RECLAMATION

Managing Water in the West

Draft Environmental Assessment

Blue River Native Fish Restoration Project

Apache-Sitgreaves National Forests
Greenlee and Apache Counties, Arizona

U. S. Department of the Interior
Bureau of Reclamation
Phoenix Area Office

July 2010

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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ACRONYMS AND ABBREVIATIONS

AAC	Arizona Administrative Code
AD	Anno Domini
ADEQ	Arizona Department of Environmental Quality
AGFD	Arizona Game and Fish Department
ASNF	Apache-Sitgreaves National Forests
AZPDES	Arizona Pollutant Discharge Elimination System
BC	Before Christ
BO	Biological Opinion
CAA	Clean Air Act
CAP	Central Arizona Project
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
COE	U.S. Army Corps of Engineers
CWA	Clean Water Act
DOI	Department of the Interior
EA	Environmental Assessment
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FBC	Full Body Contact
FC	Fish Consumption
FONSI	Finding of No Significant Impact
FR	Forest Road or Federal Register
FSH	Forest Service Handbook
FSM	Forest Service Manual
FWS	U.S. Fish and Wildlife Service
G	Goal
GHG	Greenhouse Gas
IRA	Inventoried Roadless Area
ITA	Indian Trust Asset
MIS	Management Indicator Species
MOU	Memorandum of Understanding
MSO	Mexican Spotted Owl
NAAQ	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
OHV	Off-highway Vehicle
OHWM	Ordinary High Water Mark
ORV	Outstanding Remarkable Value
PAC	Protected Activity Center
PL	Public Law

$PM_{2.5}$	Particulate matter with a diameter of 2.5 microns or less
PM_{10}	Particulate matter with a diameter less than 10 microns
Reclamation	Bureau of Reclamation
RS	Revised Statute
S&G	Standards and Guidelines
SHPO	State Historic Preservation Office
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
VQO	Visual Quality Objective
WSR	Wild and Scenic River

CHAPTER 1 – PURPOSE AND NEED

1.1 INTRODUCTION

The Bureau of Reclamation (Reclamation) and the cooperating agencies listed below have prepared this environmental assessment (EA) to analyze the potential effects of a proposed native fish restoration project on physical, biological, and cultural resources. The proposed project includes construction of a fish barrier, mechanical removal of nonnative fishes, and restoration and monitoring of federally listed warm-water fishes in the Blue River and its tributaries, Apache-Sitgreaves National Forests (ASNF), Greenlee and Apache counties, Arizona (Figure 1).

The EA was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (Public Law 91-90), Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500-1508), Department of the Interior (DOI) NEPA regulations (43 CFR 46), and Reclamation NEPA Handbook (2000 Draft). Reclamation is the lead Federal agency and the U.S. Forest Service (USFS), the U.S. Fish and Wildlife Service (FWS), and the Arizona Game and Fish Department (AGFD) are cooperating agencies as defined in 43 CFR 46.225-46.230.

This document is organized into six chapters and appendices:

- ***Chapter 1 – Purpose and Need***. Chapter 1 presents information on the history of the project proposal, the purpose of and need for the project, and the lead agency's proposal for achieving that purpose and need. This chapter also describes public involvement in the NEPA process and lists environmental issues that were raised during internal and external scoping. .
- ***Chapter 2 – Comparison of Alternatives, including the Proposed Action***. Chapter 2 provides a detailed description of the lead agency's proposed action and alternative methods for satisfying the stated purpose and need.
- ***Chapter 3 – Affected Environment and Environmental Consequences.*** Chapter 3 describes the environmental effects of implementing the proposed action and no action. Within each section, the affected environment is described first, followed by a discussion of the potential effects of no action and the proposed action.
- ***Chapter 4 – Agencies and Persons Consulted.*** Chapter 4 identifies persons who contributed to the preparation of this EA and lists agencies and persons consulted during the NEPA process.
- ***Chapter 5 – Environmental Laws and Directives.*** Chapter 5 lists federal environmental laws and directives that are relevant to the project.
- ***Chapter 6 – Literature Cited****:* Chapter 6 lists documents used in preparation of this EA.
- ***Appendices –*** The appendices provide more detailed information to support the analysis presented in this EA.

1.2 BACKGROUND

The proposed Blue River native fish restoration project complements similar projects being implemented by Reclamation and other agencies to assist in the recovery and conservation of federally-listed fish and amphibian species in the Gila River Basin. Reclamation's fish barrier construction program is mandated by a May 15, 2008 FWS biological opinion (BO) that addressed delivery of water through the Central Arizona Project (CAP) and its potential to introduce and spread nonnative aquatic species in the Gila River Basin (FWS 2008).[1] A key conservation measure of the BO requires the construction of fish barriers to "prevent or hinder upstream movements of nonindigenous fish and other [nonnative] aquatic organisms into high-value native fish and amphibian habitats" during the 100-year life of the CAP (FWS 2008).[2] Potential fish barrier sites were selected primarily "to protect existing populations of listed fishes or facilitate the repatriation and stocking of native fishes" into suitable habitat to achieve enhanced status toward recovery (FWS 2008).

A native species management emphasis for certain Gila River Basin streams is desirable to protect rare species and their habitats against nonnative invasions. Native fish populations in the Gila River Basin have deteriorated significantly over the past century and a half to the point that 11 of the 21 native fishes are now listed under the ESA, two are candidates for listing, and one is recently extinct. The remaining species have also declined, and five of them have been recommended for federal listing (Desert Fishes Team 2004). Seven species have been extirpated from the basin, although some have been repatriated with variable success. Only the two native trouts have exhibited noticeable population increases in recent times, and slow progress is being made with five other species (desert pupfish, Gila chub, Gila topminnow, loach minnow, and spikedace).[3]

Many of the Gila River Basin's native amphibian and semi-aquatic reptile populations are also declining. Sonora tiger salamander and Chiricahua leopard frog are federally-listed as endangered and threatened, respectively, northern Mexican garter snake is a candidate species, and northern leopard frog has been petitioned for listing. Eighteen species of native amphibians and semi-aquatic reptiles are listed by the State of Arizona as vulnerable species with the greatest conservation need (AGFD 2010a).

Human-induced physical impacts to aquatic habitats of the Gila River Basin have resulted from construction of dams for water storage, hydroelectric production, and flood control; dewatering of streams due to surface diversions and groundwater pumping for municipal,

[1] The 2008 BO resulted from reinitiated formal consultation between Reclamation and FWS, pursuant to section 7(a)(2) of the Endangered Species Act of 1973, as amended. This BO supersedes 1994 and 2001 BOs on CAP water transfers to the Gila River basin. The 2001 and 2008 BOs include a fish barrier on the Blue River as a conservation measure to be implemented by Reclamation. All three BOs are available at http://www.fws.gov/southwest/es/arizona/Biological.htm.

[2] To date, barriers have been constructed on Aravaipa, Bonita, Fossil creeks, and at Cottonwood Spring. In addition to Blue River, barriers are proposed for Sheehy Spring, Sonoita Creek, O'Donnell Creek, Redfield Canyon, Hot Springs Canyon, Spring Creek (Tonto Creek drainage), and Verde River.

[3] The scientific names of species discussed in this document are listed in Appendix D.

industrial, and agricultural purposes; and watershed perturbations arising from grazing by domestic livestock, harvesting of timber, mining of commercially valuable ores; and habitat loss due to expansion of human populations (Dobyns 1981, Bahre 1991). Concurrent with these physical impacts has been the widespread introduction and establishment of nonnative aquatic organisms that have biologically polluted native fish habitats (Miller 1961, Moyle et al. 1986, Minckley 1991, Fuller et al. 1999, Schade and Bonar 2005, Minckley and Marsh 2009).

Primary avenues by which nonnative species depress and often eliminate native species include predation on early life stages (eggs, larvae, juveniles) and adults, competition, hybridization, habitat alteration, and parasite and pathogen transmission (Propst and Bestgen 1991, Minckley 1991, Johnson et al. 1993, Douglas et al. 1994, Fernandez and Rosen 1996, Kupferberg 1997, Torchin et al. 2001, Rosen and Schwalbe 2002, Stockwell and Leberg 2002, Bonar et al. 2004, Clarkson et al. 2005, Minckley and Marsh 2009, Germaine and Hays 2009, and many others). These effects are often exacerbated by low flow (drought) conditions (Propst et al. 2008). The accumulation of these physical and biological stressors to aquatic habitats (especially in mainstem rivers) has fostered a pattern where native species persist primarily in tributaries or the upper reaches of tributary drainages (FWS 2001).

The widespread situation in the Gila River Basin is that remaining tributary populations of imperiled native fishes usually cannot recolonize habitats from where their species have been extirpated. This is because connecting habitats often are fragmented due to physical perturbations (Fagan et al. 2002, Minckley and Marsh 2009), and large populations of predatory nonnative fishes that reside in mainstem habitats hinder native fish dispersal (Minckley 1999). Not only do nonnatives block recolonization pathways, but they also prevent exchange of genetic material among diverse populations that historically facilitated adaptation to changing environments (Dowling et al. 1996).

A prominent ichthyologist and conservationist summarized this dire situation by stating: "Native fishes of the American West will not remain on earth without active management, and . . . control of nonnative, warmwater species is the single most important requirement for achieving that goal" (Minckley 1991). Practical and effective alternatives for dealing with nonnative biota are presently limited to chemical or mechanical removal or depletion of undesirable taxa. Inevitably, however, such controls are temporary unless accompanied by measures to prevent their reinvasion. The only remedy against reinvasion is to protect a stream drainage with a fish barrier. When accompanied by control of nonnatives upstream, a barrier can effectively segregate natives from nonnatives found downstream. Although there are potential long-term negative impacts to native biota that can arise from such isolation (see Section 3.4), the immediate need is to protect remaining populations against imminent local extirpation. Two reports that specifically reviewed fish barriers in the Gila River basin concluded that barriers are often the only feasible technology to segregate and protect imperiled native fishes (Carpenter and Terrell 2005, Clarkson and Marsh 2010). The same approach to recovery planning for federally-listed trouts across the West has improved or minimally

halted further deterioration of their conservation status (Rinne and Turner 1991, Young 1995, Thompson and Rahel 1998, Avenetti et al. 2006, Pritchard and Cowley 2006).

Reclamation's fish barrier construction program emphasizes streams that can be secured to prevent extinction and stabilize existing rare stocks of native fishes, or that can be renovated to replicate rare stocks of native fishes, especially loach minnow and spikedace that appear to be declining at a faster rate than many other species.[4] The Blue River was identified in the 2008 BO as one of the high-value streams on which a fish barrier would be emplaced. Among the streams considered, the Blue River is particularly noteworthy because it sustains a rare population of threatened loach minnow and is designated as critical habitat for loach minnow. In addition, the mainstem Blue River exhibits the necessary habitat heterogeneity (especially deep, flowing pools, complex shear zones along gravel/sand bars, and eddy habitats downstream of riffles) potentially suitable for repatriation[5] of threatened spikedace and the candidate-for-listing roundtail chub. Key recovery objectives for loach minnow and spikedace are to protect existing populations and to reintroduce populations into suitable habitat within the historic range of the species (FWS 1991a, 1991b). Construction of barriers in streams with populations of loach minnow and/or spikedace is considered by FWS (1991a, 1991b) as a priority 1 action, defined as "absolutely essential to prevent the extinction of the species in the foreseeable future."

1.3 PURPOSE AND NEED FOR ACTION

The purpose of the proposed native fish restoration project is to protect populations of loach minnow and Chiricahua leopard frog that reside in the Blue River drainage against future upstream invasions of nonnative aquatic organisms from the San Francisco River, and to reduce or remove the threat posed by nonnative fishes that presently occupy, or may become established in the future in, the Blue River drainage. This would be accomplished by constructing a fish exclusion barrier on lower Blue River to prevent upstream invasions of nonnative aquatic organisms, in conjunction with mechanically removing nonnative fishes that already occupy the river upstream of the proposed fish barrier. In addition, the project proposes to repatriate spikedace and roundtail chub to the mainstem Blue River upstream of the fish barrier. The success or failure of the project would be assessed via periodic monitoring of the fish community.

The proposed action is needed to meet a key conservation measure of the 2008 BO, which requires a Blue River fish barrier to protect the resident populations of loach minnow and Chiricahua leopard frog, and to facilitate replication of the Eagle Creek or New Mexico Gila River population of spikedace (FWS 2008). Placement of a barrier low in the drainage is needed to minimize fragmentation of the existing loach minnow population.

[4] The status of loach minnow and spikedace is declining rangewide, and the FWS has found that petitions to uplist these species to "endangered" is warranted (59 FR 35303).
[5] Repatriation is defined as the intentional release of individuals of a species into an area formerly occupied by that species (Reinert 1991).

Opportunities for restoration of native fishes in the Gila River Basin are constrained by conflicts with nonnative sportfish management (Clarkson et al. 2005), challenges of controlling or removing firmly established nonnative fish populations, and land ownership issues. The Blue River provides an excellent opportunity because (1) habitats appear suitable for repatriation of spikedace and roundtail chub, (2) a population of loach minnow already occupies a major part of the drainage, (3) nonnative warm-water fish populations are presently small, (4) natural bedrock landforms provide solid anchor points for a fish barrier, and (5) the project area is located on National Forest System (NFS) lands.

1.4 PROJECT LOCATION

Construction of the fish barrier is proposed on the Blue River approximately ½ mile north (upstream) of the confluence with the San Francisco River in Section 31 of Township 2 South, Range 31 East of the Gila and Salt River Baseline and Meridian (Figures 2 and 3). Initial mechanical removals of nonnative fishes and native fish repatriations or augmentations would affect an 11-mile reach of the Blue River between the barrier and Fritz Ranch, but future efforts for both of these activities, if needed, could include other portions of the mainstem Blue River and its perennially wet tributaries in Greenlee County and Apache counties (Figure 1).

1.5 DECISION FRAMEWORK

The Responsible Official for Reclamation (Area Manager of the Phoenix Area Office) must authorize the expenditure of Reclamation funds to implement the proposed action, or decide to take no action. If the EA demonstrates that there are no significant effects, the Area Manager would record this determination in a Finding of No Significant Impact (FONSI) and approve funding for construction of the fish barrier and repatriation of spikedace and roundtail chub.

The Responsible Official for the USFS (ASNF Supervisor) must decide whether to authorize construction of the fish barrier on NFS lands, or to continue with current management. If the EA demonstrates that there are no significant effects, the ASNF Supervisor would record this determination in a FONSI/Decision Notice and authorize construction of the fish barrier through issuance of a special use permit.

The AGFD, in cooperation with the USFS, FWS, and Reclamation, would coordinate the removal of nonnative fishes and repatriation of spikedace and roundtail chub as described under the proposed action. Nonnative fish removal and native fish stocking would be conducted in accordance with the existing Memorandum of Understanding (MOU) between the AGFD and the Southwestern Region of the USFS for management and conservation of fish and wildlife populations on NFS lands in Arizona (USFS 2010).

1.6 CONSISTENCY RESOURCE MANAGEMENT PLANS AND POLICY

The ASNF manages NFS lands in the Blue River watershed in accordance with the *Apache-Sitgreaves National Forests Plan* (Forest Plan), as amended (USFS 1987), and other national policy and direction, including the Endangered Species Act (ESA). The proposed action was determined to be consistent with the following forest-wide goals (G) and standards and guidelines (S&G) outlined in the Forest Plan:

- Protect areas that contain threatened, endangered, or sensitive species (G, page 15).

- Cooperate with AGFD on proposals for reintroduction of extirpated species into suitable habitat (G, page 15).

- Maintain habitat to maintain viable populations of wildlife and fish species and improve habitat for selected species (G, page 15).

- Manage threatened and endangered animal, fish, and plant habitat to achieve declassifying in a manner consistent with the goals established by the FWS and AGFD (S&G, page 46).

- Habitat management for federally listed species will take precedence over unlisted species (S&G, page 46).

- Implement threatened and endangered species recovery plans (S&G, page 46).

USFS policy is to recover threatened and endangered species so that special protective measures provided under the ESA are no longer necessary (FSM 2602), and to ensure, through appropriate management practices, that non-listed native species do not become threatened or endangered because of USFS actions (FSM 2670). Policy also is to encourage or initiate reintroduction of listed species onto suitable unoccupied habitat when such actions promote recovery of the species (FSM 2674). The National Forest Management Act of 1976 (PL 104-333, as amended) requires the USFS to provide for the biological diversity of national forests consistent with overall multiple-use objectives of the planning area and to maintain viable populations in the planning area. In accordance with these policies, the USFS has installed, or is working cooperatively with other federal and state agencies to install, fish barriers to protect native fish habitat within seven National Forests of the Southwestern Region (Apache-Sitgreaves, Carson, Coconino, Gila, Prescott, Santa Fe, and Tonto).

In addition, section 7(a)(1) of the ESA requires all federal agencies to utilize their authorities to carry out programs for the conservation of threatened and endangered species.

1.7 PUBLIC INVOLVEMENT

Scoping. The Council on Environmental Quality defines scoping as "…an early and open process for determining the scope of issues to be addressed and for identifying significant issues related to a proposed action" (40 CFR 1501.7). Scoping is an important underpinning of the NEPA process that encourages public input and helps focus the environmental analysis on relevant issues. Distribution of scoping information typically heralds the beginning of the public component of the NEPA process.

Initial scoping was conducted in 2004, and included listing the proposal on the ASNF Schedule of Proposed Actions and mailing scoping information to affected or interested individuals, agencies, and organizations. Distribution of the scoping notice was followed up with a community meeting in Blue, Arizona, on March 5, 2005.

The 2004 scoping notice solicited public comment on two proposals: (1) construction of small fish barriers, application of a piscicide to remove nonnative fishes, and reintroduction of Gila trout in several headwater streams of the Blue River drainage (identified in the scoping document as the USFS proposal); and (2) construction of a fish barrier on the mainstem Blue River and repatriation of specified native warm-water fishes (identified in the scoping document as the Reclamation proposal). After consideration of public input, the agencies decided to address each proposal in separate NEPA compliance documents. The two proposals are not connected actions, as defined under CEQ regulations at 40 CFR 1508.25(a), and thus can be addressed separately.

A revised scoping notice soliciting public comment on the Reclamation proposal described in this EA was distributed to 121 individuals, organizations, and agencies on March 12, 2009. Reclamation posted the scoping notice on its Phoenix Area Office web site (*http//:www.usbr.gov/lc/phoenix*) and submitted news releases regarding the proposal to 9 news media outlets including the *Arizona Republic*. In addition, public scoping meetings were conducted in the communities of Blue and Clifton on March 21 and 28, 2009, respectively. Forty-four individuals attended the meeting in Blue, and 8 individuals attended the meeting in Clifton. Eight comment letters and e-mails were received by Reclamation in response to the 2009 scoping notice and public meetings.

Scope of Issues. The lead agency is ultimately responsible for determining the scope of issues considered in an environmental document (36 CFR 46.235). During internal and external (public) scoping, environmental issues identified by program specialists, other agency staff, and the public helped Reclamation define the range of resource topics that are addressed in this EA and served as the basis for developing mitigation.

The following environmental issues were identified as a result of internal and public scoping in 2004 and 2009:

- Effects of the project on river hydraulics, fluvial morphology, scour, and sediment transport. See section 3.3.
- Effects of the project on soils and geology. See section 3.2.

- Need for crayfish control. There are no proven methods to eliminate crayfish from a stream network; consequently, crayfish control is not included in the proposed action. Their continued presence is not expected to jeopardize the proposed native fish restoration project.
- Effects of the project on Wild and Scenic River eligibility. See Chapter 3.1.
- Effects of the project on a Blue River road right-of-way claimed by Greenlee County under Revised Statute (RS) 2477 of the 1866 Mining Act. RS 2477 was originally intended to grant rights-of-way to construct roads across public lands that were not otherwise reserved or set aside for other public use. Although RS 2477 was repealed by Congress in 1976, existing claims were grandfathered. Greenlee County claims the right-of-way to an historic road that formerly ran up the lower Blue River through the proposed barrier site. No traces of the road remain today. This is not a key issue because any future road through the area could be ramped over the fish barrier to accommodate passage of vehicular traffic; therefore the project would not preclude road development or interfere with RS 2477 claims.
- Effects of the project on cultural resources. See section 3.5.
- Effects of the project on water-based recreation and equestrian use. See section 3.1.
- Effects of the project on potential wilderness eligibility of the lower Blue River. See section 3.1
- Effects of the project on visual resources. See section 3.6.
- Effects of the project on dispersal of invasive plants and water-borne pathogens. See section 3.4.2.
- Effects of the project on federally-listed fishes and their habitats. See section 3.4.9.
- Ability of the barrier to survive large-magnitude floods. See section 2.2.1

No issues identified within the scope of the project were of sufficient concern to drive the development of other action alternatives.

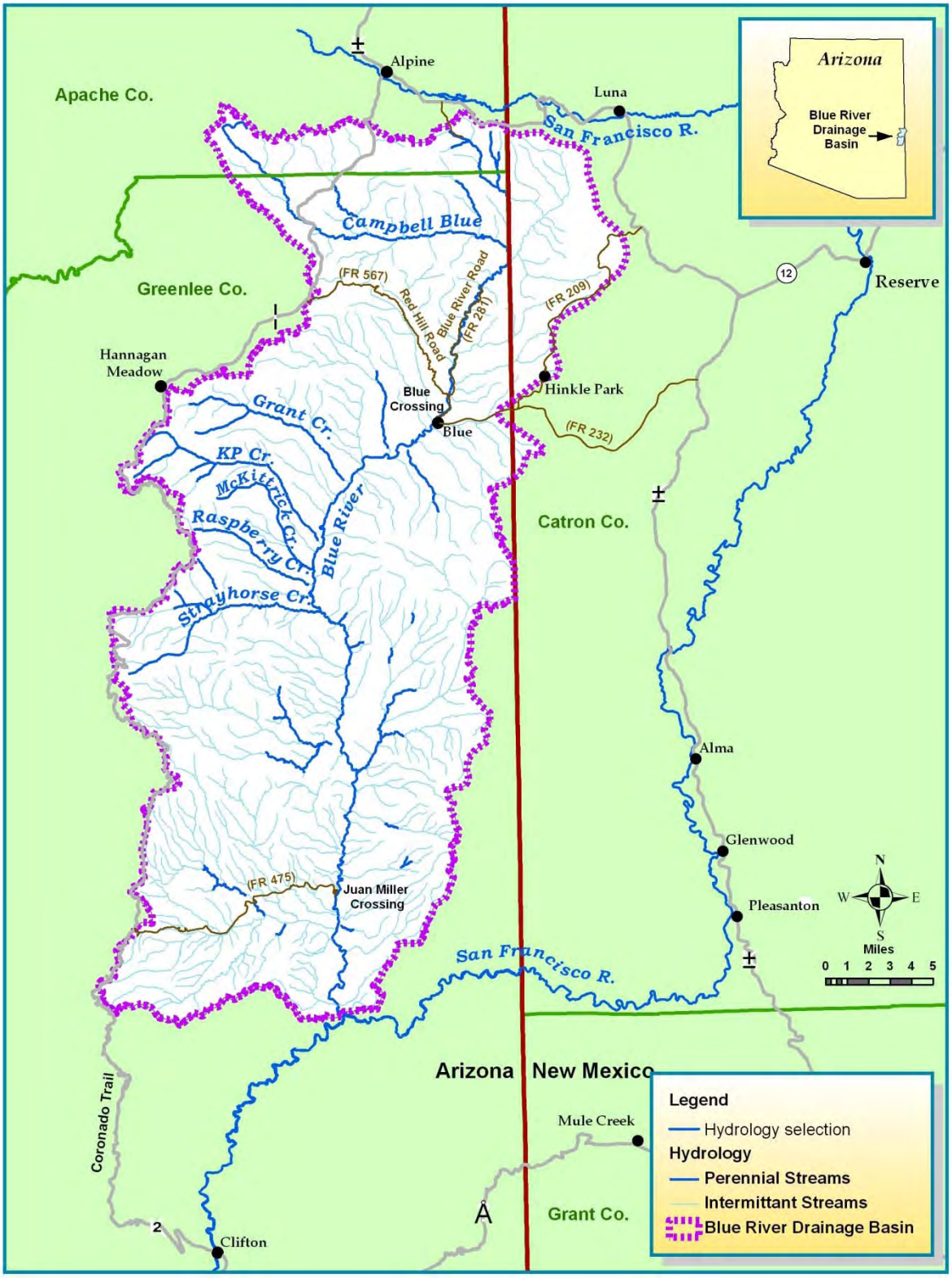

Figure 1. Blue River drainage.

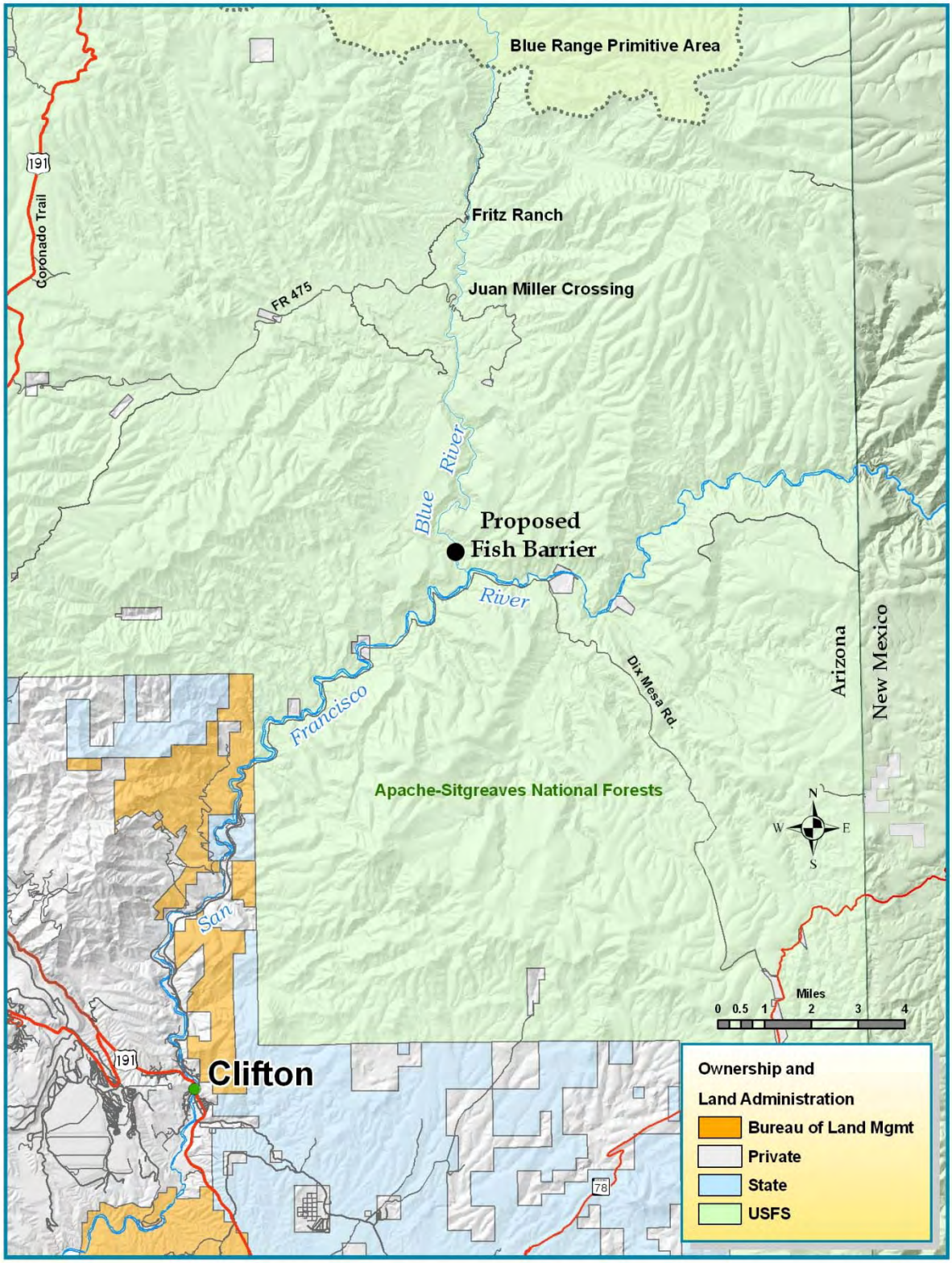

Figure 2. Map of lower Blue River.

Figure 3. Location of proposed fish barrier and temporary contactor use area.

CHAPTER 2 – DESCRIPTION OF THE ALTERNATIVES

This chapter describes in detail the alternatives considered for the proposed Blue River native fish restoration project. These consist of the proposed action and no action, which are analyzed in Chapter 3. Also described are planning alternatives that were considered but eliminated from detailed evaluation.

2.1 NO ACTION

Section 102(2)(E) of NEPA requires that no action must be considered as an alternative in an environmental review whenever there are unresolved conflicts about the proposed action with respect to alternative uses of available resources. A description of no action is also customarily used in an EA to provide the baseline for comparison of environmental effects of the action alternatives against conditions that are representative of the status quo. As considered in this EA, if no action is taken, Reclamation would not construct the proposed fish barrier. Under the fish and wildlife management authority conferred to the AGFD by the State of Arizona, AGFD could eradicate nonnative fishes and repatriate/augment native fish populations pursuant to the existing MOU with the USFS; however, these actions would not be practical without the fish barrier because of the certainty of nonnative reinvasions from the San Francisco River.

2.2 PROPOSED ACTION

The proposed Blue River native fish restoration project would be implemented by Reclamation and AGFD, in cooperation with the USFS and FWS, to meet the purpose and need stated in section 1.3. It consists of four primary elements: (1) construct a barrier to prevent upstream incursion of nonnative fishes from the San Francisco River; (2) employ mechanical methods to eradicate problematic nonnative fishes in the Blue River and its tributaries above the barrier; (3) stock roundtail chub and spikedace into suitable habitat in the Blue River drainage; and (4) monitor fish populations in the drainage following restoration.

The proposed action is described in greater detail in the following sections.

2.2.1 Fish Barrier

Site Selection. Potential barrier sites were identified through a process that included examination of topographic maps, aerial surveys, site visits by Reclamation and cooperating agency staff, and geotechnical investigations performed by Reclamation engineers and geologists. Four sites between the Forest Road (FR) 475 low-water stream crossing (also known as the Juan Miller crossing) and the confluence with the San Francisco River were initially considered. Three of these sites received further geotechnical review in September 2000 (Reclamation 2002). These sites differed in terms of abutment rock characteristics, channel width, and distance upstream from the confluence of the Blue and San Francisco Rivers, as follows: (1) *Juan Miller sit*e - well-cemented and moderately hard fanglomerate, 300 feet wide, 8.5 miles upstream; (2)

downstream site A - moderately hard tuft, 235 feet wide, ½ mile upstream; and (3) *downstream site B* - moderately hard tuft and basalt, 230 feet wide, ¼ mile upstream. A prominent fault which offsets tuff against fanglomerate was evident near the Juan Miller site. No faults were apparent in the tuff forming the canyon walls at the two downstream sites. Abutment rock at all sites was determined to be suitable for emplacement of a barrier; however, potential effects associated with backwater flooding from the San Francisco River eliminated detailed review of downstream site B.

Bedrock occurs at unknown depths greater than 60 feet below the channel at the sites where Reclamation conducted geotechnical investigations.[6] A barrier emplaced at any one of these sites would need to be anchored to bedrock along the abutments for stability and keyed into the alluvium to a depth greater than the scour potential.

Because the proposed barrier is intended, in part, to mitigate effects of the CAP on threatened or endangered native fishes, biological considerations were foremost in weighing site-selection criteria. Fragmentation of the existing loach minnow population is a key concern for the project. Therefore, only the preferred site was selected for the proposed barrier because it would protect the greatest length of stream, fragment less habitat and cause less impact on genetics of loach minnow and other native aquatic species, and satisfy the intentions of the 2008 BO to conserve existing populations of loach minnow and facilitate introduction of spikedace in the Blue River.

Fish Barrier Construction. The proposed fish barrier would consist of six key features (see Appendix A, Figures A-1 and A-2): (1) a 4-foot-high arched drop structure placed across the 235-foot-wide channel; (2) a sloped concrete apron spanning the width of the drop structure to prevent plunge pool development; (3) buried upstream and downstream scour walls to help anchor the barrier and prevent scour from undermining the structure; (4) a buried energy deflection block across the entire width of the streambed to reduce downstream scour, (5) a buried training wall to prevent scour near the left (east) abutment, and (6) a flood berm armored with rock gabions or soil cement placed along the east bank above the training wall. The optimum barrier design was determined through prior Reclamation experience with construction of similar barriers, criteria developed by the National Marine Fisheries Service (NMFS 2008), and physical and numeric hydraulic modeling and sedimentation analysis conducted at Reclamation's Hydraulics Laboratory in Denver, Colorado (Reclamation 2010a, 2010b, 2010c).

The proposed design would distribute the load exerted by the river and channel alluvium to the abutments without the need for other substantial supporting elements such as caissons, thereby reducing the amount of excavation and concrete required during construction.[7] Addition of the buried energy deflection block, buried training wall, and flood berm was determined through hydraulic modeling to be an effective method for reducing local channel scour.

[6] Auger holes were drilled at potential barrier sites to assess depth to bedrock. Test pits were excavated to determine gradation of the alluvium and depth to ground-water.
[7] Reclamation considered slurry wall construction to reduce the size of the foundation excavation, but this method was rejected because it would require considerably more concrete and aggregate processing.

The proposed flood berm would be constructed to a height of 18 feet above the existing thalweg of the river (or approximately 14 feet above the surface elevation of the east bank). Constructed of mounded alluvium, the sides would be sloped at a 45 degree angle and armored with gabions or soil cement. Without the berm, the hydraulic model predicted that flood flows associated with a 100-year event would circulate against the left abutment and induce significant plunge flow and erosion on the left side of the fish barrier. Emplacement of the berm would interrupt this circular flow pattern and reduce channel degradation.

The sequence of construction would consist of mobilization (delivery of equipment and setup of the contractor use area), site preparation (channel diversion, excavation, dewatering, and grading), placement of concrete, and demobilization (site restoration and removal of equipment). Standard excavation methods would be used to prepare the foundation trench for placement of the scour walls. Sand and gravel extracted from this trench would be temporarily stockpiled outside the wetted perimeter of the channel for reuse in concrete batching if concrete is batched onsite and as backfill. Channel alluvium adjacent to the foundation trench would be dewatered with shallow subsurface pumps to keep the excavation free of water during construction.

Concrete would be placed in several phases to allow for stream diversion. River flow would be diverted with dikes or piped around active work areas. The reinforced concrete barrier would be anchored to abutment bedrock with anchor bars and keyed into the channel alluvium to ensure stability against forces induced by a 100-year flood, as determined by hydraulic modeling and engineering. Visible portions of the barrier (drop structure and apron) would be washed to expose aggregate in the concrete to reduce the contrast between the structure and the natural setting. The dominant grayish hue of alluvial material in the streambed would be similar to the color of the concrete.

At the end of construction, dewatering pumps would be removed, and diversion berms and any surplus stockpiles of excavated alluvium would be spread along the upstream side of the barrier. All unused construction material would be removed when the project is finished. Construction would require approximately 4 months, commencing in late September. Fall construction is preferable to avoid high river flows that result from snowmelt (February through April) and monsoon storms (late June to mid-September), and the breeding season of most avian species.

The barrier would be designed to have a minimum lifespan of 100 years.

Construction Access and Staging. The proposed barrier site lacks suitable ground access for construction. Therefore, vehicles (skip loaders, small hydraulic excavator, small bulldozer, and small crane), equipment (portable generators and possibly a small concrete batch plant), materials (cement, rebar, and forms), fuel, sanitary facilities, and other construction-related items would be airlifted by helicopter (Erickson Air-Crane or equivalent) directly to the work area. A smaller helicopter would be used to transport work crews, supplies, and wet concrete if an offsite batch plant is used. Reclamation anticipates 500-1000 flights would be required during construction. Flights would

originate from a road accessible location somewhere near Clifton and follow the San Francisco River corridor to the Blue River. Flight operations would be coordinated with ASNF. A construction crew of less than 10 workers and a Government inspector would camp onsite.

A contractor use area would be established on a 1.4-acre terrace a short distance upstream of the barrier to stage equipment and materials (Figure 3). The surface of the terrace, which is approximately 12 feet higher than the invert of the channel, is above the delineated ordinary high water mark (OHWM) of the river at that location.[8] Activities affecting the contractor use area include equipment, material and fuel storage, and possibly concrete batching. If an onsite batch plant is used, discharges of process wastewater from concrete batching would be contained in a lined and bermed basin in accordance with a Type 1 Aquifer Protection General Permit and AZPDES Construction General Permit (AZG2008-01). Secondary containment would also be required for fuel containers. Following construction, the contractor use area would be graded to restore the original ground contour and seeded with a native plant mixture approved by the USFS.

Fish Barrier Operation and Maintenance. The fish barrier would become a feature of the CAP. Inspection and maintenance would be performed by the Central Arizona Water Conservation District. Operation of the structure would require annual inspections, and inspections after major flood events (5-year frequency or greater). Inspectors would hike or travel on horseback to the barrier from the nearest road accessible location, or travel by helicopter. Any maintenance or repair requiring materials and equipment that could not be carried to the site would be performed using measures and techniques similar to those described in the above sections for barrier construction, staging, and access. Substantial maintenance or repair would require supplemental NEPA review, approval by Reclamation, and coordination with ASNF.[9]

Fish Barrier Function. The fish barrier is intended to preclude upstream movement of fishes during periods of base flow and the portions of ascending and descending stages of floods that do not completely inundate the drop structure. At flows associated with peak floods that may submerge the fish barrier's crest at the abutments, high water velocity would be the primary hindrance to the upstream movement of nonnative fishes.

The 4-foot height of the drop structure from crest to apron is greater than the leaping abilities of warm-water fishes. One of the key purposes of the sloped apron is to ensure that flow velocities are swift and shallow, thereby minimizing opportunities for fishes to attempt leaps over the vertical drop. In addition, the barrier crest and apron surface will

[8] The jurisdictional delineation of the OHWM for the construction area is on file with the U.S. Army Corps of Engineers.

[9] Substantial repair includes replacement of damaged concrete or placement of fill material in scour holes. Hydraulic modeling for the 100-year frequency flood does not predict scour will be problematic for the barrier. No fish barriers constructed pursuant to the CAP biological opinions have experienced significant damage to structural components.

rise in elevation toward the abutments, thereby ensuring that a 4-foot drop is maintained across the entire width of the canyon.

2.2.2 Eradication of Nonnative Fish.

An intensive fishery survey of the lower Blue River from the confluence with San Francisco River upstream to Juan Miller crossing was conducted by Reclamation and contract biologists during May 19-22, 2008 (Clarkson et al. 2008). The major findings and recommendations of that report were:

> "We find little justification at this time for piscicide application to remove non-native fishes from lower Blue River. The two large predators, channel catfish and flathead catfish were present in relatively low numbers and found only in pool habitats with little cover. All specimens were >35 cm total length, and there was no evidence of reproduction and recruitment by either of these species. We postulate that these individuals are immigrants from the San Francisco River that have taken up residence in suitable habitats, and environmental conditions (e.g., discharge extremes, water temperature, quality, or chemistry) have precluded their reproduction or recruitment. We believe these large adults could be controlled or eliminated by physical removal (see below). Carp and red shiner both were rare and restricted to the lowermost reach near the mouth. These likely represented transients from the San Francisco River. Their future presence further upstream or in greater abundance in Blue River would be cause for concern, but that is not currently the case. Fathead minnow also was rare, albeit more generally distributed. We are unaware of situations where low numbers of this species represents [*sic*] a threat to native fishes. Finally, trouts are known to occur far upstream in Blue River and its cold water tributaries, and there is a privately-owned hatchery on the stream. Thus, trouts may be expected to occur sporadically almost anywhere downstream during colder seasons; however, they are unlikely to persist through the warm summers. Of interest, we encountered no centrarchids or bullhead catfishes, which are present in the San Francisco River.
>
> "We recommend mechanical removal of channel and flathead catfishes (plus other large bodied predatory fishes, if encountered) prior to barrier construction. During this survey, a single snorkel diver with a dip net was successful in removing a substantial proportion of those individuals encountered, so efficacy of the method is generally validated. Iterative attempts by multiple snorkelers, some perhaps equipped with hand-held spears, have potential to detect and remove all predatory fishes from the reach, especially if activities are conducted during lowest flow periods (e.g., less than 5 cfs) when these species are restricted to nearly-isolated pools and thus easily targeted. This activity could be repeated as necessary if deemed appropriate on the basis of post-construction monitoring."

It is noteworthy that during this survey virtually no native fishes (except large Sonora sucker) were observed in pools occupied by catfish (R. Clarkson, Reclamation, personal observation). Other pools without catfishes typically held schools of post-larval natives and scattered larger individuals of native species. The strong inference is that the large nonnative predators were consuming or displacing native fishes within the pools they inhabited, demonstrating the impact nonnatives have on native fish populations in the mainstem Blue River.

On June 1-3, 2009, AGFD personnel also conducted mechanical removal of nonnative fishes from the lower 11-mile reach of the Blue River. They removed 70 channel catfish, 4 flathead catfish, 3 rainbow trout, and 1 common carp from Blue River downstream of Fritz Ranch. Under the proposed native fish restoration project, mechanical removal of

nonnative fishes in the lower Blue River mainstem would be periodically repeated before and after the proposed fish barrier is constructed in an attempt to eliminate or control this stressor to native species. Mechanical removal of nonnative warm-water fishes from other portions of the Blue River and its tributaries would also be performed if nonnative populations expand and appear to be depressing native fish populations. Methods of mechanical removal could include netting, trapping, spearing, angling, electrofishing, or use of other standard fishery sampling equipment.

2.2.3 Repatriations of Native Fish.

Repatriations of spikedace and roundtail chub to the lower Blue River would be coordinated among AGFD, USFS, FWS, and Reclamation. These species would be stocked into suitable habitats throughout the lower Blue River downstream from Fritz Ranch. The transplants would also include one or more annual augmentations of individuals following the initial stocking events to ensure species establishment and that the established populations adequately reflect genetic variability inherent within the donor populations. Post-stocking monitoring (see Monitoring section below) will determine the success of the repatriations. Genetic sampling will determine the genetic representativeness of the new populations relative to the donor populations.

Spikedace. Although there are no records of spikedace from the Blue River, it is within historic range[10] of the species, and spikedace is known from Eagle Creek immediately to the west of Blue River and historically from the San Francisco River in New Mexico. Habitat conditions appear suitable for establishment of this species in the Blue River. It is proposed here to capture spikedace from Eagle Creek or another geographically-proximate population (e.g., Gila River in New Mexico) and either directly transplant them to the Blue River above the fish barrier or propagate them in a hatchery facility to build up their numbers and then transplant them to the Blue River. Chapter 3 provides additional information regarding spikedace.

Roundtail chub. Although there are no certain records of roundtail chub from the Blue River, it is within historic range of the species, and roundtail chub is known from lower Eagle Creek, the drainage immediately to the west of the Blue River, and (until recently) from the upper Gila River mainstem in Arizona. Habitat conditions appear suitable for establishment of this species in the Blue River. It is proposed here to capture roundtail chub from Eagle Creek or another geographically-proximate population (e.g., Aravaipa Creek) and either directly transplant them to the Blue River above the fish barrier, or propagate them in a hatchery facility to build up their numbers and then transplant them to the Blue River. Chapter 3 provides additional information regarding roundtail chub.

[10] Historic or native range refers to the geographic area occupied by a species before human intervention, including interconnecting waters where it reasonably occurred (Minckley 1995).

2.2.4 Monitoring

A 5-year monitoring program would be established after the barrier is constructed in an attempt to detect any incursion of new nonnative fishes, and to monitor responses of native fishes. This monitoring would be funded by Reclamation and developed in cooperation with AGFD. Surveys of the fish community in lower Blue River above the constructed barrier would be undertaken to determine presence/absence of nonnatives, document relative population sizes of natives, and detect reproduction and recruitment of native fishes. Methods would include electrofishing, snorkeling, seining, and netting. This specific monitoring program would span a 5-year post-construction period, and a lesser effort would likely continue into the foreseeable future as part of a long-term native fish recovery program.

Monitoring of the genetic variability of the repatriated populations (spikedace and roundtail chub) would be initiated following documentation of reproduction and recruitment, and augmentation stockings, probably 3-5 years following the initial repatriation. Non-lethal fin clips would be collected from a representative sample of each species (30-50 individuals) and provided to a recognized genetics laboratory with experience working with both species (e.g., Arizona State University) for comparison to archived samples from the donor population. Comparisons would determine the need for possible additional augmentations from the donor populations.

2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Several planning alternatives were considered but eliminated from detailed analysis for reasons stated below.

FR 475 (Juan Miller Road) Low-Water Crossing Site. An alternative barrier site was investigated at the FR 475 low-water crossing. A barrier at this site offers the easiest construction access, the lowest construction costs, and grade control for the channel at the road crossing. However, at approximately 8.5 miles above the mouth, the barrier would protect the least amount of stream among the sites considered. It would also isolate all loach minnow and other native fish populations in the portion of the Blue River below the barrier from those populations above, a situation the FWS concluded was biologically undesirable (FWS 2000). This would increase the probability that the lower truncated population would be lost due to random extinction events, while further fragmenting the population upstream of the barrier. If such an extinction event was to occur below the Juan Miller site, it would represent a loss of approximately 16 percent of the 53 miles of mainstem Blue River habitat occupied by loach minnow.

The Juan Miller site also is contiguous with FR 475, a public road that provides access from Highway 191 and the upper and lower Juan Miller campgrounds to the Blue River. Proximity of FR 475 and associated recreational traffic increases the vulnerability of a barrier at this site to public use and intentional or inadvertent human transfer of nonnative

fishes over the structure into the upstream reach of river. Such transfers would negate the functional utility of the barrier.

Other Lower Blue River Sites. A primary consideration for selecting a location for the barrier was to minimize fragmentation of the existing loach minnow population. Reclamation first investigated a site closer to the confluence with the San Francisco River, but hydraulic modeling determined the area would be inundated by backwater flooding from the San Francisco, and under such conditions the barrier could fail to prevent invasions by nonnative fishes. An alternative site approximately 3 miles above the mouth was found to have desirable characteristics such as narrow canyon width and solid rock abutments, but it would exclude 3 miles of occupied loach minnow habitat.

Use of Ground Access for Construction. The Blue River downstream of Juan Miller Crossing is remote and difficult to access other than by helicopter, float (limited to certain times of the year when flow is sufficient), horseback, or hiking. Reclamation considered construction of a temporary haul road to transport work crews, inspectors, tools, and heavy equipment to the proposed barrier site. Under this planning alternative, crews would have the option to camp onsite in order to reduce daily traffic volumes. Construction materials (including rebar, dry cement, formwork, batch plant components, and riprap), fuel, and sanitary facilities would be transported by truck. Concrete would be batched onsite. This alternative was rejected because it would require modification of an existing public road over Dix Mesa, construction of several new road segments between the approach to Dix Mesa and the San Francisco River, and construction of a temporary haul road down the San Francisco River (utilizing the remnants of FR 212) and up the Blue River to the proposed barrier site. Approximately 3 miles of new haul road would be required, including a section of road that would cross the Lower San Francisco Inventoried Roadless Area (IRA) east of the confluence of the Blue and San Francisco rivers. The additional direct and indirect environmental effects of road construction and road improvement in steep or unstable terrain, including numerous crossings of the San Francisco River, rendered this planning alternative substantially less desirable than the proposed action.

CHAPTER 3 – ENVIRONMENTAL CONSEQUENCES

Resource areas of primary concern that could be affected by the proposed Blue River native fish restoration project include the following: land use and recreation, geology and soils, water quantity and quality, biological resources, cultural resources, and air quality. This chapter describes the existing conditions of these resources within the project area and the potential environmental consequences resulting from the construction and operation of the proposed barrier, repatriation and augmentation of native fishes, and eradication of nonnative fishes from specified areas. The consequences of no action also are described for each of the resources identified above, as a basis for comparing the potential effects of the proposed project. Socioeconomic resources are not expected to be affected and are not discussed in this EA.

3.1 LAND USE AND RECREATION

3.1.1 Affected Environment

The proposed fish barrier construction area would straddle the western boundary of the 59,124-acre Lower San Francisco IRA (see Appendix B, Figure B-1). USFS policy limits the construction of permanent roads in roadless areas, although some improvements, including constructed facilities, are acceptable. Practically all of the area encompassing the Blue River between the Blue Range Primitive Area and the San Francisco River, including the Lower San Francisco IRA, is under evaluation by the USFS for potential wilderness designation (USFS 2009a). Comprising an area of approximately 155,800 acres, the West Blue/San Francisco potential wilderness (PW-03-01-052) evaluation is being conducted as part of the Forest Plan revision process for ASNF.[11]

The 15-mile reach of Blue River between the Blue Range Primitive Area and the San Francisco River is classified under the ASNF Recreation Opportunity Spectrum system as "semi-primitive non-motorized." Within this recreational setting, visitors expect to find an environment that is predominantly natural; where opportunities for solitude are less than in primitive areas, but user density remains low; and where motorized activities are prohibited (USFS 2005). The FR 475 low-water crossing and the spur road to Fritz Ranch are the only roads that impinge on the lower Blue River. Public use of FR 475 is light to moderate.

Overland travel along the 8.5 miles of river downstream of FR 475 is possible only on foot or horseback. Within this area, there are no developed trails or recreation sites, and public use is light and dispersed. Recreational activity along the lower river consists of hiking, backpacking, hunting, and horseback riding (including packing by licensed and permitted outfitters and guides). Sporadic use by anglers also occurs. Paralleling the San Francisco River near the mouth of the Blue River are remnants of FR 212, a primitive

[11] A recommendation for wilderness designation would require a detailed analysis of impacts in accordance with NEPA, public hearings, and legislation in Congress.

road that is passable during parts of the year but is usually washed out in several locations and inaccessible by most users. Off-highway vehicle (OHV) traffic periodically enters the lower Blue River from FR 212, despite a prohibition on motorized travel in this area.

The Blue River drainage north of Fritz Ranch offers a variety of recreational opportunities including limited fishing for trout (primarily in perennial tributaries), swimming, hiking, backpacking, hunting, camping, horseback riding and guide services. Thirteen miles of Blue River bisect the 173,762-acre Blue Range Primitive Area, which is managed as wilderness and offers a primitive recreational experience. A short distance north of the Blue Range Primitive Area is the community of Blue, which consists of dispersed residential and ranching properties situated within the river corridor. Forest Roads 281 (Blue River Road), 567, and 232 are the principle motorized routes between the community of Blue and highways 191 and 180.

During periods of optimal flow, limited use by whitewater rafters and kayakers occurs in the 34-mile reach of river between Blue Crossing and FR 475, although anecdotal evidence from residents along this segment suggests such use has been practically nonexistent in recent years. Very little if any rafting and kayaking occurs between the FR 475 crossing and San Francisco River.

There are no significant extractive uses along the Blue River such as commercial timber harvesting or mining, although limited extraction and storage of aggregate occurs on private land and is pending ASNF approval on NFS land outside the active channel in the upper drainage. Water diverted from the Blue River supports irrigated agriculture, pastures, stock-watering, and fish rearing ponds on private land in the upper 25 miles of river corridor. Ranching is an important use on private lands and permitted areas of ASNF. Livestock grazing is prohibited on NFS lands within the Blue River corridor.

Suitability of the Blue River for inclusion in the National Wild and Scenic River (WSR) System is presently under review by ASNF. In the 1993 *Resource Information Report, Potential Wild-Scenic-Recreational River Designation, National Forests in Arizona*, the Blue River was found to be eligible for inclusion in the national system based on the presence of seven outstandingly remarkable values (ORVs): scenic, recreation, fish, wildlife, historic, prehistoric, and vegetation. This determination was updated in the 2009 *Eligibility Report for the National Wild and Scenic River System, Apache-Sitgreaves National Forests*, which classified the Blue River into four segments, as follows: segment 1 as Recreational (25 miles of river from the confluence of Campbell Blue and Dry Blue creeks to Bear Creek), segment 2 as Wild (16 miles of river from Bear Creek to ¼ mile north of the Blue River Trailhead), segment 3 as Scenic (4 miles of river from ¼ mile north of the Blue River Trailhead to ½ mile south of FR 475), and segment 4 as Wild (8 miles of river from ½ mile south of FR 475 to the San Francisco River). There is no specific direction in the Forest Plan for managing eligible rivers; however, USFS policy for WSR evaluation (FSH 1901.12, Chapter 80) provides interim management guidelines for protecting the water quality, free-flowing character, and ORVs of eligible segments. The native fish restoration project accelerated the need for suitability review, separate from land management planning, in order for ASNF to

consider the proposed fish barrier and determine which, if any, of the eligible river segments should be recommended for inclusion in the National WSR System. Under the Wild and Scenic Rivers Act of 1968, federal agencies are prohibited from assisting in the construction of any water resources project that would have a direct and adverse effect on a designated river. NFS lands on river segments recommended for inclusion in the National WSR System would be managed by the direction developed through a Comprehensive River Management Plan. This direction would include protection of the free-flowing condition, water quality, and ORVs. Designation into the National WSR System could afford additional protection and enhanced emphasis of recreational opportunities on certain segments of Blue River. The ASNF does not anticipate that WSR designation would affect uses on private lands and landownersip.

3.1.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no direct impact to land use and recreation, since no project would be constructed or implemented. AGFD could eradicate nonnative fishes and repatriate/augment native fish populations under the existing MOU with the USFS. Removal of nonnative fishes, repatriation of spikedace and loach minnow, and monitoring would not have an effect on existing or reasonably foreseeable future uses on private lands. Loach minnow already occupies most of the drainage, and release of spikedace and roundtail chub into the existing fish community is not expected to affect present uses of the river. However, the ASNF would have to consult with the FWS for any ongoing or proposed actions on NFS lands that may affect spikedace or its critical habitat.

Proposed Action

Emplacement of the fish barrier would not preclude potential future wilderness designation of the lower Blue River corridor. Fish barriers have been constructed in designated wilderness, and areas with constructed features like fish barriers have been designated wilderness.[12] Concrete used in the proposed fish barrier would be treated to visually blend the structure with the dominant color and cobbled texture of alluvial material in the channel (see section 2.2.1); however, the relatively uniform configuration of the drop structure and apron, which are needed to maintain desired flow characteristics, would not appear natural, and the potential wilderness character of the landscape at the barrier would be adversely affected. Conversely, the potential wilderness character derived from perpetuating the native aquatic community, conserving threatened and endangered species, and correcting conditions resulting from human influence (i.e., historic introduction of nonnative fishes and associated ecological perturbations of the natural community) would be enhanced by the barrier. The barrier

[12] There are currently at least four existing fish barriers constructed in designated wilderness in the Southwestern Region of the USFS: Iron Creek (Gila NF), Fossil Creek (Coconino/Tonto NFs), Bear Wallow and South Fork of the Little Colorado River (ASNF). A fish barrier is currently proposed in the Red Rock-Secret Mountain Wilderness (Coconino NF).

would impede northbound OHV traffic that enters the Blue River from FR 212, which would have a beneficial effect on thenon-motorized, semi-primitive character of the lower river corridor.

The proposed fish barrier would create a minor impediment to hiking and equestrian use along the lower Blue River. Most hikers could climb over the barrier with relative ease, or alternatively scramble up the hillside to navigate past the structure. Horseback riders could follow former stock trails that traverse the hillside above and around the left (east) abutment. These effects would be limited because of the paucity of recreational use that occurs along this segment of river.

Poor access and small populations of warm-water sport fish have been a constraint to recreational fishing in the Blue River. While there would be some loss of recreational fishing that result from the mechanical removal of nonnative warm-water species, the effect generally would be minor due to the limited demand for this fishery in the Blue River and the availability of other angling opportunities in nearby streams such as the San Francisco River.

Low flows preclude use of the lower Blue River by whitewater rafters and kayakers most of the year. However, rafting and kayaking are possible when high river levels are sustained for several days or weeks. As a safety measure, signs would be posted at the barrier to warn river users of the 4-foot vertical drop.

There would be no effect to land use or recreation resulting from activities associated with inspections of the fish barrier. The effects of nonnative fish removal, native fish restoration, and monitoring on land use and recreation would be the same as those described under the No Action alternative

On NFS lands, the free-flowing characteristics of eligible river segments classified as Wild or Scenic cannot be modified to allow stream impoundments, diversions, channelization, riprapping (FSH 1900.12, Chapter 80), or constructed fish barriers. Consequently, the proposed fish barrier could be approved and constructed only if the lower ¾-mile reach of Blue River is not recommended for designation into the National WSR System.

Cumulative Effects – Land Use and Recreation

Cumulative effects to recreation are primarily associated with diminishment of sport-fishing opportunities on the lower Blue River, unless AGFD established a roundtail chub fishery as a replacement. This action would not adversely affect the recreation ORV in river segments that are potentially suitable for WSR designation.

3.2 GEOLOGY AND SOILS

3.2.1 Affected Environment

The Blue River drainage is situated in the Transition Zone province, a belt of complex geology that extends from northwestern Arizona to east-central Arizona and into New Mexico. The Transition Zone exhibits geophysical properties intermediate between those of the southern Basin and Range Physiographic Province to the south and the Colorado Plateau to the north (McCarthy and Parsons 1994, Connell et al. 2005). The Basin and Range province is characterized by elongated mountain ranges trending northwest to southeast separated by broad alluvial valleys that were produced by a Miocene extensional collapse. The Colorado Plateau is an uplifted, relatively stable cohesive block that resisted Tertiary deformation. The Transition Zone province has its own unique geologic history, having undergone Tertiary uplift and basin formation, extensive volcanism, and some extension characteristic of the Basin and Range (Connell et al. 2005). The Transition Zone can be considered a structural extension of the Colorado Plateau from which Paleozoic strata have been removed (Elston and Young 1991), and exhibits elevations well above those of the southern Basin and Range, in places exceeding those of the Colorado Plateau (McCarthy and Persons 1994). Steeper mountains separated by narrower basins also differentiate the Transition Zone from the southern Basin and Range. The Blue River drainage encompasses 396,105 acres or approximately 619 square miles.

The area encompassing the proposed fish barrier is located in the TS18 soils mapping unit, termed the Graham-Lampshire-House Mountain Association. This association consists of shallow, gravelly and cobbly, medium to fine textured soils and rock outcrops mostly on volcanic hills and mountains, with sedimentary rock outcrops present in some locales (Hendricks 1985). Upland soils are formed in residuum weathered from basalt, rhyolitic tuffs, and other related volcanic rocks. Floodplain substrates consist of alluvial deposits and boulders eroded from the surrounding highlands.

The 100-year floodplain within the construction impact area is approximately 150 to 400 feet in width, with evidence of extensive lateral migration of the low-flow channel. High rock abutments and steep canyon slopes confine the floodplain throughout most of the area. Volcanic tuff with occasional intrusions of basaltic andesite forms the vertical walls of the canyon and, along with basalt, probably constitutes the bedrock beneath the channel deposits (Reclamation 2002). Alluvium consisting of varying percentages of sand, gravel, cobbles and scattered boulders fills the active channel and underlies stream terraces. Only a minor amount of fine material occurs in the active channel. Terrace soils at the proposed contractor use area are silty and show no evidence of recent inundation.

The Blue River drainage has a high sediment production rate from landslides, slope deposits and stored channel deposits (ADEQ 2001). These natural sources provide the bulk of sediment production, and they are capable of producing more sediment than the transport capability of the river. In addition, widespread catastrophic fires have the

potential to substantially increase sedimentation from ash and exposed soils. Since 1995, wildfires have affected 62,100 acres within the Blue River drainage. Under current drought conditions, the frequency and intensity of wildfire are potentially greater.

Prior to the mid-1900s, human activities such as unregulated timber harvest, log drives, road construction, and grazing contributed to sedimentation and substantial changes in riverine conditions (Dobyns 1981, Minckley 1999b, FWS 2000, Webb and Leake 2006). Today, main roads along the Blue River and tributary stream corridors (e.g., Juan Miller, Pueblo Park, Red Hill, and Blue River roads) continue to be a source of sedimention. Permitted grazing has been discontinued on NFS lands within the Blue River corridor and no longer directly affects the river corridor. Sediment production from existing anthropogenic sources is secondary to natural sources (ADEQ 2001).

3.2.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no direct impact to soils and geologic features, since no project would be constructed or implemented. Sedimentation from large slides and slumps, and high volumes of sediment stored in terraces, would continue to influence patterns of aggradation and degradation along the river. Roads and fires in the Blue River corridor could produce increased sediment if not properly managed.

There would be minimal and highly localized trampling of soils from dispersed pedestrian traffic associated with nonnative fish removal, native fish restoration, and monitoring, if those actions are undertaken by AGFD in lieu of the proposed project.

Proposed Action

During construction of the barrier, soil disturbances would result from the movement of equipment, excavation of the foundation trench, emplacement of temporary dikes, and material staging and concrete production on the terrace. Excavation required for construction of the scour walls would temporarily displace an estimated 5,000 cubic yards of alluvium, most of which would be used in concrete batching or returned as backfill. Approximately 100 cubic yards of rock would be removed from the canyon walls at the abutments prior to placement of anchor bars and concrete. Stockpiles of unused channel aggregate and rock would be used to backfill the area between the gabions and canyon wall. Construction would directly affect approximately 1.1 acres of floodplain and channel soils at the barrier. Use of the terrace for staging would affect an additional 1.4 acres. Soil stabilization measures would be implemented at the staging area following construction (see mitigation in section 3.4.14).

During the first 5-10 years following construction, stream-transported coarse material would be immobilized by the barrier, forming a new layer of bedload deposits over existing channel substrates. Deposition of this material would be accelerated by seasonal high flows and floods. Local effects include a slight reduction in gradient and

aggradation of the active stream channel for approximately 2,450 feet upstream of the barrier, affecting 6.1 acres (Appendix C, Figure C-1). Short-term capture of bedload sediment and hydraulic changes induced by the barrier are expected to cause localized scour and lowering of the active channel downstream (see section 3.3.2). The Blue River carries high sediment loads during floods (ADEQ 2001), and the amount of bedload that would be immobilized at the barrier relative to the total volume transported within the river is likely to be small. Total sediment yield downstream would be consistent with pre-project conditions once streambed aggradation at the barrier has stabilized.

There would be minimal trampling of soils from pedestrian traffic associated with fish barrier inspections. The effects of nonnative fish removal, native fish restoration, and monitoring on soils would be the same as those described under the No Action alternative.

Cumulative Effects -- Soils and Geology

Aggradation and degradation caused by the barrier would affect approximately one percent of the Blue River. This effect would be cumulative to historic and ongoing natural and anthropogenic influences affecting channel characteristics in the lower ¾-mile reach of river. The proposed project would not add substantially to the cumulative impacts of other past, present, or reasonably foreseeable future actions on soils because of the limited scope of the proposal (short implementation duration and relatively small area affected), application of appropriate erosion control on the contractor use area, and incorporation of scour reduction in the design of the barrier.

The proposed fish barrier would be constructed only if ASNF determines the lower ¾-mile reach of Blue River is unsuitable for WSR designation. Under this condition, the barrier would be constructed downstream of river segments found to be suitable and would not influence sedimentation or degradation of those river segments.

3.3 WATER RESOURCES

3.3.1 Affected Environment

The Blue River is a major perennial tributary of the San Francisco River, flowing generally south approximately 53 miles through ASNF. Encompassing 396,105 acres, the majority of the drainage is on ASNF in Arizona, with approximately 28,100 acres within the Gila National Forest in New Mexico (Figure 1). Drainage area elevations vary from over 9,400 feet near Hannagan Meadow to 3,860 feet at the San Francisco River confluence. Storm runoff and snowmelt within the watershed contribute to flows in excess of base flow. In the summer, intense but brief and localized monsoon storms are capable of generating highly variable flow rates and flash floods.

The U.S. Geological Survey (USGS) maintains a stream discharge gauge station (09444200) immediately downstream of the FR 475 low-water crossing. That gauge has functioned on a continuous basis since 1967. For the period of record, the peak

instantaneous discharge is 30,000 cubic feet per second (cfs), which occurred in October 1972. Monthly mean daily discharges range from a low of 9.3 cfs in June to a high of 152 cfs in February, which correlate to total monthly discharges of 18.4 and 300.9 acre-feet, respectively. Flow rates in excess of 5,000 cfs were recorded 15 times during the period of record, or approximately once every 2.3 years. Incipient motion analysis of the Blue River determined that mobilization of sediment begins at approximately 2,000 cfs (Reclamation 2010d); therefore, under normal flow of the river, significant bed movement is not occurring.

Reclamation estimated instantaneous peak flows at the site of the proposed fish barrier by adjusting the USGS data to reflect input from storm runoff in the 8-mile reach downstream of the gauge station (Table 1).

Table 1. Estimated peak flood flows at barrier.

Recurrence Interval	Instantaneous Peak Flow (cfs)
2 year	2,600
5 year	7,100
10 year	12,600
25 year	19,700
50 year	27,800
100 year	35,700

Arizona sets narrative and numeric surface water standards for water quality based on the uses people and wildlife make of the water. The Arizona Department of Environmental Quality (ADEQ) reported in the 2006/2008 Arizona Integrated 305 (b) Assessment and 303 (d) Listing Report that the reach of Blue River between Fritz Ranch and the San Francisco River attained surface water quality standards for the designated uses of fish consumption, agricultural livestock watering, crop irrigation, and warm-water aquatic community (ADEQ 2008). The Blue River is presently listed as impaired for fecal-coliform from Strayhorse Creek to the confluence with the San Francisco River.[13] No Outstanding Arizona Waters as listed under AAC R18-11-112 are located in the project area.

Due to the geology of the watershed, the Blue River has a naturally high sediment load that is capable of affecting water quality during high flow events. Large slumps and slides discharge sediment directly to the river, and there are high volumes of sediment stored in terraces and along the channel itself that become mobilized and entrained by flood waters. Anthropogenic sources that contribute to the sediment load include human-caused fires, roads, and land development.

There is approximately 1,844 acre-feet per annum of water rights claimed under the Ling Decree or otherwise filed or asserted for waters within the Blue River and its tributaries. The principle consumptive uses of water diverted from the Blue River are for irrigation, stock watering, domestic purposes, and fish rearing ponds. These consumptive uses can

[13] Exceedance of standard occurred in 3 of 20 water samples collected between 3/20/2000 and 10/25/2005.

contribute to a reduction in flows, particularly during the irrigation season which occurs from the spring to the summer monsoon season.

3.3.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no direct impact to water resources, since no project would be constructed or implemented. Existing environmental factors, including natural and anthropogenic sources of sedimentation, would continue to affect water resources in the project area into the foreseeable future.

There would be no effect to water resources resulting from nonnative fish removal, native fish restoration, and monitoring, if those actions are undertaken by AGFD in lieu of the proposed project.

Proposed Action

Direct and indirect impacts to water resources may result during barrier construction and operation. Mechanical treatments to remove nonnative species and repatriation and monitoring of native species would not affect water resources.

Waters of the United States. The U.S. Army Corps of Engineers (COE) regulates discharges of fill material to waters of the United States, pursuant to Section 404 of the Clean Water Act (CWA), and issues permits for actions proposed within such waters. Jurisdictional, non-tidal waters of the United States regulated by the COE are defined in 33 CFR 328.4 (c) as those that comprise the area of a water course that extends up to the OHWM, in the absence of wetlands. Based on a delineation of the OHWM, approximately 0.7 acre of jurisdictional waters would be permanently affected by the placement of fill (concrete and excavated alluvium redeposited as backfill) during construction of the fish barrier. An additional 1.1 acres of channel could be affected by temporary stockpiles of excavated alluvium and soil disturbances associated with site preparation at the barrier. Following construction, immobilized bedload material would permanently aggrade the channel upstream of the barrier, affecting approximately 6.1 acres (Appendix C, Figure C-1). The terrace on which the proposed contractor use area (staging area and possible batch plant location) would be situated is above the OHWM. A COE 404 permit and ADEQ 401 water quality certification have been issued for the project (see Chapter 5 for additional CWA information). There are no wetlands in the construction area.

Hydrology and Fluvial Morphology. Aggradation would reduce the channel gradient from an average of 0.7 to 0.5 percent and permanently raise the water surface profile on approximately 2,450 feet of river. The altered stream profile would be most noticeable where water overtops the barrier, resulting in a 4-foot change in elevation, and then gradually diminish to 0 approximately 2,450 feet upstream. The raised water profile is

expected to have a minimal erosive effect on the channel banks, which are armored with exposed bedrock, boulders, and cobbles.

Based on physical modeling, a permanent plunge pool between 1 and 2 feet deep is expected to form immediately downstream of the deflection block (Reclamation 2010d). The bed slope and bed elevations of the Blue River would decrease from the fish barrier to the San Francisco River due to the short-term reduction in sediment load and local hydraulic changes caused by the structure. Downstream of the plunge pool, the thalweg of the channel would be permanently lowered 6-10 inches (see Appendix C, Figure C-2). This degradation represents the long-term "reach averaged" or steady-state condition that is expected to occur following a 2-year through 100-year flood (after sediment has been deposited on the receding phase of the hydrograph). Elevational control exerted by the San Francisco River would limit the extent of scour near the mouth of the Blue River. No measurable effect on the San Francisco River is anticipated.

Water Quality and Quantity. Dewatering and equipment operation would result in artificially elevated levels of suspended sediment and turbidity in the river between the work area and the San Francisco River. These effects would persist intermittently only during active construction. Bank disturbances at the barrier would be confined to coarse alluvial deposits and the bedrock walls of the canyon. Regeneration of vegetation on other areas disturbed by construction would obviate any long-term source of sediment production. The project would not cause long-term changes in water quality.

Construction of the barrier would have a minor effect on surface and subsurface flows. The reach of river encompassing the barrier site is situated on deep alluvial deposits; consequently, ground-water would pass under the structure. Any subsurface flow that might be cut off would become surface flow that spills over the top of the structure.

The ASNF holds 188 acre-feet per year of water rights on the Blue River.[14] Under Revised Certificate of Water Right No. BB-530.0001, the ASNF has a right to 28 acre-feet per year of Blue River water in the NW ¼ of Section 31, Township 2 South, Range 31 East, immediately upstream of the proposed fish barrier. Reclamation proposes to use a portion of these water rights to compensate for the consumptive use of water during construction (approximately 1.4 acre-feet) and evaporative losses from water that is temporarily pooled at the barrier, initially at a rate of approximately 10 acre-feet per year (or 0.8 acre-foot per month) and then decreasing to 0 once all pooled water is displaced with sediment.

The effects of nonnative fish removal, native fish restoration, and monitoring on water resources would be the same as those described under the No Action alternative.

There would be no effect to water resources resulting from activities associated with fish barrier inspections.

[14] Water rights on the Blue River are administered by the Superior Court for the State of Arizona in and for Greenlee County in accordance with the Ling Decree.

Cumulative Effects – Water Resources

The effects of the proposed fish barrier would be incremental to historic and ongoing natural and anthropogenic sources that have affected water quality, quantity, and/or stream morphology. Production of suspended sediment during construction and deposition of bedload sediment following construction would have a minor cumulative effect on the lower ¾-mile reach of the Blue River. Changes in fluvial morphology that are induced by operation of the barrier would be cumulative to effects that are induced by canyon slope erosion, roads, fires, water diversions, land development, and other anthropogenic and natural influences in the watershed (FWS 2000, ADEQ 2001). Consumptive use of water during construction and evaporative losses attributable to the fish barrier would be cumulative to other uses that contribute to a reduction in flow.

The proposed fish barrier would be constructed downstream of river segments that are potentially suitable for WSR designation; consequently, there would be no effect to the free-flowing characteristic, water quality, or flow rate of those segments.

3.4 BIOLOGICAL RESOURCES

3.4.1 Affected Environment – Vegetation

Watershed. The Blue River watershed is extremely rugged and varies from a mountainous area in the northwest to steep walled gorges and open canyons in the south. The highly dissected, rugged terrain that is predominant in this watershed contributes to the variable vegetation distribution. Vegetation communities range from pine and fir communities at the highest elevations to desert scrub communities at the lowest elevations. Narrowleaf cottonwood, alder and associated willows dominate the riparian habitat in the upper reaches of the Blue River (NRST 2000).

The Blue River vegetation is described in the Eligibility Report for the National Wild and Scenic River System (USFS 2009b) as follows:

> "The river corridor contains a diverse mix of species including alligator and one-seed juniper and occasional piñon and ponderosa pine. Gray and Emory oak, mountain mahogany, Wright's silktassel, buckbrush, desert ceanothus, and some mesquite also occur. Perennial bunchgrasses can be abundant within the canyon, with five different species of grama grasses present. There are also more than seven species of muhly grasses. Riparian vegetation includes narrowleaf and Fremont cottonwood, Arizona sycamore, boxelder, Arizona walnut, alder, various willows, ash, hoptree, and seepwillow. The tree canopy is not continuous, but broken up by vertical rock canyons that eventually open to gentler slopes. Wildflowers bloom in the spring and after summer rains, while sand-loving grasses such as vine mesquite, creeping muhly, and sand dropseed are found in the river's shifting floodplain."

Barrier Site. The fish barrier is located within the Interior Riparian Deciduous Forest Biotic Community (Brown 1994). These deciduous communities can exhibit a diverse array of vegetation as high altitude species merge into lowlands.

The Blue River is subject to scouring floods on a regular basis and consequently there is limited riparian vegetation within the channel in this reach of the river. When the project area was first visited in 2000, few riparian trees were present in the general area. Since 2000, narrow stringers of cottonwood and willow trees have become established at the confluence and spread upstream toward the barrier site.

The majority of riparian vegetation is tucked onto protected terraces elevated above the scouring floods (Appendix C, Figure C-1). Tree species are predominately Goodding willow and Fremont cottonwood interspersed with sycamore and walnut. Velvet mesquite, burrobrush, and rabbitbrush commonly occur on the floodplain terraces. A narrow band of habitat between the river and the adjacent mesa top is classified as Madrean Evergreen Woodland (Brown 1994) characterized by the presence of oak and juniper species.

The mesa tops are classified as Great Basin Conifer Woodland (Brown 1994) which is characteristically dominated by pinyon and juniper species. The upland vegetation in the immediate project area includes pinyon pine, one seed juniper with associated mesquite, sotol, ocotillo, and prickly pear cacti.

Invasive Weeds. The terms "noxious weed" or "invasive weed" are often used interchangeably. An invasive noxious weed is one that grows and spreads rapidly, replacing desired plants. USFS policy defines noxious weeds as plants that generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host for serious insects or disease, or, new or not common to the United States or parts thereof." The term "noxious" also has legal ramifications for states that have noxious weed laws or regulations.[15]

The Department of Interior Manual, part 609 Weed Control Program, requires implementation of Integrated Pest Management for the control of pests on Reclamation lands. The authorities for this requirement are contained in numerous public laws, Executive Orders, and Federal regulations, the most significant of which are the Plant Protection Act of 2000 (Pub. Law 106-224), and Executive Order 13112 (Invasive Species)[16].

Reclamation coordinated with the USFS to ascertain which invasive weed species may occur in the project area. Reclamation conducted an invasive weed survey along the Blue River floodplain from the fish barrier to approximately ½ mile upstream on September

[15] Definition excerpted from "Field Guide to Noxious and Invasive Weeds Known to Occur or Are Potentially Occurring on the Apache-Sitgreaves National Forests". USDA. MR-R3-01-2
[16] Additional authorities with respect to invasive weeds include Reclamation Manual Directives and Standards PEC 10-29, ENV 01-01, ENV 01-02, and Reclamation Manual Policy ENV P02.

15, 2009. The survey was not conducted downstream of the barrier due to time constraints. However, species distribution was fairly uniform upstream and therefore it was assumed that the invasive plant distribution downstream of the barrier would be similar. The following species were identified in the project area: yellow sweetclover, white sweetclover, mullein, cocklebur, Russian thistle, morning glory, and saltcedar. Reclamation prepared and submitted to the USFS a weed inventory form for each species identified in the project area.

3.4.2 Environmental Consequences – Vegetation

No Action

Under the No Action alternative, there would be no direct impact to vegetation, since no project would be constructed. Major disturbances to vegetation at the site of the proposed barrier primarily would be the result of flood-induced scour.

There would be minimal and highly localized trampling of ground vegetation from dispersed pedestrian traffic associated with nonnative fish removal, native fish restoration, and monitoring, if those actions are undertaken by AGFD in lieu of the proposed project.

Proposed Action

Barrier Construction. Effects to vegetation were substantially reduced through modifications to the project. All personnel and materials would be transported to the project site via helicopter; no road construction along the San Francisco River would be required. A total of approximately 8.6 acres of floodplain habitat would be affected (both directly and indirectly) by construction of the fish barrier (Appendix C, Figure C-1; Table 2).

Emplacement of the barrier and associated construction-related activities would predominately affect 6.6 acres of Interior Strand habitat (77% of the total project impacts). Approximately 0.7 acres of habitat would be permanently impacted by the barrier while construction-related activity upstream and downstream of the barrier site would temporarily impact an additional 1.1 acres. The majority of the project effects (6.1 acres) result from the deposition of sediment upstream of the barrier. The sedimentation zone (contained within the active river channel) would have a short-term effect on habitat classified as Interior Strand (Brown 1994, page 265). Vegetation within strand habitats is made up of either short-lived successional species or plants adapted to periodic flooding, scouring or soil deposition. Interior Strand habitat would quickly redevelop within the disturbed areas along the active river channel following construction. Approximately ½ acre of riparian habitat would be impacted from the proposed project. A small pocket of primarily Goodding willow trees (and associated habitat) would be permanently lost within the footprint of the barrier. The remainder of the riparian habitat would be temporarily affected by the accumulation of sediment immediately upstream of the

barrier or construction activities associated with excavation of the barrier site. Sediment depths would range from 4 feet at the barrier to 0 approximately 2,450 feet upstream.

Channel disturbances during construction would extend approximately 130 feet downstream (0.9 acre) from the centerline of the barrier. The results of numeric modeling predict that hydraulic changes and short-term capture of sediment at the barrier would lower the channel thalwag (by flood scour) between 6 and 10 inches all the way to the San Francisco River. The channel degradation would primarily occur within the Interior Strand habitat which is predominantly devoid of vegetation. Impacts to habitat within the Blue River channel from the increased scour will be negligible due to: (1) the minimal depth of the scour; (2) lack of existing vegetation within the Interior Strand habitat; and (3) the fact that vegetation within this area is removed on a recurrent basis during floods.

The contractor would base his operations on a small mesquite/burrobrush bench located just upstream of the barrier site along the west side of the river. The Contractor Use Area would consist of a potential batch plant for concrete mixing, laydown yard for construction materials, and construction offices. Approximately 1.4 acres consisting predominantly of burrobrush would be affected by these activities. An additional 0.1 acre of burrobrush habitat would be impacted by the sedimentation zone for a total of 1.5 acres of impact to burrobrush habitat (Appendix C, Figure C-1; Table 2). The contractor may camp within the mesquite habitat; however, no wood cutting or wood gathering would be permitted. All wood utilized for fires must be purchased commercially or acquired from a USFS approved location.

Table 2. Impacts by vegetation type.

VEGETATION TYPE	ACREAGE OF IMPACT
Burrobrush	1.5
Riparian (Gooding willow/Fremont cottonwood)	0.5
Interior Strand (minimally vegetated river channel)	6.6
TOTAL	**8.6**

Invasive Weeds. The Blue River experiences frequent scour from flood events. These events can remove a significant portion of the vegetation within the channel increasing the potential for establishment of invasive weeds. The temporary disturbance to the river channel from construction activities or the downstream scour would not substantially increase the potential for invasive weeds over what normally occurs during the annual flood events. On the other hand, the contractor use area is located outside of the active flood zone. Construction support activities occurring on this site would result in disturbances to the vegetation and soil, increasing the probability of invasive weed establishment.

Seven species of weeds were identified during the “invasive weed” survey. Yellow and white sweetclover, mullein and cocklebur were established in areas potentially affected by construction and operation of the fish barrier. Saltcedar, Russian thistle and morning glory were less common; although due to the limited area of survey, these species may be more prevalent in the general area. The small area of disturbance outside the active

channel (1.4 acres), coupled with the presence of invasive weeds already in the area, would not result in substantial spread of invasive weeds. The following measures would be implemented to reduce potential importation and establishment of invasive weeds in the project area: (1) all equipment would be power washed prior to transport onsite, (2) the contractor use area would be scarified and seeded with an approved USFS native seed mix upon completion of construction, and (3) in cooperation with ASNF, monitor the contractor use area for 3 years after construction and treat invasive weeds with an approved herbicide pursuant to USFS requirements.

Mechanical Removal of Nonnative Fishes. Impacts to vegetation from the mechanical removal of nonnative fishes would be negligible.

Repatriations and Monitoring. Impacts to vegetation would be similar to those described for the mechanical removal of nonnative fishes.

Cumulative Effects - Vegetation. Historically, riparian vegetation and stream channel characteristics have been severely altered along the entire length of the Blue River due to a number of factors (NRST 2000). Based on early photographs, the Blue River was utilized (in the early 1900's) for downriver log transport for a charcoal mining operation. In addition to the destabilizing effects of clearing and snagging, the log drives themselves did tremendous damage to the stream channel and banks (NRST 2000). Historic overgrazing by livestock along the river in the late 1800s and early 1900s reduced herbaceous growth and destabilized streambanks; however, grazing is no longer permitted on NFS lands along the river (FWS 2000). Present uses of the Blue River valley bottom affect riparian vegetation at a level much reduced from that of historic times. The cumulative effect of the proposed project on vegetation would be minor and limited to the construction site. Any long-term effect, outside of the footprint of the barrier, would be rendered largely undetectable due to recurrent flooding and natural regeneration. There would be no effect to the vegetation ORVs in river segments determined to be suitable for WSR designation.

3.4.3 Affected Environment – Terrestrial Wildlife

The mainstem Blue River and its major tributaries provide habitat for large and small mammals such as elk, mule deer, Coues white-tailed deer, bighorn sheep, black bear, mountain lion, bobcat, javelina, coyote, coatimundi, and gray fox (USFS 2009b; page 94). Small mammals typical of the area include gray squirrel, raccoon, beaver, pocket gophers, striped skunk, mice and various bat species (red, big brown, western pipistrelle, small-footed, and Mexican free-tailed) (Brown 1994, Hubbard and Hayward 1973). The Blue River complex also serves as a migration corridor for neotropical migrants and has been designated by the National Audubon Society as an Important Bird Area (USFS 2009b; page 94; Tice Supple, Audubon Arizona, pers. comm.). Avian species typical of the Blue River include: wild turkey, Bell's vireo, ash-throated flycatcher, black phoebe, canyon wren, Cassin's king bird, cliff swallow, Gambel's quail, hooded oriole, lesser goldfinch, mourning dove, northern cardinal, red-tailed hawk, Cooper's Hawk, spotted

towhee, summer tanager, western kingbird, western wood pewee, yellow-breasted chat, and yellow warbler.

3.4.4 Environmental Consequences – Terrestrial Wildlife

No Action

Under the No Action alternative, there would be no direct impact to terrestrial wildlife, since no project would be constructed or implemented. Effects to terrestrial species would be limited to those occurring from natural flood events, fire (both prescribed and wild), and minor disturbances from recreation and other uses along the river.

There would be short term and highly localized minor disturbances to terrestrial wildlife from dispersed pedestrian traffic associated with nonnative fish removal, native fish restoration, and monitoring, if those actions are undertaken by AGFD in lieu of the proposed project.

Proposed Action

Barrier Construction. Effects to local terrestrial wildlife from construction impacts along ½ mile of the Blue River would be minor in comparison to the total length (53 miles) of stream. There would be temporary noise-related disturbances to local wildlife at the barrier location from operation of heavy equipment during construction. Over the 4-month construction period there will be an estimated 500-1000 helicopter flights between the staging area and the barrier site. The proposed flight corridor will follow the San Francisco River north from Clifton. There would be increased noise disturbance to wildlife at both the staging area and barrier locations. Noise impacts to terrestrial wildlife along the San Francisco River will depend upon the flight height.

Additionally, there could be loss of slow-moving small mammals and reptiles during construction and a permanent loss of habitat for these species upon completion of the barrier. However, the permanent loss of 0.7 acres of mostly Interior Strand habitat would have little impact on local populations. Avian species and large mammals would be capable of avoiding the area during construction; habitat loss for these species would be minor. The 4-foot vertical drop created by the fish barrier would restrict movement of small mammals and reptiles (primarily beavers and snakes) on the floor of the canyon; however, access around the barrier exists along the hills adjacent to the east bank of the river. The barrier would represent only a minor obstacle to large mammals. Effects to local wildlife from the increased downstream scour would be indistinguishable from natural flood events.

Mechanical Removal of Nonnative Fishes. There would be short term, and highly localized minor disturbances to terrestrial wildlife from standard fish removal activities.

Repatriations and Monitoring. There would be short term, and highly localized minor disturbances to terrestrial wildlife from the repatriations and monitoring of native fish.

Cumulative Effects – Terrestrial Wildlife

Anthropogenic disturbances to wildlife in areas affected by the proposed action are relatively minor. Recreational use is light and dispersed, and livestock grazing is not permitted along the lower reach of river. The cumulative effect of the native fish restoration project on terrestrial wildlife is minor. There would be no adverse effect to the (terrestrial) wildlife ORV in river segments that are potentially suitable for WSR designation.

3.4.5 Affected Environment - Fish and Aquatic Wildlife

The existing native fish community in Blue River consists of speckled dace, longfin dace (see section 3.4.10), Sonora sucker (see section 3.4.10), desert sucker (see section 3.4.10), and loach minnow (see section 3.4.7). Apache trout, native to the White and Black River systems of the Gila River basin and to the upper Little Colorado River drainage, was originally believed to be native to the Blue River system as well (e.g., Clarkson and Wilson 1995). The species was introduced into high-elevation Blue River tributaries several decades ago by AGFD, and some populations persist today. Gila trout, a threatened species, has since been considered the native form in the Blue River system based on more recent genetic and morphological analyses (Riddle et al. 1998, Gila Trout Recovery Team 1998). Based on this new evidence, Gila trout was stocked into two tributaries of Blue River, and plans are to remove Apache trout from other Blue River tributaries and replace them with Gila trout. Such potential management actions would undergo separate NEPA compliance.

The endangered razorback sucker and Colorado pikeminnow, threatened spikedace (see section 3.4.7), candidate roundtail chub (see section 3.4.7) and unlisted flannelmouth sucker historically had access to Blue River, although there are no records of collections of these species from the stream. Approximately 160,000 fingerling and 9,200 subadult razorback suckers were stocked into various sites along Blue River during 1986-1989 (Hendrickson 1993). Based on the lack of recent recapture records for razorback sucker, we do not believe the species persists in Blue River.

As discussed previously, current habitat conditions appear suitable to support populations of spikedace and roundtail chub to the Blue River, and thus both species would be stocked into the river under the proposed native fish restoration project.

Nonnative fishes that have been recorded from the Blue River and its tributaries are shown in Table 3. Based on recent surveys it appears that only rainbow trout, brown trout, and fathead minnow have persistent populations within the drainage. Species such as channel catfish, flathead catfish, red shiner, and common carp appear sporadically and currently do not seem to consistently reproduce within the stream system, while populations of the other species shown in Table 3 ostensibly have failed and have not been recorded recently.

Native amphibians and semi-aquatic reptiles potentially present within the Blue River drainage include Chiricahua leopard frog (see section 3.4.7), lowland leopard frog (see section 3.4.10), Arizona tiger salamander, Mexican spadefoot toad, red spotted toad, Arizona toad (see section 3.4.10), Woodhouse's toad, Great Plains toad, Sonoran desert toad, canyon treefrog, Arizona treefrog, western chorus frog, Sonoran mud turtle, narrow-headed gartersnake (see section 3.4.10), black-necked gartersnake, and terrestrial gartersnake. The nonnative American bullfrog may also be present within the drainage.

Table 3. Nonnative fish species occurrences in the Blue and San Francisco rivers based on visual observation or capture records, showing the most recent year of record.

Species	Blue River	San Francisco River
Channel catfish	2009	2009
Flathead catfish	2009	2009
Red shiner	2009	2009
Rainbow trout	2009	-
Common carp	2009	2009
Fathead minnow	2008	2009
Apache trout[1]	1998	-
Apache trout X rainbow trout hybrid	1998	-
Brown trout	2009	-
Brook trout	1998	-
Largemouth bass	1950[2]	-
Smallmouth bass	-	1988
Mosquitofish	2004	2009
Green sunfish		2009[3]

[1] Apache trout is native to the Gila River basin, but not to the Blue River drainage
[2] AGFD stocking record
[3] New detection

3.4.6 Environmental Consequences - Fish and Aquatic Wildlife

No Action

Under the No Action alternative, there would be no direct impact to fish and aquatic wildlife, since no project would be constructed or implemented. There would be short-term benefit to the native fish assemblage if nonnative fish removal, native fish restoration, and monitoring are successfully conducted by AGFD in lieu of the proposed project. However, without emplacement of a fish barrier, nonnative fishes, particularly large predatory species, would continue to move upstream into the Blue River and suppress native populations of fish, amphibians, and semi-aquatic reptiles. In the long term, the potential for extirpation of one of the few remaining populations of loach minnow would increase, and the opportunity to establish new populations of spikedace and roundtail chub in the Blue River would substantially diminish.

Proposed Action

Barrier Construction. The proposed fish barrier is expected to have substantial, positive benefits to native fish and other aquatic and semi-aquatic vertebrate populations by

preventing upstream invasions of nonnative fishes and other undesirable nonindigenous aquatic biota into the Blue River (Miller 1961, Moyle et al. 1986, Minckley 1991, Minckley and Marsh 2009, Rosen and Fernandez 1996, Rosen et al. 1995, Rosen and Schwalbe 2002).

Placement of a barrier would affect gene flow among native fish populations to some extent. Native fish below the barrier would not be able to move upstream of the barrier, but some individuals above the barrier are likely to go over the fish barrier during flood flows. However, the reach of Blue River below the barrier is approximately ½ mile, and is heavily impacted by nonnative fishes that occupy the San Francisco River. Native fish populations are already low in lowermost Blue River (and much lower in the San Francisco River) due to influences of nonnatives, and thus only minor genetic effects to the much larger upstream populations are anticipated. The continued presence of nonnative fishes below the barrier likely will hinder establishment of native fish populations there.

At the species level, the fish barrier would prevent integration of genetic variability of native fishes derived from other nearby stream systems to Blue River populations upstream of the barrier. Genetic communication among diverse populations is desirable to maintain long-term (100s of generations) genetic health of a species by allowing influx of novel genes that may better enable a species to adapt to changing environments. However, the condition of stream systems within the Gila River basin over the past century has deteriorated to the point that little communication among tributary fish populations occurs through connecting mainstem river corridors (Minckley 1999, Fagan et al. 2002). Presence of an array of nonnative fish predators near tributary mouths and especially in mainstem rivers like the San Francisco River, coupled with fragmentation of river drainages via stream diversions, channelization, groundwater pumping, reservoirs, etc., render long-distance movements of fishes among streams within a drainage unlikely (Fagan et al. 2002). The dire status of native fishes today makes the need to protect remaining populations more immediate than ensuring that longer-term evolutionary needs are met. If obstacles presented by the presence of nonnatives can be removed in the future, the need for the barrier would be eliminated, and it would be breached.

Downstream drift of larvae of native fishes past the barrier would result in some losses to the upstream population, as they would be unable to move back upstream past the barrier. Drift of native larval fishes in streams and rivers of the Colorado River basin is a common phenomenon, but varies greatly among species (Bestgen et al. 1985; Valdez et al. 1985; Robinson et al. 1998; Remington 2002). For example, of nearly 20,000 larval fishes collected from the drift in the Gila River, New Mexico, in March-May, 1984, only two percent were minnows (Family Cyprinidae), and the rest were suckers (Family Catostomidae; Bestgen et al. 1985). In the Bestgen et al. (1985) study, more than 79% of larval drift occurred during daylight, and daytime drift distances were estimated to be short.

Distances drifted by native fish species in Blue River have not been determined, but two lines of evidence suggest that drift losses over the fish barrier would be negligible under

the proposed project. First, drift of larval stages of these species has not been shown to be a significant feature of their life histories, and most drift that occurs is during daylight when drift distances are short (Bestgen et al. 1985). Second, a study of native fish drift in Aravaipa Creek, Arizona, determined that drift of longfin dace, desert sucker, and Sonora sucker was relatively short (on the order of 10s of meters; Remington 2002). Therefore, unless drift transport distances are relatively long (several kilometers or more), significant population losses from downstream drift are not expected.

Downstream transport of older life stages of fishes during flood or by other avenues of dispersal would also result in some losses of fishes below the barrier, although native fishes in general are adapted to avoid the worst hydraulic conditions of flood events, and they resist downstream transport (Minckley and Meffe 1987). However, entire year classes of native fishes can be destroyed from floods that occur during larval rearing periods (Robinson et al. 1998). For reasons similar to those explained for genetic isolation impacts (above), losses of native species from flood transport are expected to be minimal and of little significance to upstream populations.

As with early life stages of native fishes, floods that occur during larval development of leopard frogs have the potential to decimate a given year's cohort. Such effects would occur with or without the presence of the fish barrier, however. In the absence of flooding during larval development, downstream losses of larvae of leopard frogs over the barriers should be minor, since sites of oviposition and larval rearing are in areas of slack water with relatively little potential for entrainment in currents that could transport larvae downstream. Significant downstream drift of amphibian larvae in streams has not been noted in the literature.

No substantial impacts to later life stages (juvenile and adult metamorphs) of leopard frogs are expected from placement of fish barriers. In a steep-walled canyon reach such as the site proposed for Blue River, a fish barrier may hinder upstream movements by terrestrially-mobile adult frogs, garter snakes, or Sonoran mud turtle, but overland access is available. Impacts would be similar to those just described for fishes.

Impacts to in-stream habitats in the sedimentation zone immediately upstream from the fish barrier primarily would be a result of lowering of the local stream gradient. Thus, certain habitat types such as steep-gradient riffles would be less likely to re-form after construction of the barrier and resulting sedimentation. This impact would reduce the suitability of habitat for fishes that utilize rocky bottoms for feeding or reproduction, but the impact would be very localized, affecting less than one percent of the mainstem river.

Decreases in mean sediment size, and increases in channel sinuosity and braiding are other possible localized geomorphological effects associated with lower gradient resulting from emplacement of the fish barrier. Gradient of lower Blue River is 0.7 percent, limiting the anticipated extent of sedimentation to approximately 2,450 linear feet.

Based on Reclamation experience with other fish barriers, effects of the Blue River fish barrier to habitats downstream would include localized downcutting and scour of the channel. Downstream scour effects from various barrier designs were physically modeled at Reclamation's Denver Technical Center hydraulic lab, and the design selected and exhibited in Appendix A minimized those impacts. In addition, proximity of the barrier to the San Francisco River (which provides an elevation control) will limit the linear extent of any potential scour effects.

Mechanical Removal of Nonnative Fishes. For the most part, removal efforts directed towards large-bodied nonnative species such as channel catfish and flathead catfish would utilize dipnets and hand-held spears that would have no effect on non-target species. Removal activities for other nonnative fishes may use electrofishing, entrapment, and entanglement devices that would also capture native species. Such standard fish sampling equipment typically have very low mortality impacts, and thus mechanical removal efforts would have minimal effect, other than temporary disturbance, to non-targeted native fishes, amphibians, and semi-aquatic reptiles.

Repatriations and Monitoring. No unlisted species are proposed to be repatriated. Annual survey monitoring of fishes using standard fishery equipment is not expected to cause any substantial harm to extant populations of fishes, amphibians, or semi-aquatic reptiles. Mortality rates due to such sampling are low.

Cumulative Effects – Fish and Aquatic Wildlife. The Blue River watershed has been affected by a variety of historical and ongoing land-use practices including timber harvest, livestock grazing, agriculture, and road building. Major impacts that affected the stream channel and its associated biota occurred primarily between the middle of the 19th and 20th centuries. From FWS (2000):

> "Overgrazing by cattle and goats depleted herbaceous cover of the watershed and streambanks thus increasing sedimentation; increasing the volume and decreasing the duration of high flows; and decreasing the volume and increasing the duration of low flows. Trapping of beaver contributed to channel degradation and depletion of water storage. Timber harvest, fuelwood, and railroad tie cutting depleted vegetative cover of the watershed, created eroding roads and tracks, and damaged the river channel when logs were rafted downstream during high water. Development of fields on river terraces removed stabilizing vegetation. Irrigation canals and headworks destabilized the channel and funneled floodwaters onto terraces causing them to erode. Roads and trails along the river destroyed riparian vegetation, eroded terraces, destabilized streambanks, and channeled floodwaters into new areas thus eroding new channels or widening the existing channel. Cattle drives along the river bottom broke down streambanks, cut erosion paths, and damaged riparian vegetation. Flood control and protection measures increased velocities, decreased habitat complexity, and destabilized the river through modification and constraint of natural channel geometry."

The cumulative effect of many of these uses undoubtedly contributed to highly erosive floods that occurred between 1900 and 1916, which facilitated the loss of floodplain terraces and other major changes to the river elevation by 1916 (Olmstead 1919, NRST

2000). Some irrigation diversions became unusable due to streambed and bank erosion and reduced flows, and many irrigators were forced to drill wells to obtain dependable irrigation water. Olmstead (1919) noted:

> "Thirty years ago the Blue River flowed through a sodded or cultivated bottom land and in the channel lined with tall pines and cottonwoods. The valley, which had an average width of 700 feet, was well settled and nearly all under cultivation. To-day the bottom is a wide wash. Portions of a few of the ranches lying below projecting dikes or in coves have escaped the general destruction of the flood of recent years [1916], but they do not aggregate 200 acres in all and represent less than 8 per cent of the original arable area." (brackets ours).

Although many of these historical land uses continue today, they are managed more effectively, their impacts to the watershed and stream corridor have been lessened, and conditions are improving. Forestry practices have been mitigated to reduce impacts to soils and vegetation, as have cattle grazing and road building. Riparian vegetation and instream habitat diversity are responding positively.

In addition to physical alterations of the stream channel resulting primarily from historical land use practices, introductions of nonnative fishes to Blue River likely have impacted native species, although thus far impacts appear slight. Such subtlety is undoubtedly due to the fact that Blue River has not yet experienced the all-too-typical pattern of nonnative species invasion and establishment, followed by loss or decline of natives. The nonnative channel catfish, flathead catfish, common carp, red shiner, fathead minnow, and rainbow trout all have been recorded from the lower Blue River, but none presently seem to have established large reproducing populations. However, green sunfish was detected in the San Francisco River just upstream of the confluence with Blue River in 2010. If that species invades Blue River prior to emplacement of a fish barrier, its establishment could cause significant damage to the native fish assemblage, based on case histories known from other regional streams (Dudley and Matter 2000, Marks et al. 2009). The identical scenario could occur with other species such as smallmouth bass if they ever access the stream.

Large-scale future negative impacts to lower Blue River appear improbable due to its remoteness, large percentage of federal land ownership, and currently-improving environmental conditions. This remoteness and "wildness" is reflected in the area's potential eligibility for protection under provisions of the Wilderness Act of 1964.

The proposed native fish restoration project would have a positive cumulative effect by preventing future invasions of nonnative fishes and reducing the existing number of nonnative fishes that otherwise would continue to suppress the native fish community in the Blue River. Such benefits would also accrue to native amphibians and semi-aquatic reptiles. This would have a positive effect on the fisheries and (aquatic) wildlife ORVs in river segments that are potentially suitable for WSR designation.

3.4.7 Affected Environment – Federally Listed Species

Table 4 presents FWS listed, proposed, and candidate species that occur in Greenlee County. Listed and proposed species are afforded protection under the ESA. Candidate species are those for which FWS has sufficient information to propose them as endangered or threatened, but for which listing is precluded due to other higher priority listings. Candidate species are not afforded protection under the ESA.

Table 4. Federally listed species in Greenlee County (January 2010).

Common Name	Status
Chiricahua Leopard Frog	Threatened
Razorback Sucker	Endangered
Gila Chub	Endangered
Loach Minnow	Threatened
Roundtail chub	Candidate
Spikedace	Threatened
Apache Trout	Threatened
Gila Trout	Threatened
Mexican Spotted Owl	Threatened
Southwestern Willow Flycatcher	Endangered
Yellow-billed Cuckoo	Candidate
Lesser Long-nosed Bat	Endangered
Mexican Gray Wolf	Endangered

The following species do not occur in the project area due to (1) a lack of suitable habitat in the project area or (2) the current range for the species is outside of the project area and therefore is not considered further: lesser long-nosed bat, Apache trout, Gila chub, and Gila trout. Although the razorback sucker was stocked in the Blue River in the late 1980's, there are no recent recapture records and biologists do not believe they persist in the Blue River. Roundtail chub and spikedace are presently found in Greenlee County only in Eagle Creek (to the west of Blue River), but they are proposed for repatriation into Blue River, and thus are considered further below.

The 1994, 2001, and 2008 BOs addressed impacts to aquatic species for fish barrier construction. The FWS determined in these BOs that further section 7 consultation on listed aquatic species covered under the opinions was not required for fish barrier construction as long as specified take levels were not exceeded (Doug Duncan, FWS, pers. comm.). Consequently, the following fish species are discussed below but were not considered in the Blue River Native Fish Restoration Biological Assessment (BA): Chiricahua leopard frog, loach minnow, spikedace, and roundtail chub. The BA, which will be submitted to the FWS concurrently with this EA, concludes no effect to the southwestern willow flycatcher, may affect but not likely to adversely affect the Mexican spotted owl and not likely to jeopardize the Mexican gray wolf. Candidate species are not considered within a BA. All federally listed species that may occur in the project area are discussed below.

Mexican spotted owl. The Mexican spotted owl (MSO) was listed as threatened on March 16, 1993 (58 FR 14248), with critical habitat listed on August 31, 2004 (69 FR

53182). The MSO has an affinity for older, uneven-aged forest, and is known to inhabit a physically diverse landscape in the southwestern United States and Mexico (FWS 2008b, page 9). The MSO occupies mixed conifer and ponderosa pine/gambel oak vegetation types, usually characterized by high-canopy closure, high-stem density, multi-layered canopies within the stand, numerous snags and downed woody material. Much of the time, suitable nesting and roosting habitat are located on steep slopes or in canyons with rocky cliffs where dense vegetation, crevices, or caves provide cool moist microsites for nest and roosts.

The MSO historically nested in riparian gallery forests, however, they have not been documented breeding in these forests in recent times (Ganey and Dick 1995). MSOs commonly occur at higher elevations in canyon-bottomed riparian forests interspersed with other forest types (Ganey and Dick 1995). MSOs have also been documented at lower elevations in canyon habitat dominated by vertical-walled rocky cliffs within complex watersheds including tributary side canyons. Rock walls include caves, ledges, and other areas that provide protected nest and roost sites (69 FR 53182). While most MSOs stay on their breeding areas throughout the year, in winter, some birds migrate to lower, warmer elevations and more open pinyon-juniper woodland, mountain shrub, or the interface between pinyon-juniper and desert scrub habitats (Ganey and Dick 1995).

A reliable estimate of the number of MSOs throughout its entire range is not currently available (FWS 2008b; page 10). The most recent information from Region 3 of the USFS indicates that approximately 1,025 Protected Activity Centers (PACs) are found on the NFS lands in Arizona and New Mexico (FWS 2008b; page 10). However, surveys outside of USFS lands have located additional PACs.

MSO surveys were conducted by USFS personnel in 2003 along the Blue River; no MSOs were documented. Reclamation and FWS personnel surveyed the proposed and alternative fish barrier sites in 2004 by helicopter and determined that there is no suitable MSO breeding habitat at the Juan Miller crossing, the proposed fish barrier location, or at a previously eliminated barrier location 3 miles upstream from the San Francisco confluence. The closest MSO PAC's are the Walker Butte located approximately 5 miles west, Sardine located approximately 7 miles west, and Yam Canyon located approximately 21 miles north of the proposed fish barrier site, respectively (FWS 2008b, page 18). MSOs were detected in the Walker Butte and Yam Canyon PAC's in 2004 and in Sardine PAC in 2005, but survey efforts have been irregular (FWS 2008b, page 18). Critical habitat for MSO encompasses much of the upper Blue River drainage; however, no critical habitat has been designated along the lower reach from Fritz Ranch to the San Francisco River.

The hillsides adjacent to the Blue River are dominated by pinyon-juniper habitat which could be utilized by MSO in the winter. The Blue River within the Wildbunch Allotment (WBA), located immediately east of the project area, has been designated as "restricted habitat" and therefore falls under the management direction of Amendment 6 of the Forest Plan (Chapman et al. 2006). Restricted habitat contains broad-leaf hardwood and lowland riparian habitats. The Forest Plan Amendment 6 (specific to the MSO)

recommends maintenance and restoration of healthy riparian ecosystems through conformance with Forest Plan riparian standards and guidelines, repair of degraded areas and prevention of further damage to riparian areas.

Southwestern willow flycatcher. The southwestern subspecies of the willow flycatcher (willow flycatcher) was listed as endangered, on March 29, 1995 (60 FR 10694). Critical habitat was designated on July 22, 1997 (62 FR 39129), corrected on August 20, 1997 (62 FR 44228), set aside on May 11, 20001 and finally re-designated on October 19, 2005 (70 FR 60886). No critical habitat is designated on the Blue River. However, the Blue River from Dry Blue Creek downstream to the San Francisco River has been identified in the Recovery Plan as a specific river reach where recovery efforts should be focused (FWS 2002a; page 91).

The willow flycatcher is a neotropical migrant that breeds in the southwestern United States and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948; Stiles and Skutch 1989; Ridgely and Tudor 1994; Howell and Webb 1995). Declines in the distribution and abundance of flycatchers in the Southwest are primarily attributed to habitat loss and modification resulting from the construction of dams and reservoirs, stream diversions and ground-water pumping, channelization and bank stabilization, phreatophyte control, livestock grazing, agricultural development, urbanization, and recreation (FWS 2002a; page 28-38). Other factors include brood parasitism by brown-headed cowbirds, dominance of tamarisk, vulnerability inherently associated with small populations and stresses associated with long-distance migrations (FWS 2002a; pages 28-42)

The willow flycatcher is a riparian obligate breeder that only breeds near water or saturated soils along rivers, streams, or other wetlands (Ellis et al. 2008). Vegetation structure is an important component of the breeding habitat and most willow flycatchers are found in patches of dense contiguous vegetation (first 10-13 feet above the ground) or a mosaic of dense vegetation interspersed with multiple small openings (Ellis et al. 2008). Under natural conditions, riparian habitat in the Southwest is both spatially and temporally dynamic. Movement data suggest that willow flycatchers are adapted to the dynamic conditions and move frequently between local sites (Paradzick and Woodward 2003; p. 28). Consequently, periodic flooding and habitat regeneration are important to the recovery of this species.

With respect to the current population status, the Recovery Plan (FWS 2002a) states:

> "Developing a current population estimate is challenging. The population presents a moving target, both spatially and temporally. Because not all sites are re-surveyed in every year, the estimate generated here is a composite of known populations for different years at different sites. In each case, the most recent or more thorough year's data were used as the "current" population. This estimate is qualified by the knowledge that numbers of birds at a given site fluctuate from year to year, that inter-site dispersal takes place, and that some occupied sites have been destroyed or damaged in recent years, causing the former residents to relocate and forego breeding. Also, survey and monitoring effort has increased

> substantially from 1993 to the present, but varies among regions. Another confounding factor is the taxonomic identity of willow flycatchers at the edge of the range of the southwestern subspecies. When the southwestern willow flycatcher was listed as endangered in 1995, approximately 350 territories were known to exist."

Since 1992, more than 800 historic and new sites have been surveyed range-wide to document the population size of the flycatcher (USFWS, unpublished data). The current known population of flycatchers—based on data collected from 1993 through 2002—is estimated at 1,153 territories in five states (Sogge et al. 2003).

In Arizona, willow flycatchers now nest predominantly in mixed native and exotic habitats (Ellis et al. 2008; p.85). Seventy-five percent of willow flycatcher nests found between 1996 and 2005 in Arizona were constructed in saltcedar (Ellis et al., 2008; page 85). Southwestern willow flycatchers arrive in Arizona in late April/early May and begin nest construction in mid-to-late May. Egg laying and incubation begins in early June. Young are reared from mid-June through early August. Fledging can occur from late June through early August with birds departing for migration between August and mid-September (Sogge et al 1997).

In Arizona, the historical range of the willow flycatcher included all major watersheds. Recent surveys have documented willow flycatchers along the Big Sandy, Bill Williams, Colorado, Gila, Hassayampa, Little Colorado, Salt, San Francisco, San Pedro, Santa Cruz, Santa Maria, Tonto Creek, and Verde River systems (FWS 2002a).

The Southwestern willow flycatcher recovery plan (FWS 2002a; Chapter II, pages 15, 16) defines "currently suitable habitat" as a riparian area with all the components needed to provide conditions suitable for breeding flycatchers. These conditions are generally dense, mesic riparian shrub and tree communities 0.1 ha (0.22 acres) or greater in size within floodplains large enough to accommodate riparian patches at least 10 m (~33 ft) wide (measured perpendicular to the channel). Currently, this definition of suitability is based solely on habitat characteristics, not on measures of flycatcher productivity or survival. Suitable habitat may be occupied or unoccupied.

"Potentially suitable habitat**"** (FWS 2002a; Chapter II, pages 15-16) is defined as a riparian area that does not currently incorporate all the components needed to provide conditions suitable for nesting flycatchers but which could, if managed appropriately, develop these components over time. Potential habitat occurs where the flood plain conditions, sediment characteristics, and hydrological setting provide potential for development of dense riparian vegetation. Stressors that may be preventing regenerating and restorable habitats from becoming suitable include, but are not limited to, de-watering from surface diversion or groundwater extraction, channelization, mowing, recreational activities, overgrazing by domestic livestock or native ungulates, exotic vegetation, and fire.

"Regenerating potential habitat" (FWS 2002; Chapter II, pages 15-16) is defined as an area that is degraded or in early succession stages, but has the correct hydrological and

ecological setting to be become, under appropriate management, suitable flycatcher habitat.

"Restorable potential habitat" (FWS 2002; Chapter II, pages 15-16) is defined as an area that has the appropriate hydrological and ecological characteristics to develop into suitable habitat if not for one or more major stressors, and which requires active abatement of stressors in order to become suitable.

The suitability of the project area to support willow flycatchers varies depending upon the location. Habitat suitability of the reach downstream from the proposed fish barrier to the San Francisco River confluence can be classified as "regenerating potential habitat". As discussed in section 3.4.1, the riparian stringers have not developed the characteristics necessary to provide suitable nesting conditions for the willow flycatcher. The patch width is too narrow and there is not sufficient understory development. From the proposed fish barrier to approximately 2,000 feet upstream, the willow flycatcher habitat is classified as "unsuitable." Willow flycatcher suitability of the remainder of the project area upstream to Fritz Ranch is unknown at this time. However, the narrow confines of the canyon coupled with the high flows during spring runoff restrict vegetation development along this reach of river. There is "currently suitable habitat" for willow flycatchers located approximately ½ mile downstream of the project area along the San Francisco River (upstream and downstream of the confluence with the Blue River).

During the 2002 breeding season, the USFS conducted willow flycatcher surveys along 10 miles of the Blue River and 8 miles of the San Francisco River (Oliver et al., No Date, page 2). Breeding season surveys were conducted in 2003 (during the second and third survey windows) by USFS and Reclamation personnel. No willow flycatchers were detected during any of the surveys. No subsequent willow flycatcher surveys have been conducted in the project area.

The closest willow flycatcher detections to the project area were single birds located 18 miles south/southwest in the Gila Box in 2002 and 28 miles northeast on the Blue River in 1989 (pers. comm., Sabra Swartz, AGFD). The nearest breeding records are 34 miles to the south/southeast on the Gila River near Duncan, Arizona and a large population on the Gila River near Safford. There are also breeding locations 42 miles north on the San Francisco and 58 miles north on the Lower Colorado River near Greer, Arizona.

Yellow-billed cuckoo. On July 25, 2001, the FWS published a notice (66 FR 38611) that the petition to list the yellow-billed cuckoo under the ESA is warranted but precluded by higher listing actions. The yellow-billed cuckoo (cuckoo) remains within the candidate category. The cuckoo is an uncommon to fairly common breeder in riparian habitats in western, central, and southeastern Arizona along perennial drainages below 5,000 feet (Corman 2005a). Corman (2005a) found the highest breeding concentrations along the Agua Fria, San Pedro, upper Santa Cruz, and Verde river drainages and Cienega and Sonoita creeks. Cuckoos are a riparian obligate species with greater than 90 percent of the species nests located in riparian habitat (BLM, No Date). Research (Murrelet

Halterman, Southern Sierra Research Station, pers. comm.) indicates that cuckoos can successfully reproduce in smaller habitat patches consisting of narrow stringers of trees. Information on the San Pedro River indicates cuckoos utilized patches between 10 and 50 acres in size. In all sites, the cottonwood/willow patches were surrounded by mesquite and netleaf hackberry. Cuckoos on the Bill Williams River appeared to utilize larger patches.

The primary threat to this species is habitat loss and fragmentation (Latta et al. 1999). Pesticide use on the wintering grounds is also suspected of causing mortality of individual birds and inducing the thinning of eggshells (Latta et al. 1999). The cuckoo is primarily an insectivore, and pesticide use may reduce the availability of insect prey (Latta et al. 1999). AGFD records indicate that cuckoos have been observed within ½ mile of the proposed fish barrier site from 1985 through 1998 (Sabra Schwartz, AGFD, pers. comm.). Probable breeding was observed on the Blue River approximately 8 miles north of the proposed barrier site. The closest large breeding population is on the Gila River (Sabra Schwartz, AGFD, pers. comm.). A single cuckoo was heard on the San Francisco River approximately 2 miles from the proposed barrier site during the 2003 willow flycatcher survey (Diane Laush, Reclamation, personal observation).

Mexican gray wolf. The Mexican gray wolf (a subspecies of gray wolf) historically inhabited the southwestern United States and Mexico but was extirpated from the southwestern United States by 1970. The Mexican gray wolf was listed as an endangered subspecies on April 28, 1976 (41 FR 17742). In 1978, the Service subsumed this and several other gray wolf subspecies listings into a species-level listing for the gray wolf in order to protect the species throughout its range in the coterminous United States and Mexico. A 1982 recovery plan developed for the Mexican wolf recommended a two-pronged approach to recovery (i.e., establishment of a captive breeding program and reintroduction of wolves to the wild) but did not establish recovery criteria for the region, as did the Recovery Plans for the Eastern Timber Wolf and the Northern Rocky Mountain Wolf. A range-wide recovery plan for the gray wolf has never been developed (FWS 2008c).

On January 12, 1998, the FWS published a notice in the Federal Register indicating the intention to reintroduce the endangered Mexican gray wolf into the Blue Range Wolf Recovery Area (BRWRA) in the Apache and Gila National Forests in Arizona and New Mexico (63 FR 1752). The reintroduced Mexican gray wolf population was classified as (nonessential, experimental). Under section 10(j) of the ESA, a population of a listed species re-established outside of its current range but within its probable historic range may be designated as "experimental." The experimental population must be geographically separate from the nonexperimental population in order to increase the management flexibility for the species. Additional management flexibility exists if the FWS finds the "experimental" population to be "nonessential" to the continued existence of the species.

The reintroduced Mexican wolf population numbers approximately 50 wolves, the halfway point of the 10(j) objective to establish a single population of at least 100 wolves

(FWS 2008c). The growth of this population has lagged behind initial projections for achieving the population objective, due to a combination of biological, sociological, and regulatory factors.

Beginning in February 1998, Mexican gray wolves were released into the BRWRA at several locations on the Alpine and Clifton Ranger Districts.. The Gavilan Pack was released in May 1999, but due to the number of cattle depredations documented, the pack was removed in early 2000. Two other packs (Mule and Wildcat) were located in the area between 1999 and 2001, but those packs moved out of the area on their own (USFS 2006). There have been no wolves in the project area since 2001 (USFS 2006), but the potential exists for wolves to occur in the area at any time (USFS 2006). A March 12, 2010 review of the AGFD (2010b) website for the Mexican wolf reintroduction and management indicated no radio collared wolves near the site of the proposed barrier. The majority of wolf activity occurs between Alpine and Hannagen Meadow approximately 30 miles to the north.

According to AGFD (2010b) reintroduced Mexican wolves have experienced mortality causes similar to other wolf populations exposed to high levels of human activity. The highest cause of mortality (56 percent) during the first five years has been human-related (gunshot and vehicle collisions). Approximately 24 percent died from natural causes leaving 20percent of the causes of death as unknown. Yearling wolves have the highest mortality rate, accounting for about 36 percent of all mortality. Detailed, age-specific mortality rates for Mexican wolves have not been calculated, partially due to the regular artificial manipulation of the population through releases and removals for various reasons. Colonizing wolves in Wisconsin experienced a 39 percent mortality rate from 1979 to 1985, which dropped to 18 percent from 1985 to 1992. Some wolf populations have sustained about 30 percent human-caused mortality and still persisted. Wolves are vulnerable to control efforts as their populations can be reduced in an area, but if a reservoir population is nearby, recolonization can occur within a few years.

The gray wolf species was native to most of North America north of Mexico City. Mexican gray wolves historically occurred in much of New Mexico, Arizona and Texas and northern Mexico mostly in forested, mountainous terrain. AGFD (2010b) estimated that the average Mexican wolf will consume about 2,800 pounds of prey per year, approximately 80 percent of that being Coues white-tail deer, mule deer and elk. No detailed food habit study has been conducted on Mexican wolves; however, a preliminary scat analysis of released Mexican wolves revealed that about 75 percent of the scats contained hair from elk. Deer was found in about 10 percent of the scat content, livestock was found in four percent and 11 percent of the scat content was small mammals and unknown items. Wolves in Yellowstone National Park killed mostly elk (84 percent), with bison (six percent) and deer (one percent) making up only a fraction of the wolves' total diet in 2002.

Loach minnow. Loach minnow was federally listed as threatened on October 28, 1986 (51 FR 39468). Critical habitat designated in 2007 (72 FR 13356) includes four stream complexes in the Black River, Aravaipa Creek, San Francisco River/Blue River/Eagle

Creek, and upper Gila River drainages in New Mexico. That designation was remanded in 2009, but will be enforced until a new rule is proposed, which is expected to be finalized in 2011. Loach minnow is endemic to streams of the Gila River Basin, and its historical distribution included the Salt, Verde, Gila, White, San Francisco, Blue, and San Pedro Rivers; Eagle Creek; and major tributaries of these larger streams (Minckley 1973). The species has been extirpated from most of its historic range, surviving as a relatively large population only in Aravaipa Creek and Blue River, Arizona, and in the mainstem and West Fork of the Gila River in New Mexico (Marsh et al. 1990, FWS 1991a, Propst 1999, Paroz and Propst 2007). It persists as relatively small populations in about one-half dozen other streams in the basin and is estimated to be lost from about 85% of its historic range (FWS 1991a). FWS has determined that uplisting to endangered status is warranted.

Loach minnow is a small-bodied, short-lived, current-loving species inhabiting interstices of gravel and rubble in shallow, well-defined, stream riffles (FWS 1991a). Foods are predominantly ephemeropteran nymphs and blackfly (Family Simuliidae) larvae (Schrieber and Minckley 1981). Loach minnow is the only member of the cyprinid family known to employ egg-clumping as a mode of spawning behavior (Johnston 1999). Spawning occurs in riffles where eggs are emitted by the female, fertilized, and then retrieved and affixed in clumps to the underside of rocks by the male (Vives and Minckley 1990, Childs 2004).

The presence of nonnative fishes and other nonindigenous aquatic organisms appears the major factor in continued declines of this species (Desert Fishes Team 2003). Recovery activities that have been implemented to date for loach minnow are construction of fish barriers on Aravaipa Creek to protect an existing population (2001); construction of barriers on, renovations of, and repatriations to Fossil (2004) and Bonita Creeks (2008); and repatriations to Redfield and Hot Springs Canyons (2007-2009). It is too soon to determine if self-sustaining populations have established in any of these systems, although reproduction has been detected in Hot Springs Canyon.

Spikedace. Spikedace was federally listed as threatened on July 1, 1986 (51 FR 23769). Critical habitat designated in 2007 includes three stream complexes in the Verde River, middle Gila River/lower San Pedro River/Aravaipa Creek, and upper Gila River (New Mexico) drainages (72 FR 13356). That designation was remanded in 2009, but will be enforced until a new rule is proposed, which is expected to be finalized in 2011. Spikedace is endemic to the Gila River Basin with a historical distribution that included the Agua Fria, Verde, Salt, San Francisco, Gila, and San Pedro rivers, and many of their major tributaries (Minckley 1973). In Arizona, spikedace remains only in Aravaipa Creek, a portion of the upper Verde River, and in Eagle Creek (Marsh et al. 1990), but the species has not been detected in the two latter streams in recent years. In New Mexico, it inhabits the Gila River and its major forks, but is declining there also (Propst 1999, Paroz and Propst 2007). The FWS has determined that uplisting to endangered status is warranted.

Spikedace is a small-bodied, short-lived species that occupies flowing pools generally less than a meter deep over sand, gravel, or mud bottoms below riffles or in eddies (Minckley 1981). Spawning occurs over sand-gravel substrates with no parental care given (Barber et al. 1970, Propst et al. 1986). Foods are primarily ephemeropteran nymphs and dipteran larvae, but substantial numbers of winged adults of these groups and caddis flies are also taken (Schrieber and Minckley 1981).

Of the species that have not already been extirpated from the Gila River basin, spikedace is perhaps the most endangered due to its specialized habitat preferences and apparent need for waters with relatively high base flows that are now occupied by nonnative fishes (Desert Fishes Team 2003). Recovery activities that have been implemented to date for spikedace are construction of fish barriers on Aravaipa Creek to protect an existing population (2001); construction of a barrier on, renovation of, and repatriation to Fossil (2004) and Bonita Creeks (2008); and repatriations to Redfield and Hot Springs Canyons (2007-2009) and San Francisco River in New Mexico (2009). It is too soon to determine if self-sustaining populations have established in any of these systems, although reproduction has been detected in Redfield Canyon. This species is proposed for repatriation to the Blue River.

Roundtail chub. Roundtail chub historically was widespread in larger streams and rivers and their tributaries throughout most of the Colorado River basin. In the Gila River basin, it inhabited much of the Verde, Salt, San Pedro, and middle Gila river drainages, but it is now found in fewer than 20 localities and occupies only approximately 20 percent of its former range (Voeltz 2002). The species largely has been lost from the mainstem rivers that have been most heavily impacted by introductions of predatory nonnative fishes, which is considered the primary cause of the species' diminished status (Bestgen and Propst 1989, Minckley 1991). Roundtail chub was recently declared eligible for listing as endangered or threatened under the Endangered Species Act, but has been precluded due to higher listing priorities (74 FR 32352).

Roundtail chub can achieve total lengths of 450 mm or more and live to more than 20 years (Scoppetone 1988). It inhabits pools, eddies, and the relatively swift waters below rapids and riffles. Roundtail chub is an opportunistic omnivore, and consumes a variety of insects, algae, gastropods, crayfish, fish, and small lizards (Vanicek and Kramer 1969, Neve 1976, Schrieber and Minckley 1981, Bestgen 1985, Rinne 1992). Adult roundtail chub occupy the position of "top carnivore" in the absence of Colorado pikeminnow (Minckley 1973, Schrieber and Minckley 1981). Spawning occurs in spring when chubs deposit eggs over clean gravel at the base of a riffle in close proximity to the transition from riffle to glide. Reproductive success is positively correlated with winter-spring flooding events (Brouder 2001). Roundtail chub is not now extant in the Blue River drainage, but is intended to be repatriated into the lower mainstem as part of the proposed native fish restoration project.

Chiricahua leopard frog. Chiricahua leopard frog was federally listed as threatened without critical habitat on June 13, 2002 (67 FR 40790). The species is distributed in two disjunct ranges: 1) along the southern edge of the Colorado Plateau and along the

Mogollon Rim area of east-central Arizona and extreme western New Mexico, including headwater drainages in the White Mountains area, and 2) in montane portions of southeastern Arizona, southwestern New Mexico, northern Sonora, and the eastern base of the Sierra Madre Occidental perhaps through Chihuahua to northern Durango (Sredl et al. 1997, FWS 2007). As currently described, Chiricahua leopard frog re-subsumes the previously-described Ramsey Canyon leopard frog, based on genetic evidence of Goldberg et al. (2004).

Widespread population losses were noted for this species in Arizona in the mid-1980s (Clarkson and Rorabaugh 1989), which at the time could not be attributed to any single cause. Subsequent correlative analysis of populations in the Chiricahua Mountains region in Arizona showed a nearly perfect complementary distribution of leopard frogs and nonnative aquatic vertebrates, especially fishes and bullfrogs, strongly suggesting that nonnative predators negatively impact and eliminate leopard frogs (Rosen et al. 1995). Many similar studies of other ranid frogs in the West support this finding (Bradford 1989, Bradford et al. 1993, Fellers and Drost 1993, Hayes and Jennings 1986, and others). Loss of metapopulation centers and dispersal corridors via invasion by nonnative aquatic vertebrates is a nearly intractable problem (Sredl and Howland 1995). Habitat destruction and especially disease (Bradley et al. 2002) are also considered major causes of its decline. Although historical sites of collection have been variably occupied recently, it was estimated the species was no longer found in approximately 75% of its former range (FWS 2002b).

Chiricahua leopard frog distribution overlaps with northern leopard frog at higher elevations in the northern portion of its range and with lowland leopard frog at most lower elevations. Within the Blue River drainage, the species has been recorded from the "headwaters" of the Blue River in Arizona, and from Blue Creek and Dry Blue River and their tributaries in New Mexico (FWS 2007). Some possible hybridized specimens (with lowland leopard frog) were recorded from the Blue River mainstem in 2000 approximately 6 miles upstream from the mouth (J. Rorabaugh, FWS, pers. comm.). Other than these possible hybrids, the frog commonly documented along the mainstem Blue River in Arizona is lowland leopard frog (Platz and Frost 1984, R. Clarkson, personal observation). We include Chiricahua leopard frog in this EA to note it is possible the species ranges downstream to near the barrier site based on the presence of possible hybrids.

3.4.8 Environmental Consequences – Federally Listed Terrestrial Species

No Action

Under the No Action alternative, there would be no direct impact to federally-listed terrestrial species, since no project would be constructed or implemented. Impacts to federally-listed terrestrial species would be similar to those described under section 3.4.4.

No effect to federally listed terrestrial species would result from activities associated with nonnative fish removal, native fish restoration, and monitoring, in the event those actions are undertaken by AGFD in lieu of the proposed project.

Proposed Action

Mexican Spotted Owl

Barrier Construction. Breeding MSO surveys conducted in 2003 along the Blue River resulted in no detections of MSOs. Although the Blue River has been identified as "restricted habitat," as defined in the MSO critical habitat final rule (USDI 2004), there is no suitable MSO breeding habitat on the lower Blue River. The Blue River, in the area of the proposed barrier, does not contain all of the primary constituent elements (PCE) necessary to support breeding MSO. These PCE's include: dense vegetation covering 40 percent or more of the ground, large diameter trees, canyon walls containing crevices, ledges or caves or a high percentage of ground litter and woody debris. The lack of suitable canyon breeding habitat was confirmed by FWS during a 2004 helicopter survey of the area encompassing the site of the proposed barrier.

The closest documented PAC (Walker Butte) is located approximately 5 miles away from the proposed barrier site; at this distance there would be no disturbance from construction activities. Transport of personnel and materials would be performed by helicopter. The proposed flight path will follow the San Francisco River from Clifton, Arizona to the confluence with the Blue River and then upstream ½ mile on the Blue River. The proposed flight path will place the helicopter approximately 2 miles from the edge of the Walker Butte PAC. At this distance there would be no effect to any MSO within the PAC. The FWS approved MSO survey protocol does not require surveys beyond ½ mile outside of the project perimeter.

The mesas and hillsides adjacent to the Blue River are dominated by pinyon-juniper habitat. MSOs have been documented utilizing open pinyon-juniper habitat during winter months (Ganey and Block 2005). However, it is unlikely that project activities would negatively impact the MSO. Project activities would be restricted to the canyon bottom with the exception of the helicopter which will circle the immediate project area to pick up or drop off supplies and/or personnel. There are extensive stands of pinyon-juniper habitat located beyond the range of the construction noise in which the occasional wintering MSO could roost undisturbed by project activities.

Other than the remote potential for minor noise related disturbance to wintering MSO, there would be no effects to the MSO from the barrier construction based on the following information. There is no suitable breeding habitat in the project area. There are no documented occurrences of MSO in the project area. Helicopter operations would not occur within ½ mile of any known PAC. The proposed project would not preclude future use of the project area by MSO.

Mechanical Removal of Nonnative Fishes. There are no known PACs within close proximity to the Blue River. Mechanical removal activities would be restricted to the stream channel; therefore, no impacts would occur to any MSO.

Repatriations and Monitoring. Repatriation and long-term monitoring activities could potentially occur at any time of the year. Repatriation activities are expected to be centered near and downstream from the Juan Miller crossing. A helicopter would be utilized to distribute the roundtail chub and spikedace at locations upstream and downstream of the Juan Miller crossing. The nearest PAC is Walker Butte located approximately 8 miles to the southwest of Juan Miller crossing. There will be no effect to any MSOs from repatriation activities. Long-term monitoring activities would occur near the Juan Miller crossing, the fish barrier location and potentially a site mid-way between these two features. Activities would be confined to the stream channel and would not affect any MSO or PAC.

Cumulative effects to the MSO would be similar to those described for terrestrial wildlife under section 3.4.4.

Southwestern Willow Flycatcher

Barrier Construction. Southwestern willow flycatcher surveys in the project area were conducted in 2002 and 2003; no willow flycatchers were documented during any of the surveys. Willow flycatcher habitat suitability at the site of the proposed barrier is classified as "regenerating potential habitat." Construction of the fish barrier would not alter this classification nor preclude future development of potential willow flycatcher habitat. The additional 6-10 inches of stream channel degradation resulting from barrier emplacement would not preclude future riparian habitat development. Riparian vegetation at this site currently does not provide the characteristics necessary to support willow flycatchers; although the hydrologic characteristics of the stream are present to support development of suitable habitat. This determination is supported by the narrow width of the riparian stringer and the lack of understory development resulting from repeated flood-induced scour which continually resets the vegetative growth. In order to avoid high flows associated with the monsoon and spring runoff, construction of the barrier would be initiated after mid-September and completed prior to the end of February. Construction is expected to require approximately 4 months. This timeframe is outside of the breeding season (1 May - 31 August) for willow flycatchers.

Mechanical Removal of Nonnative Fishes. Following construction, the initial mechanical removal of nonnative fishes is expected to take place during the low-flow period in early summer. However, subsequent removal operations could take place at any time of the year. Fishery biologists will seine, net, or spear nonnative fishes in the reach of river from Fritz Ranch downstream to the barrier. Biologists will move methodically along the stream channel and are not expected to spend significant amounts of time at any location. Removal activities would be confined to the stream channel and no willow flycatcher habitat would be impacted. The suitability of the Blue River as willow flycatcher habitat is limited due to the frequent flooding that occurs during spring snowmelt. There will be

no effect to the willow flycatcher from this activity based on the lack of habitat impacts and the limited amount of time that personnel will spend at any one location. If removal activities need to be repeated in the future, the suitability of the treatment reach for willow flycatchers should be determined prior to conducting the mechanical removal activities. Personnel should avoid spending significant amounts of time (such as staging operations) near potentially suitable willow flycatcher habitat.

Repatriations and Monitoring. Repatriations and long-term monitoring activities could be scheduled any time during the year. Repatriation activities may occur more than once if the initial effort fails. The main impact to the willow flycatcher from repatriation actions would be noise disturbance from helicopter activities associated with flights upstream and downstream of the staging location. At this time, the proposed staging location is the Juan Miller crossing. The willow flycatcher habitat suitability of the selected staging area would be assessed and, depending upon the timing of the repatriation activity, appropriate ESA compliance would be conducted. There would be no effect to the willow flycatcher from long-term monitoring activities.

There would be no direct, indirect, interrelated/interdependent or cumulative effects to the southwestern willow flycatcher from the proposed project based on the following information. No willow flycatchers were detected during the 2002 and 2003 surveys. No willow flycatcher nests have been documented on either the Blue or San Francisco Rivers near of the project area. There is no currently suitable breeding habitat within the area affected by fish barrier construction, and limited (if any) suitable habitat along the remainder of the Blue River within the proposed mechanical removal area. The closest breeding populations are 34 miles to the south near Duncan and 42 miles to the northeast on the San Francisco River. Fish barrier construction would occur outside of the breeding season (May through August). The proposed project would not preclude future use of the project area by willow flycatchers.

Yellow-billed Cuckoo

Barrier Construction. Riparian habitat along the lower Blue River provides limited breeding and foraging habitat for the yellow-billed cuckoo. Suitable nesting and foraging habitat is present along the San Francisco River approximately ½ mile to the south. Cuckoos arrive primarily in early June and leave the State by mid-October. Construction activities would begin in late fall near the end of the breeding season and would not affect any cuckoos. Loss of ½ acre of Interior Strand habitat would have no effect on the cuckoo.

Mechanical Removal of Nonnative Fishes. Effects to the cuckoo will be similar to those described for the willow flycatcher with the exception that no ESA compliance is needed.

Repatriations and Monitoring. Effects to the cuckoo will be similar to those described for the willow flycatcher with the exception that no ESA compliance is needed.

Cumulative effects to the cuckoo would be similar to those described for terrestrial wildlife under section 3.4.4.

Mexican Gray Wolf

Barrier Construction. At present, no wolves occur in the project area. Construction of the fish barrier would not affect any wolf habitat nor preclude the future use of the area by Mexican gray wolves. Access around the barrier is available by traversing hills east of the barrier. Consequently, the barrier would not preclude wolf movement.

The Mexican gray wolf is listed under ESA section 10(j) as experimental nonessential. In compliance with 50 CFR 17.84(k) species listed as experimental nonessential are treated as "proposed" species. The conclusion reached for a "proposed species" [jeopardy or non-jeopardy] is different than the conclusion reached for listed species [no effect, not likely to adversely affect, or likely to adversely affect]. By definition (ESA Consultation Handbook), *a "nonessential experimental population" is not essential to the continued existence of the species. Therefore, no proposed action impacting a population so designated could lead to a jeopardy determination for the entire species.* Given this determination by FWS, the proposed action will not jeopardize the continued existence of the Mexican gray wolf.

Mechanical Removal of Nonnative Fishes. Human intrusion along the Blue River during stream renovation activities would be temporary and confined to the river corridor. This disturbance level would be minor and similar to what would occur during normal recreational or other land use on NFS lands or by livestock and/or ranchers on private lands within the drainage. As determined above, these activities would not jeopardize the Mexican gray wolf.

Repatriations and Monitoring. Effects would be similar to those described under the Mechanical Removal section above.

Cumulative effects to the Mexican gray wolf would be similar to those described for terrestrial wildlife under section 3.4.4.

3.4.9 Environmental Consequences – Federally Listed Aquatic Species

No Action

Under the No Action alternative, there would be no direct impact to federally-listed aquatic species, since no project would be constructed or implemented. The anticipated effects are similar to those described under section 3.4.6 (Fish and Aquatic Resources).

Proposed Action

Loach Minnow

Barrier Construction. The proposed fish barrier is expected to have substantial, positive long-term benefits to loach minnow by preventing upstream invasions of nonnative fishes and other undesirable aquatic biota into upper reaches of Blue River. There would be short-term impacts to loach minnow as a result of temporary disturbance to stream habitats in the construction area. Loach minnow would either be forced to move upstream or downstream from the construction site during actual construction, and some direct mortality is possible. In addition, exchange of genetic materials from populations below the barrier with those above would be prevented, although this impact can be ameliorated through human intervention by periodically capturing and moving individuals above the barrier.

Anticipated incidental take of native fish resulting from barrier construction was considered by FWS to be exceeded if more than 25 dead native fish or 5 dead native leopard frogs were found in the area of barrier construction activities or within 500 yards downstream (FWS 2008a). In that event, Reclamation must provide an explanation of the causes of the taking and review with FWS the need for possible modification of the reasonable and prudent measures of the BOs.

Mechanical Removal of Nonnative Fishes. The action of removing large catfishes from pools using nets and spears should have no impact to loach minnow as that species is a riffle-dweller. Potential mechanical removal activities directed at other nonnative species using other sampling equipment (e.g., electrofishing) could have minor impacts if riffles were targeted for removal efforts, but such effects would be of short duration and in general would be no greater than any routine fish monitoring survey. Mechanical removal efforts would not occur during spawning periods. In total, removal of nonnatives from the Blue River drainage overall will have substantial benefits to loach minnow populations, as previously described.

Repatriations and Monitoring. Loach minnow already is present in the Blue River drainage and therefore is not proposed for repatriation. Impacts associated with monitoring would be similar to those described for aquatic resources under section 3.4.6.

Chiricahua Leopard Frog

Barrier Construction. Leopard frog populations have been shown to be negatively impacted by presence of nonnative fishes, and thus the fish barrier should have overall positive long-term effects on Chiricahua leopard frog. In the unlikely event Chiricahua leopard frog is present near the proposed fish barrier site (its Blue River distribution appears to be limited to upper portions of the drainage; see section 3.4.7), frogs would be forced to move upstream or downstream from the construction area, and it is possible some mortality could occur. If more than five frogs are found dead near the construction

site, Reclamation must immediately provide an explanation of the causes of the mortality to FWS and review with them the need for possible modification of reasonable and prudent measures identified in the 2008 BO (FWS 2008a).

Mechanical Removal of Nonnative Fishes. Impacts associated with mechanical removal would be similar to those described for aquatic resources under section 3.4.6.

Repatriations and Monitoring. Chiricahua leopard frog already is present in the Blue River drainage and therefore is not proposed for repatriation. Impacts associated with monitoring would be similar to those described for aquatic resources under section 3.4.6.

Federally-Listed Species Proposed for Repatriation

Barrier Construction. Spikedace and roundtail chub do not presently occur in the Blue River but would be stocked in the stream upon completion of interagency coordination, the NEPA process, and ESA section 7(a)(2) consultation. Stockings could occur either before or after construction of the fish barrier. If repatriation occurs after the barrier is emplaced, there would be no impacts to either species from construction. However, if spikedace was repatriated prior to construction, spikedace would be covered under terms of the 2008 BO (FWS 2008a), as described above for loach minnow. Effects to the candidate-for-listing roundtail chub, if it was repatriated prior to barrier, would be the same as described below for sensitive fishes (section 3.4.10).

Mechanical Removal of Nonnative Fishes. The action of removing large catfishes from pools using nets and spears should have no impact to spikedace or roundtail chub other than temporary disturbance and potential low-level mortality from netting. Potential mechanical removal activities directed at other nonnative species using other sampling equipment (e.g., electrofishing) could have minor mortality impacts, but standard fishery survey methods do not typically negatively impact populations when practiced as proposed here. In general, removal of nonnatives from the Blue River drainage overall will have substantial benefits to sensitive fish populations.

Repatriations and Monitoring. Repatriation of spikedace and roundtail chub would have beneficial biological consequences by restoring the original fish community that is believed to have resided in the Blue River. Establishment of the species in Blue River would continue the long-overdue recovery process for the imperiled warm-water native fish fauna of the Gila River basin. Similar action at other streams within the basin may eventually lead to downlisting or delisting of spikedace from the Endangered Species Act, or could preclude the need for listing of roundtail chub.

Negative effects of repatriations of spikedace and roundtail chub to the existing native fish assemblage should be minor to non-existent, as all of these species evolved together within the Gila River drainage, and the identical community of seven species occurs naturally in Aravaipa Creek, Arizona. Instream habitats of Blue River and Aravaipa Creek are similar, and habitat variability in Blue River appears sufficient to support these two additional species. Habitat partitioning among native fishes in Aravaipa Creek and

elsewhere is pronounced (Minckley 1981), and there is no reason not to expect similar segregation of habitat use in Blue River. Such partitioning will minimize interspecific competition. Effects of monitoring to spikedace and roundtail chub would be similar to those described for loach minnow above.

Cumulative Effects - Federally-Listed Species Proposed for Repatriation

Cumulative impacts were previously described under section 3.4.6 (Environmental Consequences: Fish and Aquatic Resources). The cumulative effect of the proposed project would be to improve the recovery status for roundtail chub and spikedace.

3.4.10 Affected Environment – USFS Sensitive Species

The ASNF has compiled a list of sensitive species (Table 5) from the USFS Southwestern Region sensitive species list (Appendix E). Placement on the sensitive list is determined by concern for population viability because of significant current or predicted downward trends in population numbers or density and downward trends in habitat capability that would reduce a species' distribution. For species on the list that are thought to be rare, particularly plants and invertebrates, there is little information and limited surveys to accurately determine status. Only those species which have the potential to occur in the project area and be impacted by the proposed project are discussed below. Otherwise, the species' range occurs outside of the project area or there is no suitable habitat within the project area for the species.

Table 5. List of USFS sensitive species for the ASNF.

Common Name	Status
Mammals	
Merriam's Shrew	FS Sensitive
Dwarf Shrew	FS Sensitive
Water Shrew	FS Sensitive
Western Red Bat	FS Sensitive
Spotted Bat	FS Sensitive
Allen's Lappet-browed Bat	FS Sensitive
Pale Townsend's Big-eared Bat	FS Sensitive
Greater Western Mastiff Bat	FS Sensitive
White Mountains Chipmunk	FS Sensitive
White Mountains Ground Squirrel	FS Sensitive
Springerville Silky Pocket Mouse	FS Sensitive
Southern Red-backed Vole	FS Sensitive
Arizona Montane Vole	FS Sensitive
Navajo MogollonVole	FS Sensitive
Long-tailed Vole	FS Sensitive
Meadow (New Mexico) Jumping Mouse	FS Sensitive
Birds	
Bald Eagle	FS Sensitive
Zone-tailed Hawk	FS Sensitive
Northern Goshawk	FS Sensitive
Common Black Hawk	FS Sensitive

Common Name	Status
American Peregrine Falcon	FS Sensitive
Western Yellow-billed Cuckoo	FS Sensitive
Western Burrowing Owl	FS Sensitive
Gray Catbird	FS Sensitive
Abert'sTowhee	FS Sensitive
Baird's Sparrow	FS Sensitive
Fish	
Sonora sucker	FS Sensitive
Desert sucker	FS Sensitive
Longfin dace	FS Sensitive
Roundtail chub*	FS Sensitive
Amphibians	
Lowland Leopard Frog	FS Sensitive
Arizona Toad	FS Sensitive
Reptiles	
Narrow-headed Gartersnake	FS Sensitive
Snails	
3 Forks Springsnail	FS Sensitive
Insects	
Ferris Copper	FS Sensitive
Clams	
California Floater	FS Sensitive
Plants	
Greene (Wheel) Milkweed	FS Sensitive
Villous Groundcover Milkvetch	FS Sensitive
Gila Thistle	FS Sensitive
Maguire's Beardtongue	FS Sensitive
White Mountains Paintbrush	FS Sensitive
Parish's Alkali Grass	FS Sensitive
Blumer's Dock	FS Sensitive
Yellow Lady's Slipper	FS Sensitive
Arizona Willow	FS Sensitive
Arizona Sneezeweed	FS Sensitive
Arizona Sunflower	FS Sensitive
Heartleaf Wild Buckwheat	FS Sensitive
Eastwood Alum Root	FS Sensitive
Wislizeni Gentian	FS Sensitive
Goodding's Onion	FS Sensitive
Arizona Alum Root	FS Sensitive
Mogollon Hawkweed	FS Sensitive
Heartleaf Groundsel	FS Sensitive
Mogollon Clover	FS Sensitive
Davidson's Cliff Carrot	FS Sensitive
Bebb's Willow	FS Sensitive

* Roundtail chub was recently designated a Candidate for listing under ESA. The species was treated under section 3.4.9.

Sensitive Birds

Bald eagle. On February 14, 1978, all bald eagles in 43 of the 48 contiguous United States, including Arizona, were classified as endangered (43 FR 6233, February 14,

1978), and those in Minnesota, Wisconsin, Michigan, Oregon, and Washington were classified as threatened. A recovery plan (FWS 1982) was established to delineate specific research and management objectives for the population in the Southwest. Since DDT was banned from use in the United States in 1972, there has been a steady increase in both the number of breeding pairs and the number of young reared per breeding attempt in most North American populations (Gerrard and Bortolotti 1988). In Arizona, the number of known bald eagle Breeding Areas has steadily increased from one or two in 1970, to 48 active Breeding Areas in 2009 (McCarty and Jacobson 2009). The bald eagle was reclassified as threatened on July 12, 1995 (60 FR 36000). On July 9, 2007 (72 FR 37346) the bald eagle was delisted. However, on May 1, 2008 (73 FR 23966), as a result of a court order, the desert bald eagle was listed as threatened under the ESA. A status review was initiated on May 20, 2008 (73 FR 29096) to evaluate whether the bald eagle is a Distinct Population Segment as described under the ESA. On February 24, 2010 the FWS released a statement indicating the Sonoran Desert bald eagle is not a listable entity under the ESA. The Sonoran Desert bald eagle will remain listed under the ESA pending confirmation from the Court that its injunction preventing removal of the threatened species from the endangered species list is dissolved. At that time FWS will publish a new release. Greenlee County does not occur within the FWS designated area for the desert bald eagle.

There are no records of nesting bald eagles on the Blue River; the closest breeding record (non-listed bald eagle) is located 45 miles to the north at Luna Lake; while the closest (listed eagle) is located 68 miles to the west (Sabra Schwartz, AGFD, pers. comm.). The closest wintering records to the site of the proposed barrier are 5 miles to the east and 5 miles to the southwest (Sabra Schwartz, AGFD, pers. comm.). Mid-winter bald eagle surveys conducted along the Blue River from 1993 through 2008 averaged 1.5 bald eagles per year (Kenneth Jacobson, AGFD, pers. comm.). However, eagle numbers have declined in recent years. AGFD records indicated (Kenneth Jacobson, AGFD, pers. comm.) that the average number of bald eagles observed between 1993 and 2000 was 2.3. But the average number of bald eagles observed between 2001 and 2008 was only 0.8.

Wintering bald eagle populations tend to be scattered and highly mobile, usually foraging and roosting in small groups. Wintering eagles prefer areas of plentiful food resources, usually near water. Individual or small groups of eagles often occur in terrestrial habitats when open bodies of water freeze over. Grubb and Kennedy (1982) reported that the National Forests provide habitat for the most significant concentrations of wintering eagles in Arizona. Coconino County consistently records the highest number of bald eagles during annual mid-winter surveys; eagles are consistently detected on the Verde River between the East Verde and West Clear Creek (Beatty 1992, Beatty et al. 1995a, Beatty et al. 1995b, Beatty and Driscoll 1999). Bald eagles use communal night roosts that may be related to food finding (Hansen et al. 1980) or energetic considerations (Keister 1981, Knight et al. 1983). Night roosts are often on slopes (Platt 1976, Hansen et al. 1980, Dargan 1991) or are protected from prevailing winds by surrounding vegetation (Sabine 1981, Steenhof 1976). Individual roost trees are larger and have open canopies Stalmaster and Newman 1979, Hansen et al. 1980, Anthony et al. 1982, Keister

and Anthony 1983, Dargan 1991). The immediate project area provides limited roost sites for bald eagles. No trees proposed for removal are suitable for roosting bald eagles.

Zone-tailed hawk. Zone-tailed hawks are primarily tropical raptors nesting from Arizona, New Mexico, and Texas south into northern Mexico (Corman 2005b). Breeding bird atlas records (Corman 2005b) note the continued northward expansion of this raptor from southeastern Arizona north along the southern edge of the Mogollon Rim. Zone-tailed hawks were confirmed nesting as far north as the south rim of the Grand Canyon. The zone-tailed hawk is found from high elevation forests to lowland riparian areas including dry desert washes. However, the majority of breeding occurs in riparian areas dominated by Arizona sycamore and Fremont cottonwoods (Corman 2005b). Diet consists mainly of small vertebrates, mostly rodents, lizards and birds (Snyder 1998). There is one record from AGFD of a nest in Dix Creek approximately 2.5 miles from the fish barrier location (Sabra Schwartz, AGFD, pers. comm.).

Common black hawk. The majority of common black hawks in Arizona occur along the streams draining the Mogollon Rim which include the Virgin, Big Sandy, and Bill Williams rivers and both the upper and middle Gila and Salt rivers (Latta et al 1999). This large raptor is a riparian obligate species nesting along perennial drainages with mature gallery forests (Corman 2005c). More than 90 percent of all breeding bird atlas records were reported from two main riparian habitat types: Arizona sycamore-dominated drainages and Fremont cottonwood dominated drainages (Corman 2005c). Common black hawks feed on a variety of prey species including invertebrates, fish, frogs and larvae, reptiles, birds, and small mammals (Latta et al. 1999). This species is dependent upon mature, relatively undisturbed habitat supported by a permanent flowing stream. They prefer to nest in large trees (primarily cottonwood and sycamore) within a grove (Latta et al. 1999). Habitat Data Management System records indicate breeding records within ½ mile of the site of the proposed barrier. In addition there are multiple records along both the Blue and San Francisco Rivers from a 1996 survey effort (Sabra Schwartz, AGFD, pers. comm.).

American peregrine falcon. The peregrine falcon was removed from the Endangered Species list on August 25, 1999 (64 FR 46542). The historic breeding range for the peregrine falcon extended from Canada and Alaska south into Baja, California, central Mexican highlands and northwest Mexico, including continental United States with the exception of the southeast part of the country. In Arizona, both resident and migrant peregrine falcons are found over the entire state. Peregrine falcons in the southwestern United States inhabit cliffs and river gorges within 10 to 20 miles of water. Eyries occur on cliffs which generally exceed 61 meters (200 feet) in height. However, eyries have been found in locations such as rock ledges only 17 meters (56 feet) high (Laurie Ward, formerly AGFD, pers. comm., 1994). Eyries are situated on open ledges and a preference for a southern exposure increases with latitude (FWS 1984). There were approximately 188 breeding pairs of peregrine falcons in Arizona prior to delisting (Sabra Schwartz, AGFD, pers. comm.). The closest breeding records from the site of the proposed barrier are located 7.5 east on the San Francisco River, 18 miles to southwest, and 25 miles to the northwest (Sabra Schwartz, AGFD, pers. comm.)

Yellow-billed cuckoo. See previous discussion in section 3.4.7.

Abert's towhee. Arizona encompasses approximately 80 percent of the Abert's towhee range (Corman 2005d). This species prefers dense vegetation near water or moist soil; but is equally adaptable expanding into urban and rural habitats that provide sufficient cover and food resources. Breeding Bird Atlas records (Corman 2005d) found 63 percent of all Abert's towhees in lowland riparian habitat containing Fremont cottonwood, Goodding willow, seepwillow (*Baccharis* sp.) and mesquite. There is suitable habitat for the Abert's towhee in the project area. However, no Abert's towhees were observed during any of the site visits to the project area. Abert's towhees were not recorded during survey efforts conducted by Hubbard and Hayward (1973) or Carothers et al (1982). Both of these studies occurred on the San Francisco River but came within ½ mile and 2 miles (respectively) of the project area. AGFD does not keep records of common species such as the Abert's towhee (Sabra Schwartz, AGFD, pers. comm.).

Sensitive Plants

Greene (Wheel) milkweed. The Wheel milkweed population is primarily centered in eastern Colorado extending southwest in an arc through New Mexico and entering into southeastern Arizona (Decker 2006). Wheel milkweed is found in small occurrences throughout its range. The total plant range covers 75,000 square miles and historically may have been larger; but now it is known only from about 30 different localities encompassing a tiny fraction of its former range (Decker 2006). Typical habitat for wheel milkweed is level to gently sloping terrain. Although plants are often found at the base of escarpments or mesas, the species does not occur on rock ledges or outcroppings. It is absent from highly disturbed habitats such as sand dunes, erosion channels, wash slopes, and badlands (Decker 2006). Wheel milkweed is most commonly associated with Central and Southern Shortgrass Prarie habitat primarily in Oklahoma. In Arizona, it is found primarily in the Western Great Plains Shortgrass Prairie ecological system. This plant has not been found on the ASNF. The only occurrences in Arizona are two historic records: a 1915 record in the White Mountains near Springerville and a questionable 1903 record near Jerome Junction (Decker 2006). There are two extant populations in Arizona: near Sonoita and on the Appleton-Whittell Research Ranch near Elgin (Decker 2006). Habitat in the project area does not appear suitable for this species. Surveys were conducted for this species on September 15, 2009; no plants were observed.

Villous groundcover milkvetch. There is little documented information on the villous groundcover milkvetch. It is only known from Catron County, New Mexico and southeastern Apache County, Arizona. Villous groundcover milkvetch prefers sandy soils of volcanic origin on slopes, benches and ledges in xeric pine forest (Spellenberg 2007). Reclamation included this plant in our combined invasive weed/rare plant survey at the request of ASNF personnel due to its occurrence in central eastern Arizona (Linda White Trefaro, ASNF, pers. comm.). Habitat in the project area does not appear suitable for this species. No plants were observed during the September 15, 2009 survey.

Gila thistle. There is little information on the Gila thistle. It has only been documented from Catron County, New Mexico; although distribution is noted to include adjacent White Mountains in Arizona (Barlow-Irick 1999; Sabra Schwartz, AGFD, pers. comm.). The Gila thistle prefers moist areas or mountain meadows in montane coniferous forest (Barlow-Irick 1999). Reclamation included this plant in our combined invasive weed/rare plant survey at the request of ASNF personnel (Linda White Trefaro, ASNF, pers. comm.). Habitat in the project area does not appear suitable for this species. No plants were observed during the September 15, 2009 survey.

Maguire's beardtongue. There is little documented information on Maquire's beardtongue. It is only known from Grant County, New Mexico and Greenlee County, Arizona in and near the Gila River valley in both states (AGFD 2004). The two records located closest to the proposed fish barrier were both from the Morenci Pit, about 13 miles southwest of the proposed fish barrier (Sabra Schwartz, AGFD, pers. comm.). Maguire's beardtongue occurs on limestone cliffs in pinyon-juniper woodlands (AGFD 2004). Reclamation included this plant in our combined invasive weed/rare plant survey at the request of ASNF personnel due to its occurrence in central eastern Arizona (Linda White Trefaro, ASNF, pers. comm.). No plants were observed during the September 15, 2009 survey.

Sensitive Fish

Sonora sucker. Sonora sucker is a medium-sized member of the Family Catostomidae, and is endemic to the Gila and Bill Williams river drainages of Arizona, New Mexico, and Sonora, Mexico (Minckley 1973). The species remains common in many tributary streams throughout its range, but has disappeared from most of the mainstem rivers it formerly inhabited. It once was a Candidate species under the ESA.

Sonora sucker is large and robust (to 800 mm and 2 kilograms), and tends to frequent larger, mid-elevation streams, where it primarily consumes a variety of benthic invertebrates from both slow- and swift-flowing habitats (Schreiber and Minckley 1981, Clarkson and Minckley 1988). Spawning occurs in gravelly riffles in late winter or early spring, similar to desert sucker with which it occasionally hybridizes (Clarkson and Minckley 1988). Spawning consists of two or more males and a larger female swimming in a tight circle until all individuals pause and emit gametes. Release of eggs and sperm is usually accompanied by agitation of the substrate by the spawner's fins, which may serve to clean the gravel and bury eggs within the substrate (Reighard 1920, Minckley 1981). Larvae of Sonora sucker comprise a major component of stream drift in Gila River Basin waters (Bestgen et al. 1985, Remington 2002). The species was used extensively as food by primitive man (Minckley and Alger 1968, Minckley 1973).

Sonora sucker maintains a large population in Blue River, but its density in the project area is variable. Due to the proximity of the barrier site to the San Francisco River and its host of nonnative fishes, density of Sonora sucker is expected to be low compared to more upstream, less nonnative-impacted reaches.

Desert sucker. Desert sucker tends to occupy smaller, higher-elevation streams compared with Sonora sucker, but the two species are broadly sympatric over most of their common range in the Gila and Bill Williams drainages (Minckley 1973). Desert sucker remains common in most of its range but has been extirpated from many major rivers and larger tributaries (Fagan et al. 2002, Desert Fishes Team 2004). It once was a Candidate species under the ESA.

Desert sucker is a medium-sized catostomid, commonly attaining an adult length of about 300 mm in streams, although much larger individuals occasionally may be found in the larger rivers. The species is largely herbivorous, scraping algae and detritus off rock surfaces in riffles and runs with its specialized cartilaginous sheaths on the upper and lower jaws (Schreiber and Minckley 1981, Clarkson and Minckley 1988). This species also is commonly observed in pools. Spawning of desert sucker is similar to that just described for Sonora sucker, with multiple males attending a single female, and gametes deposited over gravel (J.A. Stefferud, Forest Service [retired], pers. comm.). As with Sonora sucker, a significant life-history feature of desert sucker is its proclivity to enter the stream drift as larvae (Bestgen et al. 1985, Remington 2002).

Desert sucker maintains a large population in Blue River, but its density in the project area is variable. Due to the proximity of the barrier site to the San Francisco River and its host of nonnative fishes, density of desert sucker is expected to be low compared to more upstream, less-impacted reaches.

Longfin dace. Longfin dace is one of the most common native fishes in lower-elevation streams of the Gila River Basin (Minckley 1973, Minckley 1999, Marsh and Kesner 2004). Its native range also includes the Bill Williams River and the closed Hualapai (Red) Lake drainages of Arizona and several Mexican drainages that discharge to the Gulf of California. Longfin dace has disappeared from many stream segments in Arizona (especially mainstem rivers), and it once was a Candidate species for listing under the ESA.

Longfin dace is a small (to about 75 mm) and short-lived (~3 years) species. The species has the unusual habit of migrating upstream into formerly dry reaches of stream during flood events where mortality is likely the typical result, but occasionally the behavior results in establishment of new populations (Minckley and Barber 1971, Minckley 1973). Its tolerance of sandy-bottomed, shallow, hot streams allows it to persist in areas where most other species (native or nonnative) do not. Longfin dace is omnivorous in its food habits, consuming both algae and aquatic invertebrates according to availability (Schreiber and Minckley 1981, Fisher et al. 1981). Reproduction primarily occurs during spring and late summer in sandy-bottomed, slack-water areas along the margins of streams where it excavates saucer-shaped depressions into which eggs are deposited and newly hatched young remain for a brief period until their yolk sacs are absorbed. Reproduction has been recorded throughout the year but is most pronounced in spring and early summer (Minckley and Barber 1971, Kepner 1982). Longfin dace is the most common native species in the project area.

Sensitive Amphibians and Reptiles

Lowland leopard frog. Although the conservation status of lowland leopard frog is relatively good in comparison to other species of leopard frog described from Arizona in recent decades, it has been lost from the lower Colorado and Gila rivers and likely southeastern California (Clarkson and Rorabaugh 1989, Jennings and Hayes 1994). In addition, it has declined in southeastern Arizona (Sredl et al. 1997), and it is extirpated from most of its range in southwestern New Mexico (Sredl 2005). It remains largely intact in central Arizona. The species also ranges into northern Sonora, Mexico, but its status there is largely unknown. Introduction of nonnative bullfrog and nonnative predatory fishes is the most serious known threat, and invasion of the nonnative Rio Grande leopard frog is cause for concern to some populations (Platz et al. 1990, Rorabaugh et al. 2002). A chytrid fungus infection also is increasingly suspect in losses of populations (Bradley et al. 2002). Lowland leopard frog is not protected under provisions of the ESA.

Lowland leopard frog inhabits a variety of aquatic habitats ranging from rivers, streams, and springs to earthen stock tanks, canals, and ornamental backyard ponds. Breeding occurs in two distinct episodes, one in spring (March-May) and a much smaller one in autumn (September-October) (Collins and Lewis 1979, Sartorius and Rosen 2000), a pattern similar to many native fishes. Populations may hybridize with Chiricahua leopard frog where ranges overlap (Platz and Frost 1984). Lowland leopard frogs have been observed in the project area.

Arizona toad. The Arizona toad was recently afforded full species status from what formerly was considered a complex of subspecies that inhabited several disjunct ranges along coastal southern California and northern Baja California, Mexico (now *B. californicus*), in the Sierra Madre Occidental of Mexico in Sonora, Chihuahua, Sinaloa, and Durango (now *B. mexicanus*), and in southeastern Nevada, southwestern Utah, and across central Arizona into west-central New Mexico (now *B. microscaphus)*; Gergus 1998). Threats to the Arizona toad include habitat alterations associated with construction of impoundments, and hybridization with Woodhouse's toad that appears to be displacing some populations (Sullivan 1986, Sullivan and Lamb 1988). The Arizona toad is not protected under provisions of the ESA.

In Arizona, the toad appears restricted to riparian habitats associated with perennial streams (Sullivan 1986, 1993). Adults are nocturnal except during the spring-summer breeding season (Stebbins 1985). Long, gelatinous strings of eggs are deposited in irregular masses in slow-flowing parts of streams, with clutch sizes ranging between 3100-4300 (Blair 1955, Dahl et al. 2000). Breeding does not appear related to rainfall events (Blair 1955, Sullivan 1992). The status of the species in the project area is unknown, but it is assumed to occupy the area.

Narrow-headed gartersnake. One of the most aquatic of garter snakes, the narrow-headed gartersnake is a long (approaching 1 m), distinctive-looking garter snake that has a disjunct distribution in south and west-flowing streams draining the Mogollon Rim and

White Mountain areas of Arizona and New Mexico, and in the northern half of the Sierra Madre Occidental in Chihuahua and Durango, Mexico (Rosen and Schwalbe 1988, Rossman et al. 1996). Although locally abundant in some streams, the narrow-headed gartersnake appears to have been practically eliminated from wide geographic areas in Arizona and especially from large mainstem rivers (Rosen and Schwalbe 1988, Hibbitts et al. 2009). Introduction of nonnative bullfrog and predatory fishes, and direct human take are the primary causes for these losses (Rosen and Schwalbe 1988). The species is considered threatened by the State of Arizona and endangered by the State of New Mexico, but it is not federally-listed under the ESA.

Narrow-headed gartersnakes feed almost exclusively on fish (Fleharty 1967, Hulse 1973, Rosen and Schwalbe 1988, Hibbitts et al. 2009). The snake matures sexually at 2-3 years, egg clutches contain between 8-17 ova, and hatching occurs June through August (Rosen and Schwalbe 1988). The species prefers rocky-bottomed streams, where it lies submerged and ambushes prey (Fleharty 1967, Rosen and Schwalbe 1988, Hibbitts et al. 2009). There are several historical and recent records of the species from the upper Blue River drainage (Holycross et al. 2006) and nearby in the San Francisco River of New Mexico (Hibbitts et al. 2009). Narrow-headed gartersnake was captured less than 1 mile upstream of the fish barrier site in 1996 (ASU 1996).

3.4.11 Environmental Consequences – USFS Sensitive Species

No Action

Under the No Action alternative, no project would be constructed or implemented and there would be no impact to USFS sensitive species per Forest Service handbook direction. No effect to USFS sensitive terrestrial species would result from activities associated with nonnative fish removal, native fish restoration, and monitoring, in the event those actions are undertaken by AGFD in lieu of the proposed project.

Proposed Action

Sensitive Species

Bald eagle. There are no bald eagle breeding records in the project area. No trees within the fish barrier construction area provide suitable nesting or roosting structure. The project area does provide wintering habitat for the bald eagle, although utilization of the area is low, averaging 1.5 bald eagles per year during the annual winter survey. There are numerous bald eagle foraging opportunities outside of the fish barrier construction area, along portions of the Blue and San Francisco rivers. . Although mechanical removal, repatriation, and monitoring activities are proposed for the summer, they could occur any time during the year. Due to the lack of breeding records and limited winter use of the area by bald eagles, there should be little potential for disturbance. There would be no impact to the bald eagle per Forest Service handbook direction.

Zone-tailed hawk. The suitability of the riparian habitat in the barrier construction area for zone-tailed hawk nesting is limited. Large cottonwood trees are scattered along the area, but the majority of trees are too small to provide adequate nesting substrate. Zone-tailed hawks will utilize sparsely vegetated habitats in remote areas. No impact will occur to any suitable nesting habitat from barrier construction, mechanical removal, or monitoring activities. The potential disturbance to the zone-tailed hawk from helicopter noise during repatriation activities would be short term and negligible. Zone-tailed hawks do not occur in the project area between early November and mid-March (Corman 2002005b) which coincides with proposed fish barrier construction. There will be no impact to the zone-tailed hawk per Forest Service handbook direction.

Common black hawk. Common black hawks prefer mature, dense nesting habitat. Riparian conditions in the fish barrier location have not attained the structural elements necessary to provide suitable nesting habitat for the black hawk. No impact will occur to any suitable nesting habitat from barrier construction, mechanical removal, or monitoring activities. The potential disturbance to the common black hawk from helicopter noise during repatriation activities would be short term and negligible. Common black hawks do not occur in the project area between early November and mid-March (Corman 2005c) which coincides with proposed fish barrier construction. There will be no impact to the common black hawk per Forest Service handbook direction.

American peregrine falcon. No breeding or foraging habitat would be impacted by the proposed project. Mechanical removal activities would not affect the American peregrine falcon. The potential disturbance to any breeding American peregrine falcon from helicopter noise during repatriation activities would be short term and negligible. There would be no impact to the peregrine falcon per Forest Service handbook direction.

Yellow-billed cuckoo. See previous discussion in section 3.4.8.

Abert's towhee. If the Abert's towhee occurs in the project area, impacts would be restricted to temporary noise disturbance during construction. Impacts associated with habitat loss and/or modification would be negligible. The Abert's towhee does not occur in the upper watershed (>4900 ft elevation) and therefore would not be affected by mechanical removal, repatriation of native fishes, or monitoring activities. There would be no impact to the Abert's towhee per Forest Service handbook direction.

All USFS sensitive plants. No sensitive plants were identified at the proposed barrier site. Mechanical removal, repatriation , or monitoring activities would not affect these plants. There would be no impact to any sensitive plant from the proposed project per Forest Service handbook direction.

All USFS sensitive fish. Construction-related impacts to desert sucker, longfin dace, and Sonora sucker would be similar to those described for loach minnow and repatriated fishes above. The action of mechanically removing large catfishes from pools using nets and spears should have no impact to sensitive fishes other than temporary disturbance. Potential mechanical removal activities directed at other nonnative species using other

sampling equipment (e.g., electrofishing) could have minor mortality impacts, but standard fishery survey methods do not typically negatively impact populations when practiced as proposed here. In general, removal of nonnatives from the Blue River drainage overall would have substantial benefits to sensitive fish populations. Impacts of monitoring to sensitive fishes will be as described for loach minnow and repatriated fishes above.

All USFS sensitive amphibians and reptiles. Effects to lowland leopard frog would be identical to those described above for Chiricahua leopard frog. Arizona toad is less aquatic than the leopard frogs, and thus negative project impacts should be lessened but similar to those described for leopard frogs. Narrow-headed garter snake likely sustains only a very small population in the project area, and thus negative impacts of the barrier construction, mechanical removals, repatriations, and monitoring should be small. In addition, the high mobility of narrow-headed garter snake suggests individuals could avoid project impacts by moving out of the area. In the long term, all of these species are likely to accrue positive benefits from the proposed project via elimination of nonnative fishes that have been shown to limit their populations.

3.4.12 Affected Environment – Management Indicator Species

Management Indicator Species (MIS) for ASNF are listed in Table 6. These species serve as barometers of management effects on other species with similar habitat. The presence (and relative abundance) of a MIS indicates that the habitat type is present and of suitable quality to support associated wildlife species. Changes in the population of MIS are believed to indicate the effect of forest management activities.

Table 6. List of USFS MIS for the ASNF.

Common Name	Status
Mammals	
Mule Deer	MIS
Elk	MIS
Pronghorn	MIS
Red Squirrel	MIS
Abert's Squirrel	MIS
Birds	
Merriam's Turkey	MIS
Northern Goshawk	MIS
Pygmy Nuthatch	MIS
Mexican Spotted Owl	MIS
Red-naped (Yellow-bellied) sapsucker	MIS
Juniper (Plain) Titmouse	MIS
Yellow-breasted Chat	MIS
Cinnamon Teal	MIS
Lucy's Warbler	MIS
Lincoln's Sparrow	MIS
Hairy Woodpecker	MIS
Aquatic Macroinvertebrates	MIS

MIS are selected to represent several categories, such as commonly hunted or fished species, nongame species, and threatened and endangered species. Only those species which have the potential to occur in the project area and be impacted by the proposed project are discussed below. Otherwise, the species range occurs outside of the project area or there is no suitable habitat within the project area.

Mule deer. Mule deer occur throughout the State from low desert to pine forests above the Mogollon Rim (Hoffmeister 1986). The current trend for the mule deer population in the ASNF is considered to be downward and likely near potential (Chapman et al. 2006). However, there appears to be an upward trend in the amount of early-succession habitat resulting from regeneration of habitat after the recent wildfires (Chapman et al. 2006). This may increase the forage opportunities for mule deer. Mule deer were observed in the project area during the site visits.

Elk. The elk that presently inhabit the Southern Colorado Plateau were transplanted from Yellowstone National Park in the early 1900s (Hoffmeister 1986). Fewer elk roam below the Mogollon Plateau and into the project area, but they may occur at any time throughout the year. The forest wide trend for elk is stable and likely above the carrying capacity (Chapman et al. 2006). As with the mule deer the upward trend in early succession habitat may also benefit elk. Although elk primarily graze on grasses and sedges they will browse on a variety of plants during certain times of the year (Hoffmeister 1986)

Juniper titmouse. The juniper titmouse is a secondary cavity nester tied almost exclusively to mature pinyon-juniper habitat (Latta et al 1999; LaRue 2006). The ASNF considers the juniper-titmouse population to be stable and likely near potential (Chapman et al. 2006).

Lucy's warber. Lucy's warblers are also secondary cavity nesters, and as such depend on the presence of primary cavity nesters and/or flaking bark on suitable sized nest trees in low elevation riparian habitats. The Forest-wide trend for Lucy's warbler is stable and likely near potential (Chapman et al. 2006). However, habitat potential is very low despite improving trends in low-elevation riparian habitat, due to the general lack of mesquite bosques (Chapman et al. 2006).

Yellow-breasted chat. The yellow-breasted chat requires habitat with dense understory in low elevation riparian forests. The Forest-wide trend for yellow-breasted chat is inconclusive (Chapman et al. 2006). Overall habitat trend has improved, but there is limited information to determine Forest-wide population trends. Limited local information may indicate a slightly declining population trend (consistent with a national trend) while information for Arizona indicates a possible slight increase.

Mexican spotted owl. See information provided under Federally Listed Species (section 3.4.7).

Aquatic macroinvertebrates. The USFS lists aquatic macroinvertebrates under MIS as a group. This group includes all invertebrate species that complete a part of their life cycle within aquatic environments and are visible without the aid of a microscope. Aquatic macroinvertebrates are extreme in both diversity of taxa and life history patterns. Most live on or within the sediments, but many are free-swimming. Some of the most conspicuous taxa within this group in stream environments include: (1) insects including mayflies (Order Ephemeroptera), dragonflies and damselflies (Order Zygoptera), stoneflies (Order Plecoptera), true bugs (Order Hemiptera), dobsonflies (Order Megaloptera), caddisflies (Order Trichoptera), moths (Order Lepidoptera), beetles (Order Coleoptera), and flies (Order Diptera); (2) flatworms (Class Turbellaria); (3) roundworms (Phylum Nematoda); (4) aquatic earthworms, leaches, etc. (Phylum Annelida); (5) crustaceans (Class Crustacea); snails (Order Gastropoda); and (6) clams and mussels (Order Pelecypoda). The diversity of this assemblage is often used as an indicator of water quality. Most of the groups listed above are likely found in Blue River with the likely exception of pelecypods.

3.4.13 Environmental Consequences - Management Indicator Species

No Action

Under the No Action alternative no project would be constructed or implemented. The No Action Alternative meets the goals and objectives identified for MIS in the Forest Plan and maintain or improve habitat for these species.

Proposed Action

Impacts to aquatic macroinvertebrate MIS from the proposed project would include substantial localized losses in the fish barrier construction area resulting from compaction and movement of streambed materials by earth-moving equipment, desiccation of habitats during dewatering activities, and alteration of habitats post-construction. The area would be recolonized quickly by most taxa from unimpacted upstream and downstream population sources, rendering impacts to most taxa to a duration of weeks to months (Bruns and Minckley 1980, Gray 1981, Gray and Fisher 1981, Grimm and Fisher 1989). As stream gradient immediately upstream of the barrier would be lessened, it is possible that riffle-dwelling species would not be able to recolonize the immediate area, but they would be unimpacted in areas outside of this small footprint. In total, long-term impacts resulting from construction of the barrier to this group will be insignificant relative to the amount of unimpacted habitat upstream and downstream.

Repatriation of spikedace and roundtail chub will exert additional predation pressure on certain species of aquatic macroinvertebrates, but this impact should not result in elimination of any species. Impacts of mechanical removal of fishes and fish monitoring will have insignificant impacts to these species.

With the exception of the Mexican spotted owl (see section 3.4.8) impacts to all terrestrial MIS would be similar. Implementation of the proposed project would not

change the MSO population trend. There will be no loss of habitat for any MIS with the exception of the yellow-breasted chat. However, riparian habitat loss at the barrier site is approximately ½ acre and consists of small patches or individual trees. There are no movement restrictions around the fish barrier for mule deer or elk. Implementation of the proposed project would not change the population trend for any MIS species. During construction of the barrier there would be minor mortality of aquatic macroinvertebrates. This impact would be short-term in nature. Due to the ability of macroinvertebrates to quickly repopulate an area, the long-term population trend for macroinvertebrates would remain unchanged.

Cumulative Effects – All Sensitive Species

Cumulative effects to sensitive species would be similar to those described for terrestrial wildlife species under section 3.4.4.

3.4.14 Summary of Impacts to Biological Resources

The impacts to biological resources are summarized in Table 7. A total of 8 acres of habitat would be impacted from construction of the proposed fish barrier and the resulting accumulation of sediment behind the structure. There is a slight potential for the spread of invasive weeds primarily at the contractor use area. Impacts to terrestrial wildlife would be minimal and primarily confined to the potential loss of small mammals and reptiles during construction. There would be a long-term beneficial effect to both listed and non-listed native fish, aquatic reptiles, and amphibians from the proposed native fish restoration project. There could be short-term loss of native fish, amphibians, and semi-aquatic reptiles (including federally listed species) during construction of the barrier and a permanent loss of fish larvae, juveniles, and adults that are carried over the barrier in river flow.

Table 7. Summary of impacts to biological resources.

Biological Resources	Beneficial and Adverse Impacts
Habitat	Permanent loss of 0.7 acres of primarily river strand habitat.
	Temporary impact to 7.9 acres of floodplain habitat.
	Potential increase in abundance of invasive weeds in the Contractor Use Area.
Wildlife	Permanent loss of 0.7 acres of habitat for small mammals and reptiles.
	Loss of slow-moving species (small mammals and reptiles).
	Temporary noise disturbance to wildlife in the immediate project area from barrier construction, mechanical removal, repatriation, and monitoring activities.
Aquatic Resources	Long term beneficial effects to native fish, aquatic reptiles and amphibians from removal and exclusion of non-native fish.
	Temporary impact to stream channel through diversion and construction activities.
	Losses of drifting fish larvae and displaced juveniles and adults.
	Loss of nonnative and some native fishes due to mechanical removal of nonnatives from the stream and construction activities.
	Long-term restrictions to movement for some amphibians and reptiles.

Special Status and Sensitive Species	Long term beneficial effects to loach minnow, spikedace, roundtail chub, longfin dace, Sonoran sucker, desert sucker, Chiricahua leopard frog, lowland leopard frog, Arizona toad, and narrow-mouth gartersnake from removal and exclusion of nonnative fish.
	Potential loss of individual fish and frogs from barrier construction, and mechanical removal activities.
	Minor noise disturbances from helicopter operations to avian species that may be in the project area during repatriation.

Mitigation

Pursuant to the CWA Section 404 permit issued by the COE for the 12 fish barriers required under the 1994, 2001, and 2008 BOs, Reclamation agreed to mitigate impacts for all the barriers in one location prior to the initiation of construction activities. On September 12, 2003, Reclamation purchased a Conservation Easement (CE) on 1,420 acres of land encompassing 300 acres of riparian habitat, creating a "mitigation bank." As barrier projects are completed, the mitigation required for each barrier is subtracted from the mitigation bank until all acres have been utilized. The mitigation property is located along the San Pedro River at 3 Links Farm, approximately 15 miles north of Benson in Cochise County, Arizona (portions of Sections 27, 28, 33, and 4, Township 14 South, Range 20 East; and portions of Sections 3, 4, 9, and 10, Township 15 South, Range 20 East, of the Gila and Salt River Base and Meridian).

The mitigation site lies within the transition zone of three major vegetation communities: Sonoran Desertscrub, Chihuahuan Desertscrub, and Semidesert Grassland. Consequently, elements of all three vegetation communities may be found on the mitigation property. However, the CE was purchased to preserve and protect the riparian community. Prior to acquisition of the CE, the perennial reach of the San Pedro River was only ½ mile long. Riparian growth and development had been restricted as a result of the continuous groundwater withdrawal to support agriculture.

The riparian community on the mitigation property consists of a band of Fremont cottonwood, Goodding willow, saltcedar, and patches of coyote willow. The riparian community adjacent to the perennial flow, was approximately 500-feet wide. The remaining riparian habitat gradually narrowed until only a linear strip of habitat remained adjacent to the channel. Reclamation, through enforcement of the CE restrictions, (1) reduced groundwater pumping by 90 percent, (2) restricted development in the upland habitat to specific 10-acre parcels, and (3) designated a 300-acre riparian corridor, along the San Pedro River which prohibits among other things cattle grazing, woodcutting, vehicular traffic, and development. Regeneration of the riparian corridor has begun to occur following cessation of groundwater pumping. Despite long-term drought conditions, the perennial reach on the property is slowly increasing in length.

Impacts to terrestrial habitat along Blue River from project construction will be mitigated at a ratio of 5:1 at 3 Links Farm. The mitigation ratio is stipulated in the CWA 404 permit. Approximately 7.2 acres of habitat would be impacted at the Blue River. The Contractor Use Area will be revegetated and therefore is not included in the mitigation bank computations. Consequently, a total of 36 acres would be subtracted from the

"mitigation bank." To date, 59.15 acres of the mitigation bank have been "obligated" as compensation for construction of barriers at Aravaipa, Cottonwood, Fossil, and Bonita creeks and Hot Springs Canyon.

The following on-site mitigation would be implemented during project construction.

- If any federally listed species (other than fish) are identified in the project area, construction activities would be halted until consultation with the FWS can be initiated.
- All construction areas not required for permanent facilities would be scarified and recontoured.
- Contractor-use areas affecting undisturbed upland habitat would be scarified, recontoured, and reseeded with native species.
- The contractor would exercise care to preserve the natural landscape and conduct operations so as to prevent unnecessary destruction, scaring, or defacing of the natural surroundings in the vicinity of the work.
- Contractor personnel would be instructed not to collect, disturb, or molest wildlife species.
- If mechanical renovation, repatriation or monitoring activities need to be repeated in the future, the habitat suitability for the southwestern willow flycatcher should be determined prior to conducting the activity. Personnel should avoid spending significant amounts of time (such as staging operations) near potentially suitable southwestern willow flycatcher habitat.
- Contractor would comply with the statutes of the Arizona Native Plant law. All equipment would be power washed prior to being brought onsite to remove the potential for introduction of invasive weed species.

3.5 CULTURAL RESOURCES

3.5.1 Affected Environment

The proposed barrier site is located at the southern edge of the Mogollon Highlands in an area of successive mountain chains cut by steep canyons, steep topography, varied exposures, and variable vegetation communities. The prehistoric occupation of the area is known from a few surveys in the immediate project area, and supplemented by studies farther north on the upper San Francisco and its tributaries, farther east along the Gila River, and to the west in the Safford area.

Very little is known about the PaleoIndian and Archaic occupations (12,500-200 BC) of the Mogollon highlands and valleys. Only a few scattered projectile points representative

of these early occupations attest to an at least occasional use of the Mogollon area. Information from nearby areas suggest that these early groups were mobile hunters and gatherers that initially focused on the large game that were present at the end of the Pleistocene, with an increasing emphasis on smaller game and plant resources toward the end of the Archaic. By the end of the Archaic, small pithouse villages were established along larger streams, while procurement and camp sites continued to be located in more remote highland situations. Cultivated crops supplemented the wild resources that continued to play an important subsistence role. Probable Archaic sites in the project area include lithic scatters on ridge tops and slopes that include evidence of tool manufacture from a variety of raw materials.

The lower Blue River falls within the area historically occupied by Apachean groups, yet the remnants of Apache settlement are often hard to identify. To date, none are known in the immediate project area but it is highly likely that they are present along both the Blue and San Francisco Rivers as well as in the highlands. Spanish and Mexican settlement did not extend into the Mogollon area, though scattered ranches were established farther to the south. Historic settlement by American ranchers, farmers, and miners generally began in the late 1880s, after the Apaches ceased their raiding forays. Mining towns such as Clifton and Morenci were established in the 1880s, as were farming communities, like Safford, along the perennial rivers; ranches were also established in the valleys. The immediate project area is currently within the boundaries of the ASNF; there are no known historic sites that are near the proposed barrier site.

For the most part, ground-disturbing activities for the proposed project would be limited to construction of the fish barrier, almost all of which would be limited to the previously disturbed floodplain and a terrace on which the Contractor Use Area would be situated. The occasional horseback rider would be diverted around the barrier and onto the flat ridge to the east. Horse traffic would follow existing stock trails to the ridge top and traverse on random paths; no specific trail would be created from this use.

Archaeologists from Reclamation conducted Class III (intensive) surveys of the construction area and stock/equestrian trails. Not surprisingly, since most activities associated with construction would be confined to the active channel and floodplain, no cultural resources were identified. The survey of the bypass route revealed the presence of a large, low-density, possibly Archaic, lithic scatter (AR-03-01-03-247) on the flat ridge east of the proposed barrier site. Anticipated horse traffic utilizing this route would be infrequent and randomly dispersed across the ridge top.

Consultation with tribes as outlined in the National Historic Preservation Act (NHPA) was integrated with the NEPA process in order to streamline procedural requirements. Scoping information on the proposed project was distributed to the eight tribes listed in Chapter 4.

3.5.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no direct impact to cultural resources, since no project would be constructed or implemented. Land surface erosion and livestock cattle grazing on the adjoining uplands would continue to affect cultural resources in the area. It is assumed that current land use and management practices would continue, as would Federal protections to cultural properties now in place.

Proposed Action

Activities associated with construction and contractor use would not impact any known cultural resources or archaeological sites. All equipment, material, and personnel would be flown to the site via helicopter thus eliminating impacts that are often associated with creating vehicular access. Post-construction impacts may include sediment build-up behind the barrier, but this sedimentation would not reach levels that affect areas outside of the active stream channel. Diversion of light horse traffic to the ridge east of the barrier would have a minor impact on the low density lithic scatter that extends over much of the ridge. In accordance with Section 106 of the National Historic Preservation Act, a finding of *no historic properties affected* was determined by Reclamation for the fish barrier area of potential effect and submitted to the ASNF and State Historic Preservation Office (SHPO). Subsequently, a finding of *no adverse effect to historic properties* was reached for the proposed horse traffic diversion and submitted to the ASNF and SHPO. The ASNF and SHPO concurred with these findings (see Chapter 6).

Cumulative Effects – Cultural Resources

Diversion of horse traffic around the fish barrier would have minimal cumulative impact on the low-density archaeological site situated on the adjacent ridge. This site has been subjected to historic trampling impacts associated with cattle and wildlife. The proposed project would not affect historic and prehistoric ORVs within river segments that are potentially suitable for WSR designation.

3.6 VISUAL RESOURCES

3.6.1 Affected Environment

The term “scenic integrity” is used by the USFS as a measure of the degree to which a landscape is altered from a purely natural condition. Scenic integrity is also indirectly expressed in forest plans as the Visual Quality Objective (VQO). VQOs identify different degrees of acceptable alteration of the natural landscape based upon the importance of aesthetics. They are indicative of the potential expectations of the visitor by considering the frequency a management area is viewed and the degree to which an area has been modified by human activity. A primary goal of the USFS is to manage NFS lands to attain the highest possible quality of landscape aesthetics and scenery commensurate with other appropriate goals, objectives, and uses.

According to the Forest Plan, VQOs assigned to riparian areas (Management Area 3), such as the Blue River, include "Retention" and "Partial Retention." At the site of the proposed fish barrier, the VQO classification is Partial Retention. The objective on areas classified as Partial Retention provides for management activities that may result in partial alteration of the landscape character, but must remain visually subordinate to the landscape. Under the Partial Retention objective, activities may also introduce form, line, color, or texture which are found infrequently or not at all in the characteristic landscape, but they should remain subordinate to the visual strength of the characteristic landscape (Bacon 1979). The Forest Plan allows one classification movement downward to meet specific resource management objectives.

3.6.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no direct impact to visual resources, since no project would be constructed. There are no other reasonably foreseeable future actions identified that would substantially affect scenic quality at the site of the proposed barrier.

Proposed Action

The overall visual impacts of the fish barrier and flood berm would be consistent with the Partial Retention classification. As viewed from downstream viewpoints, the sweeping arched outline of the barrier would contrast with irregular and random patterns of surrounding substrates. Contrasts would be less noticeable from upstream viewpoints once the channel aggrades and the upstream face of the barrier is mostly covered by sediment. Intervening canyon terrain and riparian vegetation would conceal the barrier and flood berm from viewpoints along the river and adjoining uplands at distances greater than 600 feet and 1,300 feet, respectively. The barrier would not be visible from key public-use viewpoints such as roads, trails, and recreation sites. Visible portions of the barrier would be washed during construction to expose aggregate in the concrete and create a pattern that is visually more compatible with the alluvial bed of the canyon. The dominant grayish hue of alluvial material in the streambed would be similar to the color of the concrete.

The flood berm would consist of mounded alluvium with either gabions or soil cement providing slope protection. Soil cement, if used, would be colored to blend with the channel alluvium. Gabions would be filled with rock extracted from the channel at the construction site.

Following construction, inspections of the fish barrier and mechanical removal of nonnative fishes, repatriation of native fishes, and monitoring would have no effect on scenery.

Cumulative Effects – Visual Resources

Other activities that have affected visual resources within the viewshed of the proposed construction area include wildfire and unauthorized OHV use. The cumulative effect of the barrier on visual resources would be highly localized and compatible with the Partial Retention objective. Intervening land topography would obscure visually altered portions of the project area from river segments that are potentially suitable for WSR designation; consequently there would be no effect on the scenery ORVs.

3.7 AIR QUALITY

3.7.1 Affected Environment

Air quality is determined by the ambient concentrations of pollutants that are known to have detrimental effects on public health and the environment. In accordance with Section 109 of the Clean Air Act (CAA), the U.S. Environmental Protection Agency has promulgated National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide, nitrogen dioxide, particulate matter (PM_{10} and $PM_{2.5}$), ozone, sulfur dioxide, and lead. Areas with air quality that do not meet the standards are designated as "nonattainment areas." Designation of nonattainment submits an area to regulatory control of pollutant emissions so that attainment of the NAAQS can be achieved within a designated time period.

The area encompassing the lower Blue River is in attainment for all regulated NAAQS (*http://www.epa.gov/oar/oaqps/greenbk/ancl3.html*). Potential regional sources of air pollutants include PM_{10} from fire (both wild and prescribed) and natural events such as dust storms. PM_{10} and other criteria pollutants from traffic (on paved and unpaved roads) and mining operations near Clifton also contribute to regional conditions. Ambient air quality in the project area is good.

The CAA provides special protection for visibility and other air quality related values in specially designated Class 1 areas where the cleanest and most stringent protection from air quality degradation is considered important. These areas include National Parks and Wilderness Areas which have been specifically designated Class 1 under Section 162(a) of the CAA. Class 1 designation allows almost no degradation in air quality. The closest Class 1 airsheds are associated with the Gila Wilderness in New Mexico (34 miles east) and Mount Baldy Wilderness in Arizona (46 miles north).

Executive Order (EO) 13514 directs Federal agencies to promote pollution prevention and reduce emissions of greenhouse gases (GHG)[17] that result from their actions. The CEQ has proposed an annual reference threshold of 25,000 metric tons of carbon dioxide (CO_2)-equivalent GHG emissions as a useful indicator for agencies to consider when analyzing potential action-specific GHG emissions in NEPA documents (CEQ 2010). This threshold was considered relevant by CEQ because it is a minimum standard for

[17] CEQ defines GHGs, in accordance with Executive Order 13514, as carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

reporting GHG emissions from specified industries under the CAA (EPA's Mandatory Reporting of Greenhouse Gasses Final Rule, 74 FR 56260). Regional sources of (CO_2)-equivalent GHGs include combustion emissions from heavy equipment and light vehicles.

3.7.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no direct impact to air quality, since no project would be constructed or implemented. Existing ambient air quality would persist into the foreseeable future.

Operation of vehicles to transport crews involved in mechanical removal of nonnative fishes, repatriation of native fishes, and monitoring would generate small amounts engine combustion products and dust, if those actions are undertaken by AGFD in lieu of the proposed project.

Proposed Action

The release of fugitive dust from construction would have a minor transient effect on ambient air quality in the project area. Minor amounts of fugitive dust would be emitted from excavation and aggregate processing at the barrier site. Additional dust would be generated by helicopter rotor downwash during landings and takeoffs, and during long-line delivery of material and equipment while the helicopter is hovering approximately 100 feet above the ground. These emissions would be highly localized and sporadic, persisting in varying intensity only during periods of active construction and helicopter operation. There are no sensitive receptors to airborne dust identified within or adjacent to the proposed construction area.

The operation of construction equipment and use of a helicopter to deliver construction material, equipment, and crews would generate minor amounts of engine combustion products such as nitrogen and nitrous oxides, CO_2, carbon dioxide, and reactive organic gases. These emissions would not produce measurable changes in ambient concentrations of regulated pollutants or result in a change in attainment status for the air quality region. Direct emission of CO_2-equivalent GHGs from the proposed project would be substantially below the level considered by CEQ to be relevant in a NEPA evaluation.

Following construction, the use of a helicopter during inspections of the fish barrier would generate small amounts engine combustion products and dust.

The effects of nonnative fish removal, native fish restoration, and monitoring on air quality would be the same as those described under the No Action alternative.

Cumulative Effects – Air Quality

Particulate and gaseous exhaust emissions (including GHGs) from the proposed project would be cumulative to pollutants emitted from other natural and anthropogenic sources into the atmosphere. The small quantities of pollutants released during construction would have a negligible, short-term cumulative effect on local air quality or global processes that lead to climate change. There would be no direct, indirect, or cumulative effect on Class 1 airsheds or nonattainment areas.

3.8 HAZARDOUS MATERIAL AND SOLID WASTE

3.8.1 Affected Environment

No sites contaminated with hazardous or non-hazardous solid wastes are known to occur within the area potentially affected by construction (http://www.epa.gov/enviro). Use, storage, and disposal of hazardous materials and solid waste associated with construction have the potential to adversely affect the environment if these materials are improperly managed. In general, most potential impacts are associated with the release of these materials to the environment. Direct impacts of such releases would include contamination of soil, water, and vegetation, which could result in indirect impacts to wildlife, aquatic life, and humans.

3.8.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no direct impact regarding use of hazardous materials, since no project would be constructed or implemented. Existing conditions would prevail on the site of the proposed fish barrier.

Proposed Action

The proposed project would require the short-term use of limited quantities of fuels, lubricants, and other fluids that would be used to power and operate equipment during construction of the barrier. Chemical toilets would also be present at the worksite. These materials would be managed in accordance with Federal and State regulations. Spills of hazardous material would require immediate corrective action and cleanup to minimize any potential adverse effect on sensitive resources.

Storage of lubricants and fuel would be restricted to the Contractor Use Area, which would be situated on a terrace above the OHWM of the river. All lubricants and fuel would be placed in temporary, clearly marked, above-ground containers which would be provided with secondary containment. Construction equipment would be maintained and inspected regularly. Any soil contaminated by fuel or oil would be removed and transported by the contractor to an appropriately permitted disposal facility.

Any solid waste generated by construction would be removed by the contractor and disposed of in accordance with Federal and State regulations. Excess or unused quantities of hazardous materials would be removed upon project completion. Although hazardous waste generation is not anticipated, any such wastes produced by the project would be properly containerized, labeled, and transported to an appropriately permitted hazardous waste disposal facility in accordance with Federal and State regulations.

Actions associated with removal of nonnative fishes, repatriation of native fishes, and monitoring would not introduce hazardous materials to the project area.

Cumulative Effects - Hazardous Material and Solid Waste

Appropriate hazardous material management and waste disposal would obviate any impacts on the environment.

3.9 ENVIRONMENTAL JUSTICE

3.9.1 Affected Environment

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," was issued by the President of the United States on February 11, 1994. This order established requirements to address Environmental Justice concerns within the context of agency operations. As part of the NEPA process, agencies are required to identify and address disproportionately high and adverse human health or environmental effects on minority or low-income communities. Federal agencies are directed to ensure that Federal programs or activities do not result, either directly or indirectly, in discrimination on the basis of race, color, or national origin.

The project area encompasses unpopulated and remote public lands and minor amounts of sparsely populated private lands along the Blue River and its tributaries.

3.9.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no direct impact on populations or communities defined under EO 12898, since no project would be constructed or implemented.

Proposed Action

Construction of the fish barrier would affect remote and unpopulated NFS lands. Nonnative fish removal, native fish repatriations and monitoring would have no effect on the community of Blue. There would be no disproportionately high and adverse health or environmental effects on communities or populations described under EO 12898.

Cumulative Effects – Environmental Justice

There would be no cumulative effects on EO 12898 communities.

3.10 INDIAN TRUST ASSETS

3.10.1 Affected Environment

Indian trust assets are legal interests in property held in trust by the United States through the Department of the Interior for federally recognized Indian tribes or individual tribal members. Examples of things that may be trust assets are lands, mineral rights, hunting, fishing, or traditional gathering rights and water rights. The United States, including all of its bureaus and agencies, has a fiduciary responsibility to protect and maintain rights reserved by or granted to Indian tribes or individual tribal members by treaties, statutes, and Executive Orders. This trust responsibility requires that all Federal agencies, including Reclamation, ensure their actions protect trust assets. Secretarial Order 3175 (incorporated into the Departmental Manual at 512 DM 2) requires that when proposed actions of a DOI agency might affect trust assets, the agency must address those potential impacts in planning and decision documents and the agency consult with the tribal government whose trust assets are potentially affected.

The Blue River and its perennially wet tributaries pass through NFS lands and private lands. No Indian trust assets have been identified in this area.

No Action

Under the No Action alternative, there would be no direct impact to Indian trust assets, since no project would be constructed or implemented.

3.10.2 Environmental Consequences

Proposed Action

Information regarding the proposed project was sent to the seven Tribes listed in Chapter 4. The Tribes did not comment on the possible occurrence of Indian trust assets in the project area. No effect to trust assets is anticipated.

Cumulative Effects – Indian Trust Assets

The proposed project would have no cumulative effect on Indian trust assets

CHAPTER 4 – CONSULATATION AND COORDINATION

List of Agencies and Persons Contacted

Reclamation submitted information on the project proposal to the following entities during development of the EA. The names of individuals are retained in the administrative record.

Indian Communities:

Fort McDowell Yavapai Nation
Pueblo of Zuni
San Carlos Apache Tribe
The Hopi Tribe
The Navajo Nation
Tonto Apache Tribe
Yavapai-Prescott Tribe
White Mountain Apache Tribe

Congressional Delegation

Senator John McCain
Senator Jon Kyl
Representative Ann Kirkpatrick

County Agencies:

Greenlee County Board of Supervisors

State Agencies:

Arizona Department of Environmental Quality
Arizona Department of Water Resources
Arizona Game and Fish Department
Arizona State Historic Preservation Office
Jan Brewer, Governor of Arizona

Federal Agencies:

Natural Resources Conservation Service
U.S. Army Corps of Engineers
U.S. Bureau of Land Management
USDA Forest Service
U.S. Fish and Wildlife Service
U.S. Geological Survey

Conservation, Environmental, and Recreation Organizations:

American Rivers
American Whitewater
Arizona Council of Trout Unlimited
Arizona Riparian Council
Arizona Trail Association
Arizona Wilderness Coalition
Apache Natural Resource Conservation District
Center for Biological Diversity
Central Arizona Paddlers Club
Desert Fishes Council
Desert Voyagers
Federation of Fly Fishers
Friends of Arizona Rivers
Friends of Pronatura
Great Western Trail Association, Inc.
Mountain States Legal Foundation
Pacific River Council
Sierra Club
Sky Island Alliance
The Nature Conservancy

Libraries and Schools

Blue Library
Blue School
Eastern Arizona College Library

Grazing Organizations:

Arizona Cattle Growers Association

Other Organizations

City of Duncan
Eastern Arizona Counties Organization
Greenlee County Chamber of Commerce
Town of Clifton

CHAPTER 5 – LIST OF PREPARERS

List of Preparers

Rob Clarkson, Bureau of Reclamation, Fish Biologist
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Mike Miller, Bureau of Reclamation, Geologist
Tom Palmer, USFS - formerly ASNF, Natural Resource Specialist
Amy Unthank, USFS – Southwestern Region, Fisheries Program Manager

CHAPTER 6 – RELATED ENVIRONMENTAL LAWS/DIRECTIVES

The CEQ regulations encourage agencies to "integrate the requirements of NEPA with other planning and environmental review procedures required by law." Coordinating NEPA procedures with those of other Federal environmental statutes and executive orders facilitates NEPA objectives by promoting efficiencies in environmental planning and development of relevant information on which to base agency decisions. This integrative approach to NEPA ensures planning, review, and compliance processes run concurrently rather than consecutively with procedures required by other environmental laws.

The following is a list of Federal laws, Executive Orders (EOs), and other directives that apply to the proposed project discussed in this EA:

The National Environmental Policy Act (NEPA) of 1969, as amended (Public Law 91-90), requires Federal agencies to evaluate the potential environmental consequences of major Federal actions. An action becomes "federalized" when it is implemented, wholly or partially funded, or requires authorization by a Federal agency. The intent of NEPA is to promote consideration of environmental impacts in the planning and decision-making process prior to project implementation. NEPA also encourages full public disclosure of the proposed action, accompanying alternatives, potential environmental effects, and mitigation. The DOI NEPA regulations are found at 43 CFR 46; USFS NEPA regulations are found at 36 CFR 220.

Scoping information on the proposed action was posted on Reclamation's Phoenix Area Office web site and distributed to more than 121 individuals, organizations, and agencies on March 12, 2009. Public comments were considered during preparation of the EA and helped guide the development of the proposed project and mitigation.

The draft EA was mailed to potentially interested individual, organizations, and agencies on July 21, 2010. News releases announcing the availability of the draft EA were sent to 10 news media outlets including the *Arizona Republic* and *White Mountain Independent*.

The Fish and Wildlife Coordination Act (FWCA) of 1958, as amended (Public Law 85-624), provides a procedural framework for the consideration of fish and wildlife conservation measures in Federal water resource development projects. Coordination with the FWS and State wildlife management agencies are required on all Federal water development projects.

The proposed project is the result of ESA section 7(a)(2) consultation between Reclamation and FWS. Coordination among Reclamation, FWS, and AGFD has been ongoing since the project's inception. The FWS concluded that the current level of coordination among the agencies is sufficient to meet any regulatory needs required by the FWCA.

The Endangered Species Act (ESA) of 1973, as amended (Public Law 93-205), provides protection for plants and animals that are currently in danger of extinction (endangered) and those that may become so in the foreseeable future (threatened). Section 7 of this law requires Federal agencies to ensure that their activities do not jeopardize the continued existence of threatened or endangered species or adversely modify designated critical habitat.

Construction of the proposed fish barrier is a conservation measure specified by the FWS in the 2001 and 2008 BOs. The FWS determined in these BOs that further ESA section 7(a)(2) consultation on listed aquatic species covered under the opinions was not required for fish barrier construction. Possible effects to non-aquatic listed species resulting from project implementation were examined in a Biological Assessment prepared by Reclamation. The Biological Assessment concluded no effect to the southwestern willow flycatcher, may affect but not likely to adversely affect the Mexican spotted owl, and not likely to jeopardize the Mexican gray wolf.

The Migratory Bird Treaty Act (MBTA) of 1918, as amended (Public Law 86-732, 90-578, 91-135, 93-300, 95-616, 99-645, 105-312), implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. The MBTA prohibits the take, possession, import, export, transport, selling, or purchase of any migratory bird, their eggs, parts, or nests.

The 4-month process to construct the proposed fish barrier would commence in September to avoid the breeding seasons of most avian species. Efforts would be undertaken to minimize the impact of helicopter noise by avoiding flights over Mexican spotted owl PACs.

The Clean Air Act (CAA) of 1963, as amended (Public Law 95-95), requires any Federal entity engaged in an activity that may result in the discharge of air pollutants must comply with all applicable air pollution control laws and regulations (Federal, State, or local). It also directs the attainment and maintenance of National Ambient Air Quality Standards (NAAQS) for six different criteria pollutants including carbon monoxide, ozone, particulate matter, sulfur oxides, oxides of nitrogen, and lead. Air quality in the project area is in attainment of NAAQS.

Short-term construction emissions (particulate matter and greenhouse gasses) associated with the project would have localized and minor effects on air quality in the project area. The project is not located in a nonattainment area or Class I airshed.

The Clean Water Act (CWA) of 1977, as amended (Public Law 92-500), strives to restore and maintain the chemical, physical, and biological integrity of the nation's waters by controlling discharge of pollutants. The basic means to achieve the goals of the CWA is through a system of water quality standards, discharge limitations, and permits. Section 404 of the CWA identifies conditions under which a permit is required for actions that result in placement of fill or dredged material into waters of the United States. In

addition, a 401 water quality certification and 402 National Pollutant Discharge Elimination System (NDPES) permit are required for activities that discharge pollutants to waters of the U.S. The EPA has delegated responsibility to administer water quality certification and NPDES programs in Arizona to ADEQ.

Reclamation received a conditional 401 water quality certification from the ADEQ, and a 404 permit from the COE, for fish barriers that are constructed pursuant to the 2001 BO. This permit/certification coverage includes the Blue River fish barrier. All special conditions of the 401 certification and 404 permit would be implemented. Coverage under the Section 402 Arizona Pollutant Discharge Elimination System General Permit for construction activities would be obtained prior to construction.

The National Historic Preservation Act (NHPA) of 1966, as amended (Public Law 96-515), mandates all federally funded undertakings that have the potential to affect historic properties are subject to Section 106 of the NHPA. Federal agencies are responsible for the identification, management, and nomination to the National Register of Historic Places of cultural resources that could be affected by Federal actions. Consultation with the Advisory Council on Historic Preservation and the SHPO is required when a Federal action may affect cultural resources on, or eligible for inclusion on, the National Register.

Archaeologists from Reclamation conducted Class III surveys of the area of potential effect for the proposed project. No cultural resources were identified within the area potentially affected by construction of the fish barrier. A finding of "no historic properties affected" was determined by Reclamation following the survey and submitted to the ASNF and SHPO. ASNF indicated concurrence with the finding in an Inventory Standards and Accounting (ISA) form, signed by Forest Archaeologist Ed DeCleva on October 16, 2008. The State Historic Preservation Office (SHPO) concurred with this determination on November 10, 2008.

An archaeological survey of the equestrian bypass revealed the presence of a large, low-density, possibly Archaic lithic scatter (AR-03-01-03-247) on the flat ridge east of the proposed barrier site. Because anticipated horse traffic would be infrequent and randomly dispersed across the ridge top, a finding of "no adverse effect to historic properties" was reached. The ASNF concurred with this finding on January 6, 2010 in an ISA signed by Forest Archaeologist Melissa Schroeder. The Arizona SHPO concurred with the finding of "no adverse effect to historic properties" on April 12, 2010.

The National Wild and Scenic Rivers Act of 1968, as amended (Public Law 90-542), provides for protection of certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. This Act is notable for safeguarding the special character of these rivers, while also recognizing the potential for their appropriate use and development.

The ASNF is conducting an environmental analysis to evaluate the suitability of four eligible river segments of the Blue River. The suitability of Blue River was evaluated, separate from land management planning, to consider the proposed fish barrier and

determine which, if any, of the eligible river segments should be recommended for inclusion in the National WSR System.

The Resource Conservation and Recovery Act (RCRA), as amended (Public Law 94-580), establishes thresholds and protocols for managing and disposing of solid waste. Solid wastes that exhibit the characteristic of hazardous waste, or are listed by regulation as hazardous waste, are subject to strict accumulation, treatment, storage, and disposal controls.

The proposed project is not expected to generate hazardous waste as defined and regulated under RCRA. To minimize the possible impact of hazardous materials (petroleum, oil, and lubricants) used during construction, all equipment would be periodically inspected for leaks. Any significant leaks would be promptly corrected. Nonhazardous solid waste would be disposed of in accordance with State and Federal regulations at an approved landfill. Spills and disposal of contaminated media would be managed in accordance with State and Federal requirements.

The Farmland Protection Policy Act of 1981, as amended (Public Law 97-98), and 7 CFR 658 are intended to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural purposes. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, and oilseed crops and is also available for these uses. In general, prime farmland has acceptable soil conditions with few rocks, a favorable temperature and growing season, and an adequate and dependable water supply from precipitation or irrigation. Unique farmland is land other than prime farmland that is used for production of specific high-value foods and fiber crops.

There are no agricultural lands within the construction area that meet the criteria for designation as prime or unique farmland.

EO 11988 (Floodplain Management) requires Federal agencies to avoid, where practicable alternatives exist, the short- and long-term adverse impacts associated with floodplain development. Federal agencies are required to reduce the risk of flood loss; minimize the impacts of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains in carrying out agency responsibility.

The proposed project is necessary for the protection of the existing native fish community, including listed fish species and their habitat. Because the project by its very nature requires construction on a floodplain, no practicable alternative exists. Floodplain effects would be restricted to undeveloped and uninhabited NFS lands administered by the ASNF. The project would not increase the flood risk to private property or human safety and welfare.

Executive Order 11990 (Wetlands) requires Federal agencies, in carrying out their land management responsibilities, to take action that would minimize the destruction, loss, or

degradation of wetlands and take action to preserve and enhance the natural and beneficial values of wetlands.

There are no wetlands within the construction area. The proposed project would not affect wetlands.

Executive Order 12898 (Environmental Justice) requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health and environmental effects of their programs, policies, and activities on minority and low-income populations.

Construction would affect uninhabited public lands administered by the USFS; consequently, no low-income or minority populations as defined by Executive Order 12898 would be affected. Nonnative fish removal and repatriation of native species would not cause disproportionate health or adverse environmental effects to EO 12898 populations.

Secretarial Order 3175 (incorporated into Departmental Manual at 512 DM 2) requires that if any Department of the Interior agency actions impact Indian trust assets (ITAs), the agency must explicitly address those impacts in planning and decision-making, and the agency must consult with the tribal government whose trust resources are potentially affected by the Federal action. Reclamation is committed to carrying out its activities in a manner which avoids adverse impacts to ITAs when possible, and to mitigate or compensate for such impacts when it cannot.

The project area encompasses public lands administered by the USFS and a minor amount of private land along the Blue River and its tributaries. No Indian trust assets have been identified in the project area; consequently, no effects to trust assets are anticipated.

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APPENDIX A — FISH BARRIER DESIGN

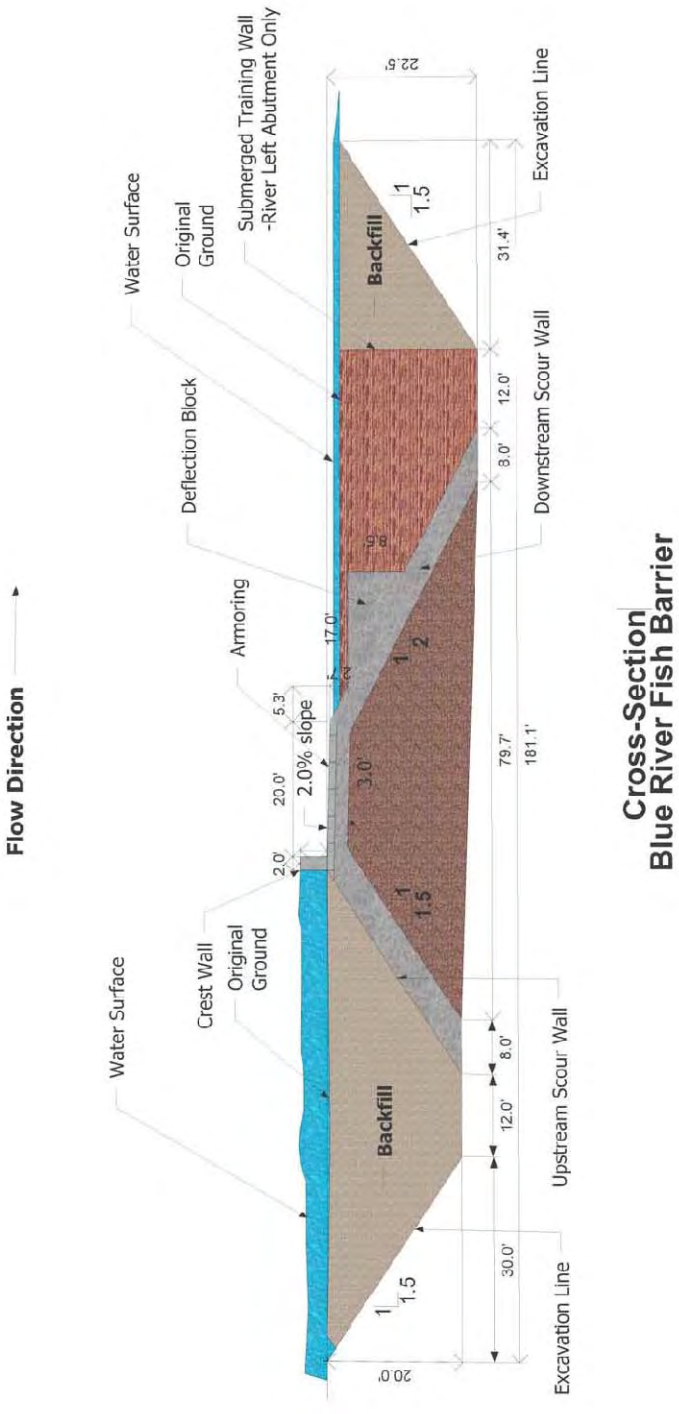

Figure A-1. Cross section view of proposed fish barrier.

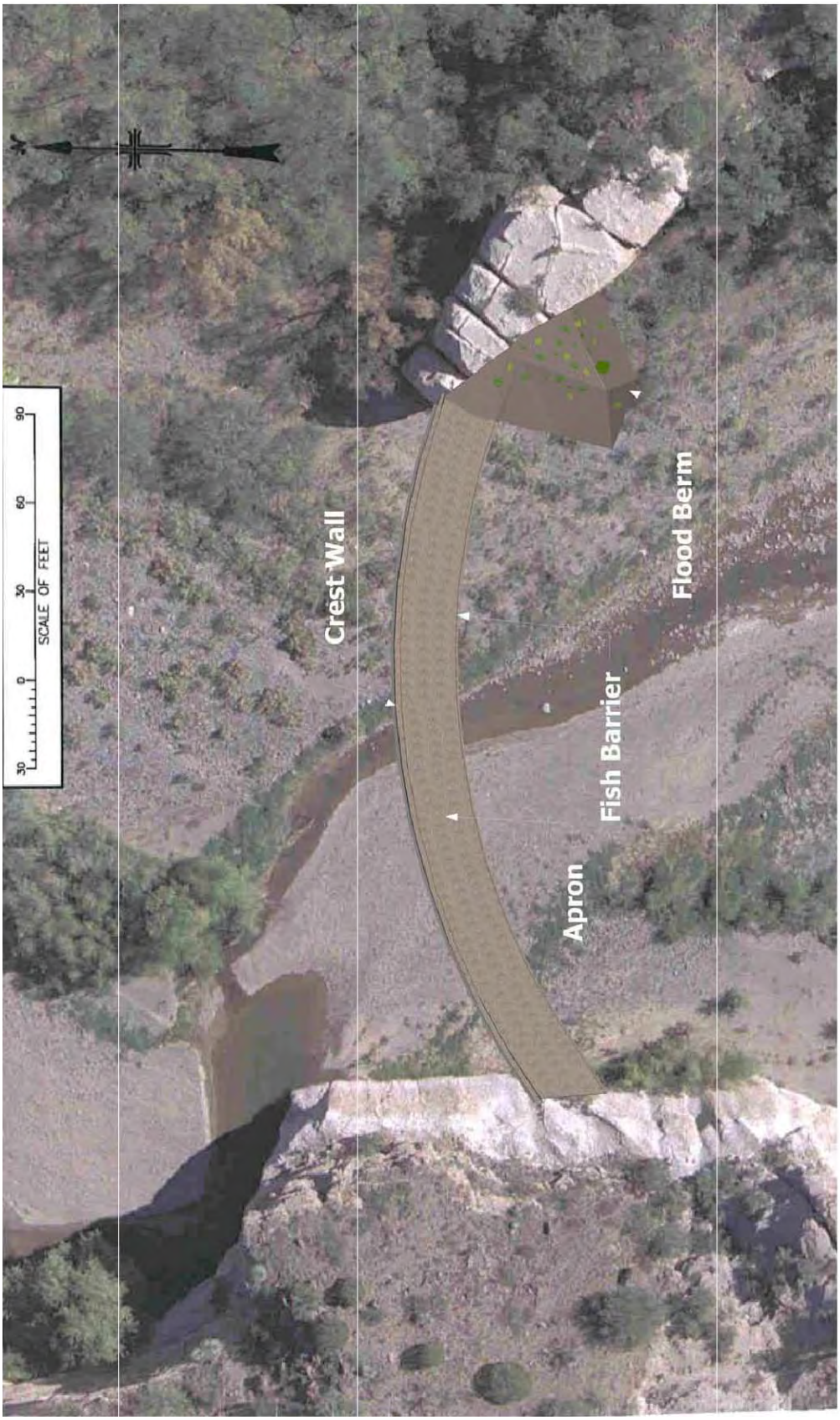

Figure A-2. Plan view of proposed fish barrier.

APPENDIX B — INVENTORIED ROADLESS AREAS

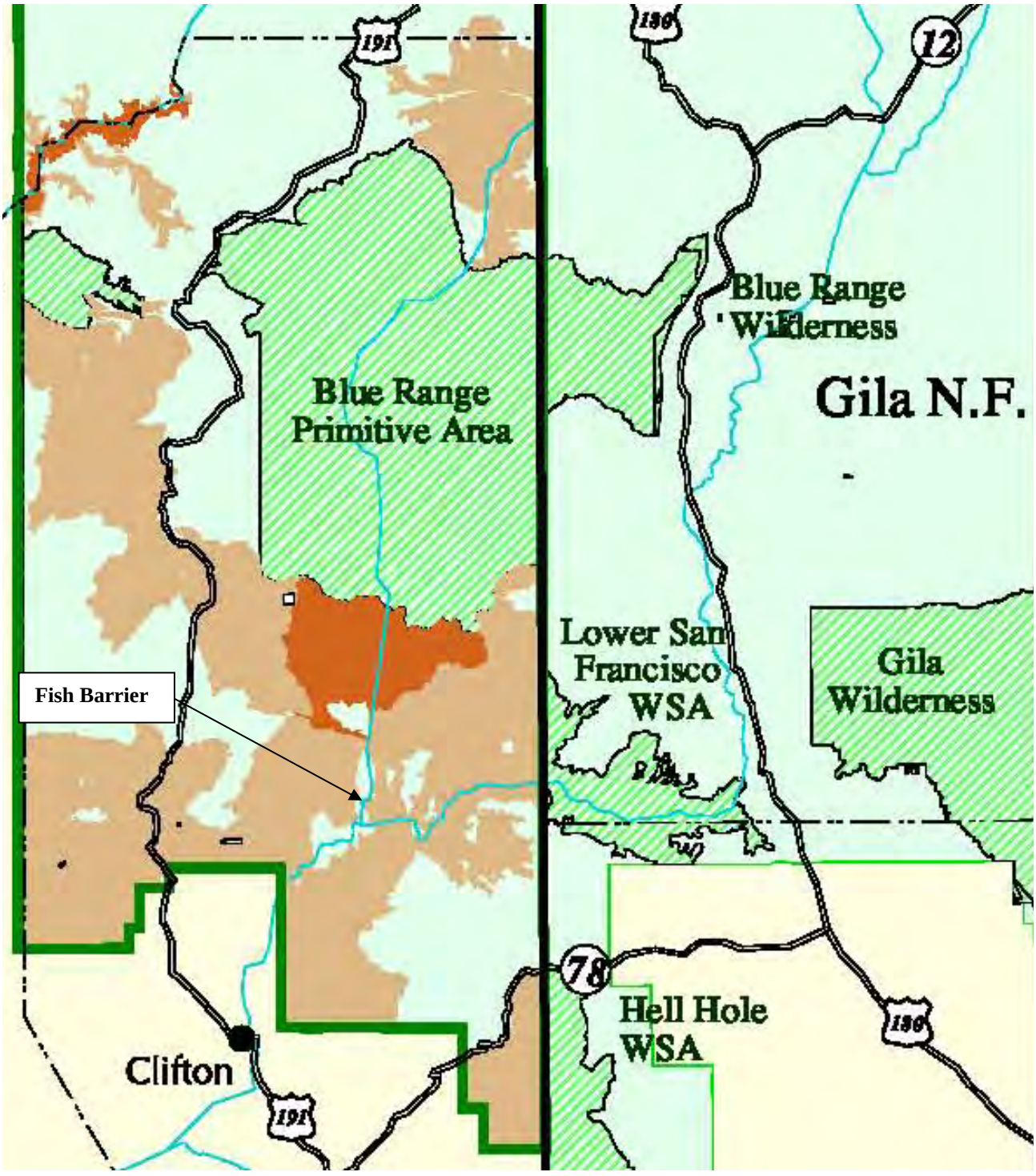

Figure B-1. Inventoried roadless areas (shown in brown).

APPENDIX C — CHANNEL AGGRADATION AND DEGRADATION

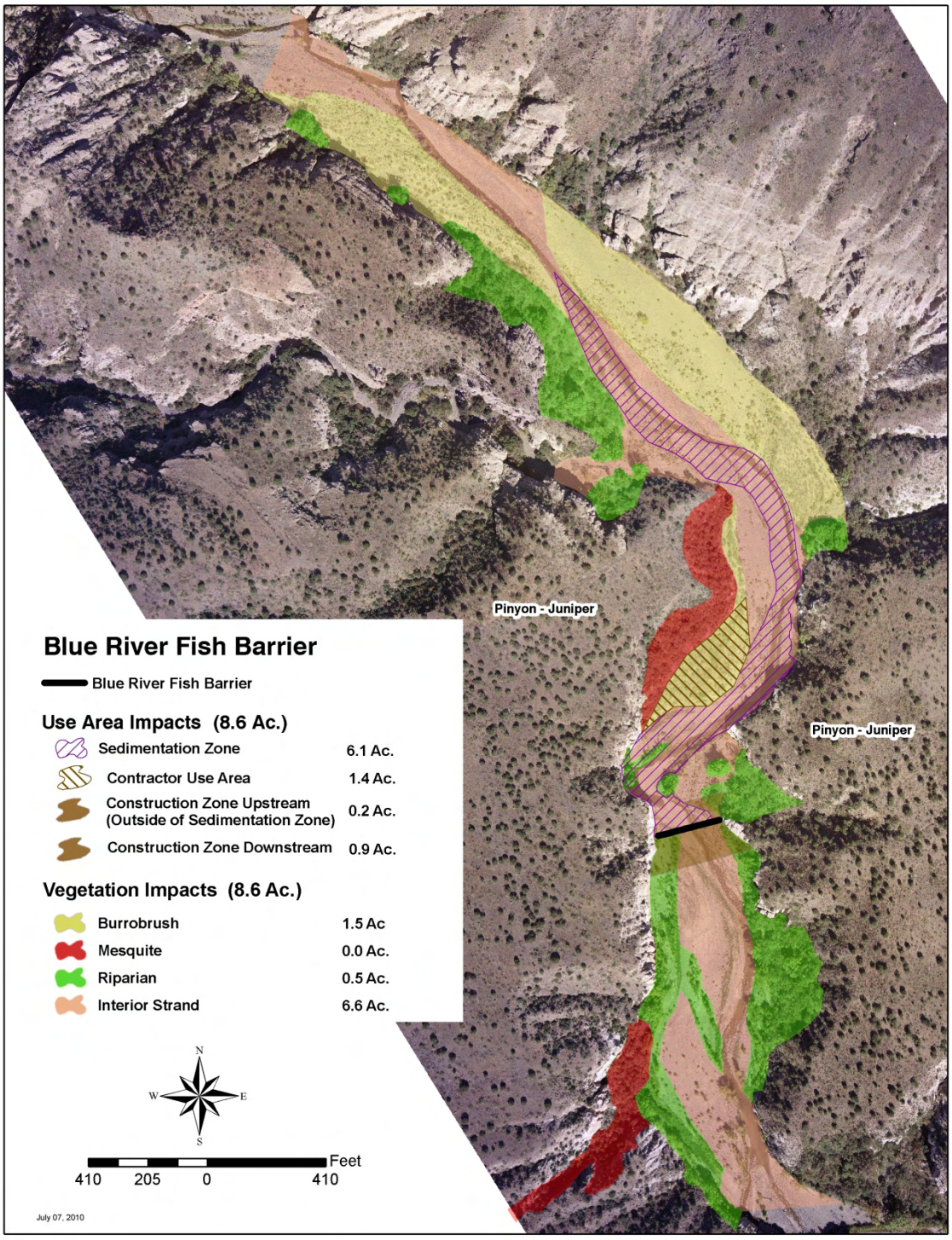

Figure C-1. Predicted channel aggradation and vegetation impacts.

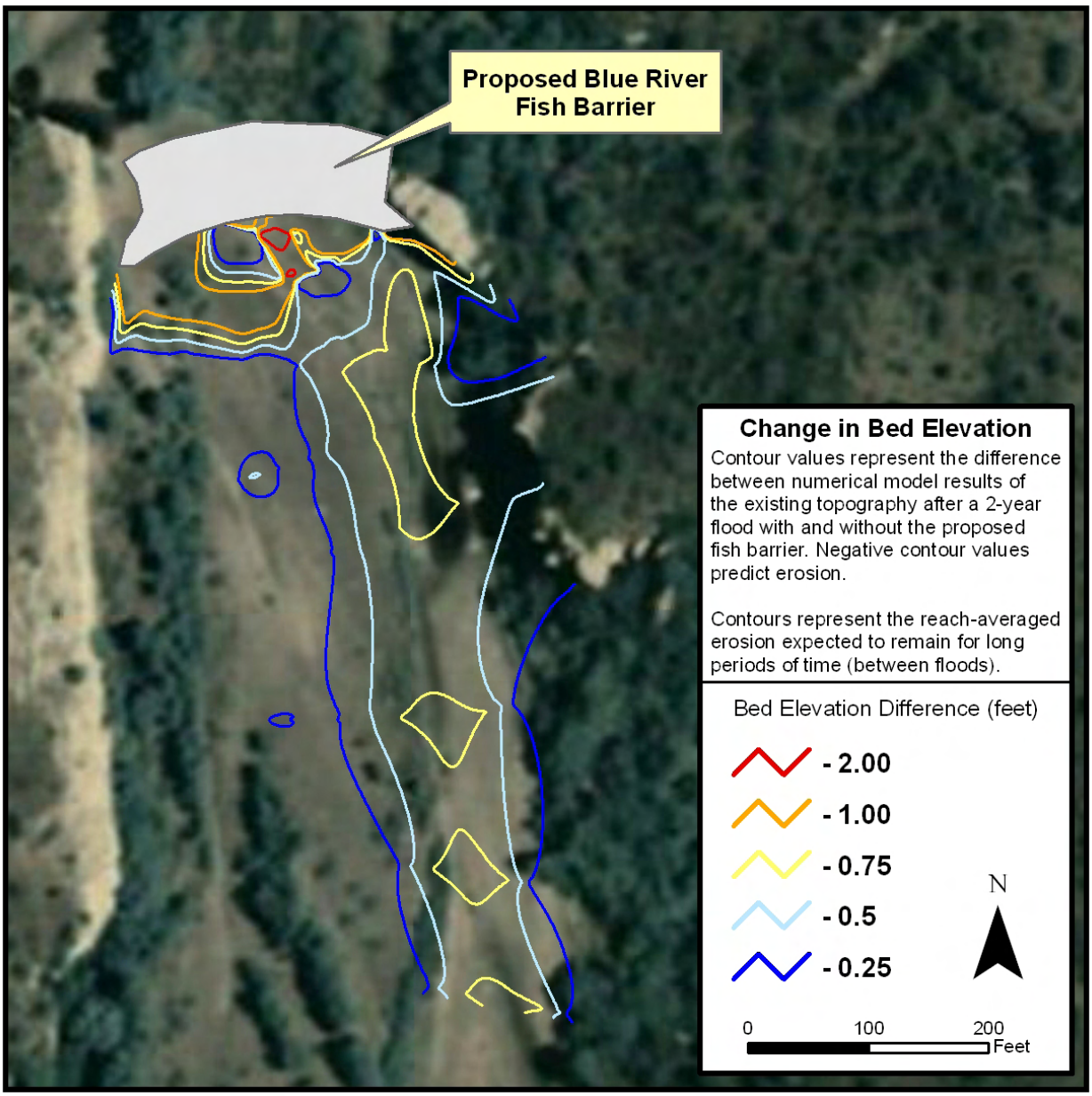

Figure C-2. Predicted downstream channel degradation.

APPENDIX D — FISH, WILDLIFE AND PLANT SPECIES

FISH

Apache Trout	*Oncorhynchus apache*
Brook Trout	*Salvelinus fontinalis*
Brown Trout	*Salmo trutta*
Common Carp	*Cyprinus carpio*
Channel Catfish	*Ictalurus punctatus*
Colorado Pikeminnow	*Ptychocheilus lucius*
Desert Sucker	*Pantosteus clarki*
Desert Pupfish	*Cyprinodon macularius*
Fathead Minnow	*Pimephales promelas*
Flannelmouth Sucker	*Catostomus latipinnis*
Flathead Catfish	*Pylodictis olivaris*
Gila Chub	*Gila intermedia*
Gila Topminnow	*Poeciliopsis occidentalis*
Gila Trout	*Oncorhynchus gilae*
Largemouth Bass	*Micropterus salmoides*
Loach Minnow	*Tiaroga cobitis*
Longfin Dace	*Agosia chrysogaster*
Mosquitofish	*Gambusia affinis*
Rainbow Trout	*Oncorhynchus mykiss*
Razorback Sucker	*Xyrauchen texanus*
Red Shiner	*Cyprinella lutrensis*
Roundtail Chub	*Gila robusta*
Smallmouth Bass	*Micropterus dolomieui*
Sonora Sucker	*Catostomus insignis*
Spikedace	*Meda fulgida*
Speckled Dace	*Rhinichthys osculus*

REPTILES AND AMPHIBIANS

American Bullfrog	*Lithobates [Rana] catesbeianus*
Arizona Treefrog	*Hyla wrightorum*
Arizona Toad	*Anaxyrus [Bufo] microscaphus*
Arizona Tiger Salamander	*Ambystoma tigrinum nebulosum*
Black-necked Gartersnake	*Thamnophis cyrtopsis*
Canyon Treefrog	*Hyla arenicolor*
Chiricahua Leopard Frog	*Lithobates [Rana] chiricahuensis*
Great Plains Toad	*Anaxyrus [Bufo] cognatus*
Lowland Leopard Frog	*Lithobates [Rana] yavapaiensis*
Mexican Spadefoot Toad	*Spea multiplicata*
Narrow-headed Gartersnake	*Thamnophis rufipunctatus*
Northern Leopard Frog	*Lithobates [Rana] pipiens*
Ramsey Canyon Leopard Frog	*Lithobates [Rana] chiricahuensis*
Red spotted Toad	*Anaxyrus [Bufo] punctatus*
Rio Grande Leopard Frog	*Lithobates [Rana] berlandieri*
Sonora Tiger Salamander	*Ambystoma tigrinum stebbinsi*
Sonoran Desert Toad	*Incilius[Bufo] alvarius*
Sonoran Mud Turtle	*Kinosternon sonoriense*
Terrestrial Gartersnake	*Thamnophis elegans*
Western Chorus Frog	*Pseudacris triseriata*
Woodhouse's Toad	*Anaxyrus [Bufo] woodhousii*

BIRDS

Abert's Towhee	*Pipilo aberti*
American Peregrine Falcon	*Falco peregrinus anatum*
Ash-throated flycatcher	*Myiarchus cinerascens*
Baird's Sparrow	*Ammodramus bairdii*
Bald Eagle	*Haliaeetus leucocephalus*
Bell's Vireo	*Vireo bellii*
Black Phoebe	*Sayornis nigricans*
Brown-headed Cowbird	*Molothrus ater*
Canyon Wren	*Catherpes mexicanus*
Cassin's Kingbird	*Tyrannus vociferans*
Cinnamon Teal	*Anas cyanoptera*
Cliff Swallow	*Petrochelidon pyrrhonota*
Common Black Hawk	*Buetogallus anthracinus*
Cooper's Hawk	*Accipitor cooperi*
Gambel's Quail	*Callipepla gambellii*
Gray Catbird	*Dumetella carolinensis*
Hairy Woodpecker	*Picoides villosus*
Hooded Oriole	*Icterus cucullatus*
Juniper (Plain) Titmice	*Baeleophus ridgwayi*
Lesser Goldfinch	*Carduelis psaltria*
Lincoln's Sparrow	*Melospiza lincolnii*
Lucy's Warbler	*Vermivora luciae*
Merriam's Turkey	*Meleagris gallopava merriami*
Mexican Spotted Owl	*Strix occidentalis lucida*
Mourning Dove	*Zenaida macroura*
Northern Cardinal	*Cardinalis cardinalis*
Northern Goshawk	*Accipiter gentilis*
Pygmy Nuthatch	*Sitta pygmaea*
Red-naped (Yellow-bellied) Sapsucker	*Sphyrapicus nuchalis*
Red-tailed Hawk	*Buteo jamaicensis*
Southwestern Willow Flycatcher	*Empidonax traillii extimus*
Spotted Towhee	*Pipilo maculatus*
Summer Tanager	*Piranga rubra*
Western Burrowing Owl	*Athene cunicularia hypugaea*
Western Kingbird	*Tyrannus verticalis*
Western Wood Pewee	*Contopus sordidulus*
Yellow-billed Cuckoo	*Coccyzus americanus*
Yellow-breasted Chat	*Icteria virens*
Yellow Warbler	*Dendroica petechia*
Zone-tailed Hawk	*Buteo albonotatus*

MAMMALS

Abert's Squirrel	*Sciurus aberti*
Allen's Lappet-browed Bat	*Idionycteris phyllotis*
Arizona Montane Vole	*Microtus montanus arizonensis*
Collared Peccary	*Pecari tajacu*
Coues White-tailed Deer	*Odocoileus virginianus couesi*
Beaver	*Castor canadensis*
Big Brown Bat	*Eptesicus fuscus*
Bobcat	*Felis rufus*
Black Bear	*Urus americana*
Coatimundi	*Nasua narica*
Coyote	*Canis latrans*
Dwarf Shrew	*Sorex nanus*
Gray Fox	*Urocyon cinereoargenteus*
Gray Squirrel	*Sciurus griseus*

Greater Western Mastiff Bat	*Eumops perotis californicus*
Lesser Long-nosed Bat	*Leptonycteris curasoae yerbabuenae*
Long-tailed Vole	*Microtus longicaudus*
Meadow (New Mexico) Jumping Mouse	*Zapus hudsonius luteus*
Merriam's Shrew	*Sorex merriami leucogenys*
Mexican Free-tailed Bat	*Tadarida brasiliensis*
Mexican Gray Wolf	*Canis lupus baileyi*
Mountain Lion	*Felis concolor*
Mule Deer	*Odocoileus hemionus*
Navajo Mogollon Vole	*Microtus mogollonensis navaho*
Pale Townsend's Big-eared Bat	*Corynorhinus townsendii pallescens*
Botta's Pocket Gopher	*Thomomys bottae*
Pronghorn	*Antilocapra Americana*
Raccoon	*Procyon lotor*
Red Bat	*Laiurus cinereus*
Red Squirrel	*Tamiascirus hudsonicus mogollonensis*
Elk	*Cervus elaphes*
Bighorn Sheep	*Ovis canadensis*
Striped Skunk	*Mephitus mephitis*
Small-footed Bat	*Myotis ciliolabrum*
Spotted Bat	*Euderma maculatum*
Springerville Silky Pocket Mouse	*Perognathus flavus goodpasteri*
Southern Red-backed Vole	*Clethrionomys gapperi*
Water Shrew	*Sorex palustris navigator*
Western Pipistrelle Bat	*Pipistrellus hesperus*
Western Red Bat	*Lasiurus blossevillii*
White Mountains Chipmunk	*Tamias minimus arizonensis*
White Mountains Ground Squirrel	*Spermophilus tridecemlineatus monticola*

SNAILS, INSECTS, AND CLAMS

3 Forks Springsnail	*Pyrgulopsis trivalis*
Ferris Copper	*Lycaena ferrisi*
California Floater	*Anodonta californiensis*

PLANTS

Alligator Juniper	*Juniperus deppeana*
Arizona Alum Root	*Heuchera glomerulata*
Arizona Sneezeweed	*Heleniym arizonicum*
Arizona Sunflower	*Helianthus arizonensis*
Arizona Sycamore	*Platanus wrightii*
Arizona Walnut	*Juglans major*
Arizona Willow	*Salix arizonica*
Alder	*Alunus* spp.
Bebb's Willow	*Salix bebbiana*
Blumer's Dock	*Rumex orthoneurus*
Boxelder	*Acer negundo*
Buckbrush	*Ceanothus* spp.
Burrobrush	*Hymenoclea monogyra*
Cocklebur	*Zanthium strumarium*
Coyote Willow	*Salix exigua*
Davidson's Cliff Carrot	*Pteryxia davidsonii*
Desert Ceanothus	*Ceanothus greggii*
Eastwood Alum Root	*Heuchera eastwoodiae*
Emory Oak	*Quercus emoryi*
Fremont Cottonwood	*Populus fremontii*
Gambell Oak	*Quercus gambelii*
Gila Thistle	*Cirsium gilense*
Goodding's Onion	*Alliym gooddingii*

Goodding Willow	*Salix gooddingii*
Gray Oak	*Quercus grisea*
Greene (Wheel) Milkweed	*Asclepias uncialisi* spp. *uncialis*
Heartleaf Groundsel	*Packera cardamine [=Senecio cardamine]*
Heartleaf Wild Buckwheat	*Eriogonum ericifolium* var. *ericifolium*
Hoptree	*Ptelea trifoliata*
Maquire's Beardtongue	*Penstemon linarioides* spp. *maguirei*
Mogollon Clover	*Trifolium longipes* spp. *Neurophullum [=T. neurophullum]*
Mogollon Hawkweed	*Hieracium brevipilum [=H. fenderli* var. *mogollense]*
Morning Glory	*Ipomoea* sp.
Mountain Mahogany	*Cercocarpus* spp.
Mullein	*Verbascum Thapsus*
Netleaf Hackberry	*Celtis reticulata*
Narrowleaf Willow	*Salix exigua*
Ocotillo	*Fouqueria splendens*
One Seed Juniper	*Juniperus monosperma*
Parish's Alkali Grass	*Puccinellia parishi*
Pinon Pine	*Pinus edulis*
Ponderosa Pine	*Pinus ponderosa*
Prickly Pear	*Opuntia* sp.
Rabbitbrush	*Chrysothamnus nauseous*
Russian Thistle	*Salsola* sp.
Sotol	*Dasylirion wheeleri*
Tamarisk	*Tamarix* sp.
Velvet Mesquite	*Prosopis velutina*
Villous Groundcover Milkvetch	*Astragalus humistratus* var. *crispulus*
White Mountain Paintbrush	*Castilleja mogollonica*
White Sweetclover	*Melilotus albus*
Wright's Silktassel	*Garrya wrightii*
Wislizeni Gentian	*Gentianella wislizeni*
Yellow Lady's Slipper	*Cypripedium parviflorum* var. *pubescens*
Yellow Sweetclover	*Melilotus officinalis*

APPENDIX E — USFS SOUTHWESTERN REGION SENSITIVE SPECIES LIST

September 21, 2007 version

ANIMALS

COMMON NAME	SCIENTIFIC NAME
AMPHIBIANS (11)	
SACRAMENTO MOUNTAINS SALAMANDER	*Aneides hardii*
JEMEZ MOUNTAINS SALAMANDER	*Plethodon neomexicanus*
BOREAL TOAD	*Bufo boreas boreas*
ARIZONA TOAD	*Bufo microscaphus*
WESTERN BARKING FROG	*Eleutherodactylus augusti cactorum*
LOWLAND LEOPARD FROG	*Rana yavapaiensis*
TARAHUMARA FROG	*Rana tarahumarae*
NORTHERN LEOPARD FROG	*Rana pipiens*
PLAINS LEOPARD FROG	*Rana blairi*
RAMSEY CANYON LEOPARD FROG	*Rana subaquavocalis*
GREAT PLAINS NARROW-MOUTHED TOAD	*Gastrophryne olivacea*
BIRDS (41)	
CLARK'S GREBE	*Aechmophorus clarkii*
BALD EAGLE	*Haliaeetus leucocephalus*
NEOTROPIC CORMORANT	*Phalacrocorax brasilianus*
WHITE-FACE-IBIS	*Plegadis chihi*
ZONE-TAILED HAWK	*Buteo albonotatus*
NORTHERN GOSHAWK	*Accipiter gentilis*
NORTHERN GRAY HAWK	*Asturina nitida maximus*
COMMON BLACK-HAWK	*Buteogallus anthracinus*
SWAINSON'S HAWK	*Buteo swainsoni*
FERRUGINOUS HAWK	*Buteo regalis*
AMERICAN PEREGRINE FALCON	*Falco peregrinus anatum*
WHITE-TAILED PTARMIGAN	*Lagopus leucurus*
LESSER PRAIRIE-CHICKEN	*Tympanuchus pallidicinctus*
GOULD'S WILD TURKEY	*Meleagris gallopavo mexicana*
MOUNTAIN PLOVER	*Charadrius montanus*
COMMON GROUND DOVE	*Columbina passerina*
WESTERN YELLOW BILLED CUCKOO	*Coccyzus americanus occidentalis*
CACTUS FERRUGINOUS PYGMY OWL	*Glaucidium brasilianum cactorum*
WHISKERED SCREECH OWL	*Otus trichopsis*
BURROWING OWL (Western)	*Athene cunicularia hypugaea*
BOREAL OWL	*Aegolius funereus*
BUFF-COLLARED NIGHTJAR	*Caprimulgus ridgwayi*
BROAD BILLED HUMMINGBIRD	*Cynanthus latirostris*
WHITE EARED HUMMINGBIRD	*Hylocharis leucotis*
VIOLET-CROWNED HUMMINGBIRD	*Amazilia violiceps*
LUCIFER HUMMINGBIRD	*Calothorax lucifer*
COSTA'S HUMMINGBIRD	*Calypte costae*
EARED QUETZAL	*Euptilotis neoxenus*
GILA WOODPECKER	*Melanerpes uropygialis*
NORTHERN BEARDLESS-TYRANNULET	*Camptostoma imberbe*
NORTHERN BUFF-BREASTED FLYCATCHER	*Empidonax fulvifrons pygmaeus*
THICK-BILLED KINGBIRD	*Tyrannus crassirostris*
LOGGERHEAD SHRIKE	*Lanius ludovicianus*
ARIZONA BELL'S VIREO	*Vireo bellii arizonae*
GRAY VIREO	*Vireo vicinior*
GRAY CATBIRD	*Dumetella carolinensis*
ROSE-THROATED BECARD	*Pachyramphus aglaiae*
ABERT'S TOWHEE	*Pipilo aberti*
ARIZONA GRASSHOPPER SPARROW	*Ammodramus savannarum ammolegus*
BAIRD'S SPARROW	*Ammodramus bairdii*
VARIED BUNTING	*Passerina versicolor*

CLAMS (3)

CALIFORNIA FLOATER	*Anodonta californiensis*
LILLJEBORG'S PEA-CLAM	*Disidium lilljeborg*
SANGRE DE CRISTO PEA-CLAM	*Disidium sanguinichristi*

CRUSTACEANS (2)

CLAM SHRIMP	*Eulimnadia follisimillis*
FAIRY SHRIMP (new species)	*Streptocephalus n. sp.1*

FISH (16)

BLUEHEAD SUCKER	*Catostomus discobolus discobolus*
FLANNELMOUTH SUCKER	*Catostomus latipinnis*
GREENTHROAT DARTER	*Etheostoma lepidum*
HEADWATER CATFISH	*Ictalarus lupus*
HEADWATER CHUB	*Gila nigra*
LITTLE COLORADO SUCKER	*Catostomus sp.3*
MEXICAN STONEROLLER	*Campostoma ornatum*
RIO GRANDE CHUB	*Gila pandora*
RIO GRANDE CUTTHROAT TROUT	*Oncorhynchus clarki virginalis*
RIO GRANDE SUCKER	*Catostomus plebeius*
ROUNDTAIL CHUB	*Gila robusta*
SONORA SUCKER	*Catostomus insignis*
SUCKERMOUTH MINNOW	*Phenacobius mirabilis*
ZUNI BLUEHEAD SUCKER	*Catostomus discobolus yarrowi*

INSECTS (21)

SABINO CANYON DAMSELFLY	*Argia sabomp*
BLEACHED SKIMMER DRAGONFLY	*Libellula composita*
DASHED RINGTAIL	*Erpetogomphus heterodon*
ARIZONA SNAKETAIL	*Ophiogomphus arizonicus*
A MAY FLY	*Lachiania dencyannae*
A MAYFLY	*Homoleptohyphes quercus*
PINALENO MONKEY GRASSHOPPER	*Eumorsea pinaleno*
BONITA DIVING BEETLE	*Deroneotes neomexicanus*
CHIRICAHUA WATER SCAVENGER BEETLE	*Cymbiodyta arizonica*
PARKER'S CYLLOEPUS RIFFLE BEETLE	*Cylloepus parkeri*
STEPHAN'S HETERELMIS RIFFLE BEETLE	*Heterelmis stephani*
FERRIS' COPPER	*Lycaena ferrisi*
HUACHUCA GIANT SKIPPER	*Agathymus evansi*
CESTUS SKIPPER	*Atrytonopsis cestus*
FOUR SPOTTED SKIPPERLING	*Piruna polingii*
POLING'S HAIRSTREAK	*Fixsenia polingi*
NOKOMIS FRITILLARY	*Speyeria nokomis nokomis*
NITOCRIS FRITILLARY	*Speyeria nokomis nitocris*
SACRAMENTO MOUNTAINS CHECKERSPOT BUTTERFLY	*Euphydryas anicia cloudcrofti*
MOTH (Notodontid moth)	*Euhyparpax rosea*
NETWING MIDGE	*Agathon arizonicus*

MAMMALS (70)

ARIZONA SHREW	*Sorex arizonae*
CINEREUS (MASKED) SHREW	*Sorex cinereus cinereus*
MERRIAM'S SHREW	*Sorex merriami leucogenys*
DWARF SHREW	*Sorex nanus*
NEW MEXICO SHREW	*Sorex neomexicanus*
WATER SHREW	*Sorex palustris navigator*
PREBLE'S SHREW	*Sorex preblei*
COCKRUM'S DESERT SHREW	*Notiosorex cockrumi*
MEXICAN LONG-TONGUED BAT	*Choeronycteris mexicana*
CALIFORNIA LEAF-NOSED BAT	*Macrotus californicus*

WESTERN YELLOW BAT	*Lasiurus xanthinus*
WESTERN RED BAT	*Lasiurus blossevillii*
SPOTTED BAT	*Euderma maculatum*
ALLEN'S LAPPET-BROWED BAT	*Idionycteris phyllotis*
PALE TOWNSEND'S BIG-EARED BAT	*Corynorhinus townsendii pallescens*
POCKETED FREE-TAILED BAT	*Nyctinomops femorosaccus*
GREATER WESTERN MASTIFF BAT	*Eumops perotis californicus*
PIKA	*Ochotona princeps*
GOAT PEAK PIKA	*Ochotona princeps nigrescens*
SNOWSHOE HARE	*Lepus americanus*
WHITE-SIDED JACK RABBIT	*Lepus callotis*
WHITE-TAILED JACK RABBIT	*Lepus townsendii campanius*
GRAY-FOOTED CHIPMUNK	*Neotamias canipes*
WHITE MOUNTAINS CHIPMUNK	*Tamias minimus arizonensis*
PEÑASCO LEAST CHIPMUNK	*Neotamias minimus atristriatus*
KAIBAB LEAST CHIPMUNK	*Neotamias minimus consobrinus*
YELLOW-BELLIED MARMOT	*Marmota flaviventris*
WHITE MOUNTAINS GROUND SQUIRREL	*Spermophilus tridecemlineatus monticola*
BLACK-TAILED PRAIRIE DOG	*Cynomys ludovicianus ludovicianus*
GUNNISON'S PRAIRIE DOG	*Cynomys gunnisoni*
KAIBAB SQUIRREL	*Sciurus aberti kaibabensis*
ARIZONA GRAY SQUIRREL	*Sciurus arizonensis arizonensis*
CHIRICAHUA FOX SQUIRREL	*Sciurus nayaritensis chiracahuae*
RUIDOSO RED SQUIRREL	*Tamiasciurus hudsonicus l ychnuchus*
BOTTA'S POCKET GOPHER	*Thomomys bottae aureus*
GRAHAM MOUNTAINS POCKET GOPHER	*Thomomys bottae grahamensis*
GUADALUPE POCKET GOPHER	*Thomomys bottae guadalupensis*
BOTTA'S POCKET GOPHER	*Thomomys bottae morulus*
CEBOLLETA SOUTHERN POCKET GOPHER	*Thomomys bottae paguatae*
BOTTA'S POCKET GOPHER	*Thomomys bottae planorum*
KAIBAB NORTHERN POCKET GOPHER	*Thomomys talpoides kaibabensis*
MT. TAYLOR NORTHERN POCKET GOPHER	*Thomomys talpoides taylori*
HUACHUCA MOUNTAINS POCKET GOPHER	*Thomomys umbrinus intermedius*
SOUTHERN (PAJARITO) POCKET GOPHER	*Thomomys umbrinus quercinus*
YELLOW-FACED POCKET GOPHER	*Cratogeomys castanops*
WHITE-ANKLED MOUSE	*Peromyscus pectoralis laceianus*
WUPATKI ARIZONA POCKET MOUSE	*Perognathus amplus cineris*
SPRINGERVILLE SILKY POCKET MOUSE	*Perognathus flavus goodpasteri*
HOUSEROCK VALLEY CHISEL TOOTHED KANGAROO RAT	*Dipodomys microps leucotis*
NM BANNER TAILED KANGAROO RAT	*Dipodomys spectabilis clarenci*
FULVOUS HARVEST MOUSE	*Reithrodontomys fulvescens*
PLAINS HARVEST MOUSE	*Reithrodontomys montanus*
MESQUITE (Merriam's) MOUSE	*Peromyscus merriami*
NORTHERN PYGMY MOUSE	*Baiomys taylori ater*
YELLOW-NOSED COTTON RAT	*Sigmodon ochrognathus*
SOUTHERN RED-BACKED VOLE	*Clethrionomys gapperi*
WESTERN HEATHER VOLE	*Phenacomys intermedius I ntermedius*
ARIZONA MONTANE VOLE	*Microtus montanus arizonensis*
NAVAJO MOGOLLON VOLE	*Microtus mogollonensis navaho*
LONG-TAILED VOLE	*Microtus longicaudus*
WHITE-BELLIED LONG-TAILED VOLE	*Microtus longicaudus leucophaeus*
MEADOW (NEW MEXICO) JUMPING MOUSE	*Zapus hudsonius luteus*
WHITE-NOSED COATI	*Nasua narica*
AMERICAN MARTEN	*Martes americana origenes*
ERMINE	*Mustela erminea muricus*
MINK	*Mustela vison energumenos*
HOODED SKUNK	*Mephitis macroura milleri*
SANDHILL WHITE-TAILED DEER	*Odocoileus virginianus texana*

ROCKY MOUNTAIN BIGHORN SHEEP	*Ovis canadensis canadensis*
DESERT BIGHORN SHEEP	*Ovis canadensis mexicana*

REPTILES (16)

RETICULATE GILA MONSTER	*Heloderma suspectum suspectum*
SONORAN DESERT TORTOISE	*Gopherus agassizii (Sonoran Population)*
SLEVIN'S BUNCHGRASS LIZARD	*Sceloporus slevini*
MOUNTAIN SKINK	*Eumeces callicephalus*
GIANT SPOTTED WHIPTAIL	*Aspidoscelis burti stictogrammus*
GREEN RATSNAKE	*Senticolis triaspis*
BROWN VINESNAKE	*Oxybelis aeneus*
THORNSCRUB HOOKNOSED SNAKE	*Gyalopion quadrangulare*
MARICOPA LEAF-NOSED SNAKE	*Phyllorhynchus browni lucidus*
YAQUI BLACK-HEADED SNAKE	*Tantilla yaquia*
MEXICAN GARTERSNAKE	*Thamnophis eques megalops*
ARID LAND RIBBONSNAKE	*Thamnophis proximus diabolicus*
NARROW-HEADED GARTERSNAKE	*Thamnophis rufipunctatus*
MOTTLED ROCK RATTLESNAKE	*Crotalus lepidus lepidus*
TWIN SPOTTED RATTLESNAKE	*Crotalus pricei*
ARIZONA RIDGE-NOSED RATTLESNAKE	*Crotalus willardi willardi*

SNAILS (38)

GILA SPRINGSNAIL	*Pyrgulopsis gilae*
VERDE RIM SPRINGSNAIL	*Pyrgulopsis glandulosa*
PAGE SPRINGSNAIL	*Pyrgulopsis morrisoni*
FOSSIL SPRINGSNAIL	*Pyrgulopsis simplex*
NEW MEXICO HOT SPRINGSNAIL	*Pyrgulopsis thermalis*
BROWN SPRINGSNAIL	*Pyrgulopsis sila*
HUACHUCA SPRINGSNAIL	*Pyrgulopsis thompsoni*
THREE FORKS SPRINGSNAIL	*Pyrgulopsis trivalis*
CLARK PEAK TALUSSNAIL	*Sonorella christenseni*
MIMIC TALUSSNAIL	*Sonorella imitator*
PINALENO TALUSSNAIL	*Sonorella grahamensis*
WET CANYON TALUSSNAIL	*Sonorella macrophallus*
NO COMMON NAME GIVEN; see Metcalf and Smartt (1997)	*Sonorella hachitana pleoncillensis*
NORTHERN THREEBAND	*Humboltiana ultima*
BEARDED MOUNTAINSNAIL	*Oreohelix barbata*
PINALENO MOUNTAINSNAIL	*Oreohelix grahamensis*
MAGDALENA MOUNTAINSNAIL	*Oreohelix magdalanae*
NO COMMON NAME	*Oreohelix metcalfei acutidiscus*
NO COMMON NAME (Black Range mountainsnail)	*Oreohelix metcalfei concentrica*
NO COMMON NAME	*Oreohelix metcalfei metcalfei*
NO COMMON NAME	*Oreohelix metcalfei radiata*
NO COMMON NAME	*Oreohelix nogalensis*
MINERAL CREEK MOUNTAINSNAIL	*Oreohelix pilsbryi*
MORGAN CREEK MOUNTAINSNAIL	*Oreohelix swopei*
SUBALPINE MOUNTAINSNAIL	*Oreohelix subrudis*
SILVER CREEK WOODLANDSNAIL	*Ashmunella binneyi*
NO COMMON NAME	*Ashmunella cockerelli argenticola*
BLACK RANGE WOODLANDSNAIL	*Ashmunella cockerelli cockerelli*
WHITEWATER CREEK WOODLANDSNAIL	*Ashmunella danielsi*
IRON CREEK WOODLANDSNAIL	*Ashmunella mendax*
CAPITAN WOODLANDSNAIL	*Ashmunella pseudodonta*
DRY CREEK WOODLANDSNAIL	*Ashmunella tetradon tetradon*
NO COMMON NAME	*Ashmunella tetradon mutator*
NO COMMON NAME	*Ashmunella tetradon inermis*
NO COMMON NAME	*Ashmunella tetradon animorum*
BLUNT AMBERSNAIL	*Oxyloma retusum*
VAGABOND HOLOSPIRA	*Holospira montivaga*

PLANTS

TUFTED SAND VERBENA	*Abronia bigelovii*
PIMA INDIAN MALLOW	*Abutilon parishii*
WRIGHT'S DOGWEED	*Adenophyllum wrightii var. wrightii*
TONTO BASIN AGAVE	*Agave delamateri*
HOHOKAM AGAVE	*Agave murpheyi*
SANTA CRUZ STRIPED AGAVE	*Agave parviflora ssp. Parviflora*
PHILLIPS' AGAVE	*Agave phillipsiana*
TRELEASE AGAVE	*Agave schottii var. treleasei*
GOODDING'S ONION	*Allium gooddingii*
SAIYA	*Amoreuxia gonzalezii*
LARGE-FLOWERED BLUE STAR	*Amsonia grandiflora*
MOGOLLON DEATH CAMAS	*Anticlea mogollonensis (=Zigadenus m.)*
CHAPLINE'S COLUMBINE	*Aquilegia chaplinei (=A. chrysantha var. chaplinei)*
CHIRICAHUA ROCK CRESS	*Arabis tricornuta*
MT. DELLENBAUGH SANDWORT	*Arenaria aberrans*
EMMON MILKWEED	*Asclepias lemmonii*
GREENE MILKWEED	*Asclepias uncialis ssp. Uncialis*
ZUNI MILKVETCH	*Astragalus accumbens*
GUMBO MILKVETCH	*Astragalus ampullarius*
TALL MILKVETCH	*Astragalus altus*
MAGUIRE'S (COPPERMINE) MILKVETCH	*Astragalus cobrensis var. maguirei*
MARBLE CANYON MILKVETCH	*Astragalus cremnophylax var. hevronii*
CLIFF MILKVETCH	*Astragalus cremnophylax var. myriorrhaphis*
VILLOUS GROUNDCOVER MILKVETCH	*Astragalus humistratus var. crispulus*
HUACHUCA MILKVETCH	*Astragalus hypoxylus*
KERR'S MILKVETCH	*Astragalus kerrii*
CHACO MILKVETCH	*Astragalus micromerius*
PAGOSA MILKVETCH	*Astragalusmissouriensis var. humistratus*
RIPLEY MILKVETCH	*Astragalus ripleyi*
RUSBY'S MILKVETCH	*Astragalus rusbyi*
ONE-FLOWERED MILKVETCH	*Astragalus wittmannii*
AYENIA	*Ayenia truncata (=A. glabra)*
SIERRA BLANCA KITTENTAILS	*Besseya oblongifolia*
CRENULATE MOONWORT	*Botrychium crenulatum*
BUSH-VIOLET	*Browallia eludens*
PECOS MARIPOSA LILY	*Calochortus gunnisonii var. perpulcher*
CHILTEPIN	*Capsicum annuum var. glabriusculum*
CHIHUAHUAN SEDGE	*Carex chihuahuensis*
COCHISE SEDGE	*Carex ultra (=C.spissa var. ultra)*
KAIBAB PAINTBRUSH	*Castilleja kaibabensis*
WHITE MOUNTAINS PAINTBRUSH	*Castilleja mogollonica*
TRANS-PECOS INDIAN PAINTBRUSH	*Castilleja nervata*
SANTA CRUZ STAR LEAF	*Choisya mollis*
TUSAYAN RABBITBRUSH, DISTURBED RABBITBRUSH	*Chrysothamnus molestus*
ARIZONA BUGBANE	*Cimicifuga arizonica*
GILA THISTLE	*Cirsium gilense*
MOGOLLON THISTLE	*Cirsium parryi ssp. Mogollonicum*
WRIGHT'S MARSH THISTLE	*Cirsium wrightii*
ARIZONA LEATHERFLOWER, CLUSTERED LEATHERFLOWER	*Clematis hirsutissima var. hirsutissima*

MEXICAN HEMLOCK PARSLEY	*Conioselinum mexicanum*
SANTA CRUZ BEEHIVE CACTUS	*Corypantha recurvata*
SMOOTH BABYBONNETS	*Coursetia glabella*
WOOTON'S HAWTHORN	*Crategus wootoniana*
YELLOW LADY'S-SLIPPER	*Cypripedium parviflorum var. pubescens (=C. calceolus var. pubescens, C. pubescens)*
GENTRY INDIGO BUSH	*Dalea tentaculoides*
ALPINE LARKSPUR	*Delphinium alpestre*
ROBUST LARKSPUR	*Delphinium robustum*
METCALFE'S TICK-TREFOIL	*Desmodium metcalfei*
SMALL-HEADED GOLDENWEED	*Ericameria microcephala (=Haplopappus m.)*
GUADALUPE RABBITBRUSH	*Ericameria nauseosa var. texensis (=Chrysothamnus n. ssp t.)*
MOGOLLON FLEABANE	*Erigeron anchana*
ARID THRONE FLEABANE	*Erigeron arisolius*
HELIOGRAPH PEAK FLEABANE	*Erigeron heliographis*
HESS' FLEABANE	*Erigeron hessii*
CHIRICAHUA FLEABANE	*Erigeron kuschei*
FISH CREEK FLEABANE	*Erigeron piscaticus*
ROCK FLEABANE	*Erigeron saxatilis*
SIVINSKI'S FLEABANE	*Erigeron sivinskii*
PECOS FLEABANE	*Erigeron subglaber*
HEATHLEAF WILD BUCKWHEAT	*Eriogonum ericifolium var. ericifolium*
MORTON WILD BUCKWHEAT	*Eriogonum mortonianum*
RIPLEY WILD BUCKWHEAT	*Eriogonum ripleyi*
ATWOOD WILD BUCKWHEAT	*Eriogonum thompsonae var. atwoodii*
VILLARD'S PINCUSHION CACTUS	*Escobaria villardii*
WISLIZENI GENTIAN	*Gentianella wislizeni*
BARTRAM STONECROP	*Graptopetalum bartramii*
FLAGSTAFF PENNYROYAL	*Hedeoma diffusum*
ARIZONA SNEEZEWEED	*Helenium arizonicum*
ARIZONA SUNFLOWER	*Helianthus arizonensis*
RUTTER'S FALSE GOLDENASTER	*Heterotheca rutteri*
EASTWOOD ALUM ROOT	*Heuchera eastwoodiae*
ARIZONA ALUM ROOT	*Heuchera glomerulata*
SANDIA ALUM ROOT	*Heuchera pulchella*
CHISOS MT. CRESTED CORALROOT	*Hexalectris revolute*
ARIZONA CORALROOT	*Hexalectris spicata var. arizonica*
TEXAS PURPLE-SPIKE	*Hexalectris warnockii*
MOGOLLON HAWKWEED	*Hieracium brevipilum (=H. fendleri var. mogollense)*
RUSBY HAWKWEED	*Hieracium abscissum (= H. rusbyi)*
NEW MEXICO BITTERWEED	*Hymenoxys ambigens var. neomexicana*
TALL BITTERWOOD	*Hymenoxys brachyactis*
SIERRA BLANCA CLIFF DAISY	*Ionactis elegans (=Chaetopappa e.)*
KAIBAB BLADDERPOD	*Lesquerella kaibabensis*
LEMON LILY	*Lilium parryi*
WOOD LILY	*Lilium philadelphicum*
CHIRICAHUA MUDWORT	*Limosella pubiflora*
ALAMOS DEER VETCH	*Lotus alamosanus*
HORSESHOE DEER VETCH	*Lotus mearnsii var. equisolensis*
HUACHUCA MOUNTAINS LUPINE	*Lupinus huachucanus*
BROADLEAF LUPINE	*Lupinus latifolius ssp. Leucanthus*
LEMMON'S LUPINE	*Lupinus lemmonii*
MAPLELEAF FALSE SNAPDRAGON	*Mabrya acerifolia (=Maurandya a.)*
SUPINE BEAN	*Macroptilium supinum*
COUNTER-CLOCKWISE FISHHOOK CACTUS	*Mammillaria mainiae*

ARIZONA MANIHOT	*Manihot davisiae*
CHAMA BLAZING STAR	*Mentzelia conspicua*
SPRINGER'S BLAZING STAR	*Mentzelia springeri*
WIGGINS MILKWEED VINE	*Metastelma mexicanum (=Cynanchum wigginsii)*
LADIES'-TRESSES	*Microthelys rubrocallosa (=Schiedeella r., Spiranthes r.)*
SOUTHWESTERN MUHLY	*Muhlenbergia palmeri (=M. dubioides)*
SYCAMORE CANYON MUHLY	*Muhlenbergia elongata (=M. xerophila)*
HEARTLEAF GROUNDSEL	*Packera cardamine (=Senecio cardamine)*
TOUMEY GROUNDSEL	*Packera neomexicana var. toumeyi (=Senecio n. var. t.)*
SPELLENBERG'S GROUNDSEL	*Packera spellenbergii (=Senecio s.)*
VIRLET PASPALUM	*Paspalum virletii*
ARIZONA PASSIONFLOWER	*Passaflora arizonica*
BEARDLESS CHINCHWEED	*Pectis imberbis*
KAIBAB PINCUSHION CACTUS	*Pediocactus paradinei*
FICKEISEN PINCUSHION CACTUS	*Pediocactus peeblesianus var. flickeisniae*
THREE-NERVED SCURF-PEA	*Pediomelum pentaphyllum*
LYNGHOLM'S BRAKEFERN	*Pellaea lyngholmii*
ALAMO PENSTEMON	*Penstemon alamosensis*
GUADALUPE PENSTEMON	*Penstemon cardinalis ssp. Regalis*
SUNSET CRATER BEARDTONGUE	*Penstemon clutei*
CATALINA BEARDTONGUE	*Penstemon discolor*
MAGUIRE'S BEARDTONGUE	*Penstemon linarioides ssp. Maguirei*
METCALFE'S PENSTEMON	*Penstemon metcalfei*
FLAGSTAFF BEARDTONGUE	*Penstemon nudiflorus*
SAN MATEO PENSTEMON	*Penstemon pseudoparvus*
CHIRICAHUA ROCKDAISY	*Perityle cochisensis*
SALT RIVER ROCKDAISY	*Perityle gilensis var. salensis*
FISH CREEK ROCKDAISY	*Perityle saxicola*
ARIZONA PHLOX	*Phlox amabilis*
BROADLEAF GROUND CHERRY	*Physalis latiphysa*
ALCOVE BOG ORCHID	*Platanthera zothecina*
HINCKLEY'S POLEMONIUM	*Polemonium pauciflorum ssp. Hinckleyi*
HUALAPAI MILKWORT	*Polygala rusbyi*
WHITE-FLOWERED CINQUEFOIL	*Potentilla albiflora*
CHIRICAHUA CINQUEFOIL	*Potentilla rhyolitica var. chiricahuensis*
HUACHUCA CINQUEFOIL	*Potentilla rhyolitica var. rhyolitica*
MEXICAN TANSY ASTER	*Psilactis gentryi (=machaeranthera mexicana)*
WHISK FERN	*Psiilotum nudum*
DAVIDSON'S CLIFF CARROT	*Pteryxia davidsonii*
PARISH'S ALKALI GRASS	*Puccinellia parishii*
GRAND CANYON ROSE	*Rosa stellata ssp. Abyssa*
SIERRA BLANCA CINQUEFOIL	*Potentilla sierrae-blancae*
BLUMER'S DOCK	*Rumex orthoneurus*
ARIZONA WILLOW	*Salix arizonica*
BEBB'S WILLOW	*Salix bebbiana*
GALIURO SAGE	*Salvia amissa*
MEARNS SAGE	*Salvia dorrii ssp. Mearnsii*
CHIRICAHUA MOUNTAIN BROOKWEED	*Samolus vagans*
MIMBRES FIGWORT	*Scrophularia macrantha*
NEW MEXICAN STONECROP	*Sedum integrifolium ssp. Neomexicana*

HUACHUCA GROUNDSEL	*Senecio multidentatus var. huachucanus (=s. huachucanus)*
NODDING BLUE-EYED GRASS	*Sisyrinchium cernuum*
GUADALUPE MESCAL BEAN	*Sophora gypsophila var. guadalupensis*
PORSILD'S STARWORT	*Stellaria porsildii*
LEMMON'S STEVIA	*Stevia lemmonii*
GUADALUPE JEWELFLOWER	*Streptanthus sparsiflorus*
PINOS ALTOS FLAME FLOWER	*Talinum humile*
TEPIC FLAME FLOWER	*Talinum marginatum*
ARAVAIPA WOODFERN	*Thelypteris puberula var. sonorensis*
SONORAN NOSEBURN	*Tragia laciniata*
MOGOLLON CLOVER	*Trifolium longipes ssp. neurophyllum (=T. neurophyllum)*
TUMAMOC GLOBEBERRY	*Tumamoca macdougallii*
SHADE VIOLET	*Viola umbraticola*