self-sustaining. The change to sterile triploid rainbow trout at these stocking sites would eliminate any augmentation of wild populations from stocking.
- Mitigation measures included in the Proposed Action would reduce threats to headwater chub from stocking rainbow trout into or adjacent to occupied habitat by improving angler education about releasing headwater chub, using triploid rainbow trout, and securing existing or establishing new populations in areas free from nonnative fish species.

Under the Reduced Stocking Alternative, none of the five sites potentially affecting headwater chubs would be stocked, and there would be no effects to the species.

#### Humpback Chub (Endangered) and Critical Habitat

Under the Proposed Action, there would be no jeopardy to the humpback chub and no adverse modification to critical habitat. The humpback chub and/or designated critical habitat may be affected by stocking in the following complexes and stocking sites: Havasu Creek (Cataract Lake, City Reservoir, Dogtown Reservoir, Santa Fe Tank, and Kaibab Lake) Canyon Diablo (Mud Tank, Kinnikinick Lake, Morton Lake, and Frances Short Pond), Schoen's (Woodland Lake, Rainbow Lake, Show Low Lake, Fool Hollow Lake, and Scott Reservoir), and White Mountain (Silver Creek and Little Mormon Lake). The following considerations factored into the determination of effects on the humpback chub:

- For the Havasu Creek stocking sites, it would be unlikely that any individuals of the stocked species, particularly channel catfish, could survive being transported by flood waters and reach the humpback chub habitats. The spill potential from the stocking sites, the distances involved, and the physical conditions encountered, when considered together, lead to a low risk of exposure of humpback chub to these stocked fish. This low potential for exposure also supports a conclusion that critical habitat would not be affected to the extent that the conservation value of the Colorado River Marble and Grand Canyon critical habitat reach would not be diminished.
- For the Canyon Diablo stocking sites, it is unlikely that any individuals of the stocked species, particularly channel catfish, could survive being transported by flood waters and reach the humpback chub habitats. The spill potential from the stocking sites, the distances involved, and

the physical conditions encountered, when considered together, lead to a low risk of exposure of humpback chub to these stocked fish.

- For the White Mountain stocking sites, it is possible that individuals of the stocked species, particularly channel catfish, could survive being transported by flood waters and reach the humpback chub habitats. There is connectivity between the Little Mormon Lake stocking site and the Little Colorado River via White Mountain Reservoir for juvenile channel catfish, which would only be present if reproduction occurs at the site. An existing grate on the outflow would prevent stocked adult channel catfish from escaping. Channel catfish are a notable predator on young humpback chub, and there is connectivity from these proposed stocking sites to the area above Chute Falls where recent translocations of small humpback chub have been undertaken to extend the area of the population and improve survivorship. However, channel catfish would have to travel more than 100 miles downstream, through White Mountain Lake, which hosts a naturally reproducing population of channel catfish, to reach humpback chub. The Proposed Action would not likely appreciably contribute to the channel catfish population in the Little Colorado River.
- For the Schoen's stocking sites, it is unlikely that stocked channel catfish would pass through Schoen's Dam and move downstream to reach humpback chub habitats. The manner of release for water behind the dam does not facilitate the downstream passage of bottom-dwelling fish such as channel catfish.
- For the Little Colorado River critical habitat reach, nonnative fishes (including channel catfish) entering the upper end of the critical habitat reach via the Little Colorado River inflows are an identified concern for critical habitat physical and biological factors. Established reproducing populations of channel catfish exist in Lyman Reservoir, lower Chevelon Creek, Clear Creek Reservoir, and in washes draining into the Little Colorado River from the north. The potential number of channel catfish derived from stocking locations rather than from these established reproducing populations of channel catfish that may access the Little Colorado River below Grand Falls cannot be determined. However, the previously noted populations are on the Little Colorado River itself and are more likely than the stocking sites to be the source of any channel catfish that reach the critical habitat. Thus, the value of the Little Colorado River critical habitat to contribute to conservation of the humpback chub would not be impaired by the Proposed Action.

Under the Reduced Stocking Alternative, three stocking locations that could affect humpback chub and critical habitat would be eliminated: Mud Tank, Kinnikinick Lake, and Morton Lake in the Canyon Diablo complex. These sites have a low risk of exposure to humpback chub. All other sites that may affect humpback chub and/or critical habitat would be stocked.

#### Little Colorado Spinedace (Threatened) and Critical Habitat

There would be no jeopardy to the Little Colorado spinedace and no adverse modification to critical habitat under the Proposed Action. Little Colorado spinedace and/or critical habitat may be affected by stocking in the following complexes and stocking sites: Chevelon Creek (Chevelon Canyon Lake, Long Tom Tank, Willow Springs Lake, and Woods Canyon Lake), Clear Creek (Bear Canyon, C.C. Cragin Reservoir, Knoll Lake, and Clear Creek Reservoir), Little Colorado River above Lyman (Hulsey Lake, Lyman Reservoir, and Nelson Reservoir), Schoen's (Fool Hollow Lake, Rainbow Lake, Mountain Meadow Recreational Complex,

Scott Reservoir, Show Low Creek, Show Low Lake, and Woodland Lake), West Fork of the Little Colorado River (Bunch Reservoir, Lee Valley Lake, Little Colorado River Greer, Little Colorado River Sheep's Crossing, Mexican Hay Lake, River Reservoir, Tunnel Reservoir, and White Mountain Reservoir) and White Mountain (Silver Creek and Little Mormon Lake). The following considerations factored into the determination of effects on the Little Colorado spinedace:

- The overall status of the natural populations of Little Colorado spinedace is declining and likely will continue to decline over the 10-year period covered by this consultation. Loss of habitat from continuing water development, combined with the ongoing drought, is a substantial threat to all populations, as is the increasing expansion of nonnative fish species in the range of the Little Colorado spinedace. The Proposed Action, however, does not create an additional burden of adverse effects above and beyond what is already in the environmental baseline because the three sites that would most likely have adverse effects to Little Colorado spinedace (C.C. Cragin Reservoir, Knoll Lake, and Nelson Reservoir) already operate under restrictions from a 1995 biological opinion (as modified in 2001) that have substantially reduced the potential for adverse effects. These three sites will continue to be operated under those restrictions (with modified creel requirements).
- Significant conservation actions were put forth by agencies, including the AGFD, to introduce new populations to West Chevelon Canyon, Bear Canyon, Dane Canyon, and Yaeger Canyon, to purchase property and water rights at Sipe White Mountain Wildlife Area, Winema Wildlife Area, Buck Springs Allotment, and Grasslands Wildlife Area, and to add spinedace refugia populations at Grasslands Wildlife Area and the Flagstaff arboretum.
- Effects to Little Colorado spinedace from stocking in the Chevelon Creek, Schoen's, West Fork Little Colorado River, and White Mountain complexes would be limited due to distance, connectivity with occupied Little Colorado spinedace, and other physical conditions.
- The Proposed Action would include the transition from normal rainbow trout to triploid rainbow trout over the next three years. This would reduce the potential for establishing rainbow trout in areas where they are currently not established.
- Stocked catfish could not reach White Mountain Reservoir because Whipple Lake is a closed system and Little Mormon Lake has a grate on the outflow. The only possible source of channel catfish from this stocking action would be from progeny that could escape through the grate at Little Mormon Lake, if catfish were able to spawn at that site. However, channel catfish are already established in White Mountain Lake, and the contribution of the escaped progeny, if it were to happen, would be minimal.
- Through continuation of the 2001 stocking restrictions, the critical habitat reaches above and below C.C. Cragin Reservoir and below Nelson Reservoir would not be degraded by rainbow trout escaping from these reservoirs. The critical habitat would not experience a decline in functionality or its conservation value to the species.

Under the Reduced Stocking Alternative, the following sites would not be stocked: C.C. Cragin Reservoir, Knoll Lake, and Clear Creek Reservoir in the Clear Creek complex, and Hulsey Lake, Lyman Reservoir, and Nelson Reservoir in the Little Colorado River above Lyman complex.

### Loach Minnow (Threatened) and Critical Habitat

Under the Proposed Action, there would be no jeopardy to the loach minnow and no adverse modification to critical habitat. Loach minnow and/or designated critical habitat may be affected by stocking in the following complexes and stocking sites: Black River (Ackre Lake, Big Lake, Crescent Lake, East Fork Black River, and West Fork Black River), Luna Lake (Luna Lake), Middle Verde River (Verde River Middle, Oak Creek, and Wet Beaver Creek), Granite Creek (Goldwater Lake, Watson Lake, and Willow Springs Reservoir), and Lower Verde River (Green Valley Lake). The following considerations factored into the determination of effects on the loach minnow:

- The size of the loach minnow population in the Black River is low, and occupied habitat has not been documented within the proposed stocking reach. The numbers of stocked trout leaving the stocking reach to invade occupied loach minnow habitat would likely be low over the period covered by this consultation, based on available information that shows most stocked trout in the East Fork Black River do not move far from the stocking reach and have a limited persistence due to angler removal and low post-stocking survival, and stocked fish from Big or Crescent lakes are unlikely to move out of those sites during winter flooding due to the placement of the weir. The distances involved for Apache trout or Arctic grayling from Ackre Lake to reach occupied habitat in the East Fork Black River are such that any effects from that stocking are unlikely to occur.
- The effects to physical and biological factors of critical habitat in the Black River are limited due to the primary stocking of native Apache trout rather than rainbow trout. While stocking high numbers does affect critical habitat, this effect would be of short duration due to the practice of stocking trout into pools and not riffles where competition for food with loach minnow could occur, angler removal of stocked trout and low post-stocking survival. The trout would be stocked multiple times over a season; therefore, numbers will repeatedly increase and decrease over the season, but the effect to critical habitat is not significant due to the reasons cited above.
- Loach minnow populations that could be affected by stocked trout leaving Luna Lake are more than 26 miles downstream in the mainstem of the San Francisco River and two of its tributaries. Though trout could move out of Luna Lake when it spills (which can happen every year), the number of such fish likely to reach occupied loach minnow habitat would likely be low.
- The effects to critical habitat from escaped trout from Luna Lake would be similarly limited in scope. The number of rainbow trout entering critical habitat would not be sufficient to reduce the existing conservation value of the critical habitat units for loach minnow or preclude improvements to the value of critical habitat through removal of other nonnative species. Any effects to critical habitat would be of short duration, and no meaningful change in the forage base for loach minnow would occur.
- The effects to proposed critical habitat units in the Verde River would be minimal given the temporary nature of the presence of rainbow trout and the limited potential for stocked bluegill, black crappie, or channel catfish to reach the upper Verde River.

- The proposed action does not result in any additional effects from stocked sport fish that are not already part of the environmental baseline. These effects are expected to continue at their current level over the 10-year period covered by this consultation.
- The Proposed Action contains substantial mitigation measures to address effects of the action and to improve the baseline status of the species.

Under the Reduced Stocking Alternative, loach minnow would not be affected, and critical habitat may be affected from stocking in the Granite Creek complex. All other stocking sites that could lead to effects to loach minnow and/or critical habitat would be eliminated with this alternative.

#### Narrow-headed Garter Snake (Potential Candidate)

The Proposed Action would not be likely to jeopardize the continued existence of the narrow-headed garter snake. The narrow-headed garter snake may be affected by stocking in the following complexes and stocking sites: Black River (Ackre Lake, Big Lake, Crescent Lake, and East and West Forks Black River), Canyon Creek (Canyon Creek), Granite Creek (Goldwater Lake, Watson Lake, and Willow Creek Reservoir), Lower Verde River (East Verde River and Green Valley Lake), Middle Verde River (Dead Horse Lake, Verde River Middle, Oak Creek, West Clear Creek, and Wet Beaver Creek), and Tonto Creek (Christopher Creek, Haigler Creek, and Tonto Creek). The following considerations factored into the determination of effects on the narrow-headed garter snake:

- The Proposed Action, through intentional, albeit illegal, mortality of narrow-headed garter snake by anglers along Oak Creek, could have continuing adverse effects on a population weakened by other causes such as nonnative predation and altered or diminished prey base. The population remains robust at locations away from heavy visitor use; however, long-term monitoring is needed to document changes to population viability.
- The numbers of rainbow trout or cutthroat trout reaching narrow-headed garter snake habitats in the San Francisco River, Tularosa River, and Negrito Creek would likely be small and their persistence limited. Trout are predators on fish species that support narrow-headed garter snake populations; however, the magnitude of the contribution of trout from Luna Lake would be limited.
- At those sites under the Proposed Action with potential exposure to the narrow-headed garter snake, most of the sport fish stockings would be rainbow trout. Though rainbow trout can be predators on small fish, they would constitute a smaller risk to the native prey base of narrow-headed garter snakes than the warm-water species that are extant in those areas. Juvenile trout would also likely provide a prey base for narrow-headed garter snakes in some areas.
- The Proposed Action contains mitigation measures that would work to offset the effects of the action and provide additional conservation benefit to the narrow-headed garter snake.

The following sites would not be stocked under the Reduced Stocking Alternative: Big Lake, East and West Forks of the Black River, East Verde River, Green Valley Lake, Dead Horse Lake, Verde River Middle, Oak Creek, West Clear Creek, Wet Beaver Creek, Tonto Creek, Christopher Creek, and Haigler Creek.

### Northern Mexican Garter Snake (Candidate)

Under the Proposed Action, there would be no jeopardy to the Northern Mexican garter snake. Northern Mexican garter snakes may be affected in the following complexes and sites: Black River (Ackre Lake, Big Lake, Crescent Lake, East Fork Black River, and West Fork Black River), Granite Creek (Goldwater Lake, Watson Lake, and Willow Creek Reservoir), Lower Verde River (East Verde River), Middle Verde River (Verde River Middle, Oak Creek, West Clear Creek, and Wet Beaver Creek), Upper Santa Cruz (Parker Canyon Lake), Middle Santa Cruz (Fagen Tank and Arivaca Lake), Schoen's (Mountain Meadow Recreational Complex, Rainbow Lake, Scott's Reservoir, Show Low Creek, Show Low Lake, and Woodland Lake), White Mountain (Little Mormon Lake, Long Lake, Sponseller Lake, and Whipple Lake), and Tonto Creek (Christopher Creek, Haigler Creek, and Tonto Creek). The following considerations factored into the determination of effects on the Northern Mexican garter snake:

- Intentional mortality of Northern Mexican garter snake by anglers along Oak Creek would not, based on existing population data, have substantial effects to the Oak Creek hatcheries population.
- Conservation actions for Northern Mexican garter snake in the Santa Cruz/San Rafael Valley through the draft San Rafael Habitat Conservation Plan could assist in maintaining or expanding that population, and efforts in the vicinity of Parker Canyon Lake could also provide additional support for the small population in Scotia Canyon. Funding for Northern Mexican garter snake work on Arizona State Parks land is lacking, but few ongoing activities there are adverse to the Northern Mexican garter snake population.
- Most of the sport fish stockings considered in this analysis would be of rainbow trout. Though rainbow trout can be predators on small fish and frogs, they constitute a smaller risk to the native prey base of Northern Mexican garter snake than the warm-water species that are extant in those areas. Two warm-water stocking sites would not likely support reproducing Northern Mexican garter snake populations even without the stocking due to the presence of other nonnative species including bullfrogs and crayfish.
- The spread of diseases that can affect the Northern Mexican garter snake's native frog prey base through legal and illegal use of nonnative tiger salamanders or bait fish is not directly connected to the Proposed Action. The proposed stocking sites would have limited exposure to the native frog prey base.
- Mitigation measures included in the Proposed Action would have benefits to the Northern Mexican garter snake that would assist in offsetting the effects of the Proposed Action.

Under the Reduced Stocking Alternative, the Northern Mexican garter snake could be affected by stocking in the following complexes: Black River (only two of the five stocking sites in the Proposed Action), Granite Creek, Middle Santa Cruz, Schoen's, and White Mountain. All other sites in the Middle Verde River, Lower Verde River, Upper Santa Cruz, and Tonto Creek complexes, and three sites in the Black River complex that could affect Northern Mexican garter snake would not be stocked under this alternative.

### Mount Graham Red Squirrel (Endangered)

Under the Proposed Action, there would be no jeopardy to the Mount Graham red squirrel. The Mount Graham red squirrel may be affected from stocking at Riggs Flat Lake. The following considerations factored into the determination of effects on the Mount Graham red squirrel:

- Stocking truck and angler access related to the Proposed Action would compose a portion of the existing estimated road traffic on Swift Trail. This amount of road traffic was documented and discussed in extant BOs (FWS 1988 and 2008b) as a level not likely to jeopardize the red squirrel. Only eight red squirrels have been documented as road kills since the subspecies was listed in 1987.
- Based on annual fall surveys, red squirrel numbers in the vicinity of Riggs Flat Lake do not appear to be adversely affected by the presence of recreationists, including anglers, at the recreation site.
- The risk of human-caused wildfire related to stocking truck or angler access or the actions of anglers while using Riggs Flat Lake is of concern. However, FS management of the recreational site contains measures to reduce the risk of human-caused wildfires originating at the site. The one wildfire in the vicinity of the lake was started by an undefined human cause in a steep area south of the lake and off an established trail.

Riggs Flat Lake would be stocked under the Reduced Stocking Alternative, and the potential effects to the Mount Graham red squirrel would not be different from those of the Proposed Action.

### Northern Leopard Frog (Potential Candidate)

Under the Proposed Action, there would be no jeopardy to the Northern leopard frog. The Northern leopard frog may be affected in the following complexes and stocking sites: Black Canyon Lake (Black Canyon Lake), Canyon Diablo (Ashurst Lake, Coconino Lake, Kinnikinick Lake, Morton Lake, and Mud Tank), Little Colorado River above Lyman (Lyman Reservoir), Upper Little Colorado River (Concho Lake), Walnut Creek (Marshall Lake, Mormon Lodge Pond, Lower Lake Mary, and Upper Lake Mary), West Fork Little Colorado River (Lee Valley Lake, Mexican Hay Lake, White Mountain Reservoir, Little Colorado River Greer, Little Colorado River Sheep's Crossing, Bunch Reservoir, Tunnel Reservoir, and River Reservoir), and Luna Lake (Luna Lake). The following considerations factored into the determination of effects on the Northern leopard frog:

- Though the Proposed Action at Canyon Diablo and Walnut Creek complexes could have substantial adverse effects to Northern leopard frog populations extant in that area, the elimination of the Mormon Lake stocking site (this site was dropped from the Proposed Action during the evaluation) would provide a substantial area for Northern leopard frog persistence in the drainage. Continuation of the stocking program with the warm-water species would likely reduce opportunities for Northern leopard frog population maintenance and expansion in the action area, which would affect distribution of the species in Arizona.
- The only functioning metapopulation in Arizona at and around Stoneman Lake would not be affected by the stocking program. Stoneman Lake was dropped from consideration as a stocking site during the evaluation.

- Effects to the Northern leopard frog at Lyman Reservoir from stocked rainbow trout would likely be limited because conditions in the lake to support stocking may not occur over the term of this consultation, and few rainbow trout may access occupied habitats.
- The Proposed Action includes mitigation measures that would improve the status of the Northern leopard frog in Arizona.

Under the Reduced Stocking Alternative, the Northern leopard frog could be affected in the Black Canyon Lake, Upper Little Colorado River, and West Fork Little Colorado River complexes. All other sites that could affect Northern leopard frog would not be stocked under this alternative.

#### New Mexico Jumping Mouse (Candidate)

There would be no jeopardy to the New Mexico jumping mouse under the Proposed Action. The New Mexico jumping mouse may be affected in the following complexes and stocking sites: Black River (Big Lake, East Fork Black River, and West Fork Black River) and West Fork Little Colorado River (Little Colorado River Greer, Little Colorado River Sheep's Crossing, and Lee Valley Lake). The following considerations factored into the determination of effects on the New Mexico jumping mouse:

- The status of the jumping mouse across its range shows evidence of continuing declines, and recent survey data for Arizona corroborates data from New Mexico in this respect. The number of new populations found is fewer than the number of historical populations that may have been extirpated; however, complete surveys of all potential habitat have not been initiated, so additional populations may be present. There is limited or no active management consideration given to the jumping mouse on FS lands that contain the majority of occupied habitats, and adverse effects from ongoing land management actions are continuing at most sites. However, three reasonably stable populations of jumping mouse in New Mexico are not experiencing any threats.
- The continuation of sport fish stocking under the Proposed Action would perpetuate the habitat degradation occurring at the stocking sites at the West Fork Black River and along the West Fork Little Colorado River. The jumping mouse population at the lower East Fork Little Colorado River appears to be robust; however, only one survey has been done there, the amount and extent of habitat is not recorded, and the amount of human use in the habitat is unknown. This area may contain the last jumping mouse population in this portion of the Little Colorado River drainage. The other population in the drainage, on Nutrioso Creek, is small and the habitat extent unrecorded. Continuing effects of human use at the East Fork Little Colorado River may, over the near term, reduce the quality of that habitat as continuing use along the West Fork has done to date. With the expansion of housing at Greer, additional recreational pressures on the area are likely to continue.
- Two of the three robust jumping mouse populations not affected by the Proposed Action may also not be at substantial risk from recreation; however, the upper San Francisco River population is near the town of Alpine and may be affected by continued growth in that area. The Campbell Blue Creek population is more remote and likely has fewer recreation pressures. The Three Forks site experiences some recreational use but at current levels does not appear to be in imminent risk. The continuing degradation at occupied habitats affected by the stocking

actions would reduce the total viability of the Arizona portion of the range; however, these populations are not supporting the species distribution in Arizona.

- All Arizona populations are at risk of reductions in habitat by the continuing drought that affects water levels in the adjoining streams. Furthermore, all populations are in drainages where wildfires present a risk to the larger area, and a fire could eliminate a population. The scattered nature of the populations reduces the risk that one fire could eliminate the species in Arizona.
- Under the Proposed Action, mitigation measures for protection of jumping mouse habitat on AGFD-owned lands in the Black River would provide conservation benefits to the species over the long term.

Under the Reduced Stocking Alternative, the New Mexico jumping mouse could be affected in the West Fork Little Colorado River complex. The Black River complex stocking sites would not be stocked under this alternative.

#### Razorback Sucker (Endangered) and Critical Habitat

There would be no jeopardy to the razorback sucker and no adverse modification to critical habitat under the Proposed Action. The razorback sucker may be affected by stocking in the following subcatchments and stocking sites: Colorado River Yuma North and South (La Paz County Park Lagoon, La Paz County Pond, Hidden Shores Golf Course, and Yuma West Wetlands), Lower Gila River (Fortuna Pond, Redondo/Yuma Lake, and Wellton Golf Course), Verde River (Oak Creek, Wet Beaver Creek, West Clear Creek, and Green Valley Lake), and Salt River (Salt River Lower and Phoenix Urban and Special Urban Lakes). The following considerations factored into the determination of effects on the razorback sucker:

- Stocking of La Paz County Park Lagoon would provide limited opportunity for adverse effects to the razorback sucker through competition for food and space with stocked fish and predation on larval razorback suckers by stocked fish. The length of exposure, the number of razorback suckers potentially exposed to the stocked fish, and the amount of competition would be low. The overall significance to the razorback sucker in the Parker Strip area of the Colorado River would be low. No effects to the razorback sucker are anticipated from proposed stockings at Hidden Shores, La Paz County Park Pond, or Yuma West Wetlands because these sites are not connected to the river, and fish stocked there would not reach the river.
- It is highly unlikely that any razorback suckers stocked in the Colorado River for conservation purposes would reach the river at the confluence of the Gila River and encounter a stocked fish or its progeny derived from Fortuna Pond. With the exception of rainbow trout, all species proposed for stocking into Fortuna Pond maintain robust, self-sustaining populations in the Colorado River below Laguna Dam, and the additive effect of any fish from Fortuna Pond to the extant populations of nonnative fish would be minor. No effects to the razorback sucker are anticipated from proposed stockings at Redondo Lake and Wellton Golf Course pond because these sites are not connected to the Gila River.
- It would be unlikely for fish stocked into the Salt River lakes and the lower Salt River to reach the Research Park via the SRP Western Canal. The water flow to the ponds is via a buried pipeline. Because SRP stocks white amur into the canals to remove aquatic vegetation, diversions are screened to keep these fish in the canal. This screening system would also

reduce the opportunity for stocked fish in the canals to reach the Research Park ponds. The water source for the Karsten Golf Course ponds is the SRP canal, and the same conclusion applies. Though nonnative stocked fish may reach the ponds, the effects to native species would be minor and discountable based on the factors discussed previously.

- Competition for food and space or potential predation by rainbow trout on larval razorback suckers along the Middle and Lower Verde River would be limited due to the limited overlap of known locations of stocked razorback suckers in relation to proposed stocking sites.
- The Proposed Action would not increase populations of nonnative fish in either the Parker-Imperial or Verde River critical habitat reaches. The small numbers of stocked fish that would likely remain in the Parker-Imperial reach after the barrier net is removed would be inconsequential to the existing populations of these species in the river. The small numbers of stocked sport fish that may reach the Upper Verde River critical habitat reach would not be likely to lead to the establishment of these species in the area, and the effect of the small numbers of individuals likely to move into the area from the Granite Creek stocking sites would not alter the existing predator and competitor community currently present. The stocking of rainbow trout into the Middle and Lower Verde River would have a temporary effect of increasing the biomass and introducing a “new” species to the reach. However, because this species would be present only temporarily, would have limited effect on the physical habitat and biological environment, and would not be expected to establish in the stocking reaches, the effects would be minor. In no case would the effect of sport fish stocking reduce the value for conservation of any affected critical habitat reach for the razorback sucker.

Under the Reduced Stocking Alternative, one stocking location in the Colorado River Yuma North subcatchment (La Paz County Park Lagoon) would not be stocked, while in the Lower Salt River subcatchment, the Salt River Lower and 24 of the Phoenix Urban and Special Urban Lakes would not be stocked (the remaining six urban sites are closed systems). All other sites that may affect the razorback sucker or its critical habitat would be stocked.

#### Roundtail Chub (Candidate)

There would be no jeopardy to the roundtail chub under the Proposed Action. The roundtail chub may be affected by stocking in the following subcatchments and stocking sites: Salt River (Canyon Creek, Workman Creek, Salt River Lakes, Salt River Lower, Tempe Town Lake, and Phoenix Urban and Special Urban Lakes), Verde River (Goldwater Lake, Watson Lake, Willow Creek Reservoir, Oak Creek, Wet Beaver Creek, Verde River Middle, West Clear Creek, East Verde River, and Green Valley Lake), Clear Creek Reservoir, and the Bill Williams River (Granite Mountain Tank #1, Granite Mountain Tank #2, Bass Tank, Blue Tank, Carter Tank, Antelope Tank, Bar 37 Tank, Harman Tank, Harmon Tank #2, Little Antelope Tank, McElhaney Tank, Stubb’s Tank, and Swale Tank). The roundtail chub may also be affected by stocking in the following complexes: Black River (Ackre Lake, Big Lake, Crescent Lake, and East and West Forks Black River), Chevelon Creek (Chevelon Canyon Lake, Long Tom, Willow Springs, and Woods Canyon Lake), and Clear Creek (Bear Canyon Lake, C.C. Cragin, and Knoll Lake). The following considerations factored into the determination of effects on the roundtail chub:

- Across Arizona, 31 waters in five discrete major river basins still contain roundtail chub, and only one is considered “stable-secure.” Determination of status categories was most recently

completed in 2009 for the 12-month finding; however, the supporting data are qualitative, non-standardized and, in some cases, limited. Though this is the best available information and it was used consistently across the sites, considerable unknowns remain about the status of the species in these occupied waters. Roundtail chub in these waters may be persisting at varying levels in the face of ongoing physical and biological threats, but a number of them are in small habitats where stochastic events may result in extirpation.

- The Proposed Action could affect 17 of the 31 known waters occupied by roundtail chub, including five currently considered “stable-threatened” and 11 currently considered “unstable-threatened” in the 12-month finding (FWS 2009). Rainbow trout are the only sport fish that would be stocked into occupied roundtail chub habitats (6 of the 17 affected waters), and an evaluation of the magnitude of the effect of these proposed stockings on roundtail chub present is complicated by the presence of wild populations of nonnative fish that are also potential predators and competitors. At the other stocking sites, a mix of cold-water and warm-water sport fish are proposed for stocking, and the connectivity between stocking sites and occupied habitats would be possible at varying levels of likelihood.
- The mitigation measure to only stock triploid rainbow trout would greatly reduce the likelihood that stocked fish would contribute to self-sustaining populations of rainbow trout in roundtail chub habitats.
- The implementation of the Statewide Conservation Agreement (AGFD 2006b) has provided conservation actions for the roundtail chub. Two new waters, Ash Creek and Roundtree Canyon, were stocked with roundtail chub under the agreement, and other actions are listed under the range-wide status of the species. Furthermore, a brood stock and refugia was established at Bubbling Pond Hatchery. Other conservation measures under the Gila River Basin Native Fishes Program have also benefitted the roundtail chub.
- Mitigation measures to improve the overall status of the roundtail chub and to adequately offset the adverse effects would be implemented as part of the Proposed Action.

Under the Reduced Stocking Alternative, the following stocking sites would be eliminated: East and West Forks of the Black River, Workman Creek, Canyon Lake, Saguaro Lake, Tempe Town Lake, and 24 Phoenix Urban and Special Urban Lakes in the Salt River subcatchment; Oak Creek and Wet Beaver Creek in the Verde River subcatchment; West Clear Creek, East Verde River, and Green Valley Lake in the Middle Verde River subcatchment; C.C. Cragin Reservoir, Knoll Lake, and Clear Creek Reservoir in the Little Colorado River subcatchment; and Bass Tank and Blue Tank in the Bill Williams River subcatchment.

#### Sonoran Tiger Salamander (Endangered)

There would be no jeopardy to the Sonoran tiger salamander under the Proposed Action. The Sonoran tiger salamander may be affected by stocking at one site, Parker Canyon Lake, in the Santa Cruz River subcatchment. The following considerations factored into the determination of effects on the Sonoran tiger salamander:

- Direct effects to individual salamanders from exposure to stocked fish species or their progeny would be limited by the inability of stocked sport fish to reach occupied salamander habitats and the low number of salamander populations within close proximity to the stocking site where salamanders could move overland into the stocking site.

- Survey information through 2006 of 139 tanks documented only four tanks containing one or more of four nonnative fish species in salamander habitats. It is unclear if illegal movement of fish species is an ongoing activity; however, the low number of compromised habitats indicates that if it occurs, the level is likely low.
- Hatchery and operational protocols would reduce the risk of inadvertent introduction of unwanted aquatic species (including diseases or parasites) via stocking events. This would reduce the risk for adverse effects from these organisms to occur in the salamander population but would not entirely eliminate them.
- The risk of disease transfer and hybridization through illegal use of waterdogs at Parker Canyon Lake would not affect the other portion of the occupied habitats in the San Rafael Valley and currently is of limited extent near Parker Canyon Lake (primarily in tanks along Highway 83).
- Mitigation measures to address the risks from introduction of nonnative tiger salamanders are included under the Proposed Action.

Under the Reduced Stocking Alternative, Parker Canyon Lake would not be stocked, and there would be no effects to the Sonoran tiger salamander.

#### Spikedace (Threatened) and Critical Habitat

Under the Proposed Action, there would be no jeopardy to the spikedace and no adverse modification of critical habitat. Spikedace and/or designated (and proposed) critical habitat may be affected by stocking in the following complexes and stocking sites: Luna Lake (Luna Lake), Middle Verde River (Verde River Middle, Oak Creek, and Wet Beaver Creek), Granite Creek (Goldwater Lake, Watson Lake, and Willow Springs Reservoir), Lower Verde River (Green Valley Lake), and Tonto Creek (Tonto Creek, Christopher Creek, and Haigler Creek). The following considerations factored into the determination of effects on the spikedace:

- For the upper Verde River, the low number of documented individuals of stocked sport fish species in spikedace habitat, combined with the low numbers of spikedace present, would likely result in limited opportunities for competition and predation. Furthermore, it is unlikely that the stocked sport fish would establish populations in the upper Verde River. Though there may be some predation and competition between spikedace and escaped sport fish, the potential losses would not be enough to result in reduction of population size or distribution.
- The ability of the spikedace population in the San Francisco River to establish a self-sustaining population would not likely be substantially impacted by the proposed stocking at Luna Lake. It would be unlikely that any rainbow trout from Luna Lake would reach proposed critical habitat; however, the presence of these trout would be additive to the existing nonnative fish community and could use space and some of the available food base provided by critical habitat. However, rainbow trout do not persist in most of the units and would be unlikely to alter physical and biological factors such that the critical habitat could no longer function to provide conservation benefits to the species.
- Designated critical habitat physical and biological factors in the upper Verde River would not be substantially altered by the occasional presence of individuals of stocked sport fish species. This infrequent circumstance would not preclude restoration of full functionality of the critical

habitat due to the infrequency of occurrence and the lack of persistence of the stocked sport fish in the critical habitat. This effect would be minor and would not alter the ability of the critical habitat to provide for survival and conservation of the spinedace.

- Minor effects to proposed critical habitat units in the Verde River below Tapco Diversion could occur from the presence of stocked rainbow trout. The presence of these trout would be additive to the existing nonnative fish community. However, rainbow trout would not persist in most of the units, and their additive effect to the ability of the proposed critical habitat to provide for survival and conservation of the spinedace would be minor.
- Effects to proposed critical habitat units in Tonto Creek would be unlikely to occur due to the short time any rainbow trout would likely be present in the units.

Under the Reduced Stocking Alternative, spinedace and critical habitat could be affected by stocking in the Granite Creek complex. All other sites that would potentially affect spinedace and/or critical habitat would be eliminated from this alternative.

#### Southwestern Willow Flycatcher (Endangered)

There would be no jeopardy to the Southwestern willow flycatcher under the Proposed Action. The Southwestern willow flycatcher may be affected in the following complexes and stocking sites: Little Colorado River above Lyman (Nelson Reservoir), West Fork Little Colorado River (Little Colorado River Greer and Little Colorado River Sheep's Crossing), and Middle Verde River (Verde River Middle). The following considerations factored into the determination of effects on the Southwestern willow flycatcher:

- Adverse effects to the Southwestern willow flycatcher and critical habitat at the middle Verde River would be unlikely to occur due to season of use and limited access to the river within the critical habitat reach.
- Adverse effects to the Southwestern Willow flycatcher at Nelson Reservoir would be unlikely to occur because the species is apparently not present; however, if it is present, the area likely used is not where anglers would be accessing the lake.
- Anglers would be unlikely to access the River Reservoir nesting areas, so flycatchers there would not likely be disturbed. There could be some disturbance of flycatchers attempting to set up territories near Greer related to anglers accessing the habitat. The amount of this potential disturbance is unknown but would not likely preclude use of the wider habitat area where angler access would not be occurring.
- The amount of critical habitat potentially degraded by angler access would be approximately 15 percent of the total. Recreational use of all types has had effects to these areas in the past and will continue into the future. The ability of the critical habitat at West Fork Little Colorado River to provide the physical and biological factors at the time of designation compared with the present time may or may not have declined substantially; however, the Proposed Action may not allow habitat components to improve in some specific locations. This would not appreciably diminish the value of the entire critical habitat unit for either survival or conservation of the species. The overall area would likely continue to provide critical habitat physical and biological factors, so the conservation value of the habitat as a whole would be maintained.

- Effects to critical habitat physical and biological factors in Tonto Creek proposed critical habitat units would be unlikely to occur due to the short time any rainbow trout would likely be present in the units.

Under the Reduced Stocking Alternative, the Southwestern willow flycatcher may be affected by stocking in the West Fork Little Colorado River complex. All other sites (those in the Little Colorado River above Lyman and Middle Verde River complexes) that may affect the Southwestern willow flycatcher would not be stocked under this alternative.

### **Stocking Effects on Other Special Status Species**

Stocking effects on aquatic and semi-aquatic species were identified as a primary issue during project scoping. Therefore, other special status species within this functional grouping (i.e., native fish, amphibians, and aquatic invertebrates) were further analyzed by species, by site, and by subcatchment. Distinct methodologies were used to analyze effects on native fish, amphibians, and aquatic invertebrates (Appendix F), and these are summarized in the following paragraphs.

For the remaining (non-aquatic) functional groups, the analysis was based on the occurrence of species records within 5 miles, as recorded in the HDMS database and identified in the Statewide Action Plan threat matrix (AGFD 2006a). Five miles was used because it is the standard distance that the AGFD HDMS uses to evaluate potential impacts to other special status species with this type of project. The HDMS is part of a global network of more than 80 natural heritage programs and conservation data centers. The information comes from published and unpublished reports, data collected by cooperating agencies, museum and herbarium collections, the scientific and academic communities, the Federal Register, and many other sources.

The HDMS represents the most comprehensive information currently available for assessing the occurrence of other special status species. However, there are several important considerations with regard to the use of HDMS data and other records in assessing environmental consequences. First, the recorded occurrence of a particular species within 5 miles of a stocking site or in the subcatchment does not mean that suitable habitat occurs at the stocking site or that this species would be impacted by stocking activities (though the analysis conservatively assumes that the potential exists). Second, the occurrence data do not reflect the total potential distribution of a species' occupied or potential habitat on the landscape, only where this species was observed and recorded.

Tables I through K (Appendixes G through I) list the number of other special status species in these remaining (non-aquatic) functional groups recorded within 5 miles of a stocking site and within a subcatchment. The data were filtered to include only records from 1986 to present to eliminate older records that may no longer be indicative of current species presence or habitat suitability. The data presented in these tables provide an initial comparison among the stocking sites and subcatchments of the number of species that could potentially be subjected to the effects of stocking.

Environmental consequences of the alternatives on other special status species vary by functional group, site characteristics, species composition, species stocked, and other factors. Table 5 identifies the relevant spatial scale of analysis and summarizes potential effects for each

functional group. The impacts presented in this table are general in nature, without consideration for variability in site characteristics, species composition, stocking species, etc. The functional groups are listed in order of potential intensity of effects and range from those most prone to direct and indirect effects across a wide range of spatial scales (i.e., aquatic and semi-aquatic species), those primarily subject to indirect effects on a local scale (terrestrial riparian species), and those subject to a mix of beneficial and negative effects, whether direct or indirect, on a local to regional scale (i.e., fish-eating birds).

**Table 5. Summary of potential effects on other special status species functional groups.**

Functional Group	Summary of Potential Effects
<p>Native fish, amphibians, and aquatic invertebrates</p>	<p>Because they are associated with aquatic habitats, potential effects to species in this functional group can occur at a range of spatial scales from individual stocking sites to the subcatchment and regional levels. The potential for effects is highest at and near the stocking sites where stocked fish or other special status species have the greatest potential to interact. Though less likely, potential effects to these species can also occur in other portions of the subcatchment through dispersal of stocked sport fish out of stocking sites or movement of other special status species into stocking sites along perennial waterways or through intermittent or ephemeral waterways during flood events.</p> <p>Other special status species in this functional group can also be affected on all spatial scales, including the regional level, through illegal translocation of stocked fish to more distant waters or incidental transport of diseases, parasites, or other introduced species (e.g., transfer of quagga mussels by recreational boats between distant waters in the state).</p> <p>Potential direct impacts from stocking of nonnative sport fish species include predation on eggs, young, and adults, and competition for food and space (i.e., restricted habitat use, reduced activity rates, and changes in trophic position and feeding behavior).</p> <p>Indirect effects may include introduction of parasites and diseases; introduction of other nonnatives such as crayfish; changes in invertebrate trophic structure (food-web); genetic isolation between subpopulations or meta-populations due to restricted dispersal/movement; and disturbance from angler activity on breeding sites, habitat, food sources, or water quality.</p>
<p>Riparian plants, non-piscivorous riparian/aquatic nesting birds, terrestrial riparian invertebrates, and ground-dwelling riparian mammals and reptiles</p>	<p>These species are potentially subject to indirect effects on a localized (stocking site and vicinity) scale. Fish stocking would not directly affect these species, but angling activities/access could indirectly affect them through disturbance.</p> <p>Stocking may result in indirect impacts to plants and the species that depend on them for habitat as a result of trampling by anglers attempting to access fishing areas, associated soil erosion, and disturbance favoring weedy plant species, transport of weedy species propagules by anglers, and some fragmentation of plant populations. Human presence/disturbance from angling may result in bird flushing from nests or altering their foraging patterns and trampling of vegetation that provides nesting cover. Angling activity also results in potential entanglement or ingestion of discarded fishing debris by birds.</p>

**Table 5. Summary of potential effects on other special status species functional groups.**

Functional Group	Summary of Potential Effects
Piscivorous riparian/aquatic nesting birds	<p>These species may experience some beneficial effects mixed with indirect adverse effects. These may occur on a localized (stocking site and vicinity) and a more widespread scale (subcatchment or regional) because many of these species use multiple sites.</p> <p>Stocking may benefit species in this taxonomic group by providing or supplementing food resources and potentially enhancing survival and/or reproductive success. Stocking may also result in disturbance of nesting birds from human presence (anglers) and potential entanglement/ingestion of discarded fishing debris by birds.</p>

*Stocking Effects on Other Special Status Native Fishes, Amphibians, and Aquatic Invertebrates*

Effects of the alternatives on other special status species in this functional group were analyzed in detail for each site and each species. Based on species occurrence records, 13 species are found within the stocking subcatchments: seven native fish species, one frog species, one toad species, and four species of aquatic invertebrates.

Distinct analysis methods were developed for each of the following groups of other special status species: native fishes, frogs, toads, and aquatic invertebrates (Appendix F). The potential for stocked fish to come into contact with other special status species (exposure) was analyzed for each stocking location based on hydrological connectivity (open vs. closed systems) and species occurrence (recorded occurrence within subcatchment or at stocking site). If exposure was possible, the likelihood of exposure was evaluated based on the nature of hydrological connections between the stocking location and other special status species–occupied areas, presence of physical barriers or management strategies that limit or preclude movement, the movement and persistence potential of stocked fish based on their biology, and the movement potential of other special status species based on their biology.

For the special status fish and amphibian species, the nature of the interactions with stocked fish (i.e., what would happen if exposure were to occur) was evaluated by considering whether other special status species are abundant despite past stocking and/or occurrence of stocked species, potential survival and reproduction of stocked species based on habitat factors and survey data, and the extent to which stocked fish already occur at the stocking site or in the subcatchment. For special status fishes, the predatory nature of stocked species (Table 6) on vertebrates was also considered. Species of sport fish proposed for stocking, with the exception of threadfin shad and white amur, exhibit some range of vertebrate predation.

For the purposes of identifying magnitude of predation risk, species proposed for stocking are categorized into two groups: those that are less predacious (predatory) and those that are more predacious based on literature cited in the BA (FWS 2011a). Other species of nonnative fish may exist as resident populations at or near the stocking sites that have higher or lower predation rates than those species proposed for stocking (e.g. flathead catfish or green sunfish).

**Table 6. General predatory nature of fish species proposed for stocking.**

Less-predacious Species Proposed for Stocking	More-predacious Species Proposed for Stocking
Apache trout	Black crappie
Arctic grayling	Brown trout
Bluegill	Channel catfish
Brook trout	Largemouth bass
Cutthroat trout	Smallmouth bass
Gila trout	Walleye
Rainbow trout	White crappie
Redear sunfish	Yellow perch

White amur and threadfin shad are also proposed for stocking, but these species do not consume vertebrate prey; therefore, they are not listed in this table.

Based on these methodologies, the magnitude of effects on each species at each stocking site was rated as “High,” “Moderate,” “Low,” or “No Effect.” The definitions follow.<sup>12</sup>

- *High*—Stocking locations predicted to have exposure that was highly probable and the potential biological impacts to other special status species would be expected to be substantial. Actions at these stocking sites could result in long-term population declines of other special status species in a localized area or at a watershed level.
- *Moderate*—Stocking locations predicted to have exposure that was more limited in probability or to have exposure that was highly probable but in conjunction with potential biological impacts to other special status species that were not substantial. Actions at these sites, when analyzed at a site-specific level, could impact individuals of other special status species or even cause temporary and/or localized population declines but would not likely result in long-term population declines at a watershed level. However, individual sites, when considered together with other stocking sites in the same watershed that had “Moderate” outcomes, could have more substantial impacts and result in long-term population declines of other special status species in a localized area or at a watershed level.
- *Low*—Stocking locations predicted to have exposure that was limited in probability or probable exposure but in conjunction with limited potential biological impacts to other special status species. Actions at these sites could impact individuals of other special status species but would not likely result in population declines of other special status species even when considered with other stocking sites within the same watershed that had “Low” outcomes.
- *No Effect*—Stocking locations predicted to have no potential exposure or an extremely low probability of exposure. Actions at these sites would not impact individuals or populations of other special status species.

Detailed analyses of the other special status species at the site level is shown in Tables L–P (Appendixes K–O). Tables 7–18 summarize the effects of the Proposed Action and the Reduced Stocking Alternative on other species status fish, amphibian, and aquatic invertebrate species.

<sup>12</sup> The nature of interactions between stocked species and native fish species and lowland leopard frog are not fully understood, can be site-specific, and is a topic in need of further research. However, many of the uncertainties that exist are not easily answered by research and may never be fully understood. In cases where adequate information was not available to determine the nature of the interactions, the higher effects call was chosen to describe the effects to the special status species.

The No Action alternative would have no effect on other species status species in this functional group and is not included in these tables.

**Table 7. Summary of effects within each subcatchment to longfin dace resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to Longfin Dace from Proposed Action	Summary of Impacts to Longfin Dace from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	51 NE	36 NE
Riggs Flat	1	1	1 NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 Low	1 Low
Luna	1	0	1 Low	0 stocking sites
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	1 NE; 2 Low	1 NE; 2 Low
Salt River	45	10	36 NE; 4 Low; 5 Mod	8 NE; 2 Low
Santa Cruz	11	7	8 NE; 2 Low; 1 Mod	7 NE
Verde	22	14	6 NE; 11 Low; 5 Mod	5 NE; 9 Low
Bill Williams	14	12	1 NE; 11 Low; 2 Mod	1 NE; 9 Low; 2 Mod
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>122 NE; 32 Low; 13 Mod</b>	<b>76 NE; 23 Low; 2 Mod</b>

Mod = Moderate, NE = No Effect

**Table 8. Summary of effects within each subcatchment to speckled dace resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to Speckled Dace from Proposed Action	Summary of Impacts to Speckled Dace from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	26 NE; 15 Low; 10 Mod	17 NE; 10 Low; 9 Mod
Riggs Flat	1	1	1 NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 NE	1 NE
Luna	1	0	1 Mod	0 stocking sites
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	1 NE; 2 Low	1 NE; 2 Low
Salt River	45	10	31 NE; 12 Low; 2 Mod	6 NE; 4 Low
Santa Cruz	11	7	8 NE; 3 Low	7 NE
Verde	22	14	6 NE; 13 Low; 3 Mod	5 NE; 9 Low
Bill Williams	14	12	5 NE; 7 Low; 2 Mod	3 NE; 7 Low; 2 Mod
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>97 NE; 52 Low; 18 Mod</b>	<b>58 NE; 32 Low; 11 Mod</b>

Mod = Moderate, NE = No Effect

**Table 9. Summary of effects within each subcatchment to Sonora sucker resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to Sonora Sucker from Proposed Action	Summary of Impacts to Sonora Sucker from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	51 NE	36 NE
Riggs Flat	1	1	1 NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 Low	1 Low
Luna	1	0	1 Low	0 stocking sites
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	3 NE	3 NE
Salt River	45	10	45 Low	10 Low
Santa Cruz	11	7	8 NE; 3 Low	7 NE
Verde	22	14	6 NE; 11 Low; 5 Mod	5 NE; 9 Low
Bill Williams	14	12	1 NE; 11 Low; 2 Mod	1 NE; 9 Low; 2 Mod
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>88 NE; 72 Low; 7 Mod</b>	<b>70 NE; 29 Low; 2 Mod</b>

Mod = Moderate, NE = No Effect

**Table 10. Summary of effects within each subcatchment to desert sucker resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to Desert Sucker from Proposed Action	Summary of Impacts to Desert Sucker from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	51 NE	36 NE
Riggs Flat	1	1	1 NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 Low	1 Low
Luna	1	0	1 Mod	0 stocking sites
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	1 NE; 2 Low	1 NE; 2 Low
Salt River	45	10	45 Low	10 Low
Santa Cruz	11	7	8 NE; 3 Low	7 NE
Verde	22	14	6 NE; 11 Low; 5 Mod	5 NE; 9 Low
Bill Williams	14	12	1 NE; 11 Low; 2 Mod	1 NE; 9 Low; 2 Mod
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>86 NE; 73 Low; 8 Mod</b>	<b>68 NE; 31 Low; 2 Mod</b>

Mod = Moderate, NE = No Effect

**Table 11. Summary of effects within each subcatchment to Little Colorado sucker resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to Little Colorado Sucker from Proposed Action	Summary of Impacts to Little Colorado Sucker from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	28 NE; 13 Low; 10 Mod	19 NE; 10 Low; 7 Mod
Riggs Flat	1	1	1 NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 NE	1 NE
Luna	1	0	1 NE	0
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	3 NE	3 NE
Salt River	45	10	45 NE	10 NE
Santa Cruz	11	7	11 NE	7 NE
Verde	22	14	22 NE	14 NE
Bill Williams	14	12	14 NE	12 NE
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>144 NE; 13 Low; 10 Mod</b>	<b>84 NE; 10 Low; 7 Mod</b>

Mod = Moderate, NE = No Effect

**Table 12. Summary of effects within each subcatchment to bluehead sucker resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to Bluehead Sucker from Proposed Action	Summary of Impacts to Bluehead Sucker from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	51 NE	36 NE
Riggs Flat	1	1	NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 Low	1 Low
Luna	1	0	1 Low	0
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	1 NE; 2 Low	1 NE; 2 Low
Salt River	45	10	36 NE; 4 Low; 5 Mod	8 NE; 2 Low
Santa Cruz	11	7	8 NE; 2 Low; 1 Mod	7 NE
Verde	22	14	6 NE; 11 Low; 5 Mod	5 NE; 9 Low
Bill Williams	14	12	1 NE; 11 Low; 2 Mod	1 NE; 9 Low; 2 Mod
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>122 NE; 32 Low; 13 Mod</b>	<b>76 NE; 23 Low; 2 Mod</b>

Mod = Moderate, NE = No Effect

**Table 13. Summary of effects within each subcatchment to lowland leopard frog resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to Lowland Leopard Frog from Proposed Action	Summary of Impacts to Lowland Leopard Frog from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	51 NE	36 NE
Riggs Flat	1	1	1 NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 NE	1 NE
Luna	1	0	1 NE	0
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	1 NE; 2 Low	1 NE; 2 Low
Salt River	45	10	38 NE; 5 Low; 2 Mod	9 NE; 1 Low
Santa Cruz	11	7	5 NE; 5 Low; 1 Mod	4 NE; 3 Low
Verde	22	14	14 NE; 3 Low; 3 Mod; 2 High	13 NE; 1 Low
Bill Williams	14	12	1 NE; 9 Low; 2 Mod; 2 High	1 NE; 7 Low; 2 Mod; 2 High
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>131 NE; 24 Low; 8 Mod; 4 High</b>	<b>83 NE; 14 Low; 2 Mod; 2 High</b>

Mod = Moderate, NE = No Effect

The nature of interactions between nonnative sport fish and the Western narrow-mouthed toad is not known, but it is assumed that nonnative sport fish could prey upon Western narrow-mouthed toads if they came into contact with each other. Though the Western narrow-mouthed toad might use perennial waters such as the stocking locations for breeding, the importance of perennial habitats and the degree to which perennial waters contribute to adult recruitment is not known. Ephemeral waters provide an environment with reduced natural predators, such as predatory insects (Dayton and Fitzgerald 2001) that would be present in perennial waters. Therefore, this EA analyzes exposure potential of the Western narrow-mouthed toad to stocked fish. However, it should be noted that this exposure and the resulting effects to Western narrow-mouthed toads may not be biologically meaningful to the overall Arizona population of the species due the species reliance on ephemeral waterways and the limited ability of stocked fish to reach many of these types of waterways.

**Table 14. Summary of exposure within each subcatchment to Western narrow-mouthed toad resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to Western Narrow-mouthed Toad from Proposed Action	Summary of Impacts to Western Narrow-mouthed Toad from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	52 NE	36 NE
Riggs Flat	1	1	1 NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 NE	1 NE
Luna	1	0	1 NE	0
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	3 NE	3 NE
Salt River	45	10	45 NE	10 NE
Santa Cruz	11	7	3 Low; 1 Mod; 2 High; 5 NE	2 Low; 1 Mod; 1 High; 3 NE
Verde	22	14	23 NE	14 NE
Bill Williams	14	12	14 NE	12 NE
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>161 NE; 3 Low; 1 Mod; 2 High</b>	<b>97 NE; 2 Low; 1 Mod; 1 High</b>

Mod = Moderate, NE = No Exposure

The nature of interactions between nonnative sport fish and other special status aquatic and semi-aquatic invertebrate species is largely unknown due to limited scientific studies of these invertebrate species and the difficulty in conducting research on these small and cryptic species that are often found in only low abundance. For this reason, only the exposure potential of aquatic and semi-aquatic other special status invertebrate species to stocked fish was analyzed. It was assumed that if exposure were to happen there would be some unknown level of negative effect.

**Table 15. Summary of exposure within each subcatchment to California floater resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to California Floater from Proposed Action	Summary of Impacts to California Floater from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	25 NE; 23 Low; 2 Mod; 1 High	15 NE; 18 Low; 2 Mod; 1 High
Riggs Flat	1	1	1 NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 NE	1 NE
Luna	1	0	1 NE	0
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	3 NE	3 NE
Salt River	45	10	40 NE; 3 Low; 1 Mod; 1 High	8 NE; 2 Low
Santa Cruz	11	7	11 NE	7 NE
Verde	22	14	22 NE	14 NE
Bill Williams	14	12	14 NE	12 NE
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>136 NE; 26 Low; 3 Mod; 2 High</b>	<b>78 NE; 20 Low; 2 Mod; 1 High</b>

Mod = Moderate, NE = No Exposure

**Table 16. Summary of exposure within each subcatchment to White Mountain water penny beetle resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to White Mountain Water Penny Beetle from Proposed Action	Summary of Impacts to White Mountain Water Penny Beetle from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	39 NE; 12 Low	27 NE; 9 Low
Riggs Flat	1	1	1 NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 NE	1 NE
Luna	1	0	1 NE	0
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	3 NE	3 NE
Salt River	45	10	40 NE; 3 Low; 2 High	8 NE; 2 Low
Santa Cruz	11	7	11 NE	7 NE
Verde	22	14	22 NE	14 NE
Bill Williams	14	12	14 NE	12 NE
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>150 NE; 15 Low; 2 High</b>	<b>90 NE; 11 Low</b>

Mod = Moderate, NE = No Exposure

**Table 17. Summary of exposure within each subcatchment to Page Springs caddisfly resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to Page Springs Micro Caddisfly from Proposed Action	Summary of Impacts to Page Springs Caddisfly from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	51 NE	36 NE
Riggs Flat	1	1	1 NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 NE	1 NE
Luna	1	0	1 NE	0
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	3 NE	3 NE
Salt River	45	10	45 NE	10 NE
Santa Cruz	11	7	11 NE	7 NE
Verde	22	14	20 NE; 1 Low; 1 High	14 NE
Bill Williams	14	12	14 NE	12 NE
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>165 NE; 1 Low; 1 High</b>	<b>101 NE</b>

NE = No Exposure

**Table 18. Summary of exposure within each subcatchment to balmorhea saddle-case caddisfly resulting from the alternatives.**

Subcatchment Name	Number of Sites in Proposed Action	Number of Sites in Reduced Stocking Alternative	Summary of Impacts to Balmorhea Saddle-case Caddisfly from Proposed Action	Summary of Impacts to Balmorhea Saddle-case Caddisfly from Reduced Stocking Alternative
Havasu Creek	6	6	6 NE	6 NE
Yuma North	2	1	2 NE	1 NE
Yuma South	2	2	2 NE	2 NE
Little Colorado River	51	36	51 NE	36 NE
Riggs Flat	1	1	1 NE	1 NE
Upper Gila	5	5	5 NE	5 NE
Kearny	1	1	1 NE	1 NE
Luna	1	0	1 NE	0
Lower Gila	3	3	3 NE	3 NE
Agua Fria	3	3	3 NE	3 NE
Salt River	45	10	45 NE	10 NE
Santa Cruz	11	7	11 NE	7 NE
Verde	22	14	20 NE; 1 Low; 1 High	14 NE
Bill Williams	14	12	14 NE	12 NE
<b>Statewide Summary</b>	<b>167</b>	<b>101</b>	<b>165 NE; 1 Low; 1 High</b>	<b>101 NE</b>

NE = No Exposure

Potential indirect effects of stocking to aquatic and semi-aquatic other special status species include the introduction of parasites and diseases and other nontarget species (e.g., crayfish, bullfrogs), changes in invertebrate community structure (food-web), and habitat disturbance from angler activity (Dunham et al. 2004, Fernandez and Rosen 1996, Finlay and Vredenburg 2007,

Kiesecker and Blaustein 1998, Kiesecker et al. 2001, Maezono and Miyashita 2003, Matthews et al. 2002, Minckley 1996, Robinson et al. 1997, Rosen and Schwalbe 1988, Stone et al. 2007).

The AGFD considers the potential for introduction of parasites and diseases under the Proposed Action to be relatively low because the potential risk of spreading pathogens through the AGFD hatchery stocking program is greatly reduced through recurrent fish health inspections, strict HACCP plans, and BMPs (Section 2.2.6). The potential for spread of the amphibian disease *Batrachochytrium dendrobatidis* as a result of fish stocking activities is considered low based on the life cycle of this organism and the HACCPs and operational protocols that are employed by the AGFD (FWS 2011a). Stocked fish or eggs from contract vendors and from federal or out-of-state hatcheries require health certifications from the facility of origin, are required to be free of bacteria, viruses, and parasites. Deliveries of fish from outside sources are refused at delivery if an AGFD visual inspection identifies the presence of nontarget organisms or evidence of disease. Though contract facilities are currently not subject to the HACCPs or BMPs or operation protocols of AGFD hatcheries, the AGFD plans to coordinate with vendors to require HACCPs in the near future for all contract facilities.

The Proposed Action and the Reduced Stocking Alternative could indirectly result in the introduction of other nontarget species, including invasive aquatic invertebrates and plants. Zebra mussels, quagga mussels, and New Zealand mudsnails can be incidentally introduced on the hulls of boats, on vehicles, and on fishing equipment. Zebra and quagga mussels have the potential to affect special status aquatic and semi-aquatic species by altering the aquatic community through the removal of phytoplankton, leading to food web changes; changing water clarity, resulting in proliferation of some aquatic plants; and increasing acidity of the water by expelling waste. New Zealand mudsnails compete with native mollusks for food and space (AISAC 2010). Giant salvinia has been documented along the Lower Colorado River in Arizona and California and can be spread by boats. Thick mats of giant salvinia reduce oxygen content, degrade water quality for fish and other aquatic organisms, and may alter aquatic system food-chain dynamics (ANS Task Force 2002).

Stocking of certain waters may encourage angler activity and indirectly increase the spread of these invasive species to other waters, primarily via boats. The AGFD has an active aquatic invasive species prevention program that includes regulations, outreach, and enforcement. This program is in part as a result of House Bill 2157, which gives the AGFD the ability to identify (1) a list of aquatic invasive species for Arizona, (2) a list of waters where aquatic invasive species are present or suspected, and (3) mandatory conditions on the movement of watercraft, vehicles, conveyances, or other equipment from listed waters where aquatic invasive species are present. Boat use attributable to angling activity represents only a portion of all of the recreational boating use of these waters and, therefore, the totality of effects from invasive species would only be partly attributable to sport fish stocking. Most of the concern regarding movement of quagga mussels and, to a lesser extent, other aquatic invasive species is with boats that have been moored for long periods of time, rather than day-use recreationist watercraft. The Reduced Stocking Alternative would have a reduced potential to contribute to the spread of aquatic invasive species because stocking would occur at 101 sites, compared with 167 sites under the Proposed Action.

Sport fish stocking could also indirectly result in the spread of introduced bait species, such as crayfish, shiners, mosquitofish, bullfrogs, and nonnative tiger salamanders that can indirectly impact other special status species through predation, competition, or disease transfer (Carpenter and McIvor 1999, Carpenter and Mueller 2008, Douglas et al. 1994). The AGFD regulates the use of bait species to prevent unwanted introductions into new waters through restrictions on bait collection, transportation between waters, species that may be used (varies by water and, at some waters, no live baitfish, crayfish, or salamanders are allowed; bullfrogs are not allowed as live bait anywhere in the state), and certification requirements for bait vendors. Despite regulations and enforcement, sport fish stocking may still result in the incidental spread of bait species by anglers (Ludwig and Leitch 1996). By providing sport fishing opportunities at more sites, the Proposed Action would have a higher potential for incidental spread of baitfish compared with the Reduced Stocking Alternative.

Stocking of sport fish could result in changes in the trophic structure of aquatic habitats. Competition with special status aquatic and semi-aquatic species and predation are discussed under direct effects. Stocked sport fish may also indirectly affect the availability of prey species and may reduce or control populations of other nonnatives, such as bullfrogs and crayfish, through predation. For example, once largemouth bass reach a certain size, their predation rates on crayfish may increase, and they may control crayfish (Maezono and Mayashita 2003, Marks et al. 2009). Effects on trophic structure from sport fish stocking would have the potential to occur at more sites under the Proposed Action than the Reduced Stocking Alternative.

The Proposed Action may result in habitat disturbance or other related indirect effects from angler activity. Wading activities may result in temporary changes in water quality, such as increases in turbidity and siltation, but these conditions would be localized and generally temporary in nature. Stocking of sites would result in use by anglers, who impact riparian habitats by trampling vegetation and polluting water with debris. The extent to which indirect effects of this type can be attributed to angling activity are limited because most of the stocking sites experience various other recreational uses, such as boating, swimming, hiking, camping, picnicking, and off-road vehicle travel. The Proposed Action would provide sport fishing opportunities at more sites than the Reduced Stocking Alternative. However, under the latter, sites not stocked would continue to be subject to indirect effects from other recreational uses.

*Stocking Effects on Other Special Status Riparian Plants, Non-piscivorous Riparian/Aquatic Nesting Birds, Terrestrial Riparian Invertebrates, and Ground-dwelling Riparian Mammals and Reptiles*

Tables 19–21 compare the number of sites under the Proposed Action and the Reduced Stocking Alternative with records within 5 miles of other special status riparian plants, non-piscivorous riparian/aquatic nesting birds, terrestrial riparian invertebrates, and ground-dwelling riparian mammals and reptiles, respectively. The No Action alternative would result in no stocking at any sites and is not included in these tables.

**Table 19. Number of stocking sites with records of other special status riparian plant species under the Proposed Action and the Reduced Stocking Alternative.**

Common Name	No. of Sites Under Proposed Action with Records Within 5 Miles	No. of Sites Under Reduced Stocking Alternative with Records Within 5 Miles
Blumer's dock	29	18
Goodding's onion	14	10
Slender bog orchid	12	11
Yellow lady's slipper	10	9
Arizona willow	8	7
A sedge	6	3
Boreal bog orchid	6	6
White Mountains clover	6	2
Arizona alum root	3	3
White mandarin, twisted stalk	3	3
Crenulate moonwort	2	2
Arizona giant sedge	1	0
Lemmon's stevia	1	0
Texas purple spike	1	0
Thurber's bog orchid	1	0
Weeping muhly	1	0
Aravaipa wood fern	0 (subcatchment level only)	0 (subcatchment level only)
Whisk fern	0 (subcatchment level only)	0 (subcatchment level only)
Lemmon lily	0 (subcatchment level only)	0 (subcatchment level only)
Alcove bog orchid	0	0

No direct effects to other special status species of riparian plants or non-piscivorous riparian aquatic nesting birds are anticipated under the Proposed Action or the Reduced Stocking Alternative. Species in these taxonomic groups are subject primarily to indirect effects related to habitat disturbance from angling activity.

Other special status riparian plants would be potentially affected by trampling from anglers attempting to access fishing areas and associated soil erosion, disturbance favoring weedy plant species, transport of weedy species propagules, and some fragmentation of plant populations. Under the Proposed Action, stocking would occur at 36 of the proposed stocking sites where one or more other special status riparian plant species have been recorded within 5 miles. Under the Reduced Stocking Alternative, stocking would occur at 22 sites where one or more other special status riparian plant species have been recorded within 5 miles. Potential indirect effects from angling would occur only if individuals or populations of other special status plant species occur in the direct vicinity of the stocking sites and would only occur in areas anglers use to access fishing locations. Any effects from anglers would represent only a proportion of all recreation-related impacts at these sites.

**Table 20. Number of stocking sites with records of other special status non-piscivorous aquatic/riparian nesting bird species under the Proposed Action and the Reduced Stocking Alternative.**

Common Name	No. of Sites Under Proposed Action with Records Within 5 Miles	No. of Sites Under Reduced Stocking Alternative with Records Within 5 Miles
American redstart	9	9
Black-bellied whistling duck	7	4
Pine grosbeak	6	5
Elegant trogon	2	2
Northern gray hawk	2	2
California black rail	1	1
Rose-throated becard	1	1
Tropical kingbird	1	1

Potential indirect effects of stocking on other special status non-piscivorous riparian/aquatic nesting birds include disturbance of nesting habitat and individuals through human presence (anglers), which could result in bird flushing from nests or altering their foraging patterns. These types of effects have been documented for yellow-billed cuckoos and Mexican spotted owls (Haltermann 2010, Hedwall 2009, Swarthout and Steidl 2003). Angler activity may also result in trampling of vegetation, attraction of predators or nest parasites, and mortality of nestling or adult birds from entanglement with monofilament fishing line and ingestion of other fishing debris.

Under the Proposed Action, stocking would occur at 25 of the proposed stocking sites where one or more other special status non-piscivorous riparian or aquatic nesting bird species have been recorded within 5 miles. Under the Reduced Stocking Alternative, stocking would occur at 21 sites where one or more other special status non-piscivorous riparian or aquatic nesting bird species have been recorded within 5 miles. Potential indirect effects from angling would occur only if individuals or populations of other special status non-piscivorous riparian or aquatic nesting bird species occur in the direct vicinity of the stocking sites and would only occur in areas anglers use to access fishing locations. Any effects from anglers would represent only a proportion of all recreation-related impacts at these sites.

**Table 21. Number of stocking sites with records of other special status terrestrial riparian invertebrates and ground-dwelling riparian mammals and reptiles for the Proposed Action and the Reduced Stocking Alternative.**

Common Name	No. of Sites Under Proposed Action with Records Within 5 Miles	No. of Sites Under Reduced Stocking Alternative with Records Within 5 Miles
Maricopa tiger beetle	4	2
American water shrew	7	6
Giant spotted whiptail	6	5
Arizona shrew	0	0
Redback whiptail	0	0

No direct effects to terrestrial riparian invertebrates or special status ground-dwelling riparian mammals and reptiles are anticipated under the Proposed Action or the Reduced Stocking Alternative. Species in these taxonomic groups are subject primarily to indirect effects related to competition for resources and habitat disturbance from angling activity.

Sport fish stocking may indirectly impact terrestrial riparian invertebrates and ground-dwelling riparian mammals and reptiles as a result of angler activity that disrupts breeding or foraging and/or results in changes in riparian plant community composition and cover through trampling, erosion, and introduction and proliferation of weedy plant species. Under the Proposed Action, stocking would occur at four sites where one special status terrestrial riparian invertebrate species has been recorded and 13 sites where one or more other special status ground-dwelling riparian mammals or reptiles have been recorded within 5 miles. Under the Reduced Stocking Alternative, stocking would occur at two sites where one special status terrestrial riparian invertebrate species has been recorded and at 11 sites where one or more other special status ground-dwelling riparian mammals or reptiles have been recorded within 5 miles. Potential indirect effects from angling would occur only if individuals or populations of species in these taxonomic groups occur in the direct vicinity of the stocking sites and would only occur in areas anglers use to fish or access fishing locations. Any effects from anglers would represent only a proportion of all recreation-related impacts at these sites.

*Stocking Effects on Other Special Status Piscivorous Riparian or Aquatic Nesting Birds*

Table 22 compares the number of sites under the Proposed Action and the Reduced Stocking Alternative with records within 5 miles of other special status piscivorous riparian or aquatic nesting birds. Five miles was used because it is the standard distance that the AGFD HDMS uses to evaluate potential impacts to other special status species with this type of project. Though species in this functional group regularly foray well beyond 5 miles, the occurrence data at a minimum indicate that a particular stocking site or its vicinity is visited. The No Action alternative would result in no stocking at any sites and is not included in this table.

**Table 22. Number of stocking sites with records of other special status piscivorous riparian or aquatic nesting bird species under the Proposed Action and the Reduced Stocking Alternative.**

Common Name	No. of Sites Under Proposed Action with Records Within 5 Miles	No. of Sites Under Reduced Stocking Alternative with Records Within 5 Miles
Bald eagle	85	52
Osprey	30	21
Common black-hawk	18	6
Golden eagle	17	15
Belted kingfisher	14	14
Great egret	4	4
Least bittern	1	1
Snowy egret	1	1

Sport fish stocking may have four effects on this taxonomic group: (1) augmentation of prey base, (2) disturbance, (3) entanglement/ingestion of fishing line and tackle, and (4) decreased diversity of the natural prey base.

*Augmentation of the prey base*—Sport fish stocking may benefit species in this taxonomic group by enhancing forage availability and potentially enhancing survival and reproductive success. These effects would be dependent on the foraging behavior of individual species and the degree of overlap between the presence of stocked fish and piscivorous birds. Of the species in these taxonomic groups, bald eagles and ospreys would likely benefit most from stocking of catchable fish, while other species may benefit from stocking of subcatchables. About 70 percent of the diet of bald eagles in Arizona consists of fish, including native and nonnative species (Hunt 1998). Common fish prey items for bald eagles in Arizona are native Sonora and desert suckers and nonnative channel and flathead catfish; common carp; largemouth, smallmouth, yellow, and white bass; rainbow trout; and black crappie (FWS 2011a). Resident bald eagles in Arizona are joined by eagles from other regions in winter, when they frequent reservoirs and other water bodies in the northern and eastern portions of the state (Hunt 1998). Osprey feed almost exclusively on fish. Their diet includes a variety of species, and most fish taken range from 4 to 12 inches in length (Dodd and Vahle 1998).

Bald eagles and ospreys are most likely to benefit from stocking during the breeding season, when the care of young requires additional food resources, and after fledging, when young birds range widely (regionally) in search of food. Because a large proportion of stocking activities under the Proposed Action and the Reduced Stocking Alternative represent put-and-take, benefits to eagles and ospreys are temporary in nature but would overlap at least a portion of the breeding season for these species. Most of the stocking activities under these alternatives would be unlikely to substantially benefit eagles or ospreys outside the breeding season due to low retention/survival of stocked fish during the winter months. Whether stocking would benefit species in this taxonomic group is dependent on species, location, and site-specific conditions.

*Disturbance*—Indirect effects from sport fish stocking are primarily related to disturbance of nesting birds through angler activity. Disturbance by humans is listed as a factor for the bald eagle, and the osprey (Anthony et al. 1994, Dodd and Vahle 1998, Grubb and King 1991, Hunt 1998, Knight and Knight 1984) is cited as a management factor for the belted kingfisher and the common black-hawk (AGFD 2007a, 2005) and would be anticipated to affect the other bird species in this taxonomic group as well. Angling activity represents only a portion of all recreational and other human uses that would have the potential to impact these species.

The timing of the fish stockings, the locations of stockings, and the type of angler access to a stocking site (e.g., along a stream versus at a dock) can determine the likelihood of angler disturbance to this taxonomic group.

Studies have documented that human activities can alter wintering bald eagle behavior (Buehler et al. 1991, Knight and Knight 1984, Stalmaster and Kaiser 1998, Stalmaster and Newman 1978, Steenhof 1978). In general, bald eagle use of a wintering area declines as the amount of human disturbance rises. Stalmaster and Kaiser (1998) observed that foot traffic was more disturbing to foraging bald eagles than the presence of a boat.

Recreational activity, including angling, may have a varying level of effects on nesting bald eagles, depending on visibility, duration, noise levels, extent of the area affected by the activity, prior experiences with humans, and tolerance of the pair (FWS 2007). Human activity can be a factor in abandonment of the nest by breeding adults, death of nestlings due to insufficient adult

foraging success, heat stress, hypothermia, or predation on eaglets if eagles are kept away from the nest. Having said this, the portion of contribution from anglers to any of these effects is not known. There is an entire suite of recreational activities at many stocking sites that also may impact eagles.

*Entanglement/Ingestion of Fishing Line and Tackle*—Another indirect impact from sport fish stocking is the entanglement of nestling birds by discarded monofilament line, lures, and other fishing-related debris. This has been documented to affect nestling and adult bald eagles (Beatty 2009, Hunt 1998) and may also affect other species in this functional group (Rattner et al. 2008). Fishing line and tackle are a common threat to bald eagles in Arizona, most often due to entanglement but occasionally due to ingestion or other means. Most instances involve bald eagles catching dead fish with fishing material attached or collecting dead birds that died of entanglement. Nestlings have frequently become entangled in fishing line. A Monofilament Recovery Program was established in 2002 by the AGFD to help reduce and remove fishing line from the shores of Arizona's lakes and rivers by offering recycling bins in many major angling spots and at boat ramps. This program is anticipated to reduce but not eliminate these types of impacts to bald eagles and other species in this functional group and would continue under the Proposed Action and the Reduced Stocking Alternative (FWS 2011a). Nesting and nestling bald eagles have become entangled in fishing line and tackle, but it has not been detected occurring to non-breeding/wintering bald eagles (Driscoll et al. 2006). An osprey was found dead entangled in fishing line at its nest near Greer Lakes, Arizona (Beatty 2009).

In Arizona, lead fishing weights have periodically been detected in bald eagle nests, along with fishing line and tackle. Though lead poisoning through ingesting lead weights from fishing line has not been detected yet in Arizona, it has been reported for other waterbirds that can be prey for bald eagles (Lahner and Franson 2009, Perry 1994, Rattner et al. 2008). One Arizona eaglet required treatment for lead poisoning (Jacobson et al. 2006), and though it is unknown how this nestling consumed lead, the most likely candidates are lead ammunition or fishing tackle associated with prey.

*Decreased Diversity of Native Prey Base*—Historically, eagles likely foraged on native fish species in Arizona rivers/creeks (in addition to other prey such as waterfowl or mammals). Beginning with the settlement by Anglo-Americans in the early 1800s and continuing through today, construction of dams and the introduction of a diverse array of nonindigenous fish have altered habitats and fish assemblages such that most foraging opportunity by nesting and wintering eagles is on constructed reservoirs, stock tanks, or in riverine systems with available fish. Alteration of fish populations have occurred over a long period of time, but native fish species that bald eagles and other species in this taxonomic group have been reliant upon for reproductive success still persist in some areas.

Under the Proposed Action, a total of 104 sites would be stocked where other special status piscivorous riparian or aquatic nesting birds have been recorded within 5 miles. A total of 88 of these sites have records of bald eagles or ospreys within 5 miles. The Reduced Stocking Alternative would stock 62 sites where other special status piscivorous riparian or aquatic nesting birds have been recorded within 5 miles. A total of 53 of these sites have records of bald eagles or ospreys within 5 miles.

## **Comparison of Environmental Consequences by Alternative**

A table at the end of this chapter summarizes environmental consequences related to biological resources, recreation, and socioeconomics by alternative (Table 30).

### **4.2 Recreation and Socioeconomics**

The Recreation and Socioeconomics sections focus on sport fishing recreation and associated economic benefits/impacts, in consideration of the nature of the proposed activity and the agency and public input received during scoping.

#### **4.2.1 Regulatory Setting and Associated Approach**

Title VI of the Civil Rights Act of 1964 ensures that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity receiving federal financial assistance on the basis of race, color, or national origin. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs that federal programs, policies, and activities not have disproportionately high and adverse human health and environmental effects on minority and low-income populations. For a Title VI/Environmental Justice evaluation, a protected population exists when minority or low-income individuals represent a meaningfully high percentage of the total population in the defined “area of interest.”

For this action, the individuals affected would be anglers and individuals whose economic interests rely on angler spending (e.g., owners and employees of bait and tackle shops). Demographic data are needed to characterize this affected population with regard to the presence of minority or low-income individuals. Three sources of demographic data provided the best information available for this analysis: the U.S. Census Bureau (2000), 2005 AGFD creel survey<sup>13</sup>, and 2006 FWS national survey of fishing, hunting, and wildlife-associated recreation (FWS 2008c). The AGFD creel survey and the FWS national survey collected information on angler level of income, race, and ethnicity. The 2005 AGFD creel survey provides data on the use of lakes in the Urban Sport Fish Stocking Subprogram. The 2006 FWS survey provides data for the state as a whole, and the percentages reported from this survey include anglers and hunters. The angler population represents approximately 85 percent of this combined angler and hunter survey population. Neither have information on individuals with economic interests tied to angler spending.

Data from these surveys indicate that 42 percent of urban anglers and 38 percent of the combined angler and hunter population in the state, respectively, belong to minority racial or ethnic groups. These percentages are similar to, and only slightly higher than, the U.S. Census comparison population for the state of Arizona as a whole (36 percent) and, therefore, do not represent protected populations. Eighteen percent of urban anglers and 11 percent of the combined angler and hunter population in the state, respectively, are considered low income (defined as less than \$20,000 per year). These percentages are only slightly higher than, or lower than, the Arizona comparison population (14 percent) and, therefore, do not represent protected populations. None

<sup>13</sup> A creel survey, also known as a catch assessment survey, involves interviews with anglers at a given fishing site, including inspections of individual catches.

of the alternatives have the potential to have a disproportionately high or adverse impact on a protected population.

It is assumed that anglers who rely on fish harvest for food are more likely to be low income compared with the remainder of the angling population. It is unknown what percentage of anglers rely on fish harvest for food.

#### **4.2.2 *Affected Environment***

The current AGFD Sport Fish Stocking Program provides a variety of recreational fishing opportunities across the state, including warm-water and cold-water habitats, a range of settings from urban lakes to rural streams and lakes, and various stocking management approaches (e.g., put-and-take, put-grow-and-take, and sustained yield), and fisheries management approaches. The AGFD sport fish goals to maintain the quality, abundance, availability, and diversity of sport fishing opportunities, increase public awareness of sport fishing opportunities, and increase angler recruitment and retention are supported by sport fish stocking activities. The AGFD projects a resident demand for sport fish of 4.4 million warm-water AUDs and 1.6 million cold-water AUDs in 2012 (AGFD 2008).

The three alternatives under consideration have the potential to affect recreation and associated socioeconomics throughout the state. The existing AGFD Sport Fish Stocking Program contributes to state revenues and local economies through the sale of fishing licenses and the revenues generated from recreational sport fishing, including the sale of boats, fishing equipment, fuel, accommodations, food, etc.

According to a report by Southwick Associates (2007), in 2006 there were 422,000 total anglers and 4,156,000 AUDs of fishing in Arizona, with a total economic impact of \$1.3 billion. Angling activities supported 14,729 jobs in 2006, with approximately \$445 million in salaries, wages, and business earnings. Federal tax revenues from angling activities in 2006 totaled almost \$99 million, and state and local tax revenues totaled approximately \$79 million. Though this report provides AUD and economic information for the entire state of Arizona in 2006, it does not provide county-level or site-specific data. Therefore, more specific information was needed for the purpose of comparing impacts between alternatives.

For analysis purposes in this section, information on the number of anglers and the economic impact of recreational fishing on a county- and site-specific level was obtained from a survey of fishing activities in 2001 and the associated analyses of the survey results (Pringle 2004, Silberman 2003). The results of this survey are used to approximate existing conditions and analyze the relative benefits associated with each alternative. Because the AUD and dollar amounts from these data are 2001 numbers, not 2010, they are intended to be an approximation of current conditions for use in comparing the relative alternative impacts, rather than an exact accounting of current conditions. Data are not available for all existing and proposed stocking sites; therefore, direct comparisons of the alternatives can only be made for sites with these data. The analysis of alternatives only reflects the information available and does not make assumptions about impacts for sites without data.

No recent user surveys have been developed that would fully characterize the ongoing angling activity at stocking sites occurring across the state. The most recent survey with site-specific data

available is from 2001, when the AGFD collected data about angler use of fishing sites throughout the state. It is important to note that the total number of anglers and the total economic impact (including multipliers for ripple effect) were higher in 2006 (422,000 anglers and \$1.35 billion) compared with 2001 (379,080 anglers and \$1.16 billion). To characterize the use of AGFD stocking sites, however, data from the 2001 survey were used.

The 2001 survey of angler use collected data for 148 fishing sites. Survey results indicated that a total of 5.3 million AUDs were spent on waters in Arizona (Silberman 2003).

Ninety-six of the 148 individual fishing sites in the 2001 survey are included in the sport fish stocking sites in the current AGFD Sport Fish Stocking Program. These 96 sites form the basis from which the existing stocking environment is characterized and provide a reference for comparing the three alternatives under consideration.

Because some level of angling would occur without stocking, of the total AUDs reported in the 2001 survey, only those associated with stocking were included in this analysis. Based on the 2001 survey, AUDs were categorized into two groups: trout and non-trout. If only trout would be stocked at a given site under the Proposed Action, only the AUDs associated with trout were included in this analysis. Likewise, AUDs associated with non-trout angling were included in the analyses only if species other than trout would be stocked at that site. Table 23 details the resultant number of 2001 AUDs associated with stocking at the 95 sites that coincide with the current AGFD Sport Fish Stocking Program.

**Table 23. 2001 Angler User Days (AUDs) associated with stocking, by stocking location.**

Stocking Site	County	2001 AUD
Becker Lake*	Apache	9,258
Big Lake	Apache	124,576
Black River—East Fork	Apache	33,334
Black River—West Fork	Apache	20,546
Concho Lake	Apache	9,268
Crescent Lake	Apache	19,981
Hulsey Lake	Apache	800
Lee Valley Lake	Apache	11,468
Little Colorado River at Sheep’s Crossing	Apache	7,511
Little Colorado River at Greer	Apache	16,691
Luna Lake	Apache	24,600
Lyman Reservoir	Apache	6,319
Nelson Reservoir	Apache	14,395
Pratt Lake	Apache	254
White Mountain Lake	Apache	77
Parker Canyon Lake	Cochise	28,584
Ashurst Lake	Coconino	57,669
Bear Canyon Lake	Coconino	19,266
Blue Ridge Reservoir	Coconino	16,828
Cataract Lake*	Coconino	6,214
Chevelon Lake	Coconino	9,062
City Reservoir*	Coconino	127
Dogtown Reservoir*	Coconino	18,356
Elk Tank	Coconino	714
JD Dam	Coconino	2,140

**Table 23. 2001 Angler User Days (AUDs) associated with stocking, by stocking location.**

Stocking Site	County	2001 AUD
Kaibab Lake*	Coconino	12,272
Kearny Lake*	Coconino	3,071
Kinnikinick Lake	Coconino	12,852
Knoll Lake	Coconino	15,938
Lake Mary (lower)	Coconino	9,493
Lake Mary (upper)	Coconino	38,121
Long Lake	Coconino	16,261
Marshall Lake	Coconino	381
Oak Creek*	Coconino	30,423
Perkins Tank	Coconino	2,402
Santa Fe Tank*	Coconino	330
Soldier Lake	Coconino	175
Stone Dam	Coconino	465
Whitehorse Lake	Coconino	10,373
Willow Springs Lake	Coconino	53,423
Woods Canyon Lake	Coconino	67,832
Canyon Creek	Gila	13,437
Christopher Creek	Gila	10,865
East Verde River	Gila	11,668
Green Valley Lake*	Gila	19,494
Haigler Creek	Gila	1,777
Tonto Creek	Gila	10,110
Workman Creek	Gila	808
Cluff Ranch Ponds	Graham	3,688
Riggs Flat Lake	Graham	6,586
Roper Lake	Graham	5,909
Alvord Lake*	Maricopa	46,500
Apache Lake	Maricopa	157,974
Canyon Lake	Maricopa	184,874
Chaparral Lake*	Maricopa	21,600
Cortez Lake*	Maricopa	34,800
Desert Breeze Lake*	Maricopa	26,000
Desert West Lake*	Maricopa	32,900
Encanto Lake*	Maricopa	22,300
Evelyn Hallman Pond*	Maricopa	15,800
Kiwanis Lake*	Maricopa	37,300
Papago Ponds*	Maricopa	22,700
Red Mountain Lake*	Maricopa	40,600
Rio Vista Pond*	Maricopa	23,600
Riverview Lake*	Maricopa	28,300
Saguaro Lake	Maricopa	216,714
Salt River (below Saguaro)	Maricopa	38,664
Steele Indian School Pond*	Maricopa	13,900
Surprise Lake*	Maricopa	35,600
Tempe Town Lake*	Maricopa	297
Black Canyon Lake	Navajo	16,101
Clear Creek Reservoir	Navajo	1,493
Fool Hollow Lake*	Navajo	28,433
Rainbow Lake	Navajo	17,289
Scotts Reservoir	Navajo	4,860
Show Low Lake	Navajo	44,714

**Table 23. 2001 Angler User Days (AUDs) associated with stocking, by stocking location.**

Stocking Site	County	2001 AUD
Silver Creek	Navajo	3,167
Woodland Lake*	Navajo	18,550
Arivaca Lake	Pima	22,936
Rose Canyon Lake	Pima	6,097
Patagonia Lake	Santa Cruz	10,246
Peña Blanca Lake	Santa Cruz	6,637
Coors Lake	Yavapai	1,881
Deadhorse Lake*	Yavapai	19,512
Fain Lake*	Yavapai	12,589
Goldwater Lake	Yavapai	7,230
Granite Basin Lake	Yavapai	1,167
Horsethief Basin Lake	Yavapai	163
Lynx Lake	Yavapai	28,234
Mingus Lake	Yavapai	4,346
Verde River (Cottonwood area)*	Yavapai	22,971
Watson Lake*	Yavapai	4,196
West Clear Creek	Yavapai	2,834
Wet Beaver Creek	Yavapai	5,992
Fortuna Pond	Yuma	35,288

Source: Pringle (2004)

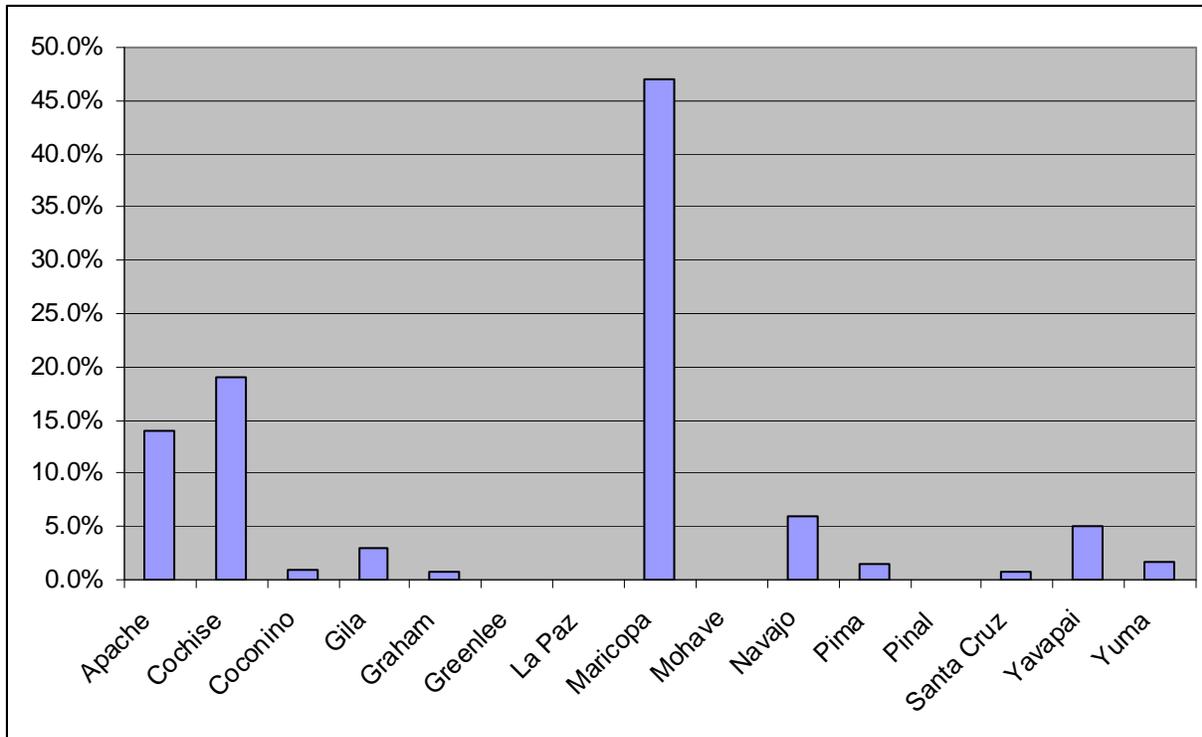
\* Sites located in urban areas (managed under statewide, urban, or FIN subprograms)

The total number of annual AUDs associated with stocking for the 95 sites is 2,143,541 (Table 23). These 95 sites represent 64 percent of the total sites surveyed (95/148) and contribute 40 percent of the total AUDs for the state (2.1 million/5.3 million).

The AUD data from the foregoing table was aggregated by county and is shown in Figure 5. A majority (47 percent) of the AUDs occur in Maricopa County, followed by Coconino County with 19 percent, and Apache County with 14 percent. The remaining counties each have 6 percent or less of the survey AUDs.

Silberman (2003) used the 2001 survey results to develop estimates of economic values associated with fishing and hunting in Arizona. Survey data were used as input for an economic model of the state that generated estimates of total economic values consisting of direct, indirect, and induced<sup>14</sup> components. According to the analysis, resident and non-resident fishing expenditures amounted to \$831.5 million in 2001 for the state of Arizona as a whole. This number includes \$416 million in food, transportation, and other logistical expenses, and \$415.5 million on equipment. Hunting (with total expenditures of \$126.5 million in 2001) and fishing activities combined provided \$58.2 million in state tax revenue and supported 17,190 full- and part-time jobs.

<sup>14</sup> Indirect and induced effects, collectively referred to as secondary effects, result from circulation of the initial spending through the local economy and are captured by the multipliers.



**Figure 5. Percentage distribution of AUDs, by county, 2001 survey.**

The economic impacts of fishing in 2001 were also calculated at the county level. Because the state tax revenues and employment figures are a combination of fishing and hunting expenditures, total hunting expenditures have also been included to provide a relative comparison and thus an idea of the proportionate impact these two activities have on the state tax revenues and employment numbers. Maricopa County generates the largest portion of annual AUDs, fishing expenditures, state tax revenues, and employment (Table 24).

The economic importance of fishing expenditures increases to \$1.16 billion in 2001 when the full effects (direct, indirect, and induced) are taken into account, as shown in Table 25. Silberman (2003) used total AUDs to estimate total fishing expenditures by county. For the purpose of the EA, the total AUD value is divided into the total multiplier<sup>15</sup> value of fishing importance to calculate an average dollar expenditure per AUD in each county. This average is used to determine an approximate dollar expenditure for the AUDs at the stocking sites with 2001 data (Table 25) and is used in the Environmental Consequences section to estimate relative differences between the three alternatives under consideration.

<sup>15</sup> The multiplier reflects the sum of expenditures, the indirect or secondary effects generated from the expenditures, and the induced impact from the salaries and wages paid by the directly and indirectly impacted industries.

**Table 24. Annual economic impacts of fishing by Arizona County.**

County	Total AUD	Fishing Expenditures (million dollars)			Hunting Expenditures (million dollars)	Fishing and Hunting Combined	
		Trip-related Spending	Equipment Spending	Total Spending	Total Spending	State Tax Revenue (million dollars)	Full- and Part-time Jobs
Apache	648,111	\$37.0	\$23.3	\$60.3	\$2.5	\$3.4	1,010
Cochise	33,499	\$3.3	\$3.4	\$6.7	\$6.0	\$0.66	194
Coconino	913,928	\$58.0	\$31.2	\$89.2	\$12.0	\$6.0	1,860
Gila	413,374	\$25.4	\$8.8	\$34.2	\$5.2	\$1.8	769
Graham	37,552	\$2.5	\$1.4	\$3.9	\$3.4	\$0.4	124
Greenlee	1,479	\$0.4	\$0.2	\$0.6	\$1.9	\$0.04	20
La Paz	234,332	\$15.9	\$0.5	\$16.4	\$1.4	\$0.8	232
Maricopa	1,190,296	\$124.4	\$242.5	\$366.9	\$42.2	\$21.1	5,382
Mohave	804,679	\$57.3	\$17.2	\$74.5	\$5.4	\$3.9	1,682
Navajo	223,606	\$15.5	\$13.4	\$28.9	\$4.4	\$1.3	543
Pima	153,893	\$22.7	\$44.2	\$66.9	\$17.6	\$5.4	1,187
Pinal	24,802	\$6.9	\$6.3	\$13.2	\$6.8	\$0.9	296
Santa Cruz	108,574	\$6.4	\$4.8	\$11.2	\$2.7	\$0.9	216
Yavapai	276,407	\$19.9	\$10.4	\$30.3	\$9.7	\$2.3	811
Yuma	238,175	\$20.5	\$8.0	\$28.5	\$5.7	\$1.8	689

Source: Silberman (2003)

**Table 25. Annual economic value of Angler User Days (AUDs) by county and for Arizona as a whole.**

County	Direct Fishing Expenditures (million dollars)	County Multiplier	Total Value of Fishing Expenditures <sup>1</sup> (million dollars)	Survey AUD	Average Value of AUD (dollars/AUD)
Apache	\$60.2	1.15	\$69.2	648,111	\$107
Cochise	\$6.7	1.20	\$8.0	33,499	\$240
Coconino	\$89.2	1.23	\$109.7	913,928	\$120
Gila	\$34.2	1.19	\$40.7	413,374	\$98
Graham	\$3.9	1.19	\$4.6	37,552	\$124
Greenlee	\$0.7	1.08	\$0.8	1,479	\$511
La Paz	\$16.4	1.17	\$19.2	234,332	\$82
Maricopa	\$366.8	1.26	\$462.2	1,190,296	\$388
Mohave	\$74.5	1.24	\$92.4	804,679	\$115
Navajo	\$29.0	1.15	\$33.4	223,606	\$149
Pima	\$66.9	1.24	\$83.0	153,893	\$539
Pinal	\$13.1	1.15	\$15.1	24,802	\$607
Santa Cruz	\$11.1	1.20	\$13.3	108,574	\$123
Yavapai	\$30.2	1.25	\$37.8	276,407	\$137
Yuma	\$28.4	1.23	\$34.9	238,175	\$147
Arizona <sup>2</sup>	\$831.5	1.40	\$1,164.1	5,302,707	\$220

Source: Silberman (2003)

<sup>1</sup> Includes direct, indirect, and induced values in 2001 dollars

<sup>2</sup> Summing the county level economic values results in a total less than the economic value for the state as a whole because the state value includes additional economic linkages not present at the county level

### **4.2.3 Environmental Consequences**

Each of the alternatives under consideration was assessed to identify potential direct and indirect effects on recreation and socioeconomics. In addition to a qualitative comparison of the alternatives, data from the previously outlined survey of fishing activities and associated analyses were considered as the basis for the quantitative impact comparison of the alternatives included in this section of the Draft EA.

#### **Recreation**

##### Proposed Action

Of the three alternatives under consideration, the Proposed Action would stock sport fish at the greatest number of stocking sites distributed across the state, thereby accommodating the highest level of angler demand and providing the most comprehensive range of angling opportunities/locations. With the Proposed Action, impacts on recreation and socioeconomics would be direct and indirect and primarily beneficial in nature. The degree of benefit to recreation and socioeconomics from stocking would vary across the state.

Similar to the current stocking program, the proposed stocking of 167 sites would continue to provide a variety of recreational opportunities for fishing across the state, including warm-water and cold-water fisheries, multiple species of fish, a range of settings from lakes in urban areas to rural streams and lakes, and various stocking management approaches (e.g., put-and-take, put-grow-and take, and sustained yield) and fisheries management approaches.

The Proposed Action includes the stocking of 58 lakes in urban areas (21 lakes in the Urban Sport Fish Stocking Subprogram, 15 in the FIN Subprogram, and 22 in the Statewide Sport Fish Stocking Subprogram) and 109 sites at other locations throughout the state. The majority (31) of the lakes in urban areas included in the Proposed Action are in the Phoenix Metro area, followed in density by the city of Williams, with six lakes. The remaining 21 lakes in urban areas are located in 12 cities or towns of various population sizes across Arizona, including Tucson, Show Low, Yuma, and Pinetop. These lakes may provide the only fishing opportunities for anglers resident in each urban area who have no access to more remote locations in Arizona.

The Phoenix Metro lakes in particular have a high frequency of use by anglers. Nineteen of 35 waters in Maricopa County have AUD data available; 15 of these are in the Phoenix metro area. The 19 waters in Maricopa County had more than 1 million AUD in 2001, the largest proportionate share of AUDs in the state, while the subset of 15 urban lakes in Maricopa County had more than 400,000 AUDs in 2001. The remaining four waters with data in Maricopa County are within an hour of the main urban center and are easily accessible for anglers with access to a personal vehicle. Maricopa County would be expected to continue to have the highest angler use demand due to the high urban population in the county.

Lakes in urban areas are also commonly used for angler education courses, including outdoor skills education for youth. Stockings are conducted specifically in support of these events. The Proposed Action would enhance opportunities for youth outdoor recreation, encouraging adolescents to spend time outdoors in nature, and supporting angler recruitment. From an economic standpoint, angler recruitment and retention contribute to future license sales and other angling expenditures.

AUD data are available for 95 (56.9 percent) of the 167 stocking locations included in the Proposed Action. Though these numbers cannot be extrapolated to the remaining 73 stocking locations, data for these 95 waters provide an indication of the use of stocked sites by anglers and a relative basis for comparison with the other alternatives. Table 26 provides the number of sites in the Proposed Action for each county, the number of sites for which AUD data are available, and the total annual AUDs associated with stocking for the sites with data in each county.

Implementation of the Proposed Action would not preclude other types of recreation from occurring at all waters (stocked or not stocked), such as swimming, boating, hiking, and wildlife watching.

The Proposed Action would satisfy the proposed activity’s purpose and need to meet the current and anticipated need and demand for recreational fishing opportunities in the state. Of the three alternatives, beneficial effects on fishing recreation with the Proposed Action would be notably greater than the Reduced Stocking Alternative and substantially greater than the No Action alternative.

**Table 26. Stocking locations and annual Angler User Days (AUDs) by county for Proposed Action.**

County	Number of Sites in Proposed Action	Number of Proposed Sites with AUD Data	Total AUD Associated with Stocking for Sites with Data
Apache	22	15	299,078
Cochise	1	1	28,584
Coconino	38	25	404,188
Gila	7	7	68,159
Graham	6	3	16,183
Greenlee	1	0	No data
La Paz	2	0	No data
Maricopa	35	19	1,000,423
Mohave	1	0	No data
Navajo	13	8	134,607
Pima	8	2	29,033
Pinal	1	0	No data
Santa Cruz	2	2	16,883
Yavapai	25	12	111,115
Yuma	5	1	35,288
<b>Total</b>	<b>167</b>	<b>95</b>	<b>2,143,541</b>

Source: Pringle (2004)

Reduced Stocking Alternative

Under the Reduced Stocking Alternative, sport fish would be stocked by the AGFD at 101 sites—a statewide reduction of approximately 40 percent (66 less sites) compared with the Proposed Action. However, for those 101 sites proposed with the Reduced Stocking Alternative, stocking levels, frequencies, and species would be the same as the Proposed Action. The level of benefit to recreation and socioeconomics from stocking would vary across the state.

The continuation of the sport fish stocking activities by the AGFD under the Reduced Stocking Alternative would have a beneficial effect on fishing recreation in the state by providing and

enhancing a range of fishing opportunities in rural and urban locations, but to a much lesser extent than the Proposed Action or the existing condition.

The 66 sites from the Proposed Action that would not be included in the Reduced Stocking Alternative are not uniformly distributed across the state or from one county to another. Some number of stocking sites would be eliminated from a majority of the counties in the state, but to varying degrees. The exceptions are Yuma and Graham counties, which would have an identical stocking program to that of the Proposed Action. In Cochise and Santa Cruz counties, however, there would be no stocking sites with the Reduced Stocking Alternative, compared with one site and two sites, respectively, with the Proposed Action. The associated county is identified for each stocking site in Table E (Appendix A).

With regard to these 101 stocking sites, the recreational benefits of stocking would be essentially the same as those of the Proposed Action; however, at the 66 sites that would no longer be stocked, the consequences of the Reduced Stocking Alternative on recreation would be notably different than the Proposed Action and would vary by site.

As a direct impact of the Reduced Stocking Alternative, in the fisheries that would no longer be stocked the overall number of sport fish available to provide angling opportunity would be expected to decrease; however, the level of reduction would be dependent on the degree of sustainability of the specific fishery. Influences on sustainability after cessation of stocking at a specific site could include the quantity of remaining sport fish (residual stocked fish and naturally reproducing fish), the species of sport fish previously stocked as well as species of naturally reproducing fish remaining, habitat suitability for sport fish spawning (reproduction), balance of natural fish reproduction to fish harvest by anglers, species habitat requirements (e.g., cold-water versus warm-water fishery), accessibility for anglers, angler demand, and fishery management.

Though some level of angling activity would be expected to continue at the 66 sites no longer stocked with sport fish, the reduction in sport fish populations at these sites could indirectly affect angler interest and, consequently, shift angler use patterns as disinterested anglers seek fishing opportunities in other locations across the state or outside of the state. Potential changes in angler interest and satisfaction as a result of this alternative would be expected to vary from site to site, or county to county. A summary of some of the key considerations that would likely affect fish population sustainability and angler satisfaction follows.

According to the AGFD, for more popular angling sites that have been stocked historically by the AGFD and managed as put-and-take fisheries, much of the sport fish population is fished out a relatively short time after fish are stocked. The elimination of future stockings at these sites would be expected to result in a decline in sport fish numbers. As a consequence of declining fish numbers, angler catch rates would be expected to decline, and angler dissatisfaction would be expected to increase. Angler satisfaction could also be affected by angler expectation. For example, anglers may be dissatisfied with a catch rate if it is notably lower than what they experienced in the past when the site was stocked. As angler catch rates decline at a given site, an increasing number of anglers that would have otherwise fished there would be expected to seek fishing opportunities at other sites instead. As AUDs decrease at the sites no longer stocked,

other sites, especially those that would be stocked under this alternative, could experience an increase in AUDs.

In areas of the state with limited fishing sites, the increase in angler use at stocked sites as a result of the Reduced Stocking Alternative could be substantial. With substantial increases in angler use at a given site, the fish population and angler catch rates could be negatively affected, and the AGFD stocking regime could prove to be insufficient to keep up with angler demand. Furthermore, with limited space for angling, some sites may not be able to accommodate new anglers.

A number of water bodies, including lakes in urban areas, may be managed as warm-water fisheries year-round and as seasonal cold-water fisheries in winter months. Cold-water fish species have lower temperature tolerances than warm-water species, and in these dual fisheries, cold-water species are stocked with the intent that they will be fished-out under a put-and-take approach as the warming water becomes intolerable. Depending on water temperatures, the presence of cold-water fish at some of these dual sites (e.g., lakes in the Phoenix Metro urban area) would be eliminated if stocking were to cease with the Reduced Stocking Alternative. As a consequence, those anglers who sought cold-water fish at these sites would have to shift to another site or sites to pursue cold-water fish, resulting in reductions in AUDs at these sites. This decline in angler use could be permanent.

Some warm-water fisheries are managed primarily as sustained-yield fisheries. Warm-water species can typically live and thrive in habitats that vary seasonally between warm- and cold-water temperatures. For these reasons, some of these warm-water fisheries, in general, would be less affected by the elimination of stocking than cold-water fisheries, and consequently, angler use at these sites would be less likely to be affected. Notable exceptions are the lakes in the more intensively stocked Urban Sport Fish Stocking Subprogram because, without stocking, it is unlikely that any self-sustaining populations would sustain the high angler demand/harvest rates typical of, and expected at, these sites.

Even for self-sustaining fisheries, however, partial or total loss of a fishery population can occur due to catastrophic events such as algae blooms and fires (fires can result in massive ash flows to streams or lakes). For the sites not stocked with the Reduced Stocking Alternative, the restoration of a fish population in response to such events (as proposed under the Proposed Action for some sites) would be precluded and, in some cases, the associated fishery could be lost permanently. For example, Saguaro Lake and Canyon Lake have self-sustaining warm-water fish populations of channel catfish, largemouth and smallmouth bass, and black crappie. Under the Proposed Action, these species are proposed for stocking only in response to a catastrophic event. These sites are not included in the Reduced Stocking Alternative; therefore, the total loss of one of these fisheries as a result of a catastrophic event would be permanent and would have a substantial effect on recreational angling due to the high number of AUDs associated with these lakes. Similarly, a partial loss of sport fish could take several years to correct without stocking and would result in substantial effects to recreational angling opportunity and satisfaction.

The Reduced Stocking Alternative would enhance opportunities for youth outdoor recreation, encourage adolescents to spend time outdoors in nature, and support angler recruitment. Compared with the Proposed Action, however, the opportunities for outdoor skills education

with the Reduced Stocking Alternative would be more limited due to elimination of a number of stocking sites in or near densely populated urban areas.

For the Reduced Stocking Alternative, AUD data are available for 48 out of 101 stocking sites, or 47.5 percent (compared with 56.8 percent with the Proposed Action). Though these data cannot be extrapolated to the remaining 53 stocking sites in this alternative, they provide an indication of the use of stocked sites by anglers and a relative basis for comparison of the Reduced Stocking Alternative with the Proposed Action. Because the percentage of available angler use data for the Reduced Stocking Alternative is 10 percent less than for the Proposed Action, some level of bias may be introduced that may overstate the difference in economic value between the two action alternatives. Table 27 provides the number of sites in the Reduced Stocking Alternative for each county, the number of these sites for which AUD data are available, and the total annual AUDs associated with stocking for the sites with data in each county.

**Table 27. Stocking locations and annual Angler User Days (AUDs) by county for the Reduced Stocking Alternative.**

County	Number of Sites in Reduced Stocking Alternative	Number of Proposed Sites with AUD Data	Total AUD Associated with Stocking for Sites with Data
Apache	15	8	74,508
Cochise	0	0	0
Coconino	26	17	222,483
Gila	1	1	13,437
Graham	6	3	16,183
Greenlee	1	0	No data
La Paz	1	0	No data
Maricopa	7	3	234,174
Mohave	1	0	No data
Navajo	12	7	133,114
Pima	7	1	22,936
Pinal	1	0	No data
Santa Cruz	0	0	0
Yavapai	18	7	58,639
Yuma	5	1	35,288
<b>Total</b>	<b>101</b>	<b>48</b>	<b>810,762</b>

Source: Pringle (2004)

The Reduced Stocking Alternative would reduce the amount of stocking in urban areas by 50 percent compared with the Proposed Action, for a total of 29 sites in urban areas (eight in the Urban Sport Fish Stocking Subprogram; three in the FIN Subprogram; and 18 in the Statewide Sport Fish Stocking Subprogram). The Reduced Stocking Alternative includes six lakes each in the Phoenix Metro and Williams areas. The remaining 17 waters in urban areas are located in nine cities or towns of various population sizes across Arizona, including Tucson, Show Low, Yuma, and Pinetop. Under this alternative, stocking would not occur in Tempe Town Lake or in the urban areas of Cottonwood, Sedona, or Payson.

The greatest drop in stocking locations under the Reduced Stocking Alternative compared with the Proposed Action would be in Maricopa County, where stocking sites would be reduced from 35 to seven. Three of the seven remaining sites have data available. Two of these are lakes in an

urban area (Phoenix Metro) stocked under the Urban Sport Fish Stocking Subprogram. These two lakes had approximately 76,000 combined AUDs associated with stocking in 2001. The third site with data is Apache Lake, which had 157,974 AUDs associated with stocking for the same period. The expected total annual AUDs in Maricopa County decreases from 1,000,423 under the Proposed Action to 234,174 under the Reduced Stocking Alternative. These numbers indicate a dramatic decrease in the number of stocking locations and in the number of expected AUDs. With the elimination of stocking at 25 lakes (81 percent) in urban areas in Maricopa County under the Reduced Stocking Alternative compared with the Proposed Action, it would be expected that the availability of fishing opportunities in this high-density area would also dramatically decrease. The reduction in the stocking sites in the Phoenix Metro and other urban areas under the Reduced Stocking Alternative would also be expected to impact angler education courses, including youth education, which is concentrated at urban lakes.

As with the Proposed Action, implementation of the Reduced Stocking Alternative would not preclude other types of recreation from occurring at all waters (stocked or not stocked), such as swimming, boating, hiking, and wildlife watching.

Though the Reduced Stocking Alternative would provide some support to AGFD's efforts to meet the current and anticipated future need/demand for recreational fishing opportunities, the level of stocking and the resultant decrease in quality and diversity of recreational fishing opportunities associated with this alternative would represent a notable decrease from the existing condition. For this reason, the Reduced Stocking Alternative would not fully satisfy the project's purpose and need. With 66 less stocking sites, the beneficial effects of the Reduced Stocking Alternative to fishing recreation would be notably less than the Proposed Action.

#### No Action

Under the No Action alternative, the AGFD would not continue to stock sport fish. The No Action alternative would represent a reduction in stocking sites of 167 less sites than the Proposed Action and 101 less sites than the Reduced Stocking Alternative.

As described for the 66 eliminated stocking sites under the Reduced Stocking Alternative, the overall number of sport fish (stocked or naturally occurring) would be expected to decrease with the No Action alternative, but to an even greater degree. As with the Reduced Stocking Alternative, the level of reduction would be dependent on the degree of sustainability of each specific fishery. In the short term, some previously stocked fish populations would persist, providing angling opportunities. Ultimately, however, angler demand would be solely reliant on self-sustaining fish populations, limiting the number of viable angling sites and the diversity of fishing opportunities dispersed across the state.

Some level of angling activity would be expected to continue at some of the current stocking sites despite the cessation of stocking activities under the No Action alternative, based on records of fish species known to be, or likely to be, self-sustaining. The reduction in the size of sport fish populations at these sites or, in some cases, the elimination of these populations entirely, could directly affect angler interest and, consequently, shift angler use patterns across the state as anglers seek fishing opportunities in other locations. Potential changes in angler interest and satisfaction as a result of this alternative would be expected to vary by site. Even for self-sustaining fisheries, however, partial or total loss of a fishery population can occur due to

catastrophic events. Because the No Action alternative represents no stocking, the restoration of a fish population in response to such events would be precluded and, in some cases, the fishery could be lost permanently.

With the least diversity of fishing opportunities and the lowest number of viable fishing sites of the alternatives, the No Action alternative would be expected to negatively affect angler recruitment, interest, use, and satisfaction, and consequently, total AUDs for the state. With the elimination of all stocking activities, programs that enhance opportunities for outdoor recreation for youth and support angler recruitment would also be severely limited. With no sport fish stocking, the No Action alternative would provide little to no support to the fulfillment of AGFD sport fish goals.

As with the other alternatives, the No Action alternative would not preclude other types of recreation from occurring at all waters, such as swimming, boating, hiking, and wildlife watching.

This alternative would provide no support for AGFD efforts to meet the current and anticipated future need/demand for recreational fishing opportunities. Considering the existing condition as the baseline, the No Action alternative would result in a substantial decrease in the quality and diversity of recreational fishing opportunities across the state. For these reasons, the No Action alternative would not be expected to satisfy the project's purpose and need. The No Action alternative would be expected to generate substantially less recreational fishing opportunities than the current AGFD Sport Fish Stocking Program, the Proposed Action, or even the Reduced Stocking Alternative.

## **Socioeconomics**

### *Proposed Action*

To estimate the annual economic value of the Proposed Action compared with the other alternatives, the average dollar expenditure per AUD in each county, as developed by Silberman (2003), was multiplied by the total number of AUDs associated with stocking for the 95 sites in this alternative with data, resulting in an estimate of the economic importance of stocking in each county, based on the 2001 survey. The economic values are expressed in terms of 2001 dollars (Table 28). This table provides an estimate of \$542.5 million for the annual economic benefit associated with the 95 stocking locations with available data from the 2001 survey.

The economic impacts computed in this section are not intended to represent absolute values, but represent relative values and are intended only for assessing the relative impacts among the alternatives. The Proposed Action would have the greatest number of stocking locations of the three alternatives carried forward in this Draft EA. With the greatest number of stocking sites of the alternatives, the Proposed Action would be expected to have the highest number of AUDs and associated expenditures and, consequently, the most beneficial impact to local economies.

**Table 28. Approximate annual economic impact of Angler User Days (AUDs) for sites with data in Proposed Action.**

County	Number of Proposed Sites with AUD Data	AUDs Associated with Stocking for Sites with Data	Average Dollar Expenditure per AUD	Estimated Economic Value of Total AUD for Sites with Data (million dollars)
Apache	15	299,078	\$107	\$32.0
Cochise	1	28,584	\$240	\$6.9
Coconino	25	404,188	\$120	\$48.5
Gila	7	68,159	\$98	\$6.7
Graham	3	16,183	\$124	\$2.0
Greenlee	0	No data	\$511	No data
La Paz	0	No data	\$82	No data
Maricopa	19	1,000,423	\$388	\$388.2
Mohave	0	No data	\$115	No data
Navajo	8	134,607	\$149	\$20.1
Pima	2	29,033	\$539	\$15.6
Pinal	0	No data	\$607	No data
Santa Cruz	2	16,883	\$123	\$2.1
Yavapai	12	111,115	\$137	\$15.2
Yuma	1	35,288	\$147	\$5.2
<b>Total Sites*</b>	<b>95</b>	<b>2,143,541</b>		<b>\$542.5</b>

Sources: Pringle (2004), Silberman (2003)

\* Values represent a total of only those sites in the Proposed Action with data. These values do not include the sites without data nor do these reflect the estimated economic value for the state as a whole.

State tax revenues and fishing license sales would also be expected to be higher in this alternative than the Reduced Stocking Alternative or the No Action alternative. Higher expenditures on equipment and logistics equate to higher state tax revenues, and stocking more locations would likely encourage more anglers to purchase licenses than would be expected with the other two alternatives.

Fifty-eight lakes in urban areas would be stocked under this alternative. This alternative would provide the greatest number of urban angler options, which would create fishing opportunities for a diverse demographic cross-section and would provide the most opportunities for anglers who rely on fish harvest for food. No data are available, but low-income anglers may be more likely to rely on fishing as a part of their food supply than higher-income anglers. Furthermore, low-income anglers may have limited transportation options to reach fishing destinations. Therefore, they likely rely on stocked urban lakes that are close and easy to access. The higher number of stocked lakes in urban areas associated with the Proposed Action would improve access to stocking sites for a large number of anglers, including those that fish primarily for food.

As with the current AGFD Sport Fish Stocking Program, the Proposed Action would have a substantial beneficial impact on local and statewide socioeconomics. Of the three alternatives, contributions to economic benefit with the Proposed Action would be notably greater than the Reduced Stocking Alternative and substantially greater than the No Action alternative.

#### Reduced Stocking Alternative

To estimate the economic importance of fishing in each county with the Reduced Stocking Alternative, the average dollar expenditure per AUD in each county was multiplied by the total number of AUDs for the 48 stocking sites in this alternative with data. Table 29 shows the

number of sites with data by county, the total 2001 AUDs for those sites, the average dollar expenditure by county based on Silberman (2003) data, and the total estimated annual dollar expenditure for the total AUDs by county.

Of the sites eliminated with the Reduced Stocking Alternative, some have records of fish species that are known to, or are likely to, be self-sustaining. Therefore, some level of angling activity would be likely to continue at these sites following the cessation of stocking. However, economic values are expected to decrease in most counties under the Reduced Stocking Alternative compared with the Proposed Action. Maricopa County would see a noticeable decline in economic activities associated with the corresponding decrease in AUD, perhaps as much as 75 percent compared with the Proposed Action. Cochise and Santa Cruz county sites would not be stocked under this alternative.

**Table 29. Approximate annual economic impact of Angler User Days (AUDs) for sites with data in the Reduced Stocking Alternative.**

County	Number of Proposed Sites with AUD Data	Total AUD for Sites with Data	Average Expenditure per AUD	Estimated Economic Value of Total AUD for Sites with Data (million dollars)
Apache	8	74,508	\$107	\$8.0
Cochise	0	0	\$240	\$0.0
Coconino	17	222,483	\$120	\$26.7
Gila	1	13,437	\$98	\$1.3
Graham	3	16,183	\$124	\$2.0
Greenlee	0	No data	\$511	No data
La Paz	0	No data	\$82	No data
Maricopa	3	234,174	\$388	\$90.9
Mohave	0	No data	\$115	No data
Navajo	7	133,114	\$149	\$19.8
Pima	1	22,936	\$539	\$12.4
Pinal	0	No data	\$607	No data
Santa Cruz	0	0	\$123	\$0.0
Yavapai	7	58,639	\$137	\$8.0
Yuma	1	35,288	\$147	\$5.2
<b>Total Sites<sup>1</sup></b>	<b>47</b>	<b>823,867</b>		<b>\$174.3</b>

Sources: Pringle (2004), Silberman (2003)

<sup>1</sup> Values represent a total of only those sites in the Reduced Stocking Alternative with data. These values do not include the sites without data nor do these reflect the estimated economic value for the state as a whole.

As mentioned in the Recreation section, one of the impacts of this alternative could be that AUDs would increase at some sites as some anglers would shift their activities to stocked locations, resulting in increased fishing pressure at these sites. This would somewhat offset the overall decrease in AUDs from this alternative, but a notable decrease in AUDs would still be expected. Therefore, the numbers in the previous table are meant to provide a general idea of the potential economic impact of the Reduced Stocking Alternative with the understanding that other factors also influence the extent of any decrease in angler use and associated expenditures.

As discussed under the Proposed Action, an unknown proportion of anglers rely on fish harvest for food, the majority of which likely use lakes in urban areas. The Reduced Stocking

Alternative would reduce the overall number of stocked lakes in urban areas from 58 to 29. The largest decrease would occur in the Phoenix Metro area, where stocking locations in urban areas would drop to six from 31 in the Proposed Action. All five Tucson area lakes would be stocked under this alternative, but no waters in urban areas would be stocked in Payson, Sedona, or Cottonwood. The decrease in stocked lakes in urban areas, particularly in the Phoenix Metro area, also translates to a greater distance between stocked lakes. Those who rely on fish harvest as a part of their food supply may be less likely to have a convenient mode of transportation to lakes that are farther away. Because of this decrease in locations and greater distance between lakes in urban areas, this alternative could have a higher impact on the portion of the angling population that relies on fishing as a source of food.

The Reduced Stocking Alternative would result in a reduction in state tax revenue compared with the Proposed Action. No quantitative data are available to determine the extent of this impact, but it would be correlated to the expenditures and fishing license sales expected under this alternative.

The Reduced Stocking Alternative would be expected to generate noticeably less economic benefit than the current AGFD Sport Fish Stocking Program or the Proposed Action, though it would generate a notably greater economic impact compared with the No Action alternative. For many small, rural communities, fishing is a primary attraction, and local businesses depend on the income generated from anglers. The elimination of stocking in the waters of these communities could result in a substantial loss to the local economy because anglers may provide a substantial percentage of the income generated by these businesses.

#### No Action

It is expected that decreases in AUDs with the No Action alternative would result in related decreases in economic benefit. Of the alternatives, the No Action alternative would be most likely to result in a decline in demand for fishing equipment and licenses, and a decline in fishing-related expenditures to businesses, including restaurants, hotels, boat rentals, fuel stations, and bait and tackle shops. With less fishing-related expenditures, job opportunities in the associated service industries may also decrease.

The Urban Sport Fish Stocking Subprogram sites are more intensively stocked than those in the Statewide Sport Fish Stocking Subprogram. The elimination of all sport fish stocking at these urban lakes would constitute a substantial change in fishing opportunities for a high percentage of anglers who fish at these waters. Furthermore, some unknown percentage of anglers who fish at lakes in urban areas may rely on fishing as a source of food. The decline or elimination of fish populations in these metropolitan areas could constitute a socioeconomic impact on these anglers, who may have limited opportunities to travel out of the area to fish.

Compared with the Proposed Action, the No Action alternative would be expected to negatively impact local economies along travel routes and in the vicinity of angler fishing destinations. For many small, rural communities, fishing is a primary attraction, and local businesses depend on the income generated from anglers. For these communities, the elimination of stocking could result in a substantial loss to the local economy because anglers may provide a substantial percentage of the income generated by these businesses. State tax revenue and licensing fees would also decline with this alternative.

Considering the existing condition as the baseline, the No Action alternative would result in a substantial decrease in economic contribution across the state. The No Action alternative would be expected to generate substantially less economic benefit than the current AGFD Sport Fish Stocking Program, the Proposed Action, or even the Reduced Stocking Alternative.

### 4.3 Comparison of Environmental Consequences by Alternative

The following table summarizes and compares the environmental consequences of the alternatives to biological resources, recreation, and socioeconomics (Table 30). It also summarizes by alternative the mitigation and conservation commitments documented in Chapter 5.0.

**Table 30. Comparison of potential effects to biological resources, recreation, and socioeconomics by alternative.**

Resource/Topic	Alternatives Under Consideration		
	Proposed Action (167 stocking sites)	Reduced Stocking Alternative (101 stocking sites)	No Action (no sites)
<b>BIOLOGICAL RESOURCES—CONSULTATION SPECIES<sup>16</sup></b>			
Effects on listed, candidate, and potential candidate species	<ul style="list-style-type: none"> <li>• No jeopardy to consultation species and no adverse modification of critical habitat.</li> <li>• Adverse effects to 14 listed species (seven with designated critical habitat and two with proposed critical habitat), four candidate species, and two species under consideration for candidate status.</li> <li>• The extent to which potential adverse effects would occur varies by species and by stocking site based on existing conditions, fish species proposed for stocking, and other factors.</li> <li>• May affect but not likely to adversely affect nine listed species, three of which have designated critical habitat, and three candidate species.</li> </ul>	<ul style="list-style-type: none"> <li>• A draft BCO was not developed for the Reduced Stocking Alternative; therefore, the number of species with adverse effects is not identified. Fewer potential interactions with, and adverse effects to, consultation species would be anticipated.</li> <li>• Reinitiation of consultation would be required and the resulting BCO would identify the number of species and/or critical habitat adversely affected.</li> </ul>	<ul style="list-style-type: none"> <li>• No effects on consultation species or critical habitat.</li> </ul>

<sup>16</sup> These are the species that were included in the ESA Section 7 consultation and include listed (threatened and endangered) and certain non-listed (candidate and potential candidate) species.

**Table 30. Comparison of potential effects to biological resources, recreation, and socioeconomics by alternative.**

Resource/Topic	Alternatives Under Consideration		
	Proposed Action (167 stocking sites)	Reduced Stocking Alternative (101 stocking sites)	No Action (no sites)
<b>BIOLOGICAL RESOURCES—OTHER SPECIAL STATUS AQUATIC AND SEMI-AQUATIC SPECIES<sup>17</sup></b>			
Effects on longfin dace	122 sites no effect 32 sites low impact 13 sites moderate impact	76 sites no effect 23 sites low impact 2 sites moderate impact	No sites stocked with potential effects on species.
Effects on speckled dace	97 sites no effect 52 sites low impact 18 sites moderate impact	58 sites no effect 32 sites low impact 11 sites moderate impact	No sites stocked with potential effects on species.
Effects on Sonora sucker	88 sites no effect 72 sites low impact 7 sites moderate impact	70 sites no effect 29 sites low impact 2 sites moderate impact	No sites stocked with potential effects on species.
Effects on desert sucker	86 sites no effect 73 sites low impact 8 sites moderate impact	68 sites no effect 31 sites low impact 2 sites moderate impact	No sites stocked with potential effects on species.
Effects on Little Colorado sucker	144 sites no effect 13 sites low impact 10 sites moderate impact	84 sites no effect 10 sites low impact 7 sites moderate impact	No sites stocked with potential effects on species.
Effects on bluehead sucker	122 sites no effect 32 sites low impact 13 sites moderate impact	76 sites no effect 23 sites low impact 2 sites moderate impact	No sites stocked with potential effects on species.
Effects on lowland leopard frog	131 sites no effect 24 sites low impact 8 sites moderate impact 4 sites high impact	83 sites no effect 14 sites low impact 2 sites moderate impact 2 sites high impact	No sites stocked with potential effects on species.
Exposure to Western narrow-mouthed toad <sup>18</sup>	161 sites no exposure 3 sites low exposure 1 sites moderate exposure 2 sites high exposure	97 sites no exposure 2 sites low exposure 1 sites moderate exposure 1 sites high exposure	No sites stocked with potential exposure to species.
Exposure to California floater <sup>18</sup>	136 sites no exposure 26 sites low exposure 3 sites moderate exposure 2 sites high exposure	78 sites no exposure 20 sites low exposure 2 sites moderate exposure 1 sites high exposure	No sites stocked with potential exposure to species.
Exposure to White Mountain water penny beetle <sup>18</sup>	150 sites no exposure 15 sites low exposure 2 sites high exposure	90 sites no exposure 11 sites low exposure	No sites stocked with potential exposure to species.
Exposure to Page Springs caddisfly <sup>18</sup>	165 sites no exposure 1 site low exposure 1 site high exposure	101 sites no exposure	No sites stocked with potential exposure to species.
Exposure to balmorhea saddle-case caddisfly <sup>18</sup>	165 sites no exposure 1 site low exposure 1 site high exposure	101 sites no exposure	No sites stocked with potential exposure to species.

<sup>17</sup> These are all other potentially affected species with special status, but that are not federally listed, candidate, or potential candidate species.

<sup>18</sup> Analysis assessed exposure only and did not identify effects.

**Table 30. Comparison of potential effects to biological resources, recreation, and socioeconomics by alternative.**

Resource/Topic	Alternatives Under Consideration		
	Proposed Action (167 stocking sites)	Reduced Stocking Alternative (101 stocking sites)	No Action (no sites)
<b>BIOLOGICAL RESOURCES—OTHER SPECIAL STATUS NON-AQUATIC SPECIES</b>			
Effects on riparian plants and non-piscivorous riparian/aquatic nesting birds	<ul style="list-style-type: none"> <li>• 36 stocking sites with one or more plant species recorded in the vicinity.</li> <li>• 25 stocking sites with one of more bird species recorded in the vicinity.</li> <li>• No direct effects.</li> <li>• Potential for only indirect effects from angler activity.</li> </ul>	<ul style="list-style-type: none"> <li>• 22 stocking sites with one or more plant species recorded in vicinity.</li> <li>• 21 stocking sites with one or more bird species recorded in vicinity.</li> <li>• No direct effects.</li> <li>• Potential for only indirect effects from angler activity.</li> </ul>	No stocking of any sites with records of special status plant or bird species in vicinity.
Effects on terrestrial riparian invertebrates and ground-dwelling riparian mammals and reptiles	<ul style="list-style-type: none"> <li>• 4 stocking sites with one terrestrial riparian invertebrate species recorded in the vicinity.</li> <li>• 13 stocking sites with one or more mammal or reptile species recorded in vicinity.</li> <li>• No direct effects.</li> <li>• Potential for only indirect effects from angler activity.</li> </ul>	<ul style="list-style-type: none"> <li>• 2 stocking sites with one terrestrial riparian invertebrate species recorded in the vicinity.</li> <li>• 11 stocking sites with one or more mammal or reptile species recorded in vicinity.</li> <li>• No direct effects.</li> <li>• Potential for only indirect effects from angler activity.</li> </ul>	No stocking of any sites with other special status terrestrial riparian invertebrates or ground-dwelling riparian mammal or reptile species records in the vicinity.
Effects on piscivorous riparian/aquatic nesting birds	<ul style="list-style-type: none"> <li>• 104 stocking sites with one or more bird species recorded in the vicinity.</li> <li>• Direct effects from food augmentation and indirect effects from angler disturbance, entanglement/ingestion of fishing line and tackle, augmentation of overall prey base, and decreased diversity of native prey base.</li> </ul>	<ul style="list-style-type: none"> <li>• 62 stocking sites with one or more bird species recorded in the vicinity.</li> <li>• Direct effects from food augmentation and indirect effects from angler disturbance, entanglement/ingestion of fishing line and tackle, augmentation of overall prey base, and decreased diversity of native prey base.</li> </ul>	No stocking of any sites with other special status piscivorous riparian or aquatic nesting bird records in the vicinity.

**Table 30. Comparison of potential effects to biological resources, recreation, and socioeconomics by alternative.**

Resource/Topic	Alternatives Under Consideration		
	Proposed Action (167 stocking sites)	Reduced Stocking Alternative (101 stocking sites)	No Action (no sites)
<b>CONSERVATION AND MITIGATION PROGRAM</b>			
Implementation of mitigation and conservation measures	<p>Expenditure of \$5 million over 10 years for:</p> <ul style="list-style-type: none"> <li>• Implementation of substantial mitigation measures targeting other special status species, as identified in Chapter 5.0, including removal of stressors from aquatic systems and watershed planning.</li> <li>• Implementation of substantial mitigation measures targeting draft BCO species, as identified in Chapter 5.0, including transition to production and stocking of triploid rainbow trout and securing or establishing populations and other actions.</li> <li>• Implementation of additional conservation measures identified in Appendix P as funding allows.</li> <li>• Mitigation and conservation measures employ a watershed management approach that would benefit aquatic communities in general.</li> </ul>	<ul style="list-style-type: none"> <li>• Reinitiation of Section 7 consultation would determine required mitigation measures, based on reduced impacts.</li> <li>• Reduced funding available for mitigation and conservation measures.</li> </ul>	No mitigation or conservation measures implemented.
<b>RECREATION AND SOCIOECONOMICS</b>			
Title VI/ Environmental Justice	<ul style="list-style-type: none"> <li>• No protected populations of low income or minorities identified.</li> <li>• No disproportionately high or adverse impacts.</li> </ul>	<ul style="list-style-type: none"> <li>• No protected populations of low income or minorities identified.</li> <li>• No disproportionately high or adverse impacts.</li> </ul>	<ul style="list-style-type: none"> <li>• No protected populations of low income or minorities identified.</li> <li>• No disproportionately high or adverse impacts.</li> </ul>

**Table 30. Comparison of potential effects to biological resources, recreation, and socioeconomics by alternative.**

Resource/Topic	Alternatives Under Consideration		
	Proposed Action (167 stocking sites)	Reduced Stocking Alternative (101 stocking sites)	No Action (no sites)
Range of angling opportunities/ diversity of locations	<ul style="list-style-type: none"> <li>Provides the most comprehensive and widespread range of angling opportunities across the state (167 sites).</li> <li>Alternative most similar to existing program.</li> </ul>	Provides a range of angling opportunities but at 38 percent fewer sites (101 sites) than the Proposed Action.	<ul style="list-style-type: none"> <li>No stocking.</li> <li>Angling opportunities limited to sites with self-sustaining fish populations.</li> </ul>
Angler satisfaction	Additional recreational opportunities provided to meet projected demand; therefore, angler satisfaction is expected to be similar to, or higher than, the existing program.	<ul style="list-style-type: none"> <li>With the elimination of many previously stocked sites, a decline in angler satisfaction and use of these sites would be anticipated.</li> <li>Angler use at some of the remaining stocked sites could increase as a result.</li> <li>Overuse or overcrowding of remaining sites could degrade sport fish populations and quality of angler experiences; therefore, angler satisfaction would be lower.</li> </ul>	With the elimination of all stocking activities and the resultant decline or permanent loss of many fisheries across the state, a substantial decline in angler satisfaction would be anticipated.
Youth recruitment and outdoor recreation opportunities	Enhances opportunities (such as fishing derbies) for outdoor recreation for youth, supporting angler recruitment.	Enhances opportunities (such as fishing derbies) for outdoor recreation for youth, supporting angler recruitment, but to a much lesser extent than the Proposed Action due to the elimination of key stocking sites in or near urban areas.	With the elimination of all stocking activities, programs that enhance opportunities for outdoor recreation for youth and support angler recruitment would be severely limited.
Decline or loss of fisheries due to catastrophic events	Accommodates restoration of fisheries lost due to catastrophic events (e.g., algae blooms) at up to 51 sites.	Accommodates restoration of fisheries lost due to catastrophic events at up to 42 sites.	Accommodates no restoration of fisheries lost due to catastrophic events. Any total loss would be permanent.

**Table 30. Comparison of potential effects to biological resources, recreation, and socioeconomics by alternative.**

Resource/Topic	Alternatives Under Consideration		
	Proposed Action (167 stocking sites)	Reduced Stocking Alternative (101 stocking sites)	No Action (no sites)
Economic Value of Sport Fish Stocking	Results in highest angler-related expenditures and highest overall economic value. Annual economic value of stocking estimated at \$542.5 million <sup>19</sup> in Arizona.	Elimination of some sites would result in a reduction in angler-related expenditures and a lower overall economic value compared with the Proposed Action. Annual economic value of this level of stocking estimated at \$174.3 million <sup>19</sup> in Arizona.	Substantial reduction in angler-related expenditures and overall economic value compared with the other alternatives. No economic value added from stocking.

<sup>19</sup> Economic estimates are relative values based on available data from 2001 and do not include all of the stocking sites in the action alternatives. Refer to Sections 4.2.2 and 4.2.3 for details on the approach used and its limitations.



## 5.0 MITIGATION MEASURES

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Mitigation measures would be implemented to avoid, reduce, offset, or otherwise minimize environmental impacts associated with the Proposed Action. The AGFD has developed a Sport Fish Stocking Conservation and Mitigation Program for species potentially affected by proposed sport fish stocking activities (Appendix P). The measures identified in this mitigation and conservation program target consultation species addressed in the draft BCO and other special status aquatic and semi-aquatic species identified in this Draft EA, collectively termed “Program Species.” Mitigation associated with the Proposed Action includes measures that address existing stressors such as the presence of nonnative aquatic species or loss of habitat. These measures would mitigate stocking impacts on consultation and other special status aquatic and semi-aquatic species and would improve the environmental baseline of aquatic habitats.

AGFD’s mitigation and conservation program identifies two types of measures. The first type are committed conservation/mitigation activities targeted at draft Program Species, Additional Conservation Species with reasonable and prudent measures and terms and conditions identified in the draft BCO, and other special status aquatic and semi-aquatic species identified in the Draft EA. The second are additional (non-mandatory) measures or activities targeting Program Species that would be implemented depending on funding availability. Only the committed mitigation and conservation measures described in this chapter would constitute mandatory mitigation measures under the Proposed Action. These are collectively termed “mitigation measures” hereafter for clarity. The remaining measures (listed in Table 4 of the Sport Fish Stocking Conservation and Mitigation Program, Appendix P) would be discretionary and dependent on the availability of funding after committed mitigation obligations were met. AGFD funding is authorized by the Arizona Game and Fish Commission.

This chapter describes mitigation only for the Proposed Action. If a different alternative were to be selected, ESA Section 7 consultation with AESO would be reinitiated to determine appropriate conservation measures, reasonable and prudent measures, and terms and conditions. Concomitant with the selection of any alternative that involves reduced stocking activities and reduced impacts to consultation and other special status species, there would be reduced funding and need for implementation of other mitigation measures. Under the No Action alternative, no mitigation would be implemented.

### 5.1 Mitigation Approach and Implementation

Under the Proposed Action, an average annual program budget of \$500,000 (\$5 million over 10 years) would be committed to implementation of mitigation measures.<sup>20</sup> A 10-year planning document would be developed to guide preparation of annual work plans by the AGFD, with input from, and coordination with, AESO and WSFR. Annual work plans for each year would identify and prioritize species, activities, conservation tools, budget, and staffing to implement the mitigation measures identified in this chapter. The annual report of the previous year’s

<sup>20</sup> Funding remaining after the implementation of the mitigation measures described in this chapter shall be used to implement discretionary conservation measures listed in Table 4 of the Sport Fish Stocking Conservation and Mitigation Program (Appendix P).

activities would be used to assess progress toward meeting mitigation objectives and to prioritize mitigation measures to be implemented each year.

The following approaches or tools would be used to implement mitigation measures identified in this chapter:

- *Population inventory*—Systematic sampling of areas to assess species presence.
- *Population or community monitoring*—Systematic sampling of populations to determine status and/or trend over time.
- *Directed research*—Activities that focus on specific issues relating to species interactions to define management options for future implementation.
- *Stressor removal or reduction*<sup>21</sup>—Identification and assessment of current and future key stressors to native aquatic wildlife populations that are, or may be, controlling or predominant contributing forces driving the population or species declines. Collaboration with stakeholders to address, remove, or mitigate these key stressors.
- *Reintroduction and augmentation*—Reintroduction or augmentation into historical range as a tool used to recover species. Reintroductions are often coupled with construction of exclusion barriers and removal or suppression of nonnative species. Reintroductions and augmentations would be implemented consistent with accepted guidelines such as George et al. (2009).
- *Information, education, and outreach activities*—Using signs, publications, promotions, and marketing activities.
- *Guideline and regulation modifications*—Assessing, evaluating, and proposing modifications of guidelines or regulations that can protect or minimize threats to native aquatic species.

One of these tools, reduction or removal of stressors on the landscape, has a range of benefits at local and broad scales. Removal of sources of nonnative species from the landscape (e.g., to facilitate introductions or to eliminate a watershed source) minimizes impacts to native species at the site of removal and minimizes downstream contributions of individuals that help maintain or augment resident nonnative populations. Another measure, conversion to the use of only triploid (i.e., sterile) trout for stocking, would eliminate any potential for hybridization with the threatened Apache trout and would eliminate any potential for establishment of naturally reproducing trout populations. Because trout stocked in most Arizona waters generally have low survival beyond the stocking season, effects from trout stocking would be largely limited to the period during and shortly after stocking takes place, and year-round effects would be substantially reduced.

The AGFD would report on progress and implementation of mitigation measures annually over the 10-year period. Reports would be submitted to the WSFR following existing annual grant reporting schedules and would include any findings as identified in the terms and conditions.

<sup>21</sup> Implementation of actions on the landscape may result in stressors that affect species or their habitat. Such actions can include land management actions, road construction, or introduction of new species. Examples of stressors are habitat loss or degradation, predation, competition, or direct disturbance of individuals of a species.

## 5.2 Mitigation Measures

Mitigation measures under the Proposed Action are listed in Tables 31 and 32. Table 31 lists mitigation measures addressing impacts to other special status aquatic and semi-aquatic Program Species analyzed in this Draft EA. Table 32 lists mitigation measures targeted at consultation Program Species with reasonable and prudent measures or terms and conditions identified in the draft BCO.

**Table 31. Mitigation measures targeting other special status aquatic and semi-aquatic species.**

Species	Mitigation Measure
Multiple other special status aquatic and semi-aquatic species <sup>22</sup>	<p>The AGFD shall contribute to the conservation of other special status aquatic and semi-aquatic species through the removal of key stressors. The AGFD shall address two stressors impacting these species and associated aquatic communities within each of the following subwatersheds/catchments:</p> <ul style="list-style-type: none"> <li>• Verde River subbasin</li> <li>• Salt River subbasin</li> <li>• Middle Gila subbasin</li> <li>• Little Colorado River subbasin</li> <li>• Bill Williams subbasin</li> </ul> <p>The AGFD shall contribute to the conservation of other special status aquatic and semi-aquatic species through planning using a watershed approach. The AGFD shall apply its Watershed-based Fish Management Process (AGFD 2009) to develop aquatic species management plans for all priority watersheds in the state. The planning process will include consideration for special status species and identify conservation opportunities for incorporation within the planning framework. Special status species will benefit through identification of focal management areas and restoration needs that can be prioritized into multiple land management programs and funding sources in a coordinated approach.</p>
Piscivorous riparian or aquatic nesting birds	The AGFD shall develop information tools to educate anglers on the impacts of fishing debris on riparian or aquatic nesting birds. The AGFD shall continue to support the monofilament recovery bin program by replacing old and providing new bins.

<sup>22</sup> Mitigation measures would also benefit Program Species. For each measure, some species may benefit directly and some species may benefit indirectly. The magnitude of benefits for each species would vary.

**Table 32. Mitigation measures targeting consultation species.**

<b>Species</b>	<b>Mitigation Measure</b>																
Multiple species <sup>23</sup>	Within three years, the AGFD shall convert to triploid rainbow trout for all AGFD hatchery stockings, with the exception of closed systems and urban lakes.																
	The AGFD shall secure existing or establish new conservation populations for the following species:																
	<table border="0"> <thead> <tr> <th style="text-align: left;"><b>Species</b></th> <th style="text-align: right;"><b>Number of Populations Secured or Established</b></th> </tr> </thead> <tbody> <tr> <td>Chiricahua leopard frog</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Headwater chub</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Roundtail chub</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Loach minnow</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Northern leopard frog</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Northern Mexican garter snake<sup>24</sup></td> <td style="text-align: right;">2</td> </tr> <tr> <td>Narrow-headed garter snake<sup>24</sup></td> <td style="text-align: right;">2</td> </tr> </tbody> </table>	<b>Species</b>	<b>Number of Populations Secured or Established</b>	Chiricahua leopard frog	3	Headwater chub	3	Roundtail chub	3	Loach minnow	2	Northern leopard frog	2	Northern Mexican garter snake <sup>24</sup>	2	Narrow-headed garter snake <sup>24</sup>	2
	<b>Species</b>	<b>Number of Populations Secured or Established</b>															
	Chiricahua leopard frog	3															
	Headwater chub	3															
Roundtail chub	3																
Loach minnow	2																
Northern leopard frog	2																
Northern Mexican garter snake <sup>24</sup>	2																
Narrow-headed garter snake <sup>24</sup>	2																
The AGFD shall conduct a statewide live bait (bait fish and tiger salamander) use assessment and risk analysis to develop recommendations to amend live bait management. The AGFD shall present these recommendations to the AGFD Commission for implementation consideration.																	
The AGFD shall review and update existing outreach programs addressing use of live bait to ensure they are adequately informing the public about capture, use, and proper disposal of live bait species.																	
The AGFD shall review and update existing outreach programs on the risks to native aquatic species from the transport of nonnative aquatic species (sport fish, baitfish, other fish species, amphibians, invertebrates, and plants) to ensure they are adequately informing the public of the harmful nature of such actions, and the means they can take to reduce or prevent inadvertent transport of such nonnative species.																	
Apache trout	The AGFD shall continue to work with partners to evaluate barrier conditions on three Apache trout recovery streams, survey for nonnative fish in recovery streams, and repair barriers as part of the Proposed Action.																

<sup>23</sup> Benefits would result for most Program Species and other special status aquatic and semi-aquatic species with implementation of these measures. For each measure, some species may benefit directly and some species may benefit indirectly. The magnitude of benefits for each species would vary.

<sup>24</sup> Dependent on available repatriation source, numbers, and protocols.

**Table 32. Mitigation measures targeting consultation species.**

Species	Mitigation Measure
Chiricahua leopard frog	For warm-water sport fish stocking actions via contract vendors at sites where effects to Chiricahua leopard frogs are a concern, the “sensitive areas” HACCP plan shall be followed by AGFD personnel receiving the fish from the vendor. This “sensitive areas” plan shall involve the double-sorting and examination of all fish in the load to reduce the risk of introduction of unwanted aquatic organisms with the sport fish. Loads containing unwanted aquatic organisms shall be refused and not stocked.
	For cold-water sport fish stocking actions at sites where effects to Chiricahua leopard frogs are a concern and trout or grayling are coming from AGFD hatcheries, the HACCP plan for disease and parasite control at the hatchery shall be in place to reduce the risk of contamination of the fish to be stocked.
	The AGFD shall review the existing angler information concerning the restrictions on transport and use of tiger salamanders at Parker Canyon Lake and modify the information as deemed appropriate to increase angler awareness that such transport and use are harmful.
	The AGFD shall visually examine the shoreline and shallow lake margins for the presence of submerged/shoreline vegetation cover for tadpoles at the time rainbow trout are stocked and during any fish surveys conducted post-stocking.
	The AGFD shall work with the Coronado National Forest in management of habitat conditions at Peña Blanca Lake to ensure that submerged/shoreline vegetation cover for tadpoles is maintained at the lake.
Gila chub	In two years during the 10-year period, the AGFD shall survey the occupied Gila chub habitat on public lands in Spring Creek above the barrier when habitat conditions are conducive to rainbow trout persistence. If any stocked rainbow trout are found, these shall be documented and removed from the stream and an additional survey to locate stocked rainbow trout shall be implemented in the following year.
Headwater chub	The AGFD shall implement actions to increase angler awareness of headwater chub, including that headwater chub is not a legal sport fish at the East Verde River and Haigler Creek stocking sites.
	Headwater chub habitats in the East Verde River and Tonto Creek shall be considered priority areas for use of triploid rainbow trout to avoid augmentations to existing wild populations.
	To obtain information needed to implement conservation actions, the AGFD shall undertake an assessment of headwater chub populations in the East Verde River, Tonto Creek, and the Haigler Creek drainage to determine population structure and extent, nonnative species present as stressors, sites for potential reestablishment, and identification of specific research needs. This assessment shall tier off the Arizona Statewide Conservation Agreement and Strategy (AGFD 2006b) for headwater chub and five other native fish species because that document contains considerable information on the conservation needs and a strategy to address those needs. The assessment shall serve as a guidance document for implementing conservation actions for the headwater chub.
Roundtail chub	The AGFD shall, within the first two years of the program, develop an assessment of opportunities across the range of the roundtail chub focusing on those with the greatest potential for conservation benefits for the species. This assessment shall tier off the Arizona Statewide Conservation Agreement and Strategy (AGFD 2006b) for roundtail chub and five other native fish species because that document contains considerable information on the conservation needs and a strategy to address those needs. The assessment shall serve as a guidance document for implementing conservation actions for the roundtail chub.
Spikedace	The AGFD shall continue monitoring the Upper Verde River to evaluate native and nonnative fish populations. Any individuals of the stocked sport fish species captured during such monitoring shall be removed from the river.

**Table 32. Mitigation measures targeting consultation species.**

Species	Mitigation Measure
Loach minnow	In the event of insufficient Apache trout to meet annual recreational stocking demands, the East Fork Black River shall be stocked with Apache trout after those recreational stocking sites associated with a recovery population (i.e., West Fork Black River, West Fork Little Colorado River at Sheep’s Crossing, and Lee Valley Lake). Any rainbow trout that are stocked into the East Fork Black River shall be sterile triploids to avoid any augmentation to the reproducing population of rainbow trout in the East Fork Black River.
	If a spill from Big Lake or Crescent Lake is anticipated, the AGFD shall install a fish weir to capture fish and prevent downstream movement. If the weir is not installed prior to a spill, a survey for nonnative trout species in the occupied habitat of the loach minnow shall be completed within that spring/summer season. All nonnative fish species encountered during that survey shall be removed.
	In coordination with partners, the AGFD shall develop and implement a standard survey schedule and procedures to evaluate the fish community, with emphasis on stocked trout presence in the loach minnow–occupied areas of the East Fork Black River drainage.
Northern leopard frog	For warm-water sport fish stocking actions via contract vendors at sites where effects to Northern leopard frogs are a concern, the “sensitive areas” HACCP plan shall be followed by AGFD personnel receiving the fish from the vendor. This “sensitive areas” plan shall involve the double-sorting and examination of all fish in the load to reduce the risk of introduction of unwanted aquatic organisms with the sport fish. Loads containing unwanted aquatic organisms shall be refused and not stocked.
	For cold-water sport fish stocking actions at sites where effects to Northern leopard frogs are a concern and trout or grayling are coming from AGFD hatcheries, the HACCP plan for disease and parasite control at the hatchery shall be in place to reduce the risk of contamination of the fish to be stocked.
Sonoran tiger salamander	The AGFD shall work with federal, state, and private partners to identify and implement projects that reduce the risk of hybridization between Sonoran tiger salamanders and nonnative salamanders.
	The AGFD shall review the existing angler information concerning the restrictions on transport and use of tiger salamanders at Parker Canyon Lake and modify the information as deemed appropriate to increase angler awareness that such transport and use are harmful.
Northern Mexican garter snake	The AGFD shall develop outreach material on garter snakes to attempt to reduce the deliberate killing or injuring of garter snakes by the public. Materials developed for this program shall be posted at stocking sites that contain populations of garter snakes.
	In providing for two Northern Mexican garter snake populations either through securing existing but threatened populations or establishment of new conservation populations, a source for individuals to reestablish conservation populations is needed, as well as information on propagation and release options. The Garter Snake Working Group has initiated work in these arenas, and the AGFD shall contribute to these efforts during the 10-year program. Once sufficient information on potential release sites, release progeny, and release methods is obtained, the AGFD shall initiate the reestablishment program.
	As part of all native fish reintroduction efforts in Arizona, the AGFD shall ensure that renovated streams occupied by Northern Mexican garter snakes are quickly restocked with appropriate native fish species and native frog species that can provide prey for Northern Mexican garter snakes in order to not put stress on any garter snake population through elimination of its forage base.

**Table 32. Mitigation measures targeting consultation species.**

Species	Mitigation Measure
Narrow-headed garter snake	The AGFD shall develop outreach material on garter snakes to attempt to reduce the deliberate killing or injuring of garter snakes by the public. Materials developed for this program shall be posted at stocking sites that contain populations of garter snakes.
	In providing for two narrow-headed garter snake populations either through securing existing but threatened populations or establishment of new conservation populations, a source for individuals to reestablish conservation populations is needed, as well as information on propagation and release options. The Garter Snake Working Group has initiated work in these arenas, and the AGFD shall contribute to these efforts during the 10-year program. Once sufficient information on potential release sites, release progeny, and release methods is obtained, the AGFD shall initiate the reestablishment program.
	As part of all native fish reintroduction efforts in Arizona, the AGFD shall ensure that renovated streams occupied by narrow-headed garter snakes are quickly restocked with appropriate native fish species that can provide prey for narrow-headed garter snakes in order to not put stress on any garter snake population through elimination of its forage base.
Three Forks springsnail	The AGFD shall continue to implement the HACCP plan for operations at state hatcheries and the transport of trout to the stocking sites in the Black River drainage.
Mt Graham red squirrel	The AGFD shall coordinate with the Coronado National Forest on traffic management that can reduce the risk of mortality to Mount Graham red squirrels from vehicles accessing Riggs Flat Lake as part of continuing implementation of the Mount Graham Red Squirrel Recovery Plan.
Little Colorado spinedace	The stocking restrictions and implementing actions from the 1995 (FWS 1995) and 2001 (FWS 2001) incidental take statements for C.C. Cragin Reservoir, Knoll Lake, and Nelson Reservoir, except for modified creel survey requirements, are part of the Proposed Action for this consultation and shall be implemented over the next 10 years as described in those documents. Creel surveys shall occur no less than once every 10 years.
Arizona treefrog, Huachuca Distinct Population Segment	The AGFD shall review the existing angler information concerning the restrictions on transport and use of tiger salamanders at Parker Canyon Lake and modify the information as deemed appropriate to increase angler awareness that such transport and use are harmful.
Bonytail chub and Razorback sucker	<p>A barrier net shall be installed at the La Paz County Park Lagoon immediately before the stocking event and remain in place for 7 days after the stocking event.</p> <p>Prior to any stocking into La Paz County Park Lagoon, signs similar to those used on Lake Havasu shall be posted at the lagoon describing bonytail chub to anglers and informing them of what to do should they catch a bonytail chub. These signs shall remain in place as long as the barrier net is in place at the lagoon.</p>
New Mexico meadow jumping mouse	The AGFD shall provide protection from human access impacts, and if needed, enhancement actions for meadow jumping mouse habitats on AGFD-owned lands on the West Fork Black River.
	The AGFD shall coordinate with the Apache-Sitgreaves National Forests on evaluations of effects to meadow jumping mouse habitat along the East and West Forks of the Little Colorado River.



## **6.0 CUMULATIVE EFFECTS**

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Cumulative effects result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). Certain conditions (e.g., climate change) may also contribute to cumulative effects. In this section, the term “actions” is defined to include anthropogenic activities and conditions, such as climate change.

The level and scale of the cumulative analysis should be commensurate with the proposed project’s potential impacts, scale, and other factors. NEPA documents should consider those past, present, and future actions that incrementally contribute to the cumulative effects on resources affected by the proposed action (CEQ 1997).

This chapter summarizes and analyzes relevant past, present, and reasonably foreseeable actions that are expected to contribute to the cumulative impact. It describes relevant cumulative effects issues and assessment goals, geographic and temporal scales for cumulative effects analysis, and past, present, and reasonably foreseeable future actions that are expected to result in cumulative effects. Based on CEQ guidance, this analysis addresses resources most likely to be significantly affected, focuses on meaningful or important effects, and includes all relevant federal, non-federal, and private actions (CEQ 1997). Per this guidance, the cumulative effects analysis in this chapter addresses impacts to biological resources—special status aquatic and semi-aquatic species. These include federally listed and candidate species as well as aquatic and semi-aquatic species with other (federal or non-federal) special status designations.

### **6.1 Cumulative Effects Issues and Assessment Goals**

The primary issue identified during the scoping process is the potential effect of the Proposed Action on special status aquatic and semi-aquatic species. The analysis in this Draft EA indicates that these are the species that have the most potential to experience negative effects across a range of spatial or geographic scales (from stocking site to regional scale). The assessment goals for cumulative effects to these species are to identify the extent to which past, present, and reasonably foreseeable future actions contribute to the continued decline of these species or contribute to their conservation or recovery.

### **6.2 Geographic Scope for Analysis**

The geographic scope of analysis for cumulative effects is the State of Arizona.

### **6.3 Temporal Scope of Analysis**

#### **6.3.1 Time Frame of Past Actions**

The analysis time frame for past actions is from post-European and other non-Native American settlement to the present because this is the time frame in which most large-scale changes in the quality and/or quantity of aquatic habitats have occurred.

### 6.3.2 Time Frame of Present and Reasonably Foreseeable Future Actions

The analysis time frame for present and future actions is the duration of the proposed stocking program.

## 6.4 Relevant Past, Present, and Reasonably Foreseeable Future Actions

Within the geographic and temporal scales identified, a number of types of actions are expected to contribute to the effects on special status aquatic and semi-aquatic species.

### 6.4.1 Description of Past, Present, and Reasonably Foreseeable Future Actions

The general categories of past, present, and reasonably foreseeable actions and their potential effects are summarized in Table 33. The potential for these actions or conditions to result in adverse or beneficial effects on special status aquatic and semi-aquatic species is summarized in Table 34.

**Table 33. General categories of actions and associated types of effects included in the analysis of cumulative effects to special status aquatic and semi-aquatic species.**

Types of Actions	Types of Effects to Special Status Aquatic and Semi-aquatic Species
Fish stocking <sup>25</sup>	Predation; competition; hybridization; habitat alteration, disturbance; introduction or spread of parasites, diseases, or aquatic invasive species
Water diversion/irrigation	Reduction in amount, extent, connectivity, and quality of aquatic habitats
Dam construction and operation	Disruption of migration corridors; isolation of subpopulations; changes in flow regimes and water temperature; changes in habitat type from lotic (stream, river) to lentic (lake, reservoir) habitats
Urbanization	Changes in flow regime, stream morphology, and water quality (increased sediment, non-point source, and point source pollution of aquatic habitats); changes in riparian vegetation and aquatic habitats, including the reduction/loss of habitat from water diversions
Recreation	Disturbance impacts; introduction or spread of invasive aquatic species; changes in water quality from pollution/debris
Mining	Point and non-point source pollution of waters; reduction of aquatic habitat from water diversion for mine operations
Agriculture	Reduction in aquatic habitat from water diversion for irrigation; reduction in water quality from discharge of pesticides and fertilizers; increased salinity; increased nutrient inputs; changes in riparian vegetation and water temperatures; increased erosion/sedimentation from livestock grazing; changes in stream morphology and flow characteristics
Wildfire, fire suppression, and fuels management	Changes in water quality due to increased surface runoff and sedimentation and discharge of fire retardants into waters
Timber harvest	Changes in water quality due to increased surface runoff and sedimentation from timber and fuelwood harvest and associated road construction

<sup>25</sup> Fish stocking includes legal (private, state, tribal, local, and federal) and illegal (e.g., illegal movement, illegal bait release, illegal aquarium release) stocking.

**Table 33. General categories of actions and associated types of effects included in the analysis of cumulative effects to special status aquatic and semi-aquatic species.**

Types of Actions	Types of Effects to Special Status Aquatic and Semi-aquatic Species
Restoration and conservation	Enhancement, reestablishment, and conservation of habitats (e.g., through elimination of predatory nonnative fishes or other species; construction and maintenance of barriers to prevent fish movement, habitat improvement, and reintroduction of consultation and other special status species)
Climate change	<p>Climate change is a continuing threat to aquatic habitats. Changes in seasonality and the amount of precipitation across the action area can affect the amount of stream flow that occurs over a year. This includes the timing and strength of spring runoff or other seasonal high flows, groundwater recharge that supports base flows, and water available in springs and seeps. These changes not only affect the amount of water in the system but the amount and quality of different habitat types (pool, runs, or riffles), the amount of seasonal connectivity within the system, and water quality parameters. Parameters of particular concern are temperature, dissolved oxygen, and salinity, all of which influence the health of fish and the extremes of which result in mortality. Reductions in aquatic habitat or habitat quality also influence species assemblages, with the most resilient species better able to survive than ones with more narrow physical requirements. Loehman (2010) presents a summary of hydrological concerns for arid lands that are relevant to the action area.</p> <p>Climate change may result in changes in habitat suitability for native and introduced aquatic and semi-aquatic species from increased temperatures and changes in dissolved oxygen concentrations and salinity; contraction of geographic range for species with lower temperature, dissolved oxygen, and salinity tolerances and range expansion for species with higher tolerances; changes in species assemblages to favor species more resilient to changing water quality conditions; loss or reduction of available aquatic habitats, disruption of dispersal corridors, increased predation, increased competition between native and nonnative aquatic and semi-aquatic species, enhanced spread of diseases and parasites, and changes in riparian vegetation from increased temperature coupled with more frequent and longer duration drought.<sup>26</sup></p>

<sup>26</sup> Climate model estimates at the state, subcatchment, or stream unit basis are lacking. Identified effects represent many climate models predicted at a regional (southwest) scale.

**Table 34. Adverse and beneficial cumulative effects on special status aquatic and semi-aquatic species from past, present, and reasonably foreseeable future actions and conditions.**

Types of Effects √- = adverse effect √+ = beneficial effect	Actions and Conditions										
	Fish Stocking	Water Diversion/ Irrigation	Dam Construction and Operation	Urbanization	Recreation	Mining	Agriculture	Wildfire, Fire Suppression, and Fuels Management	Timber Harvest	Restoration and Conservation	Climate Change
Predation	√-		√-				√-			√+	√-
Competition	√-									√+	√-
Hybridization	√-									√+	√-
Spread of parasites, diseases, or aquatic invasive species	√-	√-	√-		√-						√-
Loss of aquatic habitat		√-	√-	√-	√-	√-	√-			√+	√-
Changes in water quality (chemical, biological, and/or physical parameters)	√-	√-	√-	√-	√-	√-	√-	√-	√-	√+	√-
Disruption of migration corridors and genetic isolation	√-	√-	√-	√-		√-			√-	√+	√-
Changes in aquatic habitat and riparian vegetation	√-	√-	√-	√-	√-	√-	√-		√-	√+	√-

#### 6.4.2 Effects of Past, Present, and Reasonably Foreseeable Future Actions

For the past 100–150 years, the effects of human development and land management actions described in Table 33 have had profound negative effects to native aquatic species and their habitats in Arizona (Minckley and Marsh 2009, Vogt 2003, and Minckley 1973). Even as early as 1904, naturalists were documenting the decline and loss of fish habitat and populations (Minckley 1999). Commensurate with that, the effects of climate fluctuations have also had their effects, with some fish and amphibian populations being lost as a result of drought or disease. Past actions and effects to special status aquatic and semi-aquatic species are discussed and summarized in more detail in Chapters 1.0, 2.0, and 4.0 of this Draft EA.

The result of past cumulative effects have led to loss of populations and general declines in the distribution and abundance of many of Arizona’s native aquatic species to the point that 19 of 27 native fish, one frog, and one salamander species are listed under the Endangered Species Act as either threatened or endangered. Two additional fish species, one frog, and one gartersnake are currently candidates for federal listing and are expected to be listed in the near future.

Beginning in the late 1960s, changes were made to state and federal laws and regulations, and new laws were enacted to protect and conserve native aquatic and semi-aquatic species (e.g., the ESA and NEPA). Resource management changed in response to these new laws and because the science showed that past management practices were having an unacceptable effect on native species (e.g., addition of a native fishes conservation program to the AGFD in the late 1960s and AGFD baitfish regulations in 1976). The actions described in Table 33 still occur today and result in negative effects to native species and will continue to occur throughout the duration of this project. However, in some cases, these legal and policy measures have likely reduced the impacts of such actions from those that would be expected without them. One example is the requirement for federal agencies to evaluate and consider impacts to ESA-listed species in land management. In addition, conservation and recovery programs for listed aquatic species have been ongoing since at least 1969, when the first species were listed under the predecessor to the ESA—the Endangered Species Conservation Act. The regulatory background and resource management history are further discussed and summarized in Chapters 2.0 and 4.0 of this Draft EA.

Even with the existing regulation and management environment, additional conservation and recovery actions are needed to reverse the trend of habitat loss, habitat destruction, contamination of habitats with undesirable and incompatible nonnative aquatic species, and ultimately the decline of native aquatic and semi-aquatic species. Many of the problem nonnative species currently persist in habitats across Arizona as a result of past actions. Their mere existence on the landscape will likely result in continued expansion and detrimental effects to native aquatic species in the future unless actions are taken to reverse or reduce their presence. In addition, past habitat changes are still impacting native species and will continue to do so unless habitats are restored and the threats removed from the landscape.

## 6.5 Contributions of the Alternatives to Cumulative Effects

Table 35 compares the contribution of the alternatives on cumulative effects to aquatic and semi-aquatic special status species and considers the implementation of conservation and mitigation measures.

**Table 35. Contribution of the Proposed Action and its alternatives on cumulative effects.**

Alternatives	Cumulative Effects Contribution
Proposed Action	<p>The Proposed Action would result in adverse effects to aquatic and semi-aquatic consultation and other special status species from stocking of nonnative sport fish. These effects would be offset by the Sport Fish Stocking Conservation and Mitigation Program, which would be incorporated into the Proposed Action. In addition to offsetting the impacts of the stocking program, the Sport Fish Stocking Conservation and Mitigation Program includes measures targeted at improving the environmental baseline condition of aquatic and semi-aquatic consultation and other special status species by removing stressors (nonnative species or other stressors) from the stocked watersheds, reestablishing populations of native species, protecting existing populations of native species, and other conservation activities (Appendix P). It is expected that the contribution of the Proposed Action to cumulative effects on native aquatic and semi-aquatic consultation and other special status species would be net positive or, at a minimum, neutral, and that the environmental baseline may be improved for a number of aquatic and semi-aquatic species.</p>
Reduced Stocking Alternative	<p>Compared with the Proposed Action, adverse effects to aquatic and semi-aquatic consultation and other special status species from AGFD sport fish stocking would be reduced due to the removal of stocking sites known to have impacts on listed species. Section 7 consultation would need to be reinitiated and would likely result in the development of a revised conservation and mitigation program with a reduction in the amount of funding and conservation activities commensurate with the reduction of negative effects on special status species.</p> <p>As with the Proposed Action, conservation and mitigation measures would be developed to offset impacts of the action as well as to target improvements to the environmental baseline for a number of aquatic and semi-aquatic species. It is expected that the cumulative effects to native aquatic and semi-aquatic special status species would be neutral at a minimum.</p>
No Action	<p>Under the No Action alternative, there would be no adverse effects to aquatic and semi-aquatic consultation and other special status species from AGFD sport fish stocking and, therefore, no associated conservation and mitigation program would be implemented. Though the No Action alternative would not contribute to the downward trends of special status species, these trends would be expected to continue.</p>

## **7.0 COORDINATION AND PUBLIC INVOLVEMENT**

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### **7.1 Agency and Public Scoping**

Scoping outreach included notices in general-distribution newspapers, postings on agency websites and on-line classified listings, electronic distribution of e-mail notices to multiple e-mail addresses and LISTSERVs, electronic distribution of e-newsletters, and three public meetings. The following summarizes these outreach efforts.

E-mails were forwarded to the following federal and state agencies:

- U.S. Department of the Interior Bureau of Land Management
- U.S. Department of the Interior Bureau of Reclamation
- U.S. Department of Agriculture Forest Service
- U.S. Department of the Interior Geological Survey
- Arizona Department of Environmental Quality

Offer of Consultation letters were mailed to 22 Native American tribes:

- Ak Chin Indian Community
- Chemehuevi Tribe
- Cocopah Tribe
- Colorado River Indian Tribe
- Fort McDowell Yavapai Nation
- Fort Mohave Indian Tribe
- Gila River Indian Community
- Havasupai Tribe
- Hopi Tribe
- Hualapai Tribe
- Kaibab Band of Paiute Indians
- Navajo Nation
- Pascua Yaqui Tribe
- Quechan Tribe
- Salt River Pima-Maricopa Indian Community
- San Carlos Apache Tribe
- San Juan Southern Paiute Tribe
- Tohono O'odham Nation
- Tonto Apache Tribe
- White Mountain Apache Tribe
- Yavapai Apache Nation
- Yavapai-Prescott Tribe

E-mails were sent to the Salt River Project and the Central Arizona Project.

Public open-house-style meetings were held in three AGFD office locations: in Pinetop on November 17, 2008; in Tucson on November 24, 2008; and in Phoenix on November 25, 2008. The purpose of the meetings was to provide information on the Wildlife and Sport Fish Restoration Program, the NEPA process and associated timelines, and program background and purpose and need, and to solicit early input from the public. Presentation boards were displayed for public review, and handouts were provided. Comment forms were made available to attendees. No written comments were received during the meetings.

Notices were placed in three general-distribution newspapers in November 2008: the *Arizona Daily Star*, the *Tucson Citizen*, and the *White Mountain Independent* (Show Low). A legal notice ran in *The Arizona Republic* on February 4, 2009. Media releases were also sent to more than 500 contacts statewide.

Notices were posted on the FWS and the AGFD websites on November 14, 2008, and on the AGFD website on February 5, 2009. Notices were also posted in the classified on-line legal notice section of *azcentral.com* and on the Phoenix area *craigslist.org* site on February 4, 2009.

The scoping process included sending e-mail notices to a number of electronic mailing lists: the Desert Fishes Council, the Wildlife Society, the American Fisheries Society Arizona/New Mexico Chapter, the Native Fish Conservation Team, the Arizona Invasive Species Advisory Council, the Arizona Riparian Council, the American Sportfishing Association, the Arizona Chamber of Commerce, and Partners in Amphibian and Reptiles Conservation.

Notices were e-mailed to the following AGFD e-mail lists: Arizona Invasive Species Advisory Council (AISAC) Advisors/Experts/Stakeholders; AISAC 2 Advisors/Experts/Stakeholders; Angling Groups; Sporting Retailers; Communities–Pinetop, Show Low, and Payson; Communities–General (League of Cities and Towns, Legislators, Counties, etc.); Apache County; Gila County; Graham County; Greenlee County; Navajo County; and Alpine Area Chamber of Commerce.

The project scoping notice was placed in four e-newsletters: *AGFD Fishing Report*, *AGFD Wildlife News*, *AGFD Urban Fishing Bulletin*, and *AGFD Hunting Highlights*.

A summary of the results of scoping is included in Chapter 2.0.

## **7.2 Public Review of Draft EA**

The Notice of Availability of the Draft EA was published in general-distribution newspapers, posted on agency websites and on-line classified listings, and distributed electronically to multiple e-mail addresses, LISTSERVs, and e-newsletters. An electronic copy of the Draft EA has been posted on the FWS and AGFD websites for public review. For additional opportunities to review this document, refer to the “How to Comment on this Draft Environmental Assessment” section that follows the cover of this Draft EA. The Draft EA will be available for review for 30 calendar days. Pertinent comments received on the Draft EA during the public comment period will be addressed in the Final EA.

### **7.3 Agency and Tribal Coordination**

A notification of availability of the Draft EA was e-mailed to the following federal and state agencies: the BLM, Reclamation, the FS, the USGS, and the ADEQ. Notice of Availability letters were also mailed to the 22 Native American tribes listed in Section 7.1.

In compliance with the ESA, the WSFR program initiated formal ESA Section 7 consultation on the action of providing an SFRA grant to the AGFD for the purpose of stocking sport fish in various waters in Arizona from state hatcheries and other sources. The AGFD, the WSFR, and the AESO worked cooperatively to identify federally listed species, candidate species that were likely to be listed in the near future, and critical habitat to be evaluated in this process. The WSFR and the AGFD (as a designated Non-federal Representative), in cooperation with the AESO, have finalized a BA that evaluates the potential impacts of the Proposed Action. The AESO has provided the WSFR and the AGFD with a draft BCO. The Draft EA summarizes the findings of the draft BCO and incorporates as mitigation commitments any conservation measures agreed upon by all parties, any reasonable and prudent alternatives, if appropriate, and any reasonable and prudent measures and associated terms and conditions required by the draft BCO. A final BCO will be released after the FWS has reviewed public comments on the Draft EA and selected an alternative.



## **8.0 PREPARERS AND CONTRIBUTORS**

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This Draft EA has been prepared by the FWS and the AGFD with the assistance of EcoPlan Associates, Inc.

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