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

U.S. Department of the Interior
Bureau of Land Management
Safford Field Office

Draft Environmental Assessment

NATIVE FISH RESTORATION IN BONITA CREEK

Gila Box Riparian National Conservation Area Graham County, Arizona

February 2007

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CHAPTER 1 - PURPOSE AND NEED

1.1 Introduction

The Bureau of Reclamation (Reclamation) and Bureau of Land Management (BLM) have prepared this Environmental Assessment (EA) to analyze potential effects to physical, biological, and cultural resources that may result from construction of a fish barrier and other native fish recovery efforts in Bonita Creek and implementation of the City of Safford-BLM Memorandum of Understanding (MOU) and associated 10-year plan. Bonita Creek is located in the Gila Box Riparian National Conservation Area in Graham County, Arizona.

The EA was prepared in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality regulations (40 CFR 1500-1508), Reclamation NEPA Handbook, and BLM NEPA Handbook (H-1790-1). Reclamation and BLM are the lead Federal agencies pursuant to NEPA. The U.S. Fish and Wildlife Service (FWS) and the Arizona Game and Fish Department (AGFD) are cooperating agencies for the native fish restoration phase of the project.

The EA is organized into six chapters:

- ***Chapter 1 – Purpose and Need****:* This chapter presents information on the history of the proposed action/project, the purpose of and need for the action, and the lead agencies' proposal for achieving that purpose and need. This section also describes public involvement in the NEPA process.
- ***Chapter 2 – Comparison of Alternatives, including the Proposed Action****:* This chapter provides a detailed description of the lead agencies' proposed action; alternative methods for satisfying the stated purpose and need; and significant issues raised by the public, project proponents, and other agencies. A summary table of the environmental consequences associated with each alternative is also provided.
- ***Chapter 3 – Affected Environment and Environmental Consequences****:* This chapter describes the environmental effects of implementing the proposed action and other alternatives, including no action. Within each section, the affected environment is described first, followed by a discussion of the potential effects of each alternative.
- ***Chapter 4 – Agencies and Persons Consulted****:* This chapter 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****:* This chapter lists Federal environmental laws and directives that are relevant to the project.
- ***Chapter 6 – Literature Cited****:* This chapter 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

Gila River Basin Fishes. Native Arizona fishes[1] are among the most imperiled group of aquatic species in the United States. Twenty of 35 native fish species (57 percent) are federally listed as endangered or threatened. The decline in native fish fauna is partly attributable to a long history of water development and poor watershed practices which has dramatically altered riverine habitats (Minckley 1997). Human utilization of land and water resources has significantly affected the characteristics of streams (water quality, hydrology, and geomorphology) and associated biotic communities throughout much of Arizona. Accelerated erosion, sedimentation, channel downcutting and other changes in channel morphology have resulted from grazing, mining, timber harvesting and other land use practices, causing loss or degradation of aquatic habitat (Henderickson and Minckley 1984, Bahre 1991, Crawford et al. 1993). In addition, surface water diversions and groundwater pumping have gradually turned major segments of perennial streams into ephemeral-flow channels, resulting in lost interconnectivity of aquatic ecosystems and habitat fragmentation. Compounding these effects, predatory and/or competitory nonnative fish, crayfish, and bullfrogs have decimated or eliminated populations of native fishes and aquatic wildlife in many areas where perennial flows persist.[2] Physical and biological destabilization of riverine systems has lead to a typical pattern in Arizona where native species tend to be restricted to the upper reaches of major drainage basins (FWS 2001). The decline in native fish species is particularly acute in the Gila River basin, which drains the southern two-thirds of Arizona and portions of New Mexico and Sonora.

The effects of habitat modification and interaction with nonnative species have significantly reduced the abundance and distribution of native fishes in the Gila River basin (see Appendix A, Table A-1). Fifty-seven percent of the 21 species of native fishes that historically occupied the Gila River basin are currently imperiled or have disappeared (11 are federally listed as endangered or threatened, and one recently became extinct). At one time, all of the basin's native fishes not formally listed under the Endangered Species Act (ESA) were on the Candidate list, until a regulatory change reassigned most to the category of "species of concern." Populations of native fishes within the basin continue to decline.

Importation and establishment of nonnative fishes and ensuing community disruption are major causes for the imperiled status of many native fish species. Since the early 1900s, at least 40 species of nonnative fish have become established in the Gila River basin (see Appendix A, Table A-2). Many nonnatives were purposefully introduced to increase the diversity of the sport fishery, and some were accidentally released as bait or ornamental fish. Regardless of the mode of arrival, nonnative fishes have had a detrimental effect on native aquatic species. The introduction and proliferation of nonnative aquatic fauna,

[1] "Native" (also indigenous, endemic, and aboriginal) refers to organisms that occur, or formerly occurred, in a particular region as a result of natural ecological processes. Conversely, "nonnative" refers to organisms that have been intentionally or accidentally introduced outside their natural historic ranges by human activity.

[2] In Arizona, nonnative fish species outnumber native fish species by a 2:1 ratio (Boydstun et al. 1995).

especially fish, is increasingly viewed as one of the most serious long-term threats to the status and recovery of native aquatic vertebrates, equaled in severity only by the effect of habitat destruction (Minckley 1991, Rosen et al. 1995, Pacey and Marsh 1998, Marsh and Pacey 2005).

Direct impacts of nonnative fishes to native forms include predation, competition, hybridization, habitat alteration, and parasite and pathogen transmission (Propst et al. 1986, Propst and Bestgen 1991, Minckley 1991, Douglas et al. 1994). Predation on early life stages (eggs, larvae, juveniles) is considered the primary avenue by which nonnative fishes depress and often eliminate what are considered predator-naive native species (Minckley 1991). These effects are often exacerbated by habitat degradation. Case history shows that fishes as diverse as the "big river" razorback sucker (*Xyrauchen texanus*) and diminutive Gila topminnow (*Poeciliopsis occidentalis*) can live and reproduce in degraded habitats as long as they are unaccompanied by nonnative fishes, but they commonly wane or disappear when nonnatives become established (Pacey and Marsh 1998).

Native fishes, with only a few exceptions, are broadcast spawners that afford no parental care to their progeny, while nonnative kinds are predominated by nest builders that provide some degree of parental protection of eggs and young (Pacey and Marsh 1998). Furthermore, there is broad overlap among native and nonnative fishes in their use of physical habitats and biological resources, with the exception that most nonnatives are piscivores[3] or omnivores[4] (Pacey and Marsh 1998). Predation on early life stages is an intense, ever-present limiting factor inhibiting successful completion of native fish life cycles where the two groups coexist. For this reason, removal of nonnative fishes from native fish habitats, followed by stocking depleted or extirpated native species in concert with actions to prevent reinvasion by nonnatives, are among the foremost objectives of native fish recovery efforts in the Gila River basin (FWS 1994, 2001).

In Bonita Creek, several species of nonnative fish have invaded the lower 3-mile reach from the Gila River. These include green sunfish (*Lepomis cyanellus*), smallmouth bass (*Micropterus dolomieu*), channel catfish (*Ictalurus punctatus)*, fathead minnow (*Pimephales promelas*), red shiner (*Cyprinella lutrensis*), common carp (*Cyprinus carpio*), mosquitofish (*Gambusia affinis*), black bullhead (*Ameiurus melas*), and yellow bullhead (*Ameiurus natalis*). Smallmouth bass, green sunfish, and yellow and black bullheads have invaded the stream relatively recently; none were present during extensive sampling of Bonita Creek in the late 1970s (Minckley and Clarkson 1979). Despite this incursion, a purely native fish assemblage of five species, including the endangered Gila chub (*Gila intermedia*), persists in the upper stream. Upper and lower Bonita Creek are separated by a small grade-control dike and intermittent segment of stream that have inhibited invasion of the upper reach by nonnatives. However, future flood flows could provide sufficient connectivity between the two reaches to allow nonnatives to move from lower Bonita Creek into the upper system.

[3] Organisms that consume fish.
[4] Organisms that consume both animal and plant material.

Green sunfish is an aggressive invader of small streams in the Gila River basin, to the point of being nearly ubiquitous. It has been shown to be an effective predator on young native fish (Lemly 1985, Dudley and Matter 2000). Smallmouth bass is a renowned predator of fishes that is also capable of suppressing reproductive success by native Arizona fishes and displacing them (Minckley 1973, Barrett 1992). Yellow and black bullheads are other highly carnivorous species that readily consume fishes from their primary pool and slow-flowing run habitats (Minckley 1973). Channel catfish is a common nonnative species in the upper Gila River watershed that has deterred repatriation attempts with razorback sucker in the area because of its piscivorous tendencies (Marsh and Brooks 1989).

Mosquitofish, red shiner, and fathead minnow are small-bodied nonnative fishes that consume early life stages of native species (Ruppert et al. 1993, Bestgen et al. 2006) or otherwise harass them to decline or extirpation (Meffe 1985, Karp and Tyus 1990, Douglas et al. 1994). Fathead minnow has also been implicated in the decline of the Chiricahua leopard frog (Rosen et al. 1995). In addition to its negative impact on physical habitat conditions via its feeding behavior (Fuller et al. 1999), common carp preys on the eggs of other fish species (Moyle 1976, Taylor et al. 1984, Miller and Beckman 1996).

Effects of Central Arizona Project (CAP) on Gila River Basin Fishes. On September 30, 1968, Congress passed the Colorado River Basin Project Act (Act). This Act authorized the Secretary of the Interior, through Reclamation, to construct the CAP to deliver Colorado River water for agricultural, industrial, and municipal uses in central and southern Arizona. The CAP, which was declared "substantially complete" in 1993, conveys Colorado River water through a 336-mile-long system of pumping plants, aqueducts, dams, and reservoirs.

During the late 1980s, the issue of introduction and spread of nonnative aquatic species through the CAP began to receive serious consideration among fisheries biologists. Because the CAP is an interbasin water transfer system, concern was expressed that the CAP could accelerate the rate at which nonnative species are spread across basins and invade habitats occupied by native fishes. Recognizing the CAP could potentially affect protected native fishes, Reclamation, in 1991, requested formal consultation with the FWS, pursuant to Section 7(a)(2) of the ESA. On April 15, 1994, the FWS issued a final biological opinion on the delivery of CAP water to the Gila River basin (FWS 1994).

In March 1997, the Southwest Center for Biological Diversity filed suit, alleging that the biological opinion's reasonable and prudent alternative did not sufficiently remove jeopardy to threatened or endangered native fishes or adverse modification to their critical habitats. Simultaneously, the Central Arizona Water Conservation District filed suit alleging the mitigation measures went too far in assigning the impacts of nonnative fish introductions to the CAP. A U.S. District Court ruling in September 2000 upheld the FWS' jeopardy conclusion in the 1994 biological opinion, but also held that subsequent amendments to the reasonable and prudent alternative were arbitrary and capricious. As

a result, Reclamation and the FWS reentered formal consultation, which culminated in the FWS issuing a revised biological opinion on CAP water delivery (FWS 2001).

The FWS, in its 2001 biological opinion, concluded that interbasin water transfer through the CAP seriously and adversely affects the endangered Gila topminnow and razorback sucker and the threatened spikedace (*Meda fulgida*), loach minnow (*Tiaroga cobitis*), and bald eagle (*Haliaeetus leucocephalus*). The FWS also determined that CAP operations adversely modify critical habitat of the razorback sucker, spikedace, and loach minnow. Potential for establishment of nonnative aquatic species within the CAP system, and their subsequent escape and invasion into habitats occupied by protected native fishes, were cited as reasons for these adverse effects. Canal systems using CAP-supplied water, and associated irrigation releases to the rivers of the Gila River basin, were identified by the FWS as principal routes, among others, by which nonnative species could move from the CAP to the Gila River and its tributaries.

The 2001 CAP biological opinion incorporated the 1994 reasonable and prudent alternative and mitigative commitments proposed by Reclamation during reconsultation, which are collectively referred to in the 2001 opinion as conservation measures. These conservation measures include the construction of drop-type fish barriers in Bonita Creek and other specified drainage systems of the Gila River basin in Arizona and New Mexico.[5] In its 2001 biological opinion, the FWS concluded that the strategic placement of fish barriers, when combined with other proposed conservation measures, would avoid the likelihood that operation of the CAP will jeopardize the continued existence of listed species or adversely modify designated critical habitat.

Fish barriers built pursuant to the 2001 CAP biological opinion are subject to both NEPA and ESA compliance. Reclamation and BLM have consulted with FWS on potential effects of the Proposed Action on federally listed species (see section 3.5.7 for additional information).

Gila Box Riparian National Conservation Area. The Arizona Desert Wilderness Act of 1990 (Public Law 101-628) designated the Gila Box Riparian National Conservation Area (RNCA) to conserve, protect, and enhance riparian areas and associated resources, including aquatic, wildlife, archaeological, recreational, paleontological, scientific, cultural, educational, scenic, and other resources and values inherent to the area. The law also required BLM to develop a comprehensive management plan. That document, the *Gila Box Management Plan* (Management Plan), sets the management direction for the RNCA for a 15-year period beginning in 1998. A principal objective of the Management Plan is to maintain or enhance populations of threatened, endangered, and other priority species. Management actions prescribed in the Management Plan include reintroduction of native fishes and construction of a fish barrier in Bonita Creek. Species under

[5] The drainages consist of the Verde River between the Town of Clarkdale and the confluence of Sycamore Creek; Bonita Creek near its confluence with the Gila River; Aravaipa Creek, Fossil Creek, and Hot Springs or Redfield Canyon in their lower reaches; Blue River near its confluence with the San Francisco River; and a stream to be identified in the Tonto Creek basin. To date, fish barriers have been constructed in Aravaipa and Fossil creeks.

consideration for reintroduction in the Management Plan and this EA include spikedace, loach minnow, desert pupfish (*Cyprinodon macularius*), and Gila topminnow.

In January 1998, BLM completed the NEPA process and issued the final Management Plan EA, which included a Finding of No Significant Impact.[6] Coordination and consultation with FWS under Section 7(a)(2) of the ESA have been conducted by BLM on several project-level actions prescribed in the Management Plan. Formal Section 7 consultation has been reinitiated on the Management Plan regarding potential effects of future resource management actions on native fishes proposed for reintroduction.

The Management Plan also encourages cooperation between BLM and the City of Safford (Safford or City) regarding continued operation of the Bonita Creek Municipal Water System (water system). Since 1939, Safford has utilized the stream as a source for municipal water. Water production and delivery infrastructure within Bonita Creek canyon include an infiltration gallery, several active and capped wells, and a pipeline (Figures 3 and 4). This system has been upgraded several times in the last 60 years to increase its capacity and provide protection against flood damage. Safford also maintains approximately 2 miles of established road (Bonita Creek Road) within lower Bonita Creek canyon from the infiltration gallery to Bull Gap Road to access water system facilities. Construction of temporary roads is occasionally required to provide vehicle access to the water system where permanent roads do not exist. In 1986, BLM entered into a Cooperative Management Agreement (CMA) with Safford to supplement existing water utility rights-of-way and provide for "multiple uses within the corridor while maintaining and improving the riparian area and ensuring a continuing and reliable source of good quality municipal water for the Gila Valley." BLM and the City of Safford have developed a MOU and a 10-year operation plan (*Bonita Creek Water Production and Delivery System 10-Year Operation and Maintenance Plan*) for future management of the municipal water system. Impacts resulting from operation, maintenance, and capacity upgrade of the system under the MOU will be analyzed in this document. The MOU and 10-Year Plan will not be implemented until the NEPA process is complete.

1.3 Purpose of and Need for Action

The purpose of the proposed project is to protect the existing native fish assemblage in Bonita Creek and secure habitat for repatriation of imperiled native Gila River basin fishes identified in the RNCA Management Plan, while allowing for continued withdrawals of municipal water supplies by Safford including operation, maintenance, and possible capacity upgrade of the water system. Implementation of the action would also satisfy a required conservation measure of the 2001 CAP biological opinion to construct a fish barrier in Bonita Creek.

[6] The BLM Safford Field Manager signed a Finding of No Significant Impact on December 19, 1997. The Finding was based on the Draft Management Plan/EA. The final Management Plan/EA and Decision Record (1998) are incorporated into this EA by reference.

Restoration of sustainable populations of imperiled native fishes in streams like Bonita Creek is an important step toward native fish conservation and recovery. Although procedures for restoration of native fish populations vary with site-specific considerations, such as stream complexity and species composition, the approach most successfully used for decades in the United States is to chemically eradicate nonnative fishes from waters isolated by natural or constructed barriers and repatriate the system with native fishes from wild or hatchery populations (Finlayson et al. 2005). This management tool has been used in several New Mexico and Arizona streams to restore purely native fish assemblages (see Appendix B).

Opportunities for restoration of native fishes in the Gila River basin are extremely limited because of lack of suitable habitat, challenges of controlling or removing firmly established nonnative fish populations, and land ownership issues. A combination of factors makes Bonita Creek distinctive when compared to most other streams within the Gila River basin.

- Bonita Creek supports suitable habitats for species that are proposed for reintroduction;

- a native assemblage of five fish species including the endangered Gila chub persists in the stream indicating it has high potential for assisting in recovery of other native Gila River basin fishes if long-term security against upstream invasion of nonnative fishes can be provided by a fish barrier;

- natural bedrock landforms provide solid anchor points for a barrier;

- nonnative fishes have not successfully invaded the upper reach of stream above the water system infiltration gallery operated by Safford;

- seasonal low-flow conditions are conducive to piscicide treatments to remove nonnative fishes and to construct a fish barrier;

- the action area is relatively remote and is used very little as a sport fishery for nonnatives, providing ideal conditions for restoring and emphasizing a native fishery; and,

- the proposed fish barrier site is located on Federal land.

The proposed native fish restoration project would be conducted within the conceptual framework of sustaining Bonita Creek as a municipal water source. Bonita Creek is a significant source of potable water for the City of Safford and other Gila Valley water customers, and population growth within the service network has placed greater demands on available water supplies. Implementation of the MOU would provide for Safford's future water supply needs associated with Bonita Creek, while affording protection and enhancement of the natural resources of the Bonita Creek watershed.

1.4 Proposed Action

Project activities proposed by Reclamation and BLM, working in conjunction with AGFD and FWS, to meet the purpose and need are summarized below. The Proposed Action includes the construction of a fish barrier, application of a commercially available piscicide, and reintroduction of native fishes. An MOU would also be consummated between BLM and Safford to govern future operation and maintenance of the municipal water system in Bonita Creek. Chapter 2 describes the Proposed Action in greater detail.

- ***Fish barrier*** – Reclamation would construct a reinforced concrete fish barrier in Bonita Creek approximately 1.3 miles upstream from the confluence of the Gila River. This structure would create an effective impediment to upstream movement of nonnative fishes from the Gila River into lower and upper segments of the stream above the barrier.

- ***Native fish salvage*** – Prior to treatment, BLM and AGFD personnel would salvage a portion of the resident native fish community from the 1.7-mile perennial reach of Bonita Creek between the proposed fish barrier and Safford's infiltration gallery dike. Salvaged fishes would be temporarily held on site or nearby in aerated tanks during the treatment process.

- ***Piscicide application*** – AGFD personnel would treat the 1.7-mile reach above the fish barrier with the piscicide antimycin A or rotenone (see Appendix C for information on piscicides).[7] Applications would occur under low stream flow conditions by a certified pesticide applicator in accordance with the manufacturer's label instructions.

- ***Piscicide neutralization*** – AGFD personnel would set up a potassium permanganate or sodium permanganate drip station at the lower end of the treatment area to neutralize the piscicide (see Appendix C for information on neutralization chemicals). This would be conducted to protect water quality and aquatic biota outside the treatment area.

- ***Post-treatment monitoring –*** The stream would be sampled immediately after treatment to assess attainment of total eradication of nonnative fishes from the treatment area.

- ***Re-treatment*** (if needed) – Based on the results of initial post-treatment monitoring, re-treatment may be necessary.

[7] The upper limit of the piscicide treatment area is approximately 0.3 miles downstream from a municipal water supply infiltration gallery operated by the City of Safford. The infiltration gallery is located in a reach of Bonita Creek with intermittent flow. This reach forms the boundary between upper and lower Bonita Creek.

- ***Repatriation of salvaged fishes and other native species*** – Salvaged native fishes would be returned to the point of capture. A subset of the native fish species identified in the RNCA Management Plan would be released into lower and upper Bonita Creek at a later date.

- ***Memorandum of Understanding/10-Year Plan*** – The MOU and accompanying 10-year plan replaces the 1986 CMA. The MOU establishes new guidance for coordination and cooperation between Safford and BLM regarding operation, maintenance, and possible capacity upgrade of the municipal water system (see MOU and 10-Year Plan, Appendix D).

1.5 Project Location

The RNCA is approximately 12 miles northeast of Safford in Graham County, Arizona (Figure 1). The piscicide treatment area consists of 1.7 miles of perennial stream extending north from the proposed fish barrier site to an intermittent reach of Bonita Creek (Figure 2). Native fish would be stocked upstream of the proposed fish barrier in both upper and lower Bonita Creek. Municipal water supply facilities operated by Safford are situated in the lower 3.5 miles of Bonita Creek canyon (Figures 3 and 4). Vehicle access to the area is provided by the Kearny Camp, Solomon Pass, West Bonita Rim, and Bonita Creek roads. Except for several inholdings of City-owned land, the area consists entirely of Federal land administered by the BLM Safford Field Office. No State, tribal, or other lands are included in this area.

1.6 Decision to be Made

BLM and Reclamation must decide whether to implement the Proposed Action, modify the action, or take no action. If the Proposed Action is implemented, Reclamation would construct a fish barrier on lower Bonita Creek. Long-term maintenance and inspection of the structure would be performed by the Central Arizona Water Conservation District. The Central Arizona Project Fund Transfer Program, established under the 1994 and 2001 CAP biological opinions, would provide supplemental funding to AGFD for piscicide applications and repatriation of native fishes in Bonita Creek. The MOU would govern the relationship between BLM and Safford regarding future maintenance, operation, and possible capacity upgrade of the municipal water system in the RNCA. Authority for approving the proposed native fish restoration project and MOU is held by the Manager of the BLM Safford Field Office. Project implementation would not occur until the NEPA process is finalized and the agencies have considered the environmental consequences of the proposal.

1.7 Public Involvement

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 impact analysis on relevant issues.

On June 9, 2005, Reclamation posted the scoping notice on its Phoenix Area Office website and mailed scoping information to more than 160 potentially interested parties. Information on the proposal was also included in the July 2005 monthly utility billing mailed to municipal water customers in the Safford valley. A public scoping meeting was held at the Graham County General Services building in Safford on July 14, 2005. Thirty-five people attended the Safford meeting. Reclamation received 22 letters of comment during the scoping period.

Several issues concerning the proposed project were identified by the NEPA interdisciplinary team members and from the public comments during scoping. The BLM NEPA Handbook (H-1791-1) also requires that certain critical elements of the human environment be addressed if such elements are potentially affected by the project. In total, these issues helped define the range of actions and impacts that are addressed in this EA and served as the basis for refining the project and developing mitigation.

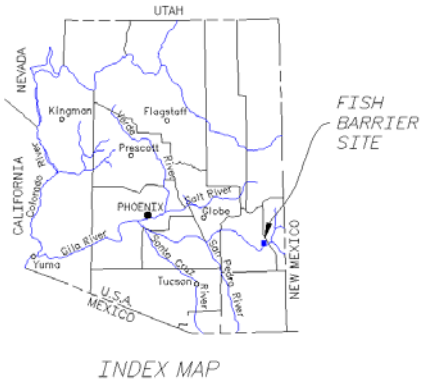
The following critical elements were identified by the interdisciplinary team in accordance with the BLM NEPA Handbook. Critical elements that are not affected by the project are also noted below.

- Air Quality: See Section 3.8.
- Areas of Critical Environmental Concern: There are no areas of critical environmental concern designated by BLM within the vicinity of the project area; therefore, no direct, indirect, or cumulative impacts on this critical element would occur.
- Cultural Resources: See Section 3.6.
- Environmental Health: See Section 3.7.
- Executive Order 12898 (Environmental Justice): The project area is unpopulated; therefore, no disproportionate direct, indirect, or cumulative impacts on this critical element would occur.
- Executive Order 13045 (Safety Risks to Children): The project area is unpopulated; therefore, no disproportionate direct, indirect, or cumulative impacts on this critical element would occur.
- Farm Lands (Prime or Unique): There are no prime or unique farmlands designated within the vicinity of the project area; therefore, no direct, indirect, or cumulative impacts on this critical element would occur.
- Floodplains: See Sections 3.2 and 3.5.
- Native American Religious Concerns: There are no Native American religious concerns identified within the vicinity of the project area; therefore, no direct, indirect, or cumulative impacts on this critical element would occur.
- Noxious Weeds: See Section 3.9.
- Threatened and Endangered Species: See Section 3.5.
- Wastes (Hazardous and Solid): See Section 3.10.
- Water Quality (Surface Water and Groundwater): See Section 3.1.

- Wetland and Riparian Zones: There are no wetlands identified in the project area; therefore, no direct, indirect, or cumulative impacts on this critical element would occur. See Section 3.5 for a discussion on riparian zone impacts.
- Wild and Scenic Rivers: See Section 3.4.
- Wilderness: There is no designated wilderness within the vicinity of the project area; therefore, no direct, indirect, or cumulative impacts on this critical element would occur.

In addition to the critical elements, the following environmental issues were identified by the interdisciplinary team and public as being potentially affected by the project.

- Biological Resources, including Nontarget Species: See Section 3.5.
- Soils: See Section 3.2.
- Visual and Recreation Resources: See Section 3.3.
- Municipal Drinking Water Supply: See Section 3.1.
- Hydrological Impacts: See Section 3.1.



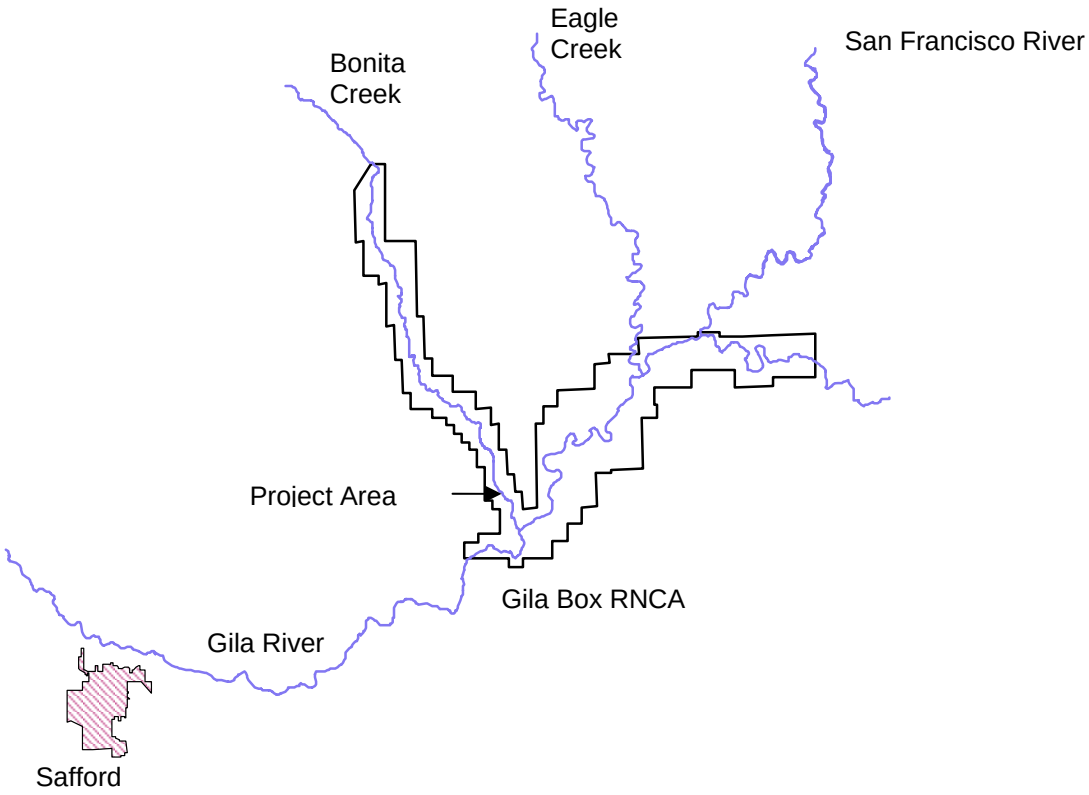


Figure 1
Project Location Map

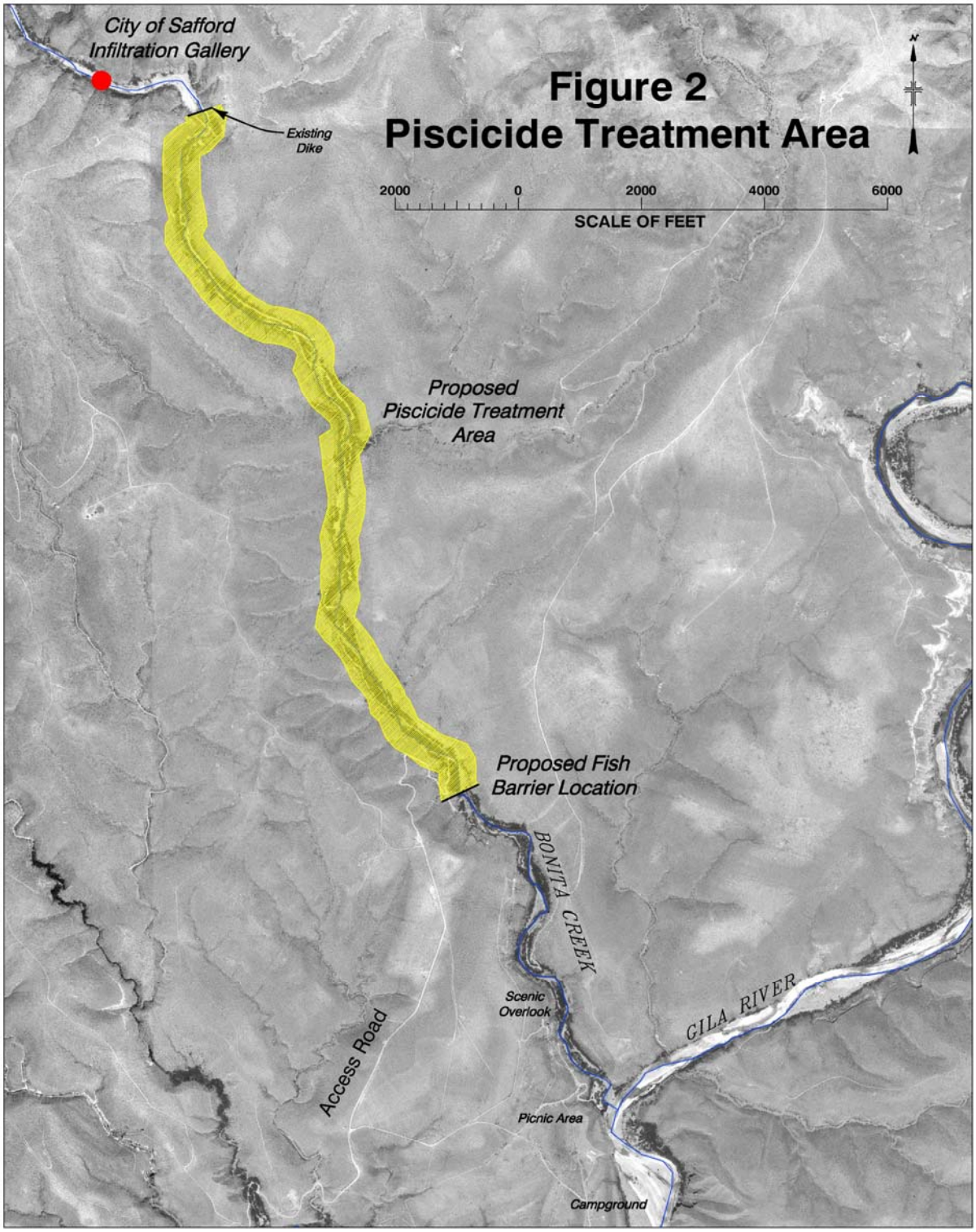

City of Safford
Infiltration Gallery
Existing
Dike
Figure 2
Piscicide Treatment Area
2000
0
2000
4000
6000
SCALE OF FEET
Proposed
Piscicide Treatment
Area
Proposed Fish
Barrier Location
BONITA CREEK
Scenic
Overlook
GILA RIVER
Access Road
Picnic Area
Campground

Figure 3. Bonita Creek Municipal Water System

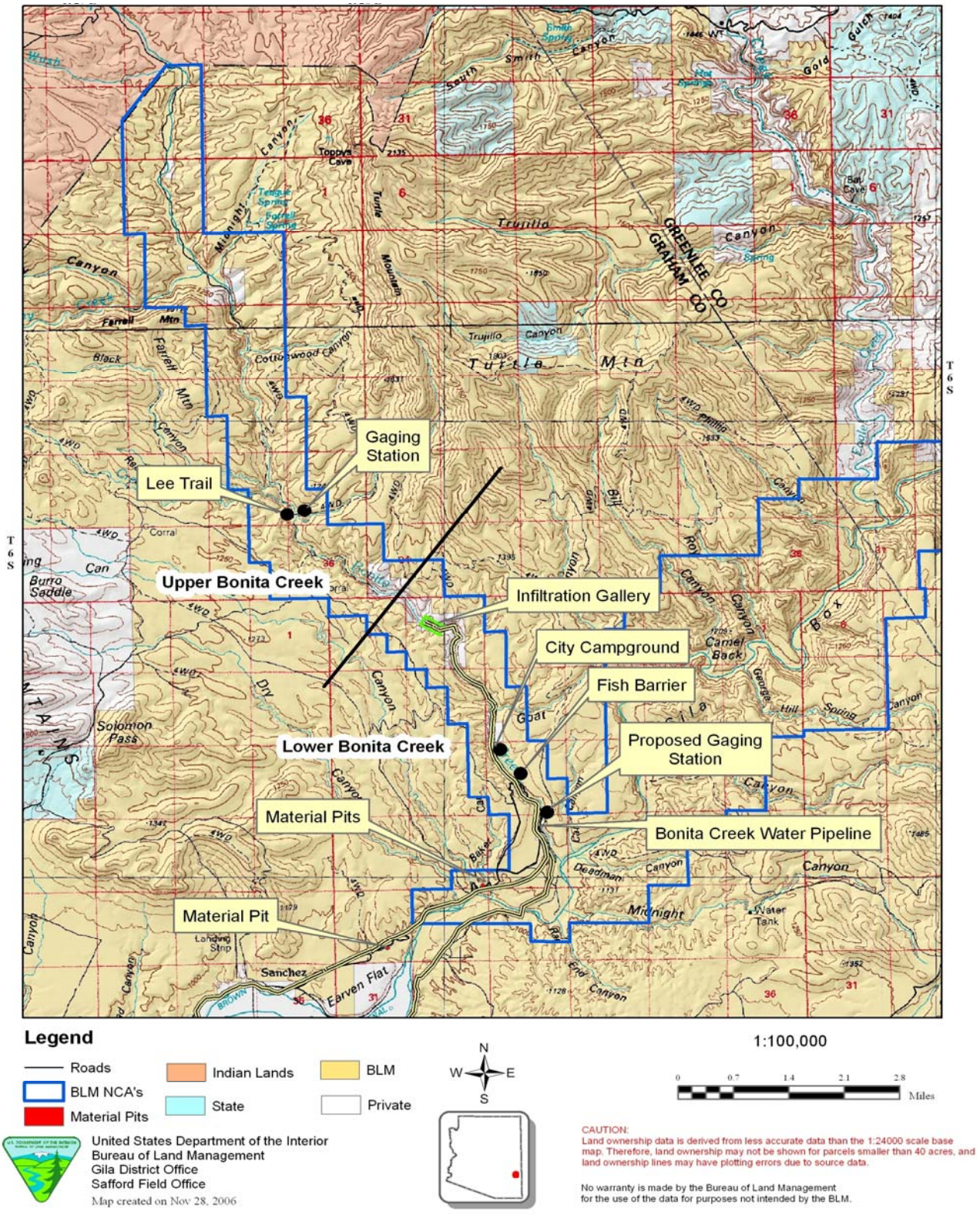
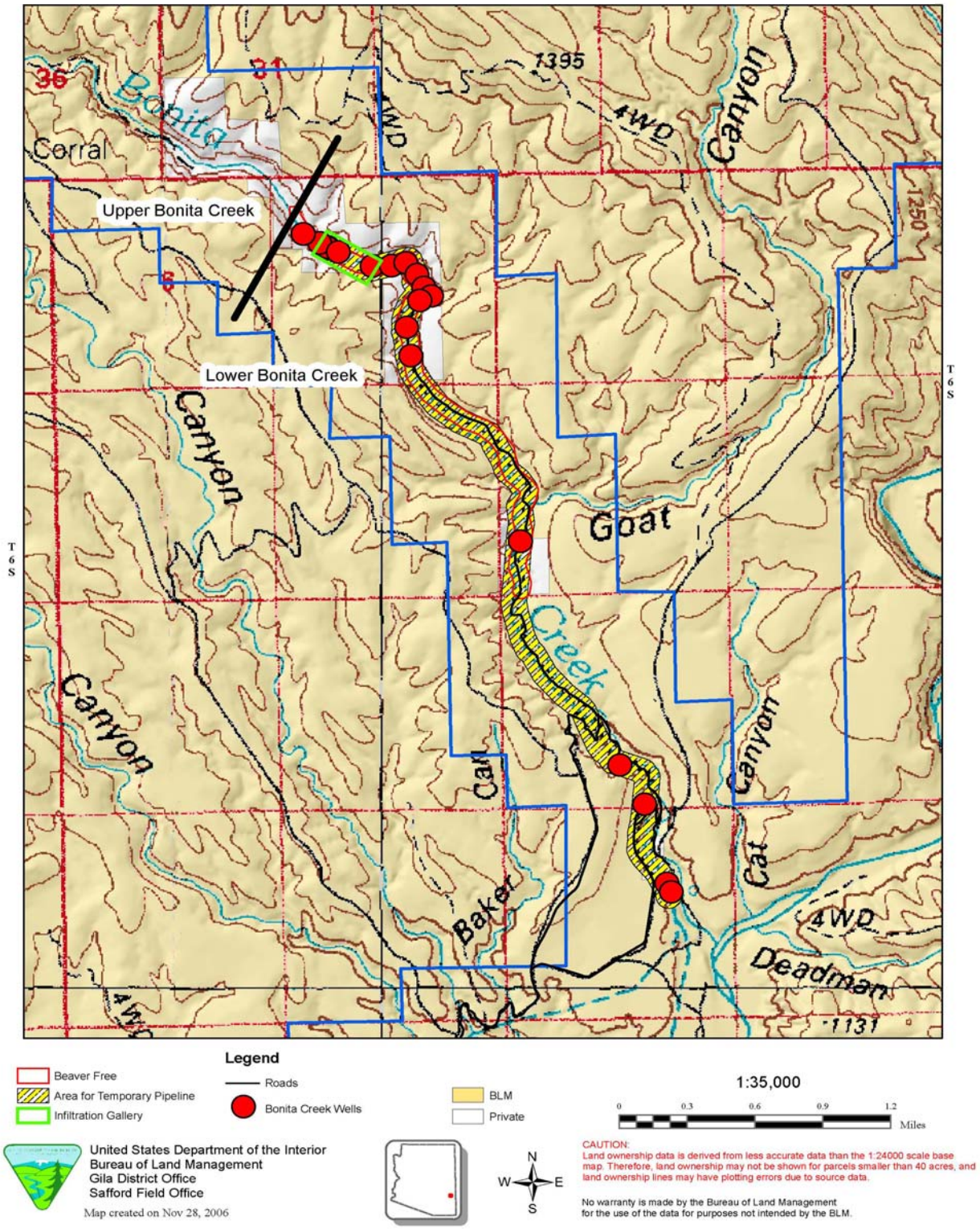


Figure 4. Municipal Water System Action Area



CHAPTER 2 - DESCRIPTION OF ALTERNATIVES

This chapter describes the alternatives considered for the native fish restoration project in greater detail. It includes the Proposed Action and no action.

2.1 No Action Alternative

The no Federal action alternative provides the baseline for comparison of environmental effects of the Proposed Action. Under this alternative, Reclamation and BLM would not implement the native fish restoration project, and BLM and Safford would continue the operation, maintenance, and possible capacity upgrade of the Bonita water system under the 1986 CMA and existing rights-of-way. No action by the lead agencies would result in the following:

- natural ecological processes in lower Bonita Creek would continue to be disrupted by nonnative fishes;
- repatriation of imperiled native Gila basin fishes into Bonita Creek would not be undertaken by the lead agencies;
- Bonita Creek would not contribute to improvement in the recovery status of threatened and endangered species proposed for reintroduction;
- future flood flows might facilitate nonnative fish incursion into upper reaches of Bonita Creek and threaten the native fish community there;
- Reclamation would fail to implement a required conservation measure stipulated in the 2001 CAP biological opinion, necessitating negotiation of an acceptable new barrier site on an alternative stream or reinitiation of formal ESA Section 7(a)(2) consultation with the FWS;
- BLM would fail to implement native fish restoration actions prescribed in the Management Plan; and,
- continued operation, maintenance, and possible capacity upgrade of the municipal water system under the CMA could jeopardize populations of Gila chub in Bonita Creek.

2.2 Proposed Action

The Proposed Action consists of the following elements: (1) construct a fish barrier to prevent upstream incursion of nonnative aquatic species, (2) salvage native fishes from the 1.7-mile perennial reach of stream above the barrier, (3) apply the piscicide antimycin A or rotenone to eradicate nonnative fishes from the 1.7-mile reach above the fish barrier,

(4) monitor the stream following treatment, (5) repatriate salvaged fishes and other native species, and (6) execute the MOU between BLM and Safford. These elements are described in greater detail on the following pages.

Fish Barrier

Site Selection. Potential barrier sites were identified through a process that included examination of topographic maps, aerial surveys, and on-the-ground visits by Reclamation biologists, engineers, and geologists accompanied by cooperating agency staff and other interested parties. All of the narrowest sites downstream from the infiltration gallery to the Gila River were considered. These sites differed in canyon width, bedrock and alluvium characteristics, and potential construction access.

A geologically suitable site was identified approximately 1.3 miles upstream from the Gila River confluence. This site is preferred because it protects the greatest length of stream while avoiding visual impacts to recreation areas near the mouth of Bonita Creek, genetically isolates fewer numbers of native fishes than sites further upstream within the drainage, and satisfies the intentions of the 2001 CAP biological opinion and RNCA Management Plan to conserve and recover listed fishes. The proposed site protects approximately 16 miles of perennial stream.

A primary consideration regarding project location was to minimize negative biological impacts to native fishes that may be created by the fish barrier. Fish barriers reproductively isolate fishes upstream from those that reside downstream; therefore, a genetic effect of a barrier is to fragment populations. Placement of the fish barrier in the lowermost reach of Bonita Creek would minimize this effect (see Section 3.5.6 for additional information).

Construction Access and Staging. Ground access would be needed to transport construction crews, inspectors, tools, machinery, and equipment. Construction vehicles and equipment would utilize Kearny Camp, West Bonita Rim, and City Pipeline roads within the RNCA to access the stream corridor. Project staging and lay-down would be confined to two temporary contractor-use areas (Figure 5).

Fish Barrier Construction. The reinforced concrete barrier would be constructed within the 160-foot-wide channel on an alluvial foundation. To ensure stability against boulders and vegetative debris carried by high magnitude flows, the barrier would be anchored to abutment bedrock with anchor bars and keyed into the channel alluvium. Standard earth-moving equipment and excavation methods would be used to create the foundation trench. The trench would be excavated to the depth required for construction of the keys, which is estimated to be approximately 19 feet. Sand and gravel from the trench excavation would be temporarily stockpiled outside the wetted perimeter of the stream for subsequent use as backfill on the upstream side of the fish barrier.

Concrete would be poured in two phases to allow for stream diversion: the first phase would construct approximately two-thirds of the structure, and the second phase would

complete the project. Streamflow would be diverted around active work areas with temporary dikes consisting of alluvium excavated from the diversion channels. Following construction, the material used in the dikes would be spread along the upstream side of the barrier to minimize temporary pool development. All formwork and other temporary construction material would be removed when the project is finished. The construction phase is expected to require 4 months. The construction impact area within Bonita Creek canyon is shown in Figure 6.

The proposed fish barrier consists of five primary features (see Appendix E, Figures E-1 and E-2): (1) a 4-foot-high concrete drop structure to preclude upstream incursion of fishes, (2) a 160-foot-wide concrete apron spanning the length of the drop structure to prevent scour and plunge pool development, (3) upstream and downstream keys to help anchor the barrier and prevent scour from undermining the structure, (4) riprap armoring across the entire width of the streambed at the base of the apron to prevent scour, and (5) a concrete ramp along the right abutment to accommodate vehicle passage over the structure.

Fish Barrier Function. The fish barrier is intended to create an impediment to nonnative fish movement upstream during stages of stream flow most likely to foster ingress of fishes from the Gila River and lower reaches of Bonita Creek (i.e., base flow, lower flood discharges, and ascending and descending stages of higher floods). Upstream movement of fishes is not expected during peak flooding due to high-flow velocities and sediment loads. The structure would also function as the downstream control site during the piscicide application phase of the project.

Native Fish Salvage

The AGFD has the statutory authority to manage the fish and wildlife resources of Arizona and ultimately would approve and oversee activities associated with fish salvage, piscicide applications, and native fish reintroduction. Native fish salvage operations would begin a week or two prior to treatment of the stream with antimycin A or rotenone. Using a combination of electrofishing (for shallow waters), seines, trammel nets, and hoop nets, major habitats in the treated reach would be sampled to capture as many native fishes alive as possible. If trammel nets are deployed, they would be run at 1- to 2-hour intervals to minimize mortalities from entanglement effects. Captured native fishes would be placed in live cars (small-meshed holding nets) that would be positioned in large pools in the to-be-treated reach. Live cars would have meshed covers to prevent fish from jumping out. Backpack frames equipped with 5-gallon buckets and battery-powered air stones would be available to transport fishes from their place of capture to the live cars. Nonnative fishes that are captured would be euthanized and their carcasses buried or covered with rocks.

Once sufficient sampling effort has been applied to the stream reach so that additional captures of native fishes are rare and all captured fishes are in the live cars, fishes would be transported by aerated bucket or transport truck from live cars to a series of holding tanks to be located either at a climate-controlled BLM warehouse in Safford or at the City

of Safford infiltration gallery dike area. The live cars would then be packed out of the stream. Moving fish directly from the treatment section into the upstream untreated area was rejected because of the possibility that native fishes in the treatment section could carry nonnative parasites or diseases resulting from their co-occurrence with nonnative fishes.

A set of two to four holding tanks would be set up at one of these sites. Tanks would consist of either commercially available self-standing, soft-sided swimming pools, or standard fiberglass circular raceways commonly used in the fish culture industry. These tanks each hold from several hundred to several thousand gallons of water and would be equipped with covers to prevent fish from jumping out.

If the stream-side infiltration gallery site was used, hoses or plastic pipe would be connected to the City of Safford outlet works to gravity feed each tank with fresh water that originates from the stream above the treatment reach. These passive flow-through systems should be adequate to maintain appropriate oxygen and temperature conditions, as well as flush organic waste products from the tanks. Compressed oxygen tanks equipped with air stones would also be available should the flow-through system prove inadequate to maintain oxygen levels. Commercially available AC-powered filtration system packs (with gas-powered generator) would also be present for use should a build-up of waste products occur. Fish would be held in these tanks for at least 24 hours beyond the final piscicide treatment and until caged sentinel fish show no effects of the treatment. At that time, fish would be transported back to the stream via truck and bucket and distributed to pools in the treatment reach above the constructed fish barrier.

If the BLM warehouse was used to hold salvaged fishes, provisions for incorporating either a filtering system for recirculating water, or a chlorine-free, flow-through system would be made. In either case, water quality filter systems and oxygen tanks would be available if needed to maintain fish health during the period of holding.

Variations in detail of the salvage operation may occur on the ground in response to need and equipment availability and effectiveness.

Piscicide Use

Piscicides and Neutralization Compounds. Application of antimycin A is one of the most effective methods for removing undesirable fishes from flowing waters. Antimycin acts at a cellular level to interrupt respiration in gill-breathing organisms (Schnick 1974a). Terrestrial animals and non-gill-breathing aquatic animals are not affected in the amounts applied during treatment. Degradation of antimycin occurs rapidly in a stream because of dilution, adsorption to organic material and sediments, and oxidation created by sunlight and water turbulence (Lee et al. 1971). Neutralization (oxidation) is hastened when antimycin is mixed with potassium permanganate ($KMnO_4$) (Marking and Bills 1975) or sodium permanganate ($NaMnO_4$). The formulations proposed for use in Bonita Creek are Fintrol® concentrate (liquid form of antimycin A) and Fintrol® 15 (antimycin A-coated sand), both of which are registered by the U.S. Environmental Protection Agency (EPA)

for general piscicide use. Antimycin A has been effective and safe for Apache trout (*Oncorhynchus apache*) renovations in Arizona and Gila trout (*O. gilae*) and Rio Grande cutthroat trout (*O. clarki virginalis*) renovations in New Mexico, where, in total, hundreds of miles of stream have been successfully treated to remove nonnative fishes without incident (S. Gurtin, AGFD, and D. Propst, New Mexico Department of Game and Fish, personal communication; also see project list in Appendix B, Table B-1). Several renovations of streams in Arizona to eliminate green sunfish for the benefit of native populations have recently been implemented (e.g., Arnett Creek, O'Donnell Canyon, Fossil Creek, and Sabino Canyon), and others are in planning stages. See Appendix C for additional information on antimycin A.

Rotenone is another EPA-registered piscicide that has seen widespread use in fisheries management for more than 50 years. Like antimycin, rotenone inhibits cellular respiration and is extremely lethal to gill-breathing animals. Rotenone is generally non-toxic to humans and other non-gill-breathing organisms when applied at recommended concentrations. Under natural conditions, rotenone degrades within several days, depending on water pH, water temperature, alkalinity, ultraviolet light, and dilution by fresh water (Schnick 1974b). Rapid neutralization (oxidation) occurs when rotenone is mixed with potassium permanganate or sodium permanganate (Engstrom-Heg 1971, 1972, 1973; Finlayson et al. 2000). One of several commercially available liquid formulations of rotenone would be considered for application in Bonita Creek if antimycin A was not applied. See Appendix C for additional information on rotenone.

Potassium permanganate is the chemical most often used to quickly neutralize rotenone and antimycin, and recently sodium permanganate has also been used for this purpose. Since permanganate itself may be toxic to aquatic organisms at high dosages, detoxification procedures would utilize calibrated equipment to achieve minimum effective concentration of permanganate to neutralize the piscicide. In the stream reach below the neutralization area, the piscicide would be totally neutralized and residual permanganate reduced to a nontoxic level. The breakdown products of the permanganate compounds (potassium or sodium, manganese, and water) have no deleterious environmental effects at concentrations used to neutralize rotenone and antimycin. See Appendix C for additional information on potassium and sodium permanganate.

Stream Treatment. The piscicide would be applied under the supervision of a certified pesticide applicator in accordance with a treatment plan approved by AGFD, FWS, and BLM. Application protocols would be in adherence to safety precautions identified on the product label. Project supervisors would be knowledgeable and experienced in state regulatory requirements regarding safe use of the product. All personnel involved with the application would receive safety training specific to the product formulation used, including the use of personal protective equipment and product handling procedures.

Prior to conducting the stream treatment, public access points to the treatment area would be signed to notify local users of access restrictions and environmental considerations necessary to avoid exposure to treated waters. The treatment area would be closed to the public during application of the piscicide and for approximately 1 week thereafter. Water

utility employees that need access during the public closure would be accommodated on a case-by-case basis through coordination with BLM and the certified pesticide applicator in charge of the project.

The treatment process would be coordinated among AGFD, BLM, and Reclamation. The piscicide would be applied to the 1.7-mile perennial reach, between the fish barrier and the infiltration gallery grade-control dike, during a 4- to 6-hour time interval on 2 consecutive days. If live fish were observed during the treatment on the second day, retreatment would occur on the third day.

Antimycin A (Fintrol®) or liquid rotenone (e.g., Chem Fish®) would be applied in accordance with a treatment plan approved by AGFD and BLM. Fintrol® is comprised of the active ingredient antimycin A and inert ingredients including soy lipids, a diluent, a surfactant, and a detergent. Chem Fish® is comprised of the active ingredient rotenone and inert emulsifiers, solvents, and carriers that ensure solubility and dispersion of rotenone in water. Either piscicide is applied by drip station (Stefferud and Propst 1996), sprayer, or mixed in buckets with water and dispersed by hand.

Prior to treatment, stream discharge and volume would be calculated using direct measurements. An inert fluorescence dye would be applied at the head of a few test pools to determine residence time and mixing potential in the larger pools. Results of the dye study would assist in determining how best to apply the piscicide to ensure all possible areas of the stream are treated at target concentrations. Because antimycin and rotenone have different strengths and weaknesses related to the ability of fish to detect the particular piscicide formulation, species variability to toxicity, product degradation and detoxification characteristics, and environmental conditions, fish managers would prefer to retain the capability of using either or both chemicals for the proposed project. Appropriate calculations and/or on-site bioassays would be made to determine the amounts of a given piscicide necessary to treat the stream reach. These calculations would be double-checked by a certified pesticide applicator.

Once application targets have been definitely determined, specified amounts of antimycin or rotenone would be applied to each reach. Controlled amounts would be released at constant-flow drip stations (Stefferud and Propst 1996) to be located every 330 to 490 feet (100 to 150 meters) (if antimycin) or ½ to 1 mile (0.8 to 1.6 km) (if rotenone) along the treated reach, over a 4- to 6-hour time period. Roving crews would treat shallow backwaters and poorly-mixed shorelines with backpack sprayers. To ensure effectiveness of the first treatment, a second piscicide application using procedures identical to the first would be made on the day immediately following the initial treatment. If no fish are observed alive during the second treatment, the renovation would be considered successful and completed. In the event live fish are observed in the section being treated, a third treatment would be undertaken immediately following the second.

At the lower end of the treatment area (fish barrier site), a drip station similar to that described for application of antimycin would be established to meter approximately one

to three parts per million (ppm) aqueous potassium permanganate or sodium permanganate into the stream during the course of each piscicide treatment. A cage with sentinel fish would be placed in the stream approximately 300 feet below the permanganate station to ensure that detoxification is occurring as intended. Should neutralization not occur as expected, permanganate concentrations would be increased. A second permanganate drip station would be set up further downstream if necessary to ensure complete neutralization.

Control of Other Sources of Nonnative Fishes. BLM will locate stock tanks or tributary streams in the lower Bonita Creek drainage above the fish barrier that could serve as a source of nonnative fish recontamination of the system. These areas would be surveyed for the presence of nonnative fishes, native leopard frogs, and other sensitive aquatic or semi-aquatic native species.[8] Waters with nonnative fishes would be renovated prior to treatment of Bonita Creek. Although most of the tanks are expected to be on BLM lands, a few may be privately owned. Agreements with landowners would be necessary for treatment of tanks on private property. Surveys (and treatments if necessary) would begin near the San Carlos Apache Reservation boundary and continue downgradient toward the fish barrier. Drainages that flow into Bonita Creek below the barrier would not be treated.

Stock tank treatment would be coordinated with AGFD, FWS, and BLM in a manner to minimize or avoid impacts to wildlife and livestock. If native leopard frog tadpoles are found, an attempt would be made to capture and hold alive as many as possible prior to renovation. Five-gallon buckets would be filled with stock tank water and aerated with battery-powered air stones. Tadpoles would be captured and held in these buckets (partially submerged in the stock tank to prevent overheating) for at least 24 hours before being returned to the source stock tank. A small sample of tadpoles would be placed in sentinel cages in the treated stock tank beginning 24 hours after the treatment to assure detoxification before the remainder was repatriated. If the tank does not detoxify within 24 hours, the process will be repeated until it is, or application of permanganate will be considered to speed the process.

The upper Bonita Creek drainage on San Carlos Apache Reservation lands has already been cleaned of nonnative fishes (M. Brouder, FWS, personal communication).

Post-treatment Monitoring

A monitoring program would be established after the barrier is constructed and stream treated to detect any incursion of new nonnative fishes and to monitor responses of native fishes, amphibians (e.g., leopard frogs), and garter snakes. This monitoring would be funded by Reclamation in cooperation with AGFD. At least annually, intensive qualitative surveys of the fish community above the constructed barrier would be undertaken for this purpose. Methods would include electrofishing, seining, and netting. This specific monitoring program would span at least 5 years post-renovation, and a

[8] Ranid surveys would be conducted in accordance with FWS protocol.

lesser effort would likely continue for the foreseeable future as part of a longer-term native fish recovery program.

Based on past experience, piscicide treatments offer the best probability of complete fish removal. However, there have been instances where unforeseen circumstances required re-treatment to reach long-term project goals.[9]

In the event that a nonnative species is detected upstream of the barrier, the first level of management action would be an immediate, intensive investigation of the species' distribution and relative abundance, with removal using traditional sampling methods (electrofishing, seining, and netting). Reach-wide surveys would expand both upstream and downstream from the point of detection to include all areas potentially accessed by the nonnative species. Mobilization of personnel in addition to the original monitoring team would likely be required for this increased sampling effort.

During this period of intensive monitoring and fish removal, managers and species experts would meet to determine possible management actions to be applied against the new species. If the detection is early following its initial invasion and the species has not spread throughout the entire stream, successful elimination of the species is possible, but not certain, through removals during intensive monitoring. If mechanical removal of the new species is not successful, another chemical renovation of the affected stream reach would likely be contemplated.

Return of Salvaged Fishes and Repatriation of Other Native Species

Native fishes salvaged prior to the treatment would be released near their point of capture once the treatment area has detoxified. Repatriation[10] of the following species identified in the RNCA Management Plan would be coordinated among AGFD, BLM, FWS, and Reclamation. These species would be stocked in both lower and upper Bonita Creek.

Loach minnow - Although there are no records of loach minnow from Bonita Creek, it is within historic range of the species, and loach minnow is known from upper Eagle Creek immediately upstream in the Gila River drainage adjacent to Bonita Creek. Habitat conditions appear suitable for establishment of this species in Bonita Creek. It is proposed here to capture loach minnow from Eagle Creek or another suitable population and either directly transplant them to Bonita Creek above the fish barrier, or propagate them in a hatchery facility to build up their numbers and then transplant them to Bonita Creek. Refer to Chapter 3 for additional information concerning loach minnow.

Spikedace - Although there are no records of spikedace from Bonita Creek, it is within historic range of the species, and spikedace is known from upper Eagle Creek immediately upstream in the Gila River drainage adjacent to Bonita Creek. Habitat conditions appear suitable for establishment of this species in Bonita Creek. It is

[9] Bait bucket introduction of nonnative fishes by anglers and other recreational users is possible along road-accessible reaches of Bonita Creek.
[10] "Repatriation" refers to the restoration of a species to suitable habitat within its historic range.

proposed here to capture spikedace from Eagle Creek or another suitable population and either directly transplant them to Bonita Creek above the fish barrier, or propagate them in a hatchery facility to build up their numbers and then transplant them to Bonita Creek. Refer to Chapter 3 for additional information concerning spikedace.

Desert pupfish - Although there are no records of desert pupfish from Bonita Creek, it is within historic range, and habitat conditions appear suitable for establishment of the species. It is proposed here to collect desert pupfish from The Nature Conservancy (TNC) Lower San Pedro River Preserve refuge population and directly transplant them to Bonita Creek upstream of the fish barrier. Refer to Chapter 3 for additional information concerning desert pupfish.

Gila topminnow - Although there are no records of Gila topminnow from Bonita Creek, it is within historic range, and habitat conditions appear suitable for establishment of the species. It is proposed here to collect Gila topminnow from one of the remaining natural metapopulations identified in the most recent draft revision of the Gila topminnow recovery plan, or from TNC's Lower San Pedro River Preserve refuge population and directly transplant them to Bonita Creek upstream of the fish barrier. Refer to Chapter 3 for additional information concerning Gila topminnow.

Memorandum of Understanding/10-Year Plan

The BLM has issued Safford rights-of-way to operate, maintain, and possibly upgrade the capacity of the existing municipal water collection and distribution system within the RNCA. In January 1986, BLM entered into a CMA with Safford for management of the Bonita Creek watershed. The objective of CMA was to provide for "multiple uses within the corridor while maintaining and improving the riparian area and ensuring a continuing and reliable source of good quality municipal water for the Gila Valley." Implementation of the MOU and accompanying 10-Year Plan would supersede and cancel the CMA and establish new procedures and guidance for coordination and cooperation regarding the management and protection of the Bonita Creek watershed. In addition to protecting the water supply for domestic and industrial applications, the MOU encourages sustainability of the native fish community within Bonita Creek

Under the MOU, Safford would continue to maintain Kearny Camp Road from Sanchez Road to West Bonita Rim Road, West Bonita Rim Road from Kearny Camp Road to Bonita Creek Road, Bonita Creek Road grade down to Bonita Creek, and Bull Gap Road from Kearny Camp Road to the Safford water facility building in accordance with BLM Level III standards. These standards require roads to be open seasonally or year-round for commercial, recreation, or high-volume administrative access. Typically, these roads are natural or aggregate surfaced, but may include low-use, bituminous-surfaced roads. The Bonita Creek Road between the infiltration gallery and Bull Gap Road would be maintained to BLM Level II standards, which require the road to be opened for limited administrative traffic.

Construction of temporary roads would continue to occur on an as-needed basis to provide vehicle access to water system facilities within lower Bonita Creek. To access the pipeline for monitoring and maintenance, Safford would have the right to remove all brush, trees, and overhanging limbs less than 6 inches in diameter within approximately 15 feet from the pipeline. Creek diversions and beaver dam breaches would also be allowed when necessary to access the pipeline and other water system facilities for maintenance and repair.

2.3 Alternatives Considered but Not Analyzed in Detail

During the planning phase, several alternative actions for meeting the purpose and need were considered and eliminated from detailed analysis for reasons stated below. These alternatives included consideration of other fish barrier sites and methods for restoration of the native fish community.

Alternative Fish Barrier Sites. Selection criteria for identifying potential barrier sites were: (1) the presence of a narrow channel with bedrock abutments to solidly anchor the barrier and minimize site impacts, and (2) proximity to the stream's convergence with the Gila River to maximize the length of aquatic habitat protected and minimize fragmentation of existing native fish populations. An attempt was also made to stay outside the viewshed of recreation areas near the Gila River confluence. No viable sites were found in the lower 1 mile of Bonita Creek. Potential sites on BLM-administered land upstream of the infiltration gallery were not considered due to poor construction access and issues associated with excessive fragmentation of stream habitat.

*Alternative Stream Renovation Methods***.** Physical removal methods (e.g., nets, traps, seines, electrofishing, and combinations of physical control techniques) were considered as alternative means of removing nonnative fishes from the treatment area. Use of these methods has been shown to suppress, but not eliminate, nonnative fish populations when practiced intensively, and populations typically rebound to pre-treatment levels once the effort is curtailed (Meronek et al. 1996; Finlayson et al. 2000). Electrofishing and netting are generally ineffective at eradicating fishes in boulder-strewn or heavily vegetated streams (Larson et al. 1986; Moore and Larson 1989; West et al. 1990). These alternative methods would also be labor intensive and costly in the long term, requiring multiple treatments every year to maintain reduced densities of nonnative fishes. Piscicide applications are the only proven methods for eradicating entire populations of undesirable fish other than total dewatering of the system (Schnick 1974).

Stream Renovation without Fish Barrier. Stream renovation without a barrier was considered impractical because the effects of treatment would be negated by continued upstream incursion of nonnative fishes from the Gila River. Without the protection afforded by the fish barrier, future flood flows might also provide sufficient connectivity between perennial reaches to allow nonnative fishes to move into upper portions of Bonita Creek. The no barrier alternative is also equivalent to "no action" for Reclamation because of the nexus between the need for the project and the 2001 CAP biological opinion.

Fish Barrier without Renovation. This alternative would protect the stream above the barrier from future incursion of nonnative aquatic species, but established populations of nonnative fishes would continue to interact with the native fish community. Although natural events such as flooding may periodically reduce densities of nonnative fishes, additional human intervention would likely be needed to eradicate nonnatives from the segment of stream above the barrier.

2.4 Comparison of Alternatives

The following table summarizes the environmental consequences of the Proposed Action and No Action.

Table 1 – Summary of environmental consequences by alternative.

Resource Component	Alternatives	
	No Action	**Proposed Action**
Water Resources	Under the existing rights-of-way, that pre-dates the Federal Lands Policy and Management Act, and the 1986 CMA, the capture of additional groundwater and alluvial flow for municipal water supply could reduce surface flow in the lower 3-mile reach of Bonita Creek.	Short-term impact to 1.7 miles of stream from piscicide application; minor short-term increase in turbidity, and suspended sediment from fish barrier construction. No adverse effect on municipal water supply. Under the MOU and 10-year plan, the capture of additional groundwater and alluvial flow for municipal water supply would have the same effect on stream flow as No Action.
Soils	Disturbance from routine access road and other water facility operation and maintenance would continue under the CMA and existing rights-of-way.	Disturbance to 0.4 acres of floodplain alluvium and 0.2 acres of upland soils from construction. Deposition of bedload sediment on 2.2 acres of floodplain following construction. Disturbance by routine road and other water facility operation and maintenance would be reduced through implementation of jointly agreed-upon standards and stipulations.
Visual and Recreation Resources	Disturbance from routine access road and other water facility operation and maintenance, including vegetation trimming and clearing, would continue under the CMA and existing rights-of-way. Also, the capture of additional groundwater and alluvial flow for municipal water supply could reduce surface flow in the lower 3-mile reach of Bonita Creek affecting visual and recreational resources.	Minor long-term impact on the natural character of the landscape within Bonita Creek canyon; visual impacts reduced once riparian vegetation recovers within construction impact area. Disturbance by routine road and other water facility operation and maintenance, including vegetation trimming and clearing, and beaver dam removal would be reduced through implementation of jointly agreed-upon standards and stipulations. Also, the capture of additional groundwater and alluvial flow for municipal water supply could reduce surface flow in the lower 3-mile reach of Bonita Creek affecting visual and recreational resources.
Wild and Scenic River Status	No effect	No effect

Vegetation	Disturbance from routine access road and other water facility operation and maintenance, including vegetation trimming and clearing, would continue under the CMA and existing rights-of-way. Also, the capture of additional groundwater and alluvial flow for municipal water supply could reduce surface flow in the lower 3-mile reach of Bonita Creek affecting riparian vegetation health.	Permanent displacement of 0.2 acres of riparian habitat at the barrier. Temporary disturbance to 2.4 acres. No impact from piscicide application. No long-term adverse effect to upland or riparian plant communities from barrier construction. Disturbance by routine road and other water facility operation and maintenance, including vegetation trimming and clearing, would be reduced through implementation of jointly agreed-upon standards and stipulations. Also, the capture of additional groundwater and alluvial flow for municipal water supply could reduce surface flow in the lower 3-mile reach of Bonita Creek affecting riparian vegetation health.
Fish and Aquatic Wildlife	Nonnative fish community dominance increases. Continuing adverse effects to native fish, including endangered Gila chub. Disturbance from routine access road and other water facility operation and maintenance, including vegetation trimming and clearing, beaver dam breaching, and potential stream flow reduction would continue under the CMA and existing rights-of-way.	Elimination of nonnative fish community from 1.7 miles of stream; short-term reduction in macroinvertebrate density. Greatest positive effects to native fish, leopard frogs, garter snakes, and other aquatic species by eliminating and preventing upstream re-invasion of nonnative fish. Disturbance by routine road and other water facility operation and maintenance, including vegetation trimming and clearing, beaver dam breaching/removal, would be reduced through the implementation of jointly agreed-upon standards and stipulations. Also, the capture of additional groundwater and alluvial flow for municipal water supply could reduce surface flow in the lower 3-mile reach of Bonita Creek affecting fish and aquatic wildlife.
Terrestrial Wildlife	Disturbance from routine access road and other water facility operation and maintenance, including vegetation trimming and clearing, beaver dam breaching, and potential stream flow reduction would continue under the CMA and existing rights-of-way.	Temporary noise disturbance to large mammals. Minor loss of small mammals and herpetofauna from construction. Disturbance by routine road and other water facility operation and maintenance, including vegetation trimming and clearing, beaver dam breaching/removal would be reduced by the implementation of jointly agreed-upon standards and stipulations. Also, the capture of additional groundwater and alluvial flow for municipal water supply could reduce surface flow in the lower 3-mile reach of Bonita Creek affecting terrestrial wildlife.
Special Status Species	Continuing adverse impacts on Gila chub from nonnative species. Disturbance from routine access road and other water facility operation and maintenance, including vegetation trimming and clearing, beaver dam breaching, and potential stream flow reduction would continue under the CMA and existing rights-of-way.	Would contribute to recovery of Gila chub, loach minnow, spikedace; positive impacts to several native fish species, and other aquatic/riparian species. Disturbance by routine road and other water facility operation and maintenance, including vegetation trimming and clearing, beaver dam breaching/removal would be reduced by implementation of jointly agreed-upon standards and stipulations. Also, the capture of additional groundwater and alluvial flow for municipal water supply could reduce surface flow in the lower 3-mile reach of Bonita Creek affecting special status species.

Cultural Resources	Safford and BLM would continue to share cultural resource information and provide educational information, monitoring, and resource protection.	Native fish restoration actions would not affect cultural resources. In addition to impacts identified under no action, implementation of the MOU and 10-year plan would provide development of an outdoor classroom lesson plan including interpretation of cultural resources.
Environmental Health and Public Safety	Disturbance from routine access road and other water facility operation and maintenance and possible system expansion work would continue under the CMA and existing rights-of-way and could lead to visitor conflicts or accidents.	Project area would be closed during application to avoid public exposure to piscicides; no direct or indirect effect to public health and safety is anticipated. Implementation of the MOU and 10-year plan would limit facility maintenance to week days, if at all possible, avoiding the highest public use period on the weekends.
Air Quality	Disturbance from routine access road and other water facility operation and maintenance would continue under the CMA and existing rights-of-way.	Highly localized minor effect resulting from fugitive dust and engine emissions during construction and routine operation and maintenance activities. No long-term adverse effect.
Noxious Weeds	Disturbance from routine access road and other water facility operation and maintenance and possible system expansion would continue under the CMA and existing rights-of-way and could lead to inadvertent spread of noxious weeds. Visitors to the area may also inadvertently introduce noxious weeds.	Heavy construction equipment power washed before entering project area; no effect anticipated. Implementation of the MOU and 10 year plan would stipulate power washing vehicles and heavy equipment before beginning maintenance project work.
Hazardous Material and Solid Waste	Use of generators in the flood plain for emergency water system operation may lead to stream contamination by diesel fuel if overwhelmed by a large flood. Spill procedures contained in 40 CFR 112.7, 112.21, and 29 CFR 1910.120 (q) would be implemented.	All construction waste would be removed from the project area and disposed of at an approved facility; no hazardous waste generation is anticipated. Use of generators in the flood plain for emergency operation of the water system may lead to stream contamination by diesel fuel if overwhelmed by a large flood. Spill procedures contained in 40 CFR 112.7, 112.21 and 29 CFR 1910.120 (q) would be implemented.

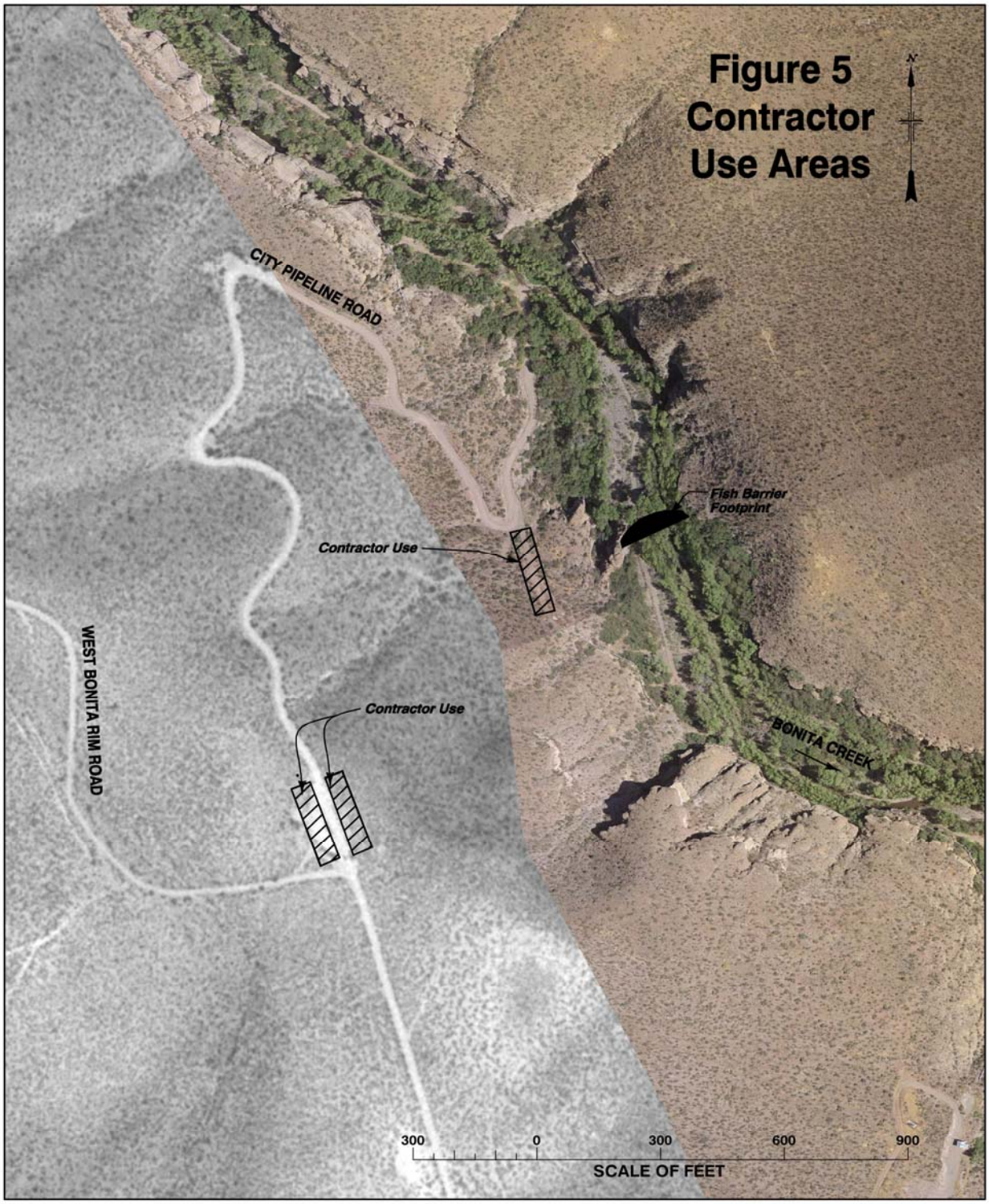


Figure 5
Contractor
Use Areas
N
CITY PIPELINE ROAD
Fish Barrier
Footprint
Contractor Use
Contractor Use
WEST BONITA RIM ROAD
BONITA CREEK
300
0
300
600
900
SCALE OF FEET

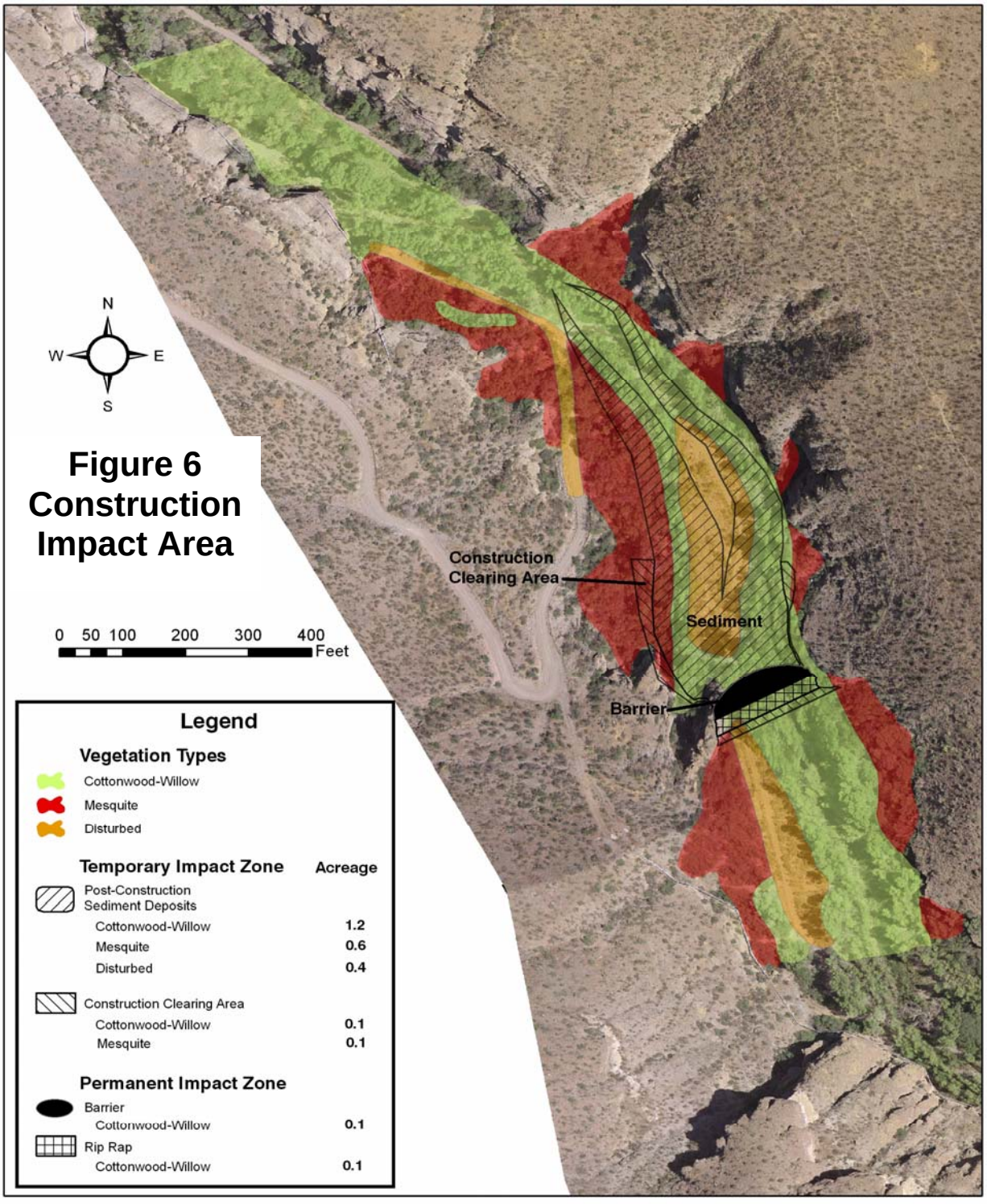


Figure 6
Construction Impact Area

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter presents the existing conditions in the project area and the environmental consequences that can be expected from implementing the Proposed Action versus No Action. Mitigation that has been integrated into the project is described at the end of each section.

3.1 Water Resources

3.1.1 Affected Environment

Hydrology and Geomorphology – Bonita Creek is a tributary of the Gila River, flowing generally southeast through approximately 49 miles of rugged and unpopulated desert terrain. Topography in the upper part of the drainage is of low relief, with a broad alluvial valley encompassing the stream. In the 15-mile segment of stream located on the RNCA, canyon conditions prevail, with walls nearly vertical to 200 feet or more, and, at one point, restricting the channel to less than 50 feet (Clarkson 1982). Drainage area elevations vary from 3,143 feet at the Gila River confluence to approximately 7,000 feet on the Nantac Rim.[11] Within the RNCA, Bonita Creek lies primarily on BLM-administered land, although there are several non-federal inholdings including seven parcels totaling 480 acres owned by Safford (Figures 3 and 4). North of the RNCA, the drainage lies entirely on the San Carlos Apache Reservation.

Annual precipitation in the project area averages about 12 inches per year (Heindl and McCullough 1961). Precipitation fluctuates considerably on a monthly and yearly basis. Generally, precipitation is distributed bimodally over the year, occurring during the winter months as a result of storms originating in the north Pacific Ocean, and during the summer monsoon as result of convective thunderstorms which form from moisture drawn into the region from the Gulf of Mexico and Gulf of California (Sellers and Hill, 1974). This bimodal pattern of storms produces higher stream flow pulses in winter and late summer. Low flow conditions are most prevalent in the weeks preceding the monsoon.

Stream flow in the upper 31 miles of Bonita Creek is ephemeral, being wholly dependent on storm runoff. Perennial flow begins on the San Carlos Apache Reservation approximately 18 miles upstream from the Gila River (Heindl and McCullough 1961). Within this perennial segment, intermittent flow has persisted in recent years in the last 1,200-foot segment at the mouth and the segment associated with the infiltration gallery.

Surface Water Quantity and Quality – Continuous records of discharge on Bonita Creek have been collected by the U.S. Geological Survey (USGS) since 1981 at their stream gage (Station No. 09447800) 6.3 miles upstream from the Gila River confluence (Figure 3). For the period of record, the maximum instantaneous peak discharge is 19,500 cubic

[11] The elevation at the proposed fish barrier site is approximately 3,200 feet.

feet per second (cfs)[12] and the lowest daily mean discharge is 0.7 cfs[13] (USGS 2005). More recently, the annual (USGS water years, which run from October 1 through September 30) average streamflow at the Bonita Creek gage varied from about 3.31 cfs in 2002, and has steadily declined to 3.08 cfs in 2003, and 2.54 cfs in 2004, but increased to 8.30 cfs in 2006. The daily discharges in water year 2006 (provisional data) ranged from 0.7 cfs on October 29 and November 3 to 836 cfs on July 31, 2006. The maximum flow on July 31 was 5,220 cfs.

The USGS (1998) computed flood flows for six frequency intervals at the gage (Table 2). Reclamation estimated flood flows at the proposed barrier site by adjusting the USGS data to reflect input from storm runoff in the 5-mile reach between the gaging station and the barrier site.

Table 2. Estimated Flood Flows.

Recurrence Interval	Instantaneous Peak Flow Bonita Creek Gage (cfs)	Instantaneous Peak Flow Barrier Site (cfs)
2 year	2,320	2,750
5 year	5,680	6,730
10 year	9,070	10,746
25 year	15,000	17,772
50 year	20,600	24,407
100 year	27,600	32,700

Because Bonita Creek is constricted by steep canyon walls and a narrow floodplain, water velocity and erosive capacity can be very high during high flows. Significant floods that overflow the low flow channel and transport substantial quantities of coarse sediment occur about every 2 years. Floods in excess of a 5-year recurrence have high peak flow velocities capable of transporting cobbles, small boulders, and considerable debris. An estimated peak flow of 17,000 cfs in August 1915 significantly altered floodplain conditions and flow patterns within the canyon (Olmstead 1919). Flooding in January 1993 scoured the breadth of the canyon bottom, damaged roads and water system facilities, and uprooted large trees.

Arizona sets narrative and numeric water standards for water quality based on the uses people and wildlife make of the water. The Arizona Department of Environmental Quality (ADEQ) 2002 Integrated 305(b) Water Quality Assessment and 303(d) Listing Report indicated surface water in Bonita Creek was in attainment of water quality standards for all designated uses. Bonita Creek is classified by ADEQ as a unique water (Arizona Administrative Code R18-11-112). Surface waters in the state may be classified as unique waters if they are free flowing and have water quality that meets or exceeds applicable water quality standards and meet one of the following criteria:

- The surface water is of exceptional recreational or ecological significance because of its unique attributes, including but not limited to attributes related to the

[12] Recorded at the USGS gaging station on January 18, 1993.
[13] Recorded at the USGS gaging station on August 31, 1988.

geology, flora, fauna, water quality, aesthetic values, or wilderness characteristics of the surface water.

- Threatened or endangered species are known to be associated with the surface water, and existing water quality is essential to the maintenance and propagation of a threatened or endangered species, or the surface water provides critical habitat for a threatened or endangered species.

Unique waters are given more stringent protection under Arizona's antidegradation rule (Arizona Administrative Code R.18-11-107(D)). Activities that result in a new or expanded discharge of pollutants to unique waters are prohibited if the discharge causes degradation of existing water quality, unless the discharge is short-term and temporary (i.e., 6 months or less in duration) as determined on a case-by-case basis by ADEQ.

Groundwater Quantity and Quality – The main aquifer in Bonita Creek occurs in the alluvial deposits beneath the stream and, to a lesser extent, the surrounding and underlying Tertiary volcanic rocks. Volcanic rocks which underlie the stream alluvium are believed to be capable of yielding small to moderately large quantities of groundwater (Errol L. Montgomery & Associates, Inc. 1996). Groundwater quality is suitable for most domestic purposes (ADWR 2005).

Since 1939, the City of Safford has operated a municipal water collection system on an intermittent reach of Bonita Creek approximately 3.5 miles upstream from the Gila River confluence. Groundwater is captured by an infiltration gallery and production wells embedded in the channel-fill deposits and underlying volcanic rock (Errol L. Montgomery & Associates, Inc. 1996). Water is conveyed to Safford by a 21-mile-long pipeline placed along the walls of Bonita Creek canyon. Approximately 3,876 acre-feet of the City's annual municipal water supply for nearly 28,000 Gila Valley residents originates in Bonita Creek. Safford may upgrade the capacity of the water system within the next 10 years to divert and transport their full Bonita Creek water right of 5,310.15 acre-feet per year.[14]

The Bonita Creek water system has been modified several times since its construction. Following a flood in 1949, the original 10-inch-diameter delivery pipeline was replaced with a 16-inch-diameter line. In 1956, the two grade-control dikes, originally installed to lessen the risk of the gallery washing out during a flood, were realigned and reinforced. The original gallery consisting of 12-inch and 15-inch perforated, galvanized steel pipe arranged in four lateral lines was replaced in 1994 following damage from a large flood. The new water system consists of the following elements: (1) a 24-inch-diameter well pipeline connected to a cluster of six wells; (2) a 24-inch-diameter gallery pipeline connected to 15 perforated laterals which are buried at a depth of approximately 19 feet; (3) a single grade-control dike downstream from the gallery that has raised the bed of the

[14] Based on the definition of river subflow in the landmark Southwest Cotton decision (Maricopa Municipal Water Conservation District No. v. Southwest Cotton, 1931), pumping of groundwater occurring adjacent to and beneath a perennial or intermittent stream is considered a diversion of appropriable surface water, in which case a surface water right is required.

channel upstream approximately 5 feet; (4) a 16-inch-diameter pipeline that carries water from the well and gallery pipelines to approximately the mouth of Bonita Creek; and, (5) two smaller pipelines that carry the water to Safford, approximately 17.5 miles to the southwest. Although significant portions of the pipeline occur on BLM-administered land, the infiltration gallery and associated well cluster are located on City-owned land within the RNCA.

3.1.2 Environmental Consequences

No Action

Under the existing CMA and pre-1976 rights-of-way, Safford may upgrade the capacity of the municipal water system to divert their full Bonita Creek water right. Increased diversion of groundwater and alluvial flows would likely reduce surface flow and promote intermittency in portions of lower Bonita Creek. The diversion of additional water also could extend the existing intermittent reach at the infiltration gallery a short distance further upstream.

The existing CMA and rights-of-way would continue to provide the guidelines for operation, maintenance, and repair of the water system. Disturbance from routine access road and other water facility operation and maintenance, such as temporary road construction, beaver dam breaching, vegetation trimming and clearing, and the potential for stream flow reduction would continue.

The City is allowed to inspect, repair, replace, and upgrade the entire pipeline from the infiltration gallery to Safford. Without adequate controls, any substantial destruction of riparian and aquatic vegetation by road construction would result in destabilization of soils which could increase the release of sediment into the stream. Habitats that are devoid of vegetation or significantly altered are not as effective in capturing and retaining pollutants, which can affect water quality. Riparian vegetation also acts to attenuate the severity of flooding and encourages stream stability by stabilizing stream banks.

Safford may use water system wells to provide supplemental water during times of increased water demand. These temporary (3 to 5 months) water production wells include a generator for pumping water to permanent transmission facilities. Approximately 100 to 300 gallons of diesel fuel is contained within each generator. No precautions currently exist to prevent the generator and spill containment facility from being damaged or washed away during a catastrophic event. Accidental releases of large quantities of diesel fuel into Bonita Creek would adversely affect water quality and aquatic biota.

Proposed Action

Hydrology and Geomorphology - Jurisdictional waters of the United States within the project area for fish barrier construction were delineated by Reclamation. The delineated acreage represents the portion of the channel up to the ordinary high-water mark for

which the U.S. Army Corps of Engineers (COE) has regulatory jurisdiction over discharges of dredged and fill material pursuant to Section 404 of the Clean Water Act (CWA). Based on this delineation, 0.2 acres of jurisdictional waters within Bonita Creek canyon would be directly affected by the discharge of permanent fill material during construction of the fish barrier. Construction fill would include approximately 1,020 cubic yards of structural concrete and 1,386 cubic yards of riprap.

After construction, the barrier would initially trap bedload sediment in a zone of deposition immediately upstream of the structure. Aggradation of the streambed from sediment deposition would slightly flatten the channel gradient and permanently raise the water surface profile on a 700-foot segment (2.2 acres) of stream (Figure 6). This effect would be greatest where water overtops the barrier (4-foot elevation change) and disappear altogether where the aggraded zone converges with the existing streambed. The raised water surface elevation would have minimal erosive effect on the channel banks, which are armored with bedrock and boulders. Pool development along the upstream side of the barrier would be minimized by backfilling the area with surplus alluvium excavated from the foundation and riprap trenches. Bedload sediment deposited from flooding and high seasonal flow is expected to displace any remaining pools within 1 to 2 years.

Temporary loss of riparian vegetation and changes in channel morphology in the construction impact area may have a minor effect on downstream flow and erosion patterns. Natural regrowth of riparian vegetation and subsequent stabilization of disturbed floodplain soils within this area would likely obviate any long-term impact on stream conditions.

Surface Water Quality and Quantity – Excavation of channel substrates during barrier construction would produce elevated levels of suspended sediment and turbidity for a short distance downstream of the work area. Substantial increases in sedimentation during active construction would be averted through the application of pollution control best management practices (BMPs). Disturbances along the abutments would be confined to bedrock and boulders, minimizing the potential for bank destabilization. Construction would create localized disturbances on floodplain soils (primarily gravels, cobbles, and sand) within the work area. During construction, storm runoff from the work area could wash fine sediment into the stream resulting in increased turbidity. These conditions would attenuate as disturbed soils stabilize and riparian vegetation recovers following construction. No long-term changes in water quality are anticipated.

The effect on water quality from the application of piscicides and neutralization compounds would be short term and restricted to the 1.7-mile treatment area. Sunlight and natural physical and chemical characteristics of the stream would quickly degrade the piscicides into inert byproducts (Lee et al. 1971, Schnick 1974a). To ensure complete neutralization and protect water quality and aquatic biota outside the treatment area, potassium permanganate or sodium permanganate would be applied to the stream at the fish barrier. Permanganate is a strong oxidizer that is toxic to fish under some circumstances (Tucker and Boyd 1977, Archer 2001, Grisak et al. 2002); however, it has

a low estimated lifespan in the environment and is readily degraded by interaction with the piscicides, organic material, and inorganic oxidation substances (Kemp et al. 1966, and Marking and Bills 1975, Sino-American 2002). The effects on water quality from application of piscicides and permanganate compounds are temporary and would become undetectable after neutralization. Short-term effects associated with the piscicide treatment would not alter the designated uses or violate water quality standards in Bonita Creek.[15] Long-term protection of Bonita Creek as refugia for imperiled native fishes would enhance the ecological and habitat values for which the stream was designated a unique waters of the State and National Conservation Area. See Appendix C for more information on the effect of piscicides and permanganate compounds on water quality.

Placement of the fish barrier at the proposed site would not affect total water yield available to Safford and holders of downstream water rights. The fish barrier would be hydrologically downgradient from the infiltration gallery and would not affect operation of that water collection facility. Mechanical backfilling and natural bedload deposition along the upstream side of the barrier would preclude any permanent pooling of water and allow stream flow to pass over the structure unimpeded.

Under the MOU, diversion of additional water by Safford to reach full capacity (5,310.15 acre-feet per year) would likely reduce stream flow in the lower 3 miles of Bonita Creek and possibly extend the existing reach of intermittency a short distance upstream from the infiltration gallery. Soil surface disturbing activities, direct and indirect, such as road maintenance and construction, vegetation trimming and clearing, and beaver dam breaching or removal would cause short-term increases in stream turbidity. Continuous removal of beaver dams could cause stream temperature to rise long term. Operation and maintenance of the water system would slightly reduce sedimentation and provide greater protection of water quality than is afforded under the CMA.

Groundwater Quantity and Quality – Construction of the fish barrier is not expected to affect groundwater. Alluvial substrata at the fish barrier site are greater than 60 feet in depth (Reclamation, unpublished data). Groundwater would pass under the barrier through these deposits.

No contamination of groundwater entering Safford's production facilities would result from the proposed piscicide application. The infiltration gallery is approximately 0.3 miles upstream from the upper limit of the piscicide treatment area. Subsurface flow in the canyon alluvium is downgradient from the infiltration gallery to the treatment area. The only active well in the treatment area would not be operated during application. In addition, antimycin and rotenone have a strong tendency to adsorb to sediment particles; consequently, neither piscicide would be expected to migrate below the top few inches of sediment (Engstrom-Heg 1971, 1976; Schnick 1974; Dawson et al. 1991; Skaar 2001). Any residuum of the piscicide in surface water or sediment following treatment would

[15] Arizona Administrative Code R18-11-116 provides AGFD and FWS a dispensation from water quality standards for fisheries management purposes. According to EPA and ADEQ, when a piscicide is applied directly to waters of the United States according to its intended purpose as allowed under the Federal Insecticide, Fungicide and Rodenticide Act, it is not a pollutant pursuant to the Clean Water Act.

quickly dissipate due to dilution from flowing water and high rates of oxidation and photolysis (Cheng et al. 1972; Biospherics 1982).

The results of aquifer testing at the Safford's groundwater collection facilities indicate that most of the groundwater produced from these facilities is derived by leakage from the volcanic rock aquifer into the stream channel alluvium (Errol L. Montgomery & Associates, Inc. 1996). As acknowledged in the 1986 CMA and current MOU, the City will take advantage of its full Bonita Creek water right by diverting additional alluvial flow and groundwater into the water system. Increased production from the collection facilities would reduce subsurface flows and likely reduce surface flows in the lower 3-mile reach of Bonita Creek and, to a lesser extent, immediately above the collection point. During drought years, this may extend intermittency into portions of the lower stream that currently have perennial flow.

Cumulative Effects

Water quality and quantity have been impacted by past human activity. Use of the canyon and upper watershed by livestock historically led to increases in sedimentation and localized declines in stream bank stability. In recent years, the removal of livestock from the segment of stream within the RNCA has substantially improved riparian conditions and reduced the risk of stream bank destabilization (BLM 1998). Continued improvement of the riparian zone is expected to increase aquatic habitat diversity and have a beneficial effect on stream dynamics. Through the RNCA Management Plan, many roads in Bonita Creek have been closed and several rerouted, thereby greatly reducing the impacts of roads on water quality. Several necessary road segments remain that cross or follow the stream, and these will continue to impact water quality through increased sedimentation. Recreational use is a minor contributor to sedimentation (BLM 1998). Vehicle use in the canyon and livestock grazing in the upper watershed will continue to be a source of sedimentation.

Minor amounts of sedimentation from heavy equipment operation during construction of the fish barrier would be incremental to sediment discharges from roads and other sources within the watershed. Following construction, short-term capture of minor amounts of bedload material at the barrier is not expected to substantially affect long-term sediment transport or stream dynamics within the system. Construction of the fish barrier would conclude major development efforts in Bonita Creek prescribed under the RNCA Management Plan.

During the application of the piscicide, water quality would be adversely impacted within the 1.7-mile treatment area. These effects would persist only during active treatment and are expected to quickly attenuate as the result of oxidation and dilution of the piscicide. No other chemical applications have occurred or are expected to occur in Bonita Creek.

Mitigation

- A CWA Section 401 Water Quality Certification has been issued by ADEQ for fish barrier construction. Terms and conditions of the certification, including water quality monitoring, would be integrated into the project.

- A CWA Section 402 storm water pollution prevention plan with pollution control BMPs has been prepared for fish barrier construction. Coverage under the Arizona Pollutant Discharge Elimination System (AZDPES) general permit for storm water discharges associated with construction would be obtained.

- Reclamation received a CWA Section 404 permit on October 28, 2003, to construct fish barriers (including the Bonita Creek barrier) required under the 2001 CAP biological opinion. Terms and conditions of the permit would be integrated into the project.

- A Water Control Plan would be prepared with measures to protect water quality and care of the stream during fish barrier construction. BMPs such as temporary culverted stream crossings placed in the construction area, temporary stream bypass channels, and settling ponds for foundation dewatering discharges would be employed as necessary to reduce water quality impacts.

- All construction equipment would be periodically inspected for leaks. Any significant leaks would be promptly corrected.

- Hazardous substances and fuels used in construction of the fish barrier would be stored outside the 100-year floodplain of Bonita Creek.

- Piscicide applications would be conducted only during periods of low stream flow by certified applicators.

- USGS stream flow monitoring station would be installed below the fish barrier and monitored regularly (Figure 3).

- The existing pit toilet at the City Campground would be replaced with a vault toilet (Figure 3).

- Safford would consult with BLM prior to reducing or eliminating any beaver ponds.

3.2 Soils

3.2.1 Affected Environment

Bonita Creek lies within the Basin and Range physiographic province. This province is characterized by broad, gently sloping alluvial basins separated by north to northwest trending block-faulted mountains that uplifted during the Tertiary period. Geologic units along Bonita Creek canyon include unconsolidated sediments (surficial alluvium deposited by flowing water), volcanics, and sedimentary rock. Volcanic flows, agglomerates (conglomerate rock formed by volcanic activity), and tuffs interbedded with sedimentary deposits form the bedrock of the canyon and surrounding highlands. High rock abutments and sloping canyon walls entrench the stream throughout the project area. Within the lower 1.3 miles of Bonita Creek, the canyon width ranges from 140 feet to an estimated 400 feet near the mouth.

Upland soils are consistent with the TS18 soils mapping unit, termed the Graham-Lampshire-House Mountain Association (Hendrick 1985). This association consists of shallow, gravelly and cobbly, medium- to fine-textured soils, and rock outcrops on volcanic hills and mountains.

Alluvial deposits eroded from the surrounding highlands fill the canyon bottom and underlie stream terraces. The alluvium consists of varying percentages of mostly sand and gravel, with cobbles, boulders, and minor amounts of fines. At the barrier site, the canyon floor is 160-feet wide with alluvial deposits that exceed 60-feet deep. Extensive lateral migration of the low-flow channel is evident. These shifts in channel alignment probably occur with each major flood event.

The dominant rock type at the fish barrier site is a fanglomerate generally referred to as basin fill. Fanglomerate (conglomerate formed by alluvial fans) forms the sides of the canyon and probably constitutes the bedrock beneath the alluvial channel deposits. The fish barrier ends would tie into the fanglomerate. A 17-foot-thick layer of andesite on the right abutment is indicative of a volcanic flow that interrupted the deposition of fanglomerate.

3.2.2 Environmental Consequences

No Action

Existing conditions would prevail into the foreseeable future. Unnatural rates of erosion and sedimentation would continue as a result of human-induced disturbances within the canyon. Safford would continue activities necessary to operate, maintain, and possibly expand the municipal water system. These activities would include road maintenance as well as the construction of temporary roads to access portions of the pipeline. Road maintenance would also include use of existing material sites.

Proposed Action

Clearing, excavation, backfilling, and channel armoring during construction of the fish barrier would directly affect approximately 0.4 acres of floodplain substrates (Figure 6). Excavation for the barrier foundation would displace an estimated 7,262 cubic yards of alluvium and 101 cubic yards of abutment rock. This material would be replaced by approximately 1,020 cubic yards of concrete, 1,386 cubic yards of riprap used for channel armoring at the base of the apron, and backfill derived from the trench excavation. Excess material excavated from the barrier foundation trench and diversion channels would be spread in the channel above the barrier to minimize temporary pool development following construction. The operation of equipment in flowing water would increase the movement of fine sediment for a short distance below the work area. These effects are expected to persist intermittently only during active construction.

Short-term capture of minor amounts of bedload sediment at the barrier is expected to have a negligible effect on stream balance downstream. Bonita Creek carries a high sediment load during flood events, and the amount of bedload that would be immobilized relative to the total volume transported within the stream is small. Sediment transport would not be affected once channel-bed aggradation at the barrier has stabilized. No long-term impact on sediment transport within the stream would occur.

Upland impacts would be restricted to 0.2 acres within the two contractor-use areas.

Implementation of the MOU would put into place specific standards and stipulations for surface-disturbing activities associated with operation and maintenance of the water delivery system. Soil surface-disturbing activities, direct and indirect, such as road maintenance and construction, vegetation trimming and clearing, and beaver dam breaching or removal would cause short-term impacts to soils. Road maintenance would also include use of existing aggregate material sites.

Cumulative Effects

The effects of project activities on channel features and sedimentation would be incremental to historic and ongoing uses of the watershed that contribute to erosion. During the 20th century, livestock grazing in the canyon and upper watershed, road development, and recreational use were the primary sources of sedimentation (BLM 1998). Removal of livestock from the stream corridor within the RNCA has improved soil conditions on riparian areas. Several road segments that cross or follow the stream continue to impact soils and contribute sedimentation. However, the BLM has reduced the number of roads through the lower reaches of Bonita Creek from 15 miles to approximately 2 miles. Recreational use is a minor contributor to sedimentation. The proposed native fish restoration project would not add substantially to the cumulative impacts of other past, present, or reasonably foreseeable actions on soils due to the limited scope of the proposal (short duration and relatively small area impacted) and use of erosion control BMPs to mitigate soil impacts.

The MOU does not propose any new permanent roads or other construction activities beyond what is permissible under the CMA and existing rights-of-way. However, temporary roads and other soil disturbing activities may be necessary to insure continued operation of the water system. These actions would introduce localized impacts on soils that would be incremental to other soil disturbances within Bonita Creek canyon.

Mitigation

- Coverage for the fish barrier under the AZDPES general permit for storm water discharges associated with construction would be obtained. A storm water pollution prevention plan with pollution control BMPs would be implemented.

- Existing roads would be used for construction haulage during construction of the fish barrier.

- No stockpiles of material would remain following fish barrier construction.

- Safford would consult with BLM prior to any road construction or relocation required for operation of the water system.

- All road construction and maintenance would follow jointly agreed-upon standards and stipulations.

3.3 Visual and Recreation Resources

3.3.1 Affected Environment

Scenic Condition. Bonita Creek canyon includes a diverse range of distinctive natural landscapes with high scenic quality. Views include high surrounding desert, rugged canyon slopes, and a meandering stream valley with a robust riparian community. Streamside gallery forests create a ribbon of green that contrasts sharply against the duller hues of the canyon walls and desert background in summer months. Within this context, intruding visual elements such as the Safford municipal water supply pipeline, roads, and recreational facilities detract from the overall natural character of the canyon setting.

Visual Resource Management (VRM) is a system used by BLM for minimizing the visual impacts of ground-disturbing activities and maintaining scenic values. The BLM has a visual rating system consisting of four VRM classes. These classes define the different degrees of modification allowed to the basic elements of the landscape on BLM lands (Table 3). Within the RNCA, Bonita Creek canyon has received a Class II designation.

Table 3. Visual Resource Management Classes.

Visual Resource Management Class	Visual Objective
I	To preserve the existing character of the landscape. The level of the characteristic landscape should be very low and must not attract attention.
II	To retain the existing character of the landscape. The level of change to the character of the landscape should be low. Contrasts are seen, but should not attract attention.
III	To partially retain the existing character of the landscape. The level of change to the character of the landscape should be moderate. Contrasts are evident but should remain subordinate to the existing landscape.
IV	To provide for management activities which require major modification of the existing characteristic of the landscape. The level of change can be high.

Recreation. Exceptional scenery and perennial stream flow have created a demand for recreation along portions of Bonita Creek. Popular recreational activities within the canyon include pleasure driving, water play, picnicking, bird watching, archaeological site study, and hiking (BLM 1994). The greatest use occurs at picnic and camp areas at the mouth of the stream. Streamside areas above the Gila River confluence receive limited use due to the sparsity of recreational facilities (BLM 1994). Two developed recreational sites – the Lee Trail day-use picnic area and the City Picnic and Campground area (Figures 3 and 4) - exist in the reach above the proposed barrier site.

Fishing is not a common activity in Bonita Creek due to the stream's low flow regime, low angler interest in available fish species, and small size of sport fishes (BLM 1994).[16] A creel survey conducted by AGFD (1999) found angler use of Bonita Creek was among the lowest of the sites surveyed along the upper Gila River. According to AGFD (1999), the majority of anglers (89 percent) on the upper Gila River sought catfish. Bonita Creek does not support quality angling opportunities for catfish or other species.

3.3.2 Environmental Consequences

No Action

Current operation and maintenance of the municipal water system under the CMA and existing rights-of-way provide opportunities for recreation activities, public education, enjoyment of cultural resources, and wildlife observation while protecting the unique resources found in the watershed. However, expansion of the water system to meet full capacity of the Safford water right may affect the visual character of the landscape and quality of the recreation experience. Stream flow may be reduced in the lower 3-mile reach of the creek below the diversion point, and to a lesser degree above the diversion. Potential periodic drying of this section of stream may adversely affect riparian vegetation health, subsequently impacting the visual characteristics of the canyon and lowering the quality of the recreation experience.

[16] The majority of nonnative fishes in Bonita Creek are smaller than 9 inches in length. Bonita Creek also lacks a long angling history. Smallmouth bass were first reported in Bonita Creek in 2001.

Proposed Action

Scenic Condition. Implementation of the proposed native fish restoration project would result in minor modifications to the scenic integrity of the area. Intervening canyon terrain and riparian vegetation would conceal the fish barrier from distant viewpoints and developed public use areas in the canyon. Visual impacts would be greatest within the channel immediately downstream from the barrier. To obviate adverse visual effects, all concrete would be colored to blend in with surrounding substrates. The fish barrier would also be built with an arched configuration, thereby avoiding linear dimensions that would detract more substantially from the natural shapes and patterns of the canyon.

Water system operation and maintenance actions contained in the MOU would not lead to any substantial changes in the existing scenic condition. However, expansion of the water system to meet the Safford full-capacity water right may affect the visual character of the landscape. Stream flow may be reduced in the lower 3-mile reach of the creek below the infiltration gallery and, to a lesser degree, immediately above the gallery. The reduction in stream flow may affect riparian vegetation health and subsequently the visual character of the lower canyon.

Recreation. Recreational access to the 1.7-mile treatment area would be closed for approximately 10 days during piscicide application phase of the project. Stream renovation would eliminate the present assemblage of nonnative sport fishes from the perennial reach between the barrier and infiltration gallery. Fishes in the 1.3-mile segment of stream below the barrier would not be affected. The impact to fishing recreation is low because of the weak demand for the nonnative fishery in Bonita Creek and the proximity of angling opportunities in the Gila River and other nearby drainages.

Implementation of the MOU would not affect recreation in any significant way from the existing situation. The City picnic area and campground would continue to receive weekly maintenance, visitor contact, and periodic law enforcement patrols. There are three primary differences concerning recreation between the No Action and the Proposed Action. The first change would be to replace the existing pit toilet at the City campground with a vault toilet. The second change would be to develop an outdoor classroom lesson plan for on-site presentations. Lesson plans would cover the enhancement, protection, conservation, and use of natural, cultural, and recreation resources within the Bonita Creek canyon. Establishing an outdoor classroom for the Bonita Creek watershed could result in increased visitation primarily through return visits and promotion via word-of-mouth. Lastly, Safford would plan all operational and maintenance work for the week days, if at all possible, to avoid conflicts with area visitors. Overall recreation activity, including motorized use, is addressed in the Gila Box Riparian National Conservation Area Interdisciplinary Activity Plan, Graham County, Arizona.

Cumulative Effects

Visual effects of the fish barrier would be incremental to other human-induced land disturbances within the canyon. After construction of the fish barrier, the viewshed at the barrier would appear degraded for a short period until disturbed alluvial soils become repopulated with riparian vegetation. Once vegetation recovers, the fish barrier would be visually less intrusive within the context of the canyon setting. Loss of the nonnative fishery from 1.7 miles of stream represents a negligible cumulative impact on recreational angling in the upper Gila River basin. Construction of the fish barrier would conclude major construction projects described in the RNCA Management Plan.

Mitigation

- The barrier would be appropriately colored to enhance its visual compatibility with surrounding substrates.

3.4 Wild and Scenic River Status

3.4.1 Affected Environment

In 1994, BLM conducted an assessment of 20 rivers in Arizona to determine their potential eligibility for inclusion in the national Wild and Scenic River (WSR) system. This process was conducted at the request of the Arizona Congressional delegation. In its final report (1997), BLM determined that portions of 14 rivers met suitability requirements for inclusion in the WSR system.

The assessment determined that the upper 8.1-mile segment of Bonita Creek in the RNCA was suitable for inclusion in the WSR system with a "recreation" classification. Outstandingly remarkable values of the segment of Bonita Creek denoting eligibility are fish and wildlife habitat, cultural resources, water quality, riparian habitat, and recreation. The lower 6.9 miles from Lee Trail Road to the Gila River confluence was determined unsuitable (BLM 1994).

All 23 miles of the Gila River in the RNCA was determined suitable with 15.2 miles recommended for "scenic" classification and two segments (one on each end of the scenic segment) recommended for "recreation" classification (BLM 1997). The lower 4.5-mile segment of the Gila River at the mouth of Bonita Creek was classified "recreation." Outstanding remarkable values are scenery, fish and wildlife habitat, recreation, geology, historic and cultural resources, and hydrology.

On April 16, 1997, a legislative package transmitted from the Assistant Secretary of the Interior to Congress recommended the suitable stream segments under BLM administration in Arizona, including those in the RNCA, as potential components of the WSR system. Congress has not acted on these recommendations. BLM must manage the

suitable reaches as designated until Congress actually designates or removes the suitable stretches from WSR system recommendation.

3.4.2 Environmental Consequences

No Action

Current practices for operation, maintenance, and possible upgrade of the water system would continue without effect on the WSR system eligibility for suitable reaches.

Proposed Action

Native fish restoration activities would not affect suitability of Bonita Creek and the Gila River. The action area for fish barrier construction and piscicide treatment is separated from suitable stream segments in Bonita Creek and the Gila River by 3.9 miles and 1.3 miles, respectively. In addition, the suitable stream segments are isolated from the action area by reaches of Bonita Creek that do not support perennial flow.

Implementation of the MOU for operation, maintenance, and possible expansion of the water system would not affect suitability of any reach for inclusion into the WSR system.

Cumulative Effects

There are no cumulative effects of the project on wild and scenic river suitability.

Mitigation

No mitigation is recommended.

3.5 Biological Resources

3.5.1 Affected Environment - Vegetation

Bonita Creek arises from a series of springs and intermittent streams below the Nantac Rim. Changes in vegetation are evident as the stream descends on a meandering course over 3,850 vertical feet to the Gila River. Riparian vegetation becomes more pronounced with the beginning of perennial flow around elevation 4,250 feet, approximately 18 miles upstream from the Gila River confluence. The proposed activities will occur within a 1.7-mile reach of Bonita Creek approximately 1.3 miles upstream from the Gila River.

Near the Gila River, upland vegetation is classified as Sonoran Desertscrub (Brown 1994). The paloverde-cacti-mixed scrub association occurs on the hills and bajadas. The primary plant species within this habitat type are foothill paloverde (*Parkinsonia microphylla*), blue paloverde (*Parkinsonia florida*), saguaro (*Cereus giganteus*), catclaw acacia (*Acacia greggii*), ocotillo (*Fouquieria splendens*), barrel cactus (*Ferocactus*

wislizenii), brittlebush (*Encelia farinosa*), triangle-leaf bursage (*Ambrosia deltoidea*), and various cholla (*Opuntia*) species.

The upland habitat adjacent to the remainder of Bonita Creek occurs within the Semidesert Grassland community; a perennial grass-shrub dominated landscape (Brown 1994). In some areas, Brown (1994) notes that trees, half-shrubs, cacti, and forbs may outnumber or completely replace the grasses. Typical grass species include plains lovegrass (*Eragrostis intermedia*), sideoats grama (*Bouteloua curtupendula*), bush muhly (*Muhlenbergia porteri*), and three awn (*Aristida* sp). Nongrass species are more typical of the paloverde, cacti-mixed scrub association and include mesquite (*Prosopis velutina*), catclaw acacia, foothill paloverde, burroweed (*Isocoma tenuisecta*), four-wing saltbush (*Atriplex canescens*), and triangle-leaf bursage.

The proposed activities will occur primarily in the riparian habitat along lower Bonita Creek which is classified within the Sonoran Riparian Deciduous Forest and Woodland community (Brown 1994). This community consists primarily of streamside vegetation such as Fremont cottonwood (*Populus fremontii*) and Goodding willow (*Salix gooddingii*). However, in the project area the riparian vegetation also includes small patches of coyote willow (*Salix exigua*) and scattered Arizona sycamore (*Platanus wrightii*), Arizona walnut (*Juglans major*), and velvet Ash (*Fraxinus velutina*). Interspersed along the creek are patches of burrobrush (*Hymenoclea monogyra*), seepwillow (*Baccharis salicifolia*), and cattail (*Typha* spp). Bonita Creek lies between steep, narrow canyon walls, and the riparian vegetation forms a relatively narrow ribbon along the canyon floor. Sandwiched between the cottonwood/willow vegetation and the adjacent upland is a band of velvet mesquite.

3.5.2 Environmental Consequences - Vegetation

No Action

Existing conditions would prevail into the foreseeable future under this alternative. This comprises disturbance from routine access road and other water facility operation and maintenance, including vegetation trimming and clearing under the current CMA and rights-of-way. Also, the capture of additional groundwater and alluvial flow for municipal water supply could reduce surface flow in the lower 3-mile reach of Bonita Creek and, to a lesser degree, above the water diversion point. Reduction in stream flow could affect riparian vegetation health.

Safford is allowed to inspect, repair, replace, and upgrade the entire pipeline from the infiltration gallery to Safford. Upgrades may include increasing the size of the pipeline to allow Safford to meet full capacity of their water right. To access the pipeline for monitoring and maintenance or upgrading, Safford can remove all brush, trees and overhanging limbs from access routes and the pipeline alignment.

Removal of vegetation to access the pipeline likely affects three different structure zones located within the Bonita Creek drainage. Located on drier soils, zone one serves as a

transition between upland and riparian plant species such as velvet mesquite, catclaw acacia, paloverde, burroweed, and grasses. Wetter soils of zone two support Fremont cottonwood, Goodding willow, coyote willow, Arizona sycamore, Arizona walnut, and velvet ash. Zone three is located along and at water's edge and supports species such as horsetail (*Equisetum* spp.), cattails (*Typha* spp.), seep willow, and sedges (*Carex* spp.). These three structure zones of vegetation, upland/riparian transition, riparian, and aquatic serve as a natural buffer by intercepting pollutants such as nutrients (nitrogen and phosphorous), sediments, and pesticides before they enter aquatic systems. Habitats devoid of vegetation or altered are not as effective in capturing and retaining pollutants which can affect water quality.

Proposed Action

Fish Barrier - A total of approximately 2.6 acres (Table 4) of vegetated habitat would be impacted by construction of the fish barrier. Figure 6 identifies the location of construction impacts within each vegetation type. Figure 5 identifies the potential contractor-use areas which are located on previously disturbed sites. Approximately 0.5 acres would be required for equipment/material storage and staging.

The concrete barrier and associated riprap armoring of the streambed would permanently remove approximately 0.2 acres of riparian habitat. All remaining impacts would be temporary; upon completion of the project, the area will naturally revegetate. Sediment deposition following construction would inundate 2.2 acres of channel habitat. An additional 0.2 acres of habitat outside of the sedimentation zone would be utilized for access and daily material staging around the barrier (Figure 6). The majority of this habitat consists of relatively young stands of Fremont cottonwood and Goodding willow vegetation (approximately 20 to 25 feet in height). Other trees and shrubs impacted by construction and sedimentation consists include coyote willow, Arizona sycamore, Arizona walnut, velvet ash, velvet mesquite, burrobrush, and a small patch of cattail.

Table 4. Vegetation impacts (acres) from fish barrier construction.

Impact	Cottonwood/ Willow	Mesquite	Existing Disturbed	Total Acres
Permanent				
Barrier	0.1			0.1
Riprap	0.1			0.1
Temporary				
Construction Zone	0.1	0.1		0.2
Sedimentation Zone	1.2	0.6	0.4	2.2
Total Acres	1.5	0.7	0.4	2.6

Stream Renovation - Neither aquatic nor riparian vegetation would be harmed by the application of antimycin or rotenone.

Memorandum of Understanding/10-Year Plan - The MOU requires consultation with BLM prior to any vegetation disturbing actions such as temporary road construction or

relocation, creek diversion, and breaching beaver ponds. Safford would closely coordinate these actions with BLM in an effort to minimize impacts to vegetation.

Under the MOU, Safford could inspect, repair, replace, and upgrade the entire pipeline from the infiltration gallery to Safford. Upgrades may include increasing the size of the pipeline to allow Safford to meet full capacity of their water right. To access the pipeline for monitoring and maintenance, Safford could remove all brush, trees, and overhanging limbs approximately 15 feet from the pipe. Trees and snags greater than 6 inches in diameter would be retained if possible. The cuttings would be scattered to allow for natural decomposition. Prior to cutting, trees and limbs would be inspected for nesting wildlife. If nesting wildlife is present, or if vegetation is to be removed beyond the 15-foot limit, Safford would consult with BLM biologists.

Removal of vegetation to access the pipeline would affect three different structure zones located within the Bonita Creek drainage as described above. Located on drier soils, zone one serves as a transition between upland and riparian plant species such as velvet mesquite, catclaw acacia, paloverde, burroweed, and grasses. Wetter soils of zone two supports Fremont cottonwood, Goodding willow, coyote willow, Arizona sycamore, Arizona walnut, and velvet ash. Zone three is located along and at water edge and supports species such as horsetail (*Equisetum* spp.), cattails (*Typha* spp.), seep willow, and sedges (*Carex* spp.).

The removal of vegetation from the pipeline corridor, beginning at the infiltration gallery to the pipeline canyon exit, would impact approximately 3.6 acres of riparian and aquatic habitat. However, it is unlikely that Safford would need to remove vegetation from the entire pipeline in any given year. More likely Safford would inspect the entire pipeline corridor and remove blocking vegetation from no more than 50 percent of the corridor annually.

Cumulative Effects

Project effects on vegetation would be incremental to past, present, and reasonably foreseeable actions. Riparian and aquatic vegetation have historically been affected by livestock grazing, recreation, and road construction. Overgrazing in the watershed indirectly affects riparian vegetation through increased sedimentation and runoff from upland areas. In addition, Safford's water system has been in place for almost 70 years, and operation of this facility requires the commitment of vehicle access through the riparian corridor for maintenance, repair, and replacement of infrastructure. Riparian conditions along the canyon floor have significantly improved in recent years with the removal of livestock, road closures, and closer coordination on vegetation treatments between Safford and BLM. Implementation of the MOU would likely result in improved future vegetation conditions through closer coordination and cooperation between the City and BLM.

3.5.3 Affected Environment - Terrestrial Wildlife

Arizona's arid conditions and high temperatures are formidable obstacles to the survival of wildlife species. Riparian vegetation can ameliorate these harsh conditions by providing food, water, and shelter for terrestrial animals and moderate stream temperatures by shading the water thereby improving conditions for aquatic species. Riparian vegetation provides habitat for 60 to 75 percent of Arizona's resident wildlife even though riparian areas occupy less than 0.5 percent of the State's total land area (Arizona Riparian Council 1994). Riparian areas also serve as important travel corridors for large mammals and resting and foraging habitat for migratory birds.

Healthy, mature stands of cottonwood-willow provide one of the most structurally diverse habitats in the Sonoran Desert (Anderson and Ohmart 1977, Arizona Riparian Council 1994, Rosenberg et al. 1991). Riparian habitat has been recognized as critical habitat for neotropical migrants; birds that breed in the United States and/or Canada but spend their winters south of the United States/Mexico border. Neotropical migrants represent over one-half of the breeding birds in Arizona (Partners In Flight, no date).

The AGFD (Snow et al. 2004) conducted a vertebrate inventory of the RNCA during 2002 and 2003 for the BLM. Barrier construction and stream renovation would affect less than a 2-mile reach of lower Bonita Creek. Snow et al. (2004) documented 150 of the 200+ birds expected within the RNCA. Common neotropical migrants which breed in the project area include the summer tanager (*Piranga rubra*), Bell's vireo (*Vireo bellii*), yellow warbler (*Dendroica petechia*), Lucy's warbler (*Vermivora luciae*), black-chinned hummingbird (*Archilochus alexandri*), Bullock's oriole (*Icterus bullockii*), and hooded oriole (*Icterus cucullatus*), mourning dove (*Zenaida macroura*), and the yellow-billed cuckoo (*Coccyzus americanus*). The dense vegetation and perennial water provide habitat for raptors such as Cooper's (*Accipiter cooperii*), common black (*Buteogallus anthracinus*), and zone-tailed hawks (*Buteo albonotatus*). Bald eagles (*Haliaeetus leucocephalus*) utilize Bonita Creek during the winter; while the red-tailed hawk (*Buteo jamaicensis*) is a permanent resident that ranges throughout the area.

Bonita Creek provides a natural movement corridor for far-ranging large mammals such as black bear (*Ursus americanus*), mule (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), and mountain lion (*Puma concolor*). In addition, Bonita Creek provides habitat for collared peccary (*Tayassu tajacu*), bobcat (*Felis rufus*), gray fox (*Urocyon cinereoargenteus*), and coyote (*Canis latrans*). The importance of forage and water for these animals varies from season to season (BLM 1993).

A wide variety of small mammals are permanent residents of the canyon and therefore are dependent upon the food and cover provided by the riparian habitat. Snow et al. (2004) observed 13 (of 25 expected) species of rodents in the RNCA. The most frequently trapped small mammals were the cactus mouse (*Peromyscus eremicus*) and the desert pocket mouse (*Chaetodipus penicillatus*). Other species observed included desert shrew (*Notiosorex crawfordii)*, beaver (*Castor canadensis*), raccoon (*Procyon lotor*), ringtail (*Bassariscus astutus*), coati (*Nasua narica*), and striped skunk (*Mephitis*

mephitis). Twelve species of bats were identified during mist net operations conducted primarily on Bonita Creek. The most commonly caught species were the Mexican free-tail (*Tadarida brasiliensis*) and western pipistrelle (*Pipistrellus hesperus*). Western red bat (*Lasiurus blossevillii*) and western yellow bats (*Lasiurus xanthinus*), two species poorly documented in Arizona, were also recorded.

Snow et al. (2004) documented 31 out of 50 reptile and amphibian species that potentially occur in the RNCA. Amphibians will be discussed later in the Fish and Aquatic Wildlife Section. The survey recorded 17 of 21 lizard species expected in the RNCA. The most common lizards were greater earless (*Cophosaurus texanus*) and Clark's spiny (*Sceloporus clarkii*). Other prevalent species included desert spiny (*Sceloporus magister*), common side blotched (*Uta stansburiana*), ornate tree lizard (*Urosaurus ornatus*), and western whiptail (*Cnemidophorus tigris*).

Snow et al. (2004) could only verify 6 out of 19 snakes potentially present in the area. Snakes observed along Bonita Creek included: Sonoran whipsnake (*Masticophus bilineatus*), Big Bend patch-nosed snake (*Salvador hexalepis deserticola*), western lyre snake (*Trimorphidon biscutatus*), gopher snake (*Pituophis catenifer*), and western (*Crotalus viridis*) and western diamondback rattlesnakes (*Crotalus atrox*).

Typical wildlife species found in the upland habitat adjacent to Bonita Creek include western diamondback, desert spiny lizard, western whiptail, greater roadrunner (*Geococcyx californianus*), lesser nighthawk (*Chordeiles acutipennis*), canyon towhee (*Pipilo fuscus*), Gambel's quail (*Callipepla gambelii*), Say's phoebe (*Sayornis saya*), Scott's Oriole (*Icterus parisorum*), cactus wren (*Campylorhynchus brunneicapillus*), black-throated sparrow (*Amphispiza bilineata*), white-throated wood rat (*Neotoma albigula*), Merriam's kangaroo rat (*Dipodomys merriami*), cactus mouse, desert pocket mouse (*Chaeotodipus penicillatus*), cliff chipmunk (*Eutamias dorsalis*), rock squirrel (*Spermophilus variegatus*), white-tailed deer, and collard peccary (*Tayassu tajaca*).

3.5.4 Environmental Consequences - Terrestrial Wildlife

No Action

Existing conditions would prevail into the foreseeable future under this alternative. Disturbance from routine access road and other water facility operation and maintenance, including vegetation trimming and clearing, beaver dam breaching, and potential stream flow reduction would continue under the CMA and existing rights-of-way. Visual and noise disturbance of resident wildlife would continue, as well as, habitat manipulation in the form of surface and vegetation disturbance.

Proposed Action

Fish Barrier - Impacts to terrestrial wildlife from construction of the fish barrier would be minor relative to the number of species along the entire reach of Bonita Creek. There would 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. Avian species and large mammals would be capable of avoiding the area during construction. Habitat loss for these species would be minor. The fish barrier would create a restriction to upstream and/or downstream movement for some small mammals and reptiles (primarily snakes, beavers, and Gila monsters) that could not negotiate the vertical face of the barrier. The barrier would have only a minor impact on large mammals. The vertical cliffs along Bonita Creek already limit wildlife access into and out of the canyon. Use of the Bonita Creek corridor by large mammals is low (Devon Skinner, AGFD, pers. comm.). Neither the AGFD (Devon Skinner, AGFD, pers. comm.) nor BLM (Heidi Kuska and Tim Goodman, BLM, pers. comm.) believe a wildlife ramp is necessary to provide access over the barrier for large mammals. A concrete ramp is being designed to provide vehicular access for the City of Safford; this ramp may also provide a means for wildlife access over the barrier. There would be temporary noise disturbance for all wildlife species during construction.

Stream Renovation - Wildlife could be exposed to concentrations in excess of 20 ppb antimycin A or 2 ppm rotenone in surface waters of the project area for about 6 hours each for up to three treatments. Among vertebrate animals, toxicity of antimycin when applied in a piscicide formulation is generally restricted to fish (Herr et al. 1967). Beck (1950) found no effect on cockroaches. Others (Walker et al 1964; Gilderhus et al. 1969) found antimycin has low toxicity to mice, rabbit, and quail and no effect on turtles, salamanders, frogs, snakes, herons, and ducks at concentrations toxic to fish. Piscicide-killed fish that escape collection, and burial would be quickly consumed by crayfish and other scavengers or decompose. The effects of consuming dead fish produced by stream renovation are poorly studied, but there have never been any reports of negative effects to wildlife (Berger et al. 1967, Gilderhus et al. 1969). Antimycin and rotenone degrade rapidly under natural stream conditions, and, when exposed to potassium or sodium permanganate and the remaining byproducts after neutralization, are not harmful to humans or other organisms (Berger et al. 1969; Gilderhus et al. 1969; Lee et al. 1971; and Marking and Dawson 1972). Cattle are currently excluded from lower Bonita Creek, and thus they would not be affected by a renovation.

Memorandum of Understanding/10-Year Plan - Disturbance by routine road and other facility operation and maintenance, including vegetation trimming and clearing and beaver dam breaching/removal would be reduced by the implementation of jointly agreed-upon standards and stipulations. Also, the capture of additional groundwater and alluvial flow for municipal water supply could reduce surface flow in the lower 3-mile reach of Bonita Creek affecting terrestrial wildlife.

Cumulative Effects

The RNCA restricts impacts along Bonita Creek. Existing wildlife impacts are associated with recreational facilities primarily concentrated near the mouth and maintenance of Safford's water system and access route. The incremental effect of the proposed native fish restoration project on the local wildlife would be predominately short term in nature and negligible.

Implementation of the MOU would reduce, but not eliminate, impacts from continuing operation, maintenance, and possible expansion of the municipal water system on wildlife and wildlife habitat in lower Bonita Creek into the foreseeable future.

3.5.5 Affected Environment - Fish and Aquatic Wildlife

The existing native fish community in Bonita Creek consists of Gila chub, speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), Sonora sucker (*Catostomus insignis*), and desert sucker (*Pantosteus clarki*).

Approximately 4,000 fingerling razorback suckers (*Xyrauchen texanus*) were stocked into Bonita Creek (site unknown) in 1987 (AGFD stocking records). A photograph taken 12.3 km above the mouth in March 1991 appears to be of a razorback sucker (Jeff Simms, BLM, pers. comm.), but other recapture records from Bonita Creek do not exist. Based on the lack of recent collection records for razorback sucker in Bonita Creek, we do not believe the species persists in Bonita Creek.

Nonnative fishes that have invaded Bonita Creek include green sunfish, smallmouth bass, channel catfish, fathead minnow, red shiner, common carp, mosquitofish, black bullhead, and yellow bullhead. Smallmouth bass, green sunfish, and black bullhead invaded the stream relatively recently; none were present during extensive sampling of Bonita Creek in the late 1970s (Minckley and Clarkson 1979; Clarkson, unpublished data). These species have invaded the lower reach of Bonita Creek only; a pure native assemblage occurs upstream of the City's infiltration gallery.

Spikedace, loach minnow, Gila topminnow, and desert pupfish historically had access to Bonita Creek, although there are no records of collections of these species from the stream. Native fish biologists believe current habitat conditions may support repatriations of these species to Bonita Creek, and it is proposed here to stock these species into Bonita Creek once the stream has been chemically renovated and protected by a fish barrier.

The original source of sport fishes now in Bonita Creek is believed a result of historic stockings by AGFD into streams and impoundments in the Gila River drainage (AGFD stocking records). Although yellow bullhead and green sunfish are not specifically listed in AGFD records, they may have been mixed with supplier stocks of bluegill (*Lepomis macrochirus*) and channel catfish (*Ictalurus punctatus*) that were widely introduced to the middle Gila River basin. Private stock pond owners also often introduce sport fishes for their personal use, although they require a permit from AGFD to do so.

Introduction of nonnative fishes from these sources to Bonita Creek was by either natural upstream movements from the Gila River or by illegal "bait bucket" transfers by anglers or recreationists. Bait bucket transfer is the transport and subsequent release of aquatic biota through sport fishing activities into a basin where it previously was absent (Ludwig and Leitch 1996). Although most intentional stockings of these species by AGFD have

ceased, bait bucket transfers continue to be a problematic source of nonnative fish and bait species contaminations to Arizona waters.

Several restrictions to using live baits for fishing have been made recently by AGFD in an attempt to minimize the bait bucket transfer problem, and monetary rewards against illegal stockings are available. However, use of live baitfish (including sunfishes and crayfish) is legal along the Gila River in the vicinity of Bonita Creek, and thus potential reintroductions of nonnative aquatic biota via this avenue remain a concern.

Other aquatic species identified by Snow et al. (2004) on Bonita Creek included the red spotted toad (*Bufo punctatus*) and canyon treefrog (*Hyla arenicolor*) which were the most common amphibians. Interestingly, although no bullfrogs (*Rana catesbeiana*) were detected on Bonita Creek, they were the most common amphibian on the Gila River. The lowland leopard frog (*Rana yavapaiensis*) was documented in Bonita Creek on three occasions during the early 1990s; however, it was not observed during the Snow et al. (2004) surveys. Only one turtle, the native Sonoran mud turtle (*Kinosternon sonoriense*), was observed on Bonita Creek (Snow et al. 2004).

3.5.6 Environmental Consequences - Fish and Aquatic Wildlife

No Action

In the absence of Federal action to protect the native fish community, the trend toward increasing nonnative populations and decreasing native populations would continue within lower Bonita Creek. Dominance by green sunfish and other nonnative species could result in the loss of the existing native fish assemblage and adversely affect amphibians and aquatic reptiles along the lower stream. These adverse effects could extend to the segment of stream above Safford's infiltration gallery dike if that structure were to fail.

The existing CMA and rights-of-way would continue to provide the guidelines for operation, maintenance, and possible expansion of the municipal water system. Disturbance from routine access road and other water facility operation and maintenance, such as temporary road construction, beaver dam breaching, vegetation trimming and clearing, and the potential for stream flow reduction and sediment releases would continue.

Road construction and maintenance through aquatic and riparian habitats have the potential to injure or kill Gila chub and other native fishes located in low water road crossings that intersect Bonita Creek. Periodic construction of temporary crossings for pipeline access and routine maintenance of permanent crossings likely results in some loss of native fishes. The effect of these losses on native fish populations is low.

Destruction of riparian and aquatic vegetation by temporary road construction can result in higher water temperatures, which reduces dissolved oxygen concentrations for fish. Riparian areas are important in providing quality habitat for fish. Increasing riparian

vegetation has been documented to increase instream and overhanging cover, buffer streams from incoming sediment and other pollutants, build a sod of herbaceous plants that support formation of undercut banks, buffer temperature extremes, increase habitat complexity, and increase terrestrial invertebrate prey for fish (Platts, 1991). Temporary roads have the potential to revegetate in two to three seasons following closure.

Riparian and aquatic vegetation influences stream morphology, structure, hydrology, and water temperature, which provides habitat for native fish. Removal of vegetation would reduce habitat for native fish and aquatic wildlife by changing stream form and function. Specific effects on habitats and fish species from pipeline maintenance and monitoring are dependent on the amount and timing of vegetation removal, which is unknown at this time.

Under the CMA, Safford may breach beaver dams, if necessary, to reach maintenance sites. Lowering of beaver ponds could kill native fish that inhabit or use pool habitat if waters are drawn down too low or too fast to allow fish to escape. Fish eggs and larvae, which are largely undetected by the human eye, could be killed when beaver dams are breached or ponds drawn down. Potential loss of eggs, larvae, and fish could likely be high depending on time of year when beaver dams are breached.

Effects from water system capacity upgrade would likely reduce, modify, and/or eliminate terrestrial, aquatic, and riparian habitats in the lower 3-mile reach below the diversion point, and to a lesser degree immediately above the diversion point. Substantial habitat modification would adversely affect Gila chub and other native fish species.

Proposed Action

Fish Barrier - The proposed fish barrier is expected to have substantial, positive benefits to native fish and other aquatic vertebrate populations by preventing upstream invasions of nonnative fishes and other undesirable aquatic biota into upper reaches of Bonita Creek. These effects should also benefit leopard frog populations, in that they have also been shown to be negatively impacted by presence of nonnative fishes (Rosen et al. 1995). A similar benefit resulting from control of nonnative organisms should accrue to populations of narrow-headed garter snake (Rosen and Schwalbe 1988) and Sonoran mud turtle (Rosen and Fernandez 1996).

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, some native fishes currently found in Bonita Creek occur in very low densities or are absent altogether in the lower reaches of the stream (AGFD and BLM unpublished data). Thus, the native species are already partially genetically isolated from downstream populations, and no genetic effects to the much larger upstream populations are anticipated. The continued presence of nonnative fishes below the barrier will likely preclude or hinder establishment of native fish populations there. If, at a future time,

enhanced genetic interchange is deemed desirable, it can be accomplished by periodically moving individuals from downstream to the segment of stream above the barrier.

At the species level, the fish barrier would prevent movements and integration of genetic materials of native fishes derived from other stream systems to Bonita Creek populations. 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, if any, communication among tributary fish populations occurs through connecting mainstem river corridors (such as the Gila River). Presence of an array of nonnative fish predators near tributary mouths and especially in mainstem rivers like the Gila 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 2 percent were minnows (Family Cyrinidae), and the rest were suckers (Family Catostomidae; Bestgen et al. 1985). In the Bestgen et al. (1985) study, most (87 percent) minnow drift occurred during daylight, and distances drifted were estimated to be short.

Distances drifted by native fish species in Bonita Creek have not been determined, but two lines of evidence suggest that drift losses over the fish barriers 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 recently-completed 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), large losses from this avenue 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 barriers, 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. Because the proposed fish barrier would function similar to other natural stream structures such as debris or rock structures, the impacts would be similar. In a steep-walled canyon reach such as the site proposed for Bonita Creek, a fish barrier may form a complete barrier to upstream movements by terrestrially-mobile adult frogs or the Sonoran mud turtle. 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 would be primarily 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. Decreases in mean sediment size, and increases in channel sinuosity and braiding are other possible localized effects associated with lower gradient. Gradient of lower Bonita Creek is 1.5 percent, limiting the extent of sedimentation to approximately 700 linear feet (2.2 acres).

Stream Renovation - Treatment with antimycin A or rotenone would affect approximately 1.7 miles of stream between the proposed barrier site and the infiltration gallery dike. Piscicide would not be applied downstream of the barrier or upstream of the infiltration gallery dike.

Effects of antimycin on aquatic invertebrates are variable. Any effects on aquatic insect populations are usually short-term, as kills are incomplete and recolonization is rapid (Minckley and Mihalick 1981, Gray 1981, Gray and Fisher 1981). Kiner et al. (2000) found no significant difference in species abundance for pre- and post-treatment sites but found significant differences in relative abundances of some invertebrate groups. In Arizona, Minckley and Mihalick (1981) concluded that long-term changes in the aquatic invertebrate fauna resulting from antimycin treatment of Ord Creek were minimal, but that a few taxa may have been locally eliminated. Lopez (1991) reported no loss of taxa 1 month following antimycin renovation of Hayground Creek, Arizona. Others (Walker et al. 1964, Vezina 1967, Gilderhus et al. 1969, Lennon and Berger 1970, Snow 1974, Houf and Campbell 1977, and Morrison 1979) failed to discern adverse effects of antimycin on invertebrates in general. Source populations for recolonization of aquatic

invertebrates will be available in nontreated reaches above the infiltration gallery dike and below the fish barrier.

Stream renovation would eliminate all fishes within treated reaches. A large portion of the native fish community would be salvaged and returned to the stream following treatment. Native fishes upstream of the infiltration gallery dike would also be a source for natural recruitment following renovation. There is no definitive number of fish that must be salvaged to ensure that genetic variability is preserved for repatriation following chemical renovation (T.E. Dowling, Arizona State University, pers. comm.). The recommended goal is to retain at least 90 percent of the wild genetic variation in captive breeding programs of endangered species (Soule et al. 1986); and, in stream renovation, the best way to achieve that goal is to sample as much of the source population as possible. Genetic "repopulation" in the treated reach will rely upon a combination of salvaged individuals, inputs from populations above the infiltration gallery dike, and possibly translocations from other local stream sources that are genetically similar.

Repatriation of native fishes would have beneficial environmental consequences. Repatriations will restore the original fish community that is believed to have resided in Bonita Creek prior to human-induced stream impacts and introductions of nonnative species and will initiate a long-overdue recovery process for the imperiled warmwater native fish fauna of the Gila River basin. Similar action at other streams within the basin may eventually lead to downlisting and delisting of some fishes from the Endangered Species Act and may help remove the need to list others.

No ongoing land uses in the Bonita Creek watershed are expected to be greatly affected by the native fish restoration project, and some (such as ecotourism and wildlife watching) may be enhanced. Analysis of economic responses to potential environmental protections of this sort suggests that long-term health of the economy seems compatible with, and may benefit from, the long-term health of the environment (Niemi 2002).

Stream renovation activities were successfully conducted on Fossil Creek during the fall of 2004 by AGFD, Forest Service, and Reclamation. Renovation operations (fish salvage, holding, piscicide application, detoxification, and repatriation) were completed smoothly with no significant loss of native fish. The major lesson learned from Fossil Creek was to retain flexibility with respect to the choice of piscicides. Efficacy of antimycin and rotenone vary under different stream conditions.

Memorandum of Understanding/10-Year Plan - Implementation of the MOU would address continued operation, maintenance, and possible capacity upgrade of the municipal water system. Disturbance from routine road and other facility operation and maintenance including temporary road construction, beaver dam breaching and removal, and vegetation trimming and clearing would be reduced by employing jointly agreed-upon standards and stipulations. These new conditions apply directly to road maintenance and construction, fire prevention, weed control, monitoring and mitigation for list species, hazardous material, weekday work, creek diversion, beaver dam breaching and removal, and vegetation trimming and clearing.

Safford could divert additional groundwater and alluvial flow to capture their allotted water right under the MOU and existing rights-of-way. Removing additional water from Bonita Creek may reduce surface flow and lengthen intermittent segments in the lower 3-mile reach of the creek below the diversion point and to a less degree above the diversion. The reduced flow would adversely affect fish and aquatic wildlife habitat.

The impacts and effects of road maintenance and construction on fish and aquatic wildlife can affect individuals, populations, or habitat directly and indirectly. Direct effects include mortality from road maintenance and construction; whereas indirect effects include habitat fragmentation and degradation (physical and chemical).

Destruction of riparian and aquatic vegetation by temporary road construction results in higher water temperatures, which reduces dissolved oxygen concentrations for fish. Riparian areas are important in providing quality habitat for fish. Increasing riparian vegetation has been documented to increase instream and overhanging cover, buffer streams from incoming sediment and other pollutants, build a sod of herbaceous plants that support formation of undercut banks, buffer temperature extremes, increase habitat complexity, and increase terrestrial invertebrate prey for fish (Platts, 1991). Temporary roads have the potential to revegetate in two to three seasons following closure.

Safford could breach beaver dams on approximately 1.5 miles of Bonita Creek downstream from the grade-control dike as needed to reach maintenance sites. Removal of beaver ponds would displace beavers to other segments of the stream. Lowering of beaver ponds may kill native fish that inhabit or use pool habitat if waters are drawn down too low or too fast to allow fish to escape. To reduce this threat from happening, Safford would consult with BLM prior to any beaver ponds being lowered. A biologist from BLM will be on site when beaver dams are breached to minimize injury and/or mortality to native fish. Fish eggs and larvae, which are largely undetected by the human eye, may be killed when beaver dams are breached or ponds drawn-down. Potential loss of eggs, larvae, and fish could likely be high depending on time of year when beaver dams are breached.

Safford could remove beaver dams in the designated beaver dam free zone (Figure 4). Removal of beaver dams may kill native fish that inhabit or use pool habitat if dams are removed. Removing the beaver dams would be a one-time event, with periodic monitoring and maintenance to ensure reconstruction does not occur. Fish eggs and larvae, which are largely undetected by the human eye, may be killed when the beaver dams are removed. Potential loss of eggs, larvae, and fish could likely be high depending on time of year when beaver dams are removed. Safford would consult with BLM prior to any beaver dam removal. A biologist from BLM would be on site when beaver dams are removed to minimize injury and/or mortality to native fish.

Vegetative structure zones also serve to stabilize the streambank, increase water storage within streambanks, provide water recharge, and provide a measure of flood control. Removal of any of the vegetative structure zones will affect stream health of Bonita

Creek. Erosion and bank undercutting by flooding events result when structure zones that hold streambank soils in place are reduced or eliminated. Structure zones of vegetation also aid water recharge. As water moves across the lands from a precipitation event, healthy riparian areas slow or capture the water allowing it to seep into the ground to recharge the water table. If the water table drops as a result of less recharge, the surface water in Bonita Creek would likely decrease. Stream intermittency and drying below the infiltration gallery would likely occur with a decrease in surface water. Fish unable to reach suitable habitat will perish.

Riparian and aquatic vegetation influences stream morphology, structure, hydrology, and water temperature, which provides habitat for native fish. Removal of vegetation will reduce habitat for native fish and aquatic wildlife by changing stream form and function. Specific effects on habitats and fish species from pipeline maintenance and monitoring are dependent on the amount and timing of vegetation removal, which is unknown at this time.

Indirect effects to fish and aquatic wildlife and their habitats from well monitoring and maintenance would likely result from road repair, road construction, and vegetation removal, which were covered under access and roads and pipeline maintenance and monitoring. These activities are largely covered under Safford's rights-of-way to construct, operate, and maintain a water collection and distribution system within Bonita Creek.

Safford may use water system wells to provide supplemental water during times of increased water demand. These temporary (3-5 months) water production wells would include a generator for pumping water to permanent transmission facilities. Approximately 100-300 gallons of diesel fuel would be contained within each generator. No additional diesel and/or oil would be stored on the floodplain. A fuel containment facility would be supplied for each generator.

No precautions currently exist to prevent the generator and spill containment facility from being damaged or washed away during a catastrophic event. Such an event could result in up to 300 gallons of diesel fuel entering the Bonita Creek watershed. Effects to fish, macroinvertebrates, and aquatic and riparian habitat would depend on the amount of diesel fuel spilled and the volume of water present for dilution.

Effects from the Bonita Creek water production and delivery system expansion would reduce, modify, and/or eliminate terrestrial, aquatic, and riparian habitats in the lower 3-mile reach below the diversion point, and to a lesser degree above the diversion point. Habitat modification or destruction would likely result in loss of native fish.

Cumulative Effects

Physical changes to aquatic habitat historically resulted from diversion of alluvial flows and subsequent reduction in surface flow in lower Bonita Creek; sedimentation and alteration of flow patterns in the watershed from overgrazing, road construction, and use;

and recreation use of the stream corridor. In addition to the physical changes, the introduction of nonnative fish species has depressed or eliminated native fish populations in the lower system.

Cessation of cattle grazing along Bonita Creek within the RNCA in the 1980s resulted in a dramatic rebound of riparian vegetation and change in instream habitats. Regeneration of riparian trees and shrubs quickly improved the structural diversity of the riparian habitat resulting in increased diversity and abundance of terrestrial wildlife species. Improved bank stability resulting from development of riparian vegetation noticeably increased pool development in the lower stream, which allowed Gila chub populations to expand, while certain other native fishes that preferred riffles diminished. Historical and current conditions in upper Bonita Creek on Indian lands are largely unavailable, although presently riparian vegetation and instream conditions immediately above the RNCA do not appear dramatically dissimilar to those within. Current grazing patterns within the watershed appear to have a negligible impact on Bonita Creek.

Dispersed recreation in the form of picnicking, camping, hiking, recreational driving, horseback riding, water play, bird watching, hunting, and photography occur within Bonita Creek to various degrees. These activities have the potential, if they become concentrated, to affect fish and wildlife species and their habitats. Concentrated recreation activity such as wading, splashing, and hiking up and down the creek can cause injury to fish, or displace and stress fish sensitive to frequent disturbances. The level of disturbance is not likely to reach proportions leading indirectly to mortality through stress, which predisposes fish to disease and predation. It is possible that streambanks and spawning areas may be damaged by excessive use from hikers and sightseers. Currently, the activity level from these types of activities in the area is so light that trampling damage is largely undetectable (Jeff Wilbanks, BLM, pers. comm.). However, it is likely that current activity level within and around Bonita Creek will increase due to Safford's forecasted growth. If this occurs, Bonita Creek would likely experience more recreational traffic, and, if not monitored, species of native fish may decrease and aquatic and riparian habitat may be damaged or destroyed.

Motorized vehicles driving through established road crossings have the potential to disrupt normal behavior of and injure or kill fish and macroinvertebrates, increase turbidity, and destroy fish eggs and larvae. In addition, mechanical action of vehicles can cause damage to existing vegetation and prevent the establishment of vegetation, which affects habitat quality and quantity. BLM has reduced roads through the bottom of Bonita Creek from 15 miles to approximately 2 miles, resulting in a proportional reduction of road impacts on aquatic and riparian biota. Localized impacts from vehicle use of remaining road segments would continue to affect Bonita Creek.

The incremental adverse effect on aquatic habitat resulting from the implementation phase of the proposed native fish restoration project would be short term and limited in scope. In the long term, the action would protect native fish populations from the disruptive effects of nonnative fish interaction and promote native fish conservation.

Implementation of the MOU would limit impacts both direct and indirect to aquatic habitat due to agreed-upon standards and stipulations and close coordination between BLM and Safford. The MOU would not limit Safford's ability to operate and maintain the municipal water system within the existing rights-of-way or the ability to pursue their full water right allocation.

3.5.7 Affected Environment –Federally Listed Species

Table 5 presents FWS listed and candidate species that occur in Graham County. Listed 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 5. Federally listed and candidate species in Graham County.

Common Name	Scientific Name	Status
Apache (Arizona) trout	*Oncorhynchus apache*	Threatened
Arizona cliffrose	*Purshia subintegra*	Endangered
Bald eagle	*Haliaetus leucocephalus*	Threatened
California brown pelican	*Pelecanus occidentalis californicus*	Endangered
Chiricahua leopard frog	*Rana chiricahuensis*	Threatened
Desert pupfish	*Cyprinodon macularius*	Endangered
Gila chub	*Gila intermedia*	Endangered
Gila topminnow	*Poeciliopsis occidentalis occidentalis*	Endangered
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	Endangered
Loach minnow	*Tiaroga cobitis*	Threatened
Mexican gray wolf	*Canis lupus baileyi*	Endangered
Mexican spotted owl	*Strix occidentalis lucida*	Threatened
Mount Graham red squirrel	*Tamiasciurus hudsonicus grahamensis*	Endangered
Razorback sucker	*Xyrauchen texanus*	Endangered
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered
Spikedace	*Meda fulgida*	Threatened
Yellow-billed cuckoo	*Coccyzus americanus*	Candidate
Wet Canyon talussnail	*Sonorella macrophallus*	Conservation Agreement

The following species would not be affected by the project due to the lack of suitable habitat and/or because the current range for the species is outside of the project area: Arizona cliffrose, Apache (Arizona) trout, California brown pelican, Chiricahua leopard frog, lesser long-nosed bat, Mexican gray wolf, Mexican spotted owl, Mount Graham red squirrel, razorback sucker, and Wet Canyon talussnail.

The 2001 CAP biological opinion addressed impacts to aquatic species for barrier construction and was tiered to the biological assessment for the proposed project. The proposed project includes stream renovation activities, which were not covered under the biological opinion. A biological assessment was submitted to the FWS in February 2007 and concluded: no effect to the southwestern willow flycatcher; may affect but will not likely adversely affect, the bald eagle; and may affect, and will likely adversely affect, the Gila chub; and may affect, and will likely adversely affect, repatriated desert pupfish,

loach minnow, Gila topminnow, and spikedace. A discussion of the species that may be affected by the project is presented below.

Bald Eagle - In 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 47 in 2005 (James Driscoll, AGFD, pers. comm.). The bald eagle was reclassified as threatened on July 12, 1995 (FR 60 (133): 36000).

There are no records of nesting bald eagles in Bonita Creek; the closest nest record is located 60 miles from Bonita Creek (Sabra Schwartz, AGFD, pers. comm.). Bald eagles occasionally winter in Bonita Creek, and the lower 12-mile reach of Bonita Creek is included in AGFD's annual Midwinter Bald Eagle Survey. Surveys have been conducted along Bonita Creek since 1995, and an average of 1.6 bald eagles is observed each year (Jamey Driscoll, AGFD, pers. comm.). AGFD records also indicated (Jamey Driscoll, AGFD, pers. comm.) four to six wintering bald eagles were detected annually from 1995 through 1997. However, over the past 8 years (1998 to 2005), a single bald eagle was detected only in 1999, 2001, and 2003. Potential roosting habitat (large trees protected from the wind by adjacent slopes) occurs throughout Bonita Creek. The immediate project area provides limited roost sites for bald eagles. The majority of trees to be removed for construction are not suitable for roosting bald eagles.

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 2001 biological opinion identified the following activities that would be considered "take" under Section 9 of the ESA: (1) barrier site selection occurred within 1 mile of an

active bald eagle nest site; (2) barrier construction exceeded the bounds of the anticipated disturbance area as determined by Reclamation, with FWS concurrence, prior to construction initiation, and (3) helicopter use occurred within 1 mile (horizontal radius or 2,000 feet above a known bald eagle nest.

Southwestern Willow Flycatcher - The southwestern subspecies of the willow flycatcher (willow flycatcher) was listed as endangered, effective March 29, 1995 (60 FR 10694). Critical Habitat designation was made on July 22, 1997 (62 FR 39129), with a correction on August 20, 1997 (62 FR 44228). On May 11, 2001, the 10th Circuit Court of Appeals set aside designated Critical Habitat. In 2003, the 10th Circuit Court ruled that FWS must repropose Critical Habitat within a year and complete a final designation by September 30, 2005 (Memorandum Opinion, U.S. District Court, New Mexico, September 2003). Critical Habitat was re-proposed on October 12, 2004 (69 FR 60706), with comments due by May 31, 2005. Critical habitat was designated on October 19, 2005 (70 FR 60886). There is no critical habitat in the project area.

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 attributed to habitat loss and modification caused by impacts of dams and reservoirs, stream diversions and groundwater pumping, channelization and bank stabilization, phreatophyte control, livestock grazing, agricultural development, urbanization, and recreation (FWS 2002).

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 2002).

The willow flycatcher breeds in riparian habitats along rivers, streams, or other wetlands, where patchy to dense trees and shrubs are established, usually near or adjacent to surface water or saturated soil (FWS 2002). Plant species composition and height vary across the geographical range of this species, but occupied habitat usually consists of a mosaic of dense patches of vegetation, often interspersed with small openings, open water, or shorter/sparser vegetation. Dense vegetation usually occurs within the first 10 to13 feet above ground. Willow flycatchers can occupy habitat within 3 to 5 years of a flood event (Paradzick and Woodward 2003). Periodic flooding and habitat regeneration are important to the recovery of this species.

In Arizona, willow flycatchers now nest predominantly in saltcedar. Saltcedar-dominated stands mimic the riparian woodlands structure of willow in many areas where willow has declined (FWS 2002). Ninety percent of willow flycatcher nests found between 1993 and 2000 in Arizona were in saltcedar (Paradzick and Woodward 2003). Of 462 willow flycatcher nests monitored in Arizona in 2004, 298 were in saltcedar, 129 were in Goodding willow, 24 were in Fremont cottonwood, and the remaining nests were in other

tree species (Munzer et al. 2005). Nesting substrate in the upper Gila River in Arizona is primarily saltcedar and willow, with some seepwillow and cottonwood.

Southwestern willow flycatcher surveys were conducted on a 1-mile reach of Bonita Creek during the 2004, 2005, and 2006 breeding seasons. No willow flycatchers were detected during any of the 15 survey visits. There are no nesting records for Bonita Creek (Sabra Schwartz, AGFD, pers. comm.). The closest nesting willow flycatcher was located approximately 3 miles south of the project area along the Gila River (Susan Sferra, Reclamation, and Heidi Kuska, BLM, pers. comm.). Previous records have all been along the Gila River approximately 20 to 25 miles southwest of the project area, with the exception of one record in 1997 approximately 10 miles south of the project area. Willow flycatcher survey coverage along the Gila River has been inconsistent due to the large number of private land parcels. Additionally, areas where surveys have been conducted have not been consistently surveyed. Consequently, there may be more nesting willow flycatchers along the Gila River than current records indicate.

Construction activities would begin in late summer. This time frame is outside of the breeding season for willow flycatchers, therefore no willow flycatchers would occur in Bonita Creek during the construction activities. Removal of the small amount of riparian habitat for the project would not preclude future use of the area by willow flycatchers.

Yellow-billed Cuckoo - On July 25, 2001, the FWS published notice in the *Federal Register* (66 FR 38611-38626) that the petition to list the western yellow-billed cuckoo under the ESA is warranted but precluded by higher listing actions (FWS 2001). The western 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 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 resulting in direct mortality of individual birds and causing thin 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).

Snow et al. (2004) documented cuckoos on Bonita Creek during their general avian surveys. Cuckoo surveys were conducted by Reclamation during the 2004, 2005, and

2006 breeding seasons. Cuckoos were recorded during every survey visit (three per year), and casual observations were made of cuckoos during surveys for southwestern willow flycatcher. Although, on several occasions, pairs of birds were observed, and, during 2004, one bird gave a knocker call, (an alarm call made when an intruder is near a nest); nesting was not confirmed. Based on the locations identified during the surveys, there may be portions of three territories within 1 mile of the project area. One potential territory encompasses the proposed fish barrier site.

Gila Chub - A Gila River basin endemic, Gila chub is similar in many ways to the closely related roundtail chub, but is smaller and thicker-bodied and characteristic of deeper pools in small streams, cienegas, and springs (Minckley 1973, Minckley 1987). The species historically was widespread and locally common in suitable habitat throughout central and southeastern Arizona, but much of that habitat has been lost and only remnant populations restricted to tributaries persist today (DeMarais 1986). Gila chub is federally listed as endangered because of extensive habitat loss and establishment of nonnative fishes throughout most of its range (FR 70(211):66664-66721). Although critical habitat was designated for 25 streams in the Gila River basin, designation for Bonita Creek was precluded due to consideration of positive benefits to the species resulting from anticipated completion of the MOU between BLM and the City of Safford and native fish conservation efforts under the Proposed Action.

Females achieve lengths of 250 mm, whereas males seldom exceed 150 mm (Minckley and Rinne 1991). No information on longevity is available, but individuals up to 4 years have been estimated from scale analysis (Griffith and Tiersch 1989). Few life history data are available (Weedman et al. 1996), but the species is omnivorous with a significant component of the diet comprised of insects (Griffith and Tiersch 1989). Reproduction takes place throughout much of the year except the coldest months, and young are found from early spring through autumn (Minckley and Rinne 1991). Gila chub is reclusive, hiding in deep water among roots and other cover.

Prior to removal of livestock grazing from Bonita Creek, most instream habitats were riffles and shallow runs, with very little pool habitat present. Because of the proclivity of Gila chub for pools, the species was rare in Bonita Creek (Minckley and Clarkson 1979; Clarkson, unpublished data). As riparian habitat recovered following removal of livestock grazing, Bonita Creek developed considerable pool habitat, and Gila chub populations responded positively. Today, Gila chub is common in the stream (BLM, unpublished data).

Species Proposed for Repatriation

The following species do not presently occur within Bonita Creek but would be repatriated to Bonita Creek upon construction of the fish barrier and renovation of Bonita Creek: desert pupfish, Gila topminnow, loach minnow, and spikedace,

Desert pupfish - Desert pupfish was listed as endangered on March 31, 1986, with critical habitat (Federal Register 51(61):10842-10851). The species formerly was widespread

throughout lower elevations of the Gila River basin among mainstem river backwaters, springs, cienegas, and slow-flowing streams (Minckley 1973). It was extirpated from the entire Gila River drainage but has been repatriated successfully in the wild to a handful of isolated waters from where nonnative fishes are absent (Voeltz and Bettaso 2003). It persists naturally only in the vicinity of Salton Sea, California, and in the delta region of the Colorado River in Mexico (Zengel and Glenn 1996, Varela-Romero et al. 2003). Critical habitat for the species does not include any waters in Arizona.

Individuals rarely exceed 30 mm total length and probably do not live longer than 2 years in the wild. Males of this species are brightly colored blue, black, and yellow-orange and highly territorial. Dominant males gather on a patch of silt-free bottom and try to lure females to spawn. The males aggressively defend oviposition sites from both smaller males and other species (Loiselle 1994). They forage primarily on small invertebrates and algae picked off the substrate and occasionally their own eggs and young (Schoenherr 1988). Pupfish resist almost any natural environmental extreme known in aquatic systems of the Sonoran Desert (Minckley 1985). They are capable of withstanding temperatures between 7 and 45 C, salinities from fresh water to twice the salt content of sea water (68 parts per thousand), and oxygen levels from saturation down to 0.1-0.4 mg/liter (Lowe et al. 1967).

Repatriation of the species in the Gila River basin to protected wild sites where nonnative fishes have been removed or precluded is occurring but at an unhurried pace. More than a half-dozen additional natural sites without nonnative fishes need to be identified and stocked, and dozens of additional quasi-natural sites need to be established in the basin before the species can be considered for downlisting (Marsh and Sada 1993). A statewide Safe Harbor Agreement that could facilitate such activity has been stalled for a number of years.

Gila topminnow - Gila topminnow was federally listed as endangered on March 11, 1967 (Federal Register 32(48):4001). No critical habitat has been designated. This small (<50 mm) live-bearing fish was historically one of the most common species at lower elevations in its endemic distribution within the Gila River basin, where it inhabited springs, streams, cienegas, and margins of mainstem rivers (Hubbs and Miller 1941, Minckley 1973). The species began to experience loss of range in the basin early in the 20th century due to lowering water tables and arroyo cutting (Hendrickson and Minckley 1984). Introduction of nonnative fishes, particularly western mosquitofish (*Gambusia affinis*), in the 1930-40s significantly accelerated decline of the species and is the primary reason for its endangerment today (Meffe 1985, Marsh and Minckley 1990). Less than one dozen natural populations remain, with all but one confined to the Santa Cruz River subbasin.

Longevity of Gila topminnow is usually less than 1 year (Schoenherr 1974). It feeds on a variety of small plants and macroinvertebrates. Reproduction may occur year-round when water temperatures are suitable, but is typically in spring through summer. Females can store spermatozoa for several months and are capable of superfetation, where two or more groups of embryos develop simultaneously at different developmental

stages at the same time, with births occurring at 21-day intervals. Broods can consist of 14-49 embryos (Schoenherr 1977). They can become sexually-mature as early as two months, and can produce up to 10 broods per year under laboratory conditions (Schultz 1961).

Hundreds of natural and artificial habitats have been stocked with this species in an attempt to recover it, but most sites have failed (Voeltz and Bettaso 2003), and repatriation efforts have slowed dramatically in recent years. A statewide Safe Harbor Agreement that could facilitate such activity has been stalled for a number of years, as has its recovery plan revision.

Loach minnow - Loach minnow was federally listed as threatened on October 28, 1986 (Federal Register 51(208):39468-39478). Critical habitat has been twice designated and twice revoked. A new proposal to designate critical habitat was published on December 20, 2005 (Federal Register 70(243):75546-75590), and 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. No critical habitat has been proposed for Bonita Creek. 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 the 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 forks of the Gila River in New Mexico (Marsh et al. 1990, FWS 1990, Propst 1999). 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 percent of its historic range (FWS 1990). The U.S. Fish and Wildlife Service 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 1990). 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 to be the major factor in continued declines of this species. There have been no successful transplants and repatriations of loach minnow (Desert Fishes Team 2003), and the only recovery activities that have been implemented to date are construction of fish barriers on Aravaipa Creek to protect an existing population and construction of a barrier and renovation of Fossil Creek to replicate one of the wild populations; the actual transplant has not yet occurred.

Spikedace - Spikedace was federally listed as threatened on July 1, 1986 (Federal Register 51(126):23769-23781). Critical habitat has been twice designated and twice

revoked. A new proposal to designate critical habitat was published on December 20, 2005 (Federal Register 70(243):75546-75590), and includes four stream complexes in the Verde River, middle Gila River/lower San Pedro River/Aravaipa Creek, San Francisco River/Blue River/Eagle Creek, and upper Gila River drainages. No critical habitat has been proposed for Bonita Creek. 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). In New Mexico, it inhabits the Gila River and its major forks, but is declining there also (Propst 1999). The species is extremely rare in the Verde River and Eagle Creek. The U.S. Fish and Wildlife Service 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 taken (Schrieber and Minckley 1981).

This species (excluding those that are already extirpated) is perhaps the most endangered native fish in the basin due to its specialized habitat preferences and apparent need for waters with relatively high base flows that are now occupied by nonnative fishes. There have been no successful transplants or repatriations (Desert Fishes Team 2003), and the only recovery activities that have been implemented to date are construction of fish barriers on Aravaipa Creek to protect an existing population and construction of a barrier and renovation of Fossil Creek to replicate the Verde River population; the actual transplant has not yet occurred.

3.5.8 Environmental Consequences–Federally Listed Species

No Action

Nonnative fishes would continue to adversely affect Gila chub in lower Bonita Creek. Future flood flows could facilitate incursion of nonnative fishes into upper Bonita Creek and result in adverse impact to Gila chub. Repatriation of specified native fishes into Bonita Creek would not be undertaken by the lead agencies, foregoing an opportunity to improve the recovery status of these species. Impacts from the operation and maintenance of Safford's water system would be similar to those described previously under the No Action section for fish and aquatic wildlife.

Proposed Action

The proposed action may affect, but will not likely adversely affect, the bald eagle based on the following information. There are no records of nesting bald eagles on Bonita Creek. Wintering use of Bonita Creek by bald eagles is low with an average of 1.6 bald eagles per year over a 12-mile reach. Bald eagles have only been observed in Bonita Creek in 3 out of the last 8 years. Construction activities will be limited to a ¼-mile reach of Bonita Creek. Construction of the fish barrier would remove an insignificant percentage of the total habitat on Bonita Creek. With the exception of one large cottonwood tree, all trees proposed for removal are too small to be utilized by roosting bald eagles. Wintering bald eagles are not tied to a specific territory and therefore have the remaining length of Bonita Creek to utilize. Construction of the barrier would not preclude future use of the area by bald eagles. Renovation of Bonita Creek would result in a short-term (6 to 7 days) loss of foraging habitat for the bald eagle. The 1.7 mile-reach represents only a fraction of the potential habitat available for foraging. The Gila River and Bonita Creek (above the infiltration gallery) would remain available sources of foraging habitat. Winter use of Bonita Creek by bald eagles is very low. Bald eagles are highly mobile, and the short-term loss of this small section of stream would have no effect to the bald eagle. No take would occur pursuant to the criteria established under the 2001 Biological Opinion.

Routine water system pipeline operation and maintenance and possible expansion would not affect potential bald eagle roosting habitat (i.e., large trees buffered from the wind), which exists throughout Bonita Creek. Trees removed for road maintenance or construction would not be suitable for roosting bald eagles due to their small size (less than six inches in diameter). Safford must consult with BLM before removing vegetation if nesting wildlife is found.

Known bald eagle occurrences in Bonita Creek appear to be opportunistic; it is unlikely that they would consistently forage or roost in Bonita Creek. Bald eagle forage and roosting habitat are more likely along larger rivers and around lakes. If at some point bald eagles start consistently foraging and roosting in Bonita Creek, operation, maintenance, and construction of the municipal water system has the potential to disturb individuals. If bald eagles are documented consistently foraging and roosting in Bonita Creek, the BLM would coordinate with Safford to reduce disturbance consistent with current practices in Arizona. This may include a buffer zone around particular trees and specific areas.

Southwestern willow flycatcher - No willow flycatchers were detected during 3 years of surveys on Bonita Creek. The current conditions in Bonita Creek are not conducive to nesting willow flycatchers. Bonita Creek does provide habitat for migratory and dispersing willow flycatchers. The potential for development of suitable breeding habitat in the future is uncertain and dependent upon effects to vegetation from Safford's utilization of their full allotment of water. Neither the proposed native fish restoration

project nor implementation of the MOU/10-year plan would affect the willow flycatcher or preclude its future use of the project area.

Yellow-billed cuckoo - Cuckoos were observed on Bonita Creek by Snow et al. (2004) during their avian surveys and by Reclamation personnel during their cuckoo surveys. Suitable nesting and foraging habitat are present in the project area. A small portion of the habitat will be removed during construction operations. Cuckoos are very sensitive to disturbance (Halterman and Johnson 2003). Construction activities would begin in late summer at the end of the breeding season. There would be short-term, noise-related disturbances. The effect of the loss of habitat at the barrier location on cuckoos is unknown. Cuckoos can forage over large distances (Murrelet Halterman, Southern Sierra Research Station, pers. comm.). Based on the continuous presence of riparian habitat along Bonita Creek and the small percentage of habitat impacted (2.6 acres), it is assumed that barrier construction will have only a minor effect on the cuckoo. Only one cuckoo territory encompasses the construction area. The cuckoo is a candidate species under the ESA and as such is not afforded any official protection. Reclamation has purchased a Conservation Easement on 1,420 acres (encompassing 300 acres of riparian habitat) on the San Pedro River, near Benson, Arizona, as mitigation for impacts to riparian habitat from construction of all fish barriers required pursuant to the ESA. This mitigation site provides habitat for the cuckoo. Cuckoos were observed on the mitigation property during surveys. In addition, Reclamation will conduct 1 year of post-project surveys to document any changes in cuckoo locations. The application of a piscicide during the stream renovation process will not affect foraging opportunities.

Gila chub – There would be short-term impacts to Gila chub as a result of temporary disturbance to stream habitats in the construction area. Chub would either be forced to move upstream or downstream from the construction site during actual construction, and some direct mortality is possible. Impacts from the fish salvage operation would be minimized to the maximum extent possible, but some mortality during capture and subsequent holding is possible. Stream renovation would kill any fishes that were not captured during salvage operations prior to application of piscicide within the 1.7-mile stream treatment area. In the long term, however, barrier construction, stream renovation, and repatriation activities would remove predation and competition impacts from nonnative species in lower Bonita Creek and provide added protection for Gila chub throughout the stream.

Implementing the MOU/10-year plan would allow continued operation and maintenance and possible expansion of the municipal water system. Although continued operations would not increase the hazard of direct harm to individuals of the species, the hazard would continue to exist. Vehicles crossing the creek while conducting operations and maintenance could injure or kill individuals. Construction of spur roads and alteration of vegetation could affect the quality of habitat and indirectly affect the species. The MOU/10-year plan does limit surface and vegetation disturbance thereby reducing some of the indirect affects.

Implementing the MOU would allow continued operation and maintenance and possible expansion of the municipal water system. Although continued operations would not increase the hazard of direct harm to individuals of the species, the hazards as described below would continue to exist.

Road construction, maintenance, repair, and travel through aquatic and riparian habitats has the potential to injure or kill Gila chub located in low-water road crossings that intersect Bonita Creek. Roads accelerate soil erosional rates and modify natural drainage networks, which degrade stream habitat for aquatic species. Erosion from roads often results in sedimentation of streams and declines in spawning habitat when too high a proportion of fine sediment is deposited. Fine sediments may clog spawning gravels and reduce the availability of oxygen to eggs and increase embryo mortality. Sedimentation also has negative effects on macroinvertebrates (Waters, 1995), the primary food supply of Gila chub and many other native fish species. Excess sedimentation could likely cover algae-encrusted rocks and affect feeding habits of macroinvertebrates and native fish.

Destruction of riparian and aquatic vegetation by road construction or pipeline maintenance and repair activities results in higher water temperatures, which reduces dissolved oxygen concentrations for fish. Riparian areas are important in providing quality habitat for fish. Increased riparian vegetation has been documented to increase instream cover, increase overhanging cover, buffer streams from incoming sediment and other pollutants, and build a sod of herbaceous plants that support formation of undercut banks, buffer temperature extremes, increase habitat complexity, and increase terrestrial invertebrate prey for fish (Platts 1991). The MOU/10-year plan does limit surface and vegetation disturbance thereby reducing some of the indirect affects.

Safford may breach or remove beaver ponds which may result in a loss of Gila chub. To minimize impacts, Safford would consult with BLM prior to such actions. A biologist from BLM would be on site when beaver ponds are breached or removed to minimize injury and/or mortality to Gila chub. Fish eggs and larvae, which are largely undetected by the human eye, may be killed when beaver ponds are breached or drawn down. Potential loss of eggs, larvae, and fish could likely be high depending on time of year when beaver ponds are breached.

Species Proposed for Repatriation

The desert pupfish, Gila topminnow, loach minnow, and spikedace do not presently occur within Bonita Creek but would be stocked in the stream upon completion of the fish barrier, fish salvage, and stream renovation activities. Consequently, there would be no impact to these species from fish barrier construction, fish salvage, or stream renovation activities. Impacts to the desert pupfish, Gila topminnow, loach minnow, and spikedace from repatriation and implementation of the MOU and 10-year action plan would be similar to those described for the Gila chub above.

Repatriation of native fishes would have beneficial biological consequences. Repatriations would restore the original fish community that is believed to have

resided in Bonita Creek prior to human-induced stream impacts and introductions of nonnative species and would initiate a 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 and delisting of some fishes from the Endangered Species Act and may help remove the need to list others.

Cumulative Effects

Actions that have affected special status species in Bonita Creek canyon in the past include physical changes to aquatic and riparian habitat from water diversions, overgrazing, and road construction and use. Removal of livestock from the canyon floor has resulted in significant improvement of the riparian community. Reduction of roads in the riparian area, removal of petroleum-powered pumps, and construction of containment structures have also reduced the risk of impacts to special status species. The introduction of nonnative fish species has adversely affected native fish populations including the Gila chub.

The incremental effect of the proposed project would be to improve the recovery status for Gila chub and other federally listed species that are repatriated into Bonita Creek. There would be no cumulative effect on other federally listed species. Construction of the fish barrier concludes the known major projects proposed for lower Bonita Creek. For the foreseeable future, the stream would be managed as described in the RNCA Management Plan.

Impacts to the repatriated species from the ongoing management of the RNCA must also be addressed. The status review of the species proposed for repatriation has been described in the Management Plan Biological Opinion (02-21-88-F-0114). Effects to the repatriated species will be similar to those described for the Gila chub in BLM's Gila Box Biological Evaluation as well as in the FWS Biological Opinion (02-21-96-F-0160-F7). BLM has requested reinitiation of formal consultation on the Management Plan to determine effects to the proposed repatriated species from ongoing management of the RNCA.

3.5.9 Affected Environment – Sensitive Species

The BLM Safford Field Office has compiled a list of sensitive species that includes FWS Candidate species, FWS Species of Concern, AGFD Wildlife of Concern, and BLM Sensitive Species that are found within the boundaries of the BLM Safford District (September 22, 2003). Species listed as federally threatened, endangered, proposed, or candidate are treated in Section 3.5.7. The subset of species shown in Table 6 below includes all species from the BLM Safford District list that may occur in or near the proposed project area. Placement on this list reflects concerns by the various agencies 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. There is little information and limited surveys to accurately determine status of some species on the list.

Table 6. List of BLM Safford District Sensitive Species for the Bonita Creek area, Arizona, excluding federally listed or proposed species-September 2003.

Common Name	Scientific Name	Status
Sensitive Mammals		
Arizona myotis	*Myotis lucifugus occultus*	SSBLM, SCFWS
Cave myotis	*Myotis velifer*	SSBLM, SCFWS
Fringed myotis	*Myotis thysanodes*	SSBLM, SCFWS
Long-legged myotis	*Myotis volans*	SSBLM, SCFWS
Sensitive Birds		
Belted kingfisher	*Ceryle alcyon*	WCG&F
Common Black Hawk	*Buteogallus anthracinus*	WCG&F
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	C, WCG&F
Sensitive Fish		
Desert sucker	*Pantosteus clarki*	SSBLM
Longfin dace	*Agosia chrysogaster*	SSBLM, SCFWS
Sonora sucker	*Catostomus insignis*	SSBLM, SCFWS
Speckled dace	*Rhinichthys osculus*	SSBLM, SCFWS
Sensitive Amphibians		
Lowland Leopard Frog	*Rana yavapaiensis*	SSFWS, WCG&F
Sensitive Plants		
Aravaipa Sage	*Salvia amissa*	SSBLM, SCFWS

Table Legend*:*

SSBLM = Sensitive species, Bureau of Land Management
WCG&F= Wildlife of concern, Arizona Game and Fish Department
SCFWS = Species of concern, Fish and Wildlife Service
C = Candidate species, Fish and Wildlife Service

Sensitive Mammals

Arizona myotis - The Arizona myotis, a BLM-sensitive species, is generally found at higher elevations in ponderosa pine and oak-pine woodland habitat (Hoffmeister 1986, AGFD 1992, Hinman and Snow 2003). Most records are from the Mogollon Rim (Alpine to Flagstaff) and include Mingus Mountain, Verde Valley, Sierra Ancha, and the Pinal Mountains but can also be found in lower elevations along permanent water or riparian areas (Hinman and Snow 2003). The winter range is unknown (Hinman and Snow 2003). This species typically roosts in buildings and under bridges (AGFD 1992, Hinman and Snow 2003). This species hunts low over water foraging on flying insects (Hinman and Snow 2003). Snow et al. (2004) did not detect or discuss Arizona myotis in their Gila Box RNCA report. The closest site record is located approximately 50 miles to the north of the project area (Sabra Schwartz, AGFD, pers. comm.).

Cave myotis - The cave myotis, a BLM-sensitive species, is found at lower elevations primarily in desertscrub habitat but can also occur up to the pine-oak community (Hoffmeister 1986, Hinman and Snow 2003). The distribution of the cave myotis in Arizona covers all areas south of the Mogollon Rim except for portions of southwestern Arizona and most areas higher than 5,000 feet in elevation (Hinman and Snow 2003). Cave myotis will utilize roost sites in tunnels, mine shafts, and underneath bridges

(Hoffmeister 1986, Hinman and Snow 2003). Winter roosts are located in wet mine tunnels above 6,000 feet (Hinman and Snow 2003). Cave myotis are opportunistic feeders which forage along the tops of trees (Hinman and Snow 2003). Snow et al. (2004) detected several cave myotis during surveys on Bonita Creek.

Fringed myotis - The fringed myotis, a BLM-sensitive species, is found in middle elevational habitats from chapparal to ponderosa pine habitats but prefer oak woodlands (Hoffmeister 1986, Hinman and Snow 2003). The fringed myotis is found throughout Arizona with the exception of the southwestern and northeastern corners (Hinman and Snow 2003). Winter range in Arizona includes Santa Cruz, Cochise, and Mohave counties (Hinman and Snow 2003). Fringed myotis roost in the open in tightly packed groups rather than crevices. They have been recorded nesting in caves, mines, large snags, under exfoliating bark, and buildings (Hinman and Snow 2003). Snow et al. (2004) detected fringed myotis bats on Bonita Creek in the general vicinity of Jones-Lee Road crossing. This site is upstream of the project area. This species is expected to occur in the project area.

Long-legged myotis - The long-legged myotis, a BLM-sensitive species, is found in forested mountains; it is absent from the desert and desert mountains in the southwestern part of the State (Hoffmeister 1986, Hinman and Snow 2003). This species utilizes a variety of roost sites including abandoned buildings, cracks in the ground, crevices in cliff faces and spaces behind exfoliating tree bark (Hinman and Snow 2003). This species forages on insects high over water and in openings in the woods. Snow et al. (2004) detected one long-legged myotis bat during surveys on Bonita Creek. This species is an expected migrant in the project area.

Sensitive Birds

Belted kingfisher - The belted kingfisher, was listed as a Wildlife of Concern by the AGFD (1988), but it does not occur on their recent (AGFD 1996) draft list. However, BLM still retains this species on their Sensitive Species List. Belted kingfishers can be found along relatively clear, perennial stretches of water where aquatic prey is present (Corman 2005b). Breeding in the State was not confirmed until 1980 (Monson and Philips 1981); although Bendire (1895) reported they nested in southern Arizona in the 1890s. Recent breeding atlas records (Corman 2005b) revealed belted kingfishers to be uncommon, but widespread and localized. Most records were obtained along the Verde, Black and upper Little Colorado rivers (Corman 2005b). During the nonbreeding season, this species can be found throughout the State where there are permanent fish-inhabited waters that do not freeze (Phillips et al 1964). The belted kingfisher's diet is 50 to 90-percent small fish. But they also consume aquatic invertebrates, amphibians, reptiles, insects, young birds, mice, and rarely berries (AGFD 2005). Belted kingfishers were not observed during any of Reclamation's visits to the project area.

Common black hawk - The common black hawk was listed as a Wildlife of Concern by the AGFD (1988), but the species does not occur on their recent draft (AGFD 1996). However, BLM still retains this species on their Sensitive Species List. 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 from 1992 indicate that common black hawks were observed in the project area (Sabra Schwartz, AGFD, pers. comm.). Snow et al. (2004) observed a nest with young on Bonita Creek in 2002. Reclamation observed common black hawks along Bonita Creek during both 2004 and 2005 site visits.

Yellow-billed cuckoo - See previous discussion.

Sensitive Fish

Desert sucker, a BLM-sensitive species, 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. 2005, Desert Fishes Team 2004). It once was a Candidate species under the Endangered Species Act.

Desert sucker is a medium-sized catostomid, attaining an adult size of about 300 mm (Smith 1966). It 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 described below for Sonora sucker, with multiple males attending a single female and gametes deposited over gravel (J.A. Stefferud, USFS [retired], personal communication). 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).

Before removal of livestock grazing, desert sucker was by far the most common fish species in Bonita Creek (Minckley and Clarkson 1979, Clarkson unpublished data). This presumably was due to the lack of streamside vegetative shading that allowed high insolation to the streambed, which in turn sustained high-standing crops of the desert sucker's preferred food base, encrusting algae. As riparian vegetation shaded the stream bottom and pool development proceeded, the algal food base declined, as did the

prevalence of stony riffles. The species remains common in Bonita Creek today but not at the exceptional standing crop levels found in the 1970s (BLM unpublished data).

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 to the Gulf of California. Longfin dace have disappeared from many stream segments in Arizona (especially mainstem rivers), and it once was a Candidate species for listing under the Endangered Species Act.

Longfin dace is a small (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. 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. Reproduction has been recorded throughout the year but is most pronounced in spring and early summer (Minckley and Barber 1971, Kepner 1982).

Longfin dace was and remains one of the most common native species in lower Bonita Creek (Minckley and Clarkson 1979, Clarkson unpublished data, BLM unpublished data).

Sonora sucker is a medium-sized catostomid 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 Endangered Species Act.

Sonora sucker is large and robust (to 800 mm and 2 kg), 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, as does 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 spawners' 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).

Presumably, due to the scarcity of pools in Bonita Creek before the removal of livestock grazing in the 1980s, Sonora sucker was common but sporadic in collections from the creek in the late 1970s (Clarkson unpublished data). The species appears more uniformly distributed today (BLM unpublished data), perhaps due to the greater amount of pool development compared to the 1970s.

Speckled dace is a small-bodied and short-lived minnow, with a life span likely similar to loach minnow and spikedace (2-3 years). It typically inhabits swiftly flowing riffles and runs in habitats varying from tiny headwater creeks to mainstem rivers such as the Colorado River in the Grand Canyon. The species ranges widely across most of the western United States and is represented in all of the major drainages of Arizona (Minckley 1973, Wallace 1980). However, like the rest of Arizona's native fishes, speckled dace has suffered serious local declines in distribution and abundance in the last 75 years, especially from lower elevation streams. The species at one time was on the Candidate species list under the Endangered Species Act.

Whereas, the closely related loach minnow usually inhabits interstices of rubble bottoms, speckled dace typically occupy the water column immediately above those substrates. Speckled dace has been shown to spawn in response to summer rains (John 1963) and other substrate-disturbing events (Mueller 1984). Spawning occurs in gravel riffles where females deposit eggs into nests excavated by the male (John 1963, Mueller 1984). Foods are predominated by Ephemeroptera (mayflies) nymphs and Diptera fly larvae (Schreiber and Minckley 1981).

Speckled dace was and remains one of the most common native species in lower Bonita Creek (Minckley and Clarkson 1979, Clarkson unpublished data, BLM unpublished data).

Sensitive Amphibians

Lowland leopard frog is one of the several species of leopard frog described from Arizona in recent decades that has escaped extensive population losses from the interior of Arizona, although it has been lost from the lower Colorado River, Arizona-California-Baja California, and Imperial County, California (Clarkson and Rorabaugh 1989), has declined in southeastern Arizona (Sredl et al. 1997), and is extirpated from all but one locality in New Mexico (C. Painter, NMGFD, pers. comm.). The species also ranges into northern Sonora, Mexico, but its status there is largely unknown. Introduction of bullfrogs and nonnative predatory fishes is the most serious known threat, and invasion of the nonnative Rio Grande leopard frog (*Rana berlandieri*) 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 frogs inhabit a variety of aquatic habitats ranging from rivers, streams, and springs to earthen cattle 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).

Other than casual observations and collections that confirm lowland leopard frog occurs along Bonita Creek, its specific population status in Bonita Creek is unknown.

Sensitive Plants

Aravaipa Sage - Araviapa Sage is a BLM-sensitive species. Aravaipa sage occurs on the upper floodplain terraces in shady canyon bottoms in the understory of mature sycamore, ash, walnut, and mesquite groves on sand and silt substrates (FWS, No Date). Aravaipa Sage has not been documented in Bonita Creek. The closest known plant population occurs approximately 50 miles away in the Galiuro Mountains along Aravaipa Creek (Sabra Schwartz, AGFD, pers. comm.).

3.5.10 Environmental Consequences – Sensitive Species

No Action

Native fishes and lowland leopard frog in lower Bonita Creek would be adversely affected by increased community dominance of nonnative aquatic species. Reproduction of native fishes and lowland leopard frog in lower Bonita Creek could be significantly suppressed by predaceous nonnative fishes. These adverse effects could extend to the segment of stream above the City of Safford infiltration gallery dike if that structure fails during flood or is otherwise modified over time.

Proposed Action

Sensitive Mammals

Arizona myotis - This bat species will not be impacted by the proposed project. No roost sites occur within the project area. There will be no loss of foraging habitat. Construction activities would not occur during normal foraging times.

Implementation of the MOU would not negatively affect this species.

Cave Myotis - This bat species will not be adversely impacted by the proposed project. No roost sites occur within the project area. This species forages over trees, and there will be an insignificant loss of foraging habitat. The trees removed for barrier construction would be representative of a large opening in the canopy. Construction activities would primarily occur during daylight hours and would not affect bats foraging along the creek.

Implementation of the MOU would not negatively affect this species.

Fringed myotis - This bat species will not be adversely impacted by the proposed project. Few potential roost sites (snags or exfoliating bark) occur in the construction zone. This species' preferred habitat, oak woodland, does not occur in the immediate project area. This species forages in and around vegetation, and there will be an insignificant loss of foraging habitat. Construction activities would primarily occur during daylight hours and would not affect bats foraging along the creek.

Implementation of the MOU would not negatively affect this species.

Long-legged myotis - This bat species will not be adversely impacted by the proposed project. There are potential roost sites (crevices in cliffs or exfoliating bark) that occur in the construction zone. However, only an insignificant portion of the habitat will be impacted by construction activities. This species' preferred habitat, forested woodland, does not occur in the immediate project area. No loss of foraging habitat would occur.

Implementation of the MOU would not negatively affect this species.

Sensitive Birds

Belted Kingfisher- There has been no documented nesting attempts by the belted kingfisher on Bonita Creek. This species normally nests in excavated burrows in earthen banks, but one nest was observed in a natural cliff cavity (Corman 2005b). Based on the lack of nesting records and the low incidence of cliff use, no impact will occur to any potential nesting habitat from either the stream renovation or barrier construction. The application of a piscicide during the stream renovation process will not affect foraging opportunities. Potential food sources such as reptiles and adult amphibians would not be affected by antimycin or rotenone (Walker et al. 1964, Gilderhus et al. 1969). The effects to fish would be temporary; native fish species would be quickly reintroduced into Bonita Creek. If the belted kingfisher was present on Bonita Creek during construction and the stream renovation phase, it could find forage opportunities downstream of the project area.

Implementation of the MOU would not negatively affect this species.

Common Black Hawk – Common black hawks were observed breeding on Bonita Creek by Snow et al. (2004); although the exact location is unknown. The majority of trees in the immediate project area are young and structurally too small to support a typical nest. Common black hawks typically site their nests in the main trunk of large, cottonwood or sycamore trees (Corman 2005c). Only one large, decadent cottonwood will be removed during construction. The application of a piscicide during the stream renovation process will not affect foraging opportunities. Potential food sources such as reptiles and adult amphibians would not be affected by antimycin or rotenone (Walker et al. 1964, Gilderhus et al. 1969). The effects to fish would be temporary; native fish species would be quickly reintroduced into Bonita Creek. The common black hawk could forage on alternate species downstream of the project area for the short time fish are unavailable.

Implementation of the MOU would not negatively affect this species.

Yellow-billed cuckoo - See previous discussion.

Sensitive Fish

Desert sucker, longfin dace, Sonora sucker, and speckled dace – Impacts from the proposed action would be identical to those described for Gila chub in Section 3.5.8.

Implementation of the MOU would limit adverse effects to habitat; however, direct effect of injury and possibly death from motorized vehicles would remain.

Sensitive Amphibians

Lowland Leopard Frog – Impacts from the salvage operation would be minimized to the maximum extent possible. Barrier construction and stream renovation activities would remove competition from nonnative species and improve conditions for this species, resulting in a long-term beneficial effect. Piscicide application would not affect juvenile or adult frogs; however, tadpoles would be adversely affected if present. Any leopard frog eggs and tadpoles that are detected prior to treatment would be removed and placed in temporary holding tanks for repatriation later. Removal of nonnative fishes would improve conditions for leopard frogs.

Implementation of the MOU would limit adverse effects to habitat; however, direct effect of injury and possibly death from motorized vehicles would remain.

Sensitive Plants

Aravaipa Sage – Aravaipa sage is not known from the project area. The FWS (Mima Falk, FWS, pers. comm.) indicated that few surveys have been conducted for this species and recommended the area be surveyed. This plant would most likely be found on the terrace which will receive little impact from construction. Surveys for this species were conducted on September 15, 2005, by the BLM (Arizona State Office) botanist; no individuals of this species were observed.

Cumulative Effects

Actions that have affected sensitive species in Bonita Creek canyon in the past include physical changes to aquatic and riparian habitat from water diversions, overgrazing, recreation, and road construction and use. Overgrazing and vehicle use has had an effect on riparian resources through increased erosion, scouring or aggradation of floodplain sediment, and loss of vegetation. Removal of livestock from the canyon floor has resulted in significant improvement of the riparian community. The overall reduction in the road network in Bonita Creek has reduced the direct and indirect impacts to sensitive species. Possible future increases in concentrated recreation activity within the stream could adversely affect reintroduced native fishes if such activity is not adequately

managed. The introduction of nonnative fish species has adversely affected native fish and amphibians in the lower segment of stream.

There would be a net benefit for native fish and amphibian conservation through implementation of the proposed native fish restoration project. No long-term adverse effect on sensitive terrestrial species is anticipated.

In addition to upgrading the water system, construction of the fish barrier concludes the known major projects proposed for the lower end of Bonita Creek. For the foreseeable future, the creek will be managed as described in the RNCA Management Plan.

3.5.11 Summary of Impacts to Biological Resources

The majority of impacts (Table 7) to the aquatic biological resources would be beneficial. Native fish (Gila chub, desert and Sonoran sucker, longfin and speckled dace), lowland leopard frog and repatriated fish species (loach minnow, spikedace, desert pupfish, and Gila topminnow) would all benefit from the removal of nonnative, predatory fish from the aquatic ecosystem. Construction of the fish barrier would block the upstream movement of nonnative fish species into the newly renovated reach of Bonita Creek. Some drift of larval and juvenile fish species downstream of the barrier will occur throughout the life of the project. The potential loss of individual fish and/or frog tadpoles from barrier construction or piscicide treatment would be localized and short-term in nature. Activities occurring under the MOU/10-year plan and ongoing management of the RNCA may result in potential loss of native fish, amphibians, and aquatic reptiles. Measures are in place within the MOU/10-year plan to reduce those potential impacts.

There would be no impact to any of the federally listed or sensitive terrestrial wildlife or plant species with the exception of the cuckoo and the bald eagle. Construction activities would occur at the end of the cuckoo breeding season, resulting in the potential disturbance to one territory. Impacts to the bald eagle from implementation of the MOU/10-year plan and barrier construction may affect, but would not likely adversely affect, the species. There would be a potential short-term loss of slow-moving terrestrial species such as small mammals and reptiles during barrier construction.

There would be a permanent loss of 0.2 acres of riparian habitat and a temporary loss of 1.8 acres of riparian habitat from barrier construction. Ongoing maintenance impacts under the MOU/10-year plan would affect approximately 3.6 acres of riparian habitat along the pipeline. Implementation of the MOU/10-year plan would place restrictions on the amount of vegetation clearing permitted, providing increased protection for the biological resources.

Table 7. Summary of impacts to biological resources.

Biological Resource	Beneficial and Adverse Impacts
Habitat	Permanent loss of 0.2 acres of riparian habitat.
	Temporary impact to 5.4 acres of riparian habitat and 0.4 acres of disturbed habitat.
Wildlife	Permanent loss of 0.2 acres of habitat for small mammals, reptiles, amphibians, and avian species.
	Loss of slow-moving species (small mammals, reptiles, and amphibians) in the construction zone.
	Long-term restrictions to movement for some amphibians and aquatic reptiles.
	Temporary noise disturbance to wildlife in the immediate project area.
Aquatic Resources	Long-term beneficial effects to native fish, aquatic reptiles, and amphibians from removal and exclusion of nonnative fish
	Temporary impact to stream channel through diversion and construction activities
	Losses of drifting fish larvae and displace juvenile and adults.
	Loss of nonnative and some native fishes due to chemical or mechanical treatment of the stream, construction activities, and operation and maintenance activities for Safford's pipeline and road system.
	Temporary impact to stream channel through diversion and construction activities, and potential change of instream habitat types in the sedimentation zone.
	Long-term restrictions to movement for some amphibians and aquatic reptiles.
Special Status and Sensitive Species	Long-term beneficial effect to Gila chub, Gila topminnow, desert pupfish, loach minnow, spikedace, and lowland leopard frog.
	Potential loss of individual fish and frogs from barrier construction, stream renovation, road and pipeline maintenance activities, and ongoing management activities under the RNCA Management Plan.
	Potential short-term impact to yellow-billed cuckoo from habitat loss.
	Potential effect to the bald eagle from barrier construction, stream renovation, and operation and maintenance activities associated with the pipeline and road system.

Mitigation

- Pursuant to the CWA Section 404 permit issued by the COE for the 12 fish barriers required under the 2001 CAP biological opinion, Reclamation agreed to mitigate impacts for all the barriers in one location prior to actual construction activities. Reclamation purchased a Conservation Easement (CE) on 1,420 acres of land encompassing 300 acres of riparian habitat, creating a "mitigation bank". As the barrier projects are completed, the mitigation required for each barrier would be determined and then subsequently subtracted from the 300 acres of riparian habitat total until all acres have been utilized.

  On September 12, 2003, Reclamation placed a CE on 1,420 acres of the 2,100-acre 3 Links Farm owned by TNC. The property is located along the San Pedro River approximately 15 miles north of Benson in Cochise County, Arizona (Sections 27, 28, 33, and 4, Township 14 South, Range 20 East; and 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 property by TNC, the perennial reach of the San Pedro River on 3 Links Farm was only 0.5 miles long. Riparian growth and development had been restricted as a result of the continuous groundwater withdrawal to support agriculture. The riparian community consists of a band of Fremont cottonwood, Goodding willow, saltcedar, and patches of coyote willow (*Salix exigua*). 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.

TNC has subdivided 3 Links Farm into five parcels and placed identical easement restrictions on their parcels. Reclamation's easement (which includes three parcels) would preserve and protect, in perpetuity, the open space and natural features of 1,420 acres on the upper portion of the property. 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 within each subdivided parcel, (3) designated a 300-acre riparian corridor, along the San Pedro River which prohibits among other things cattle grazing, woodcutting, vehicular traffic, and development. Vegetation enhancement of the riparian corridor has begun to occur following cessation of groundwater pumping and will be ongoing throughout the construction of all of Reclamation's fish barriers (estimated to occur over 15-years). Despite long-term drought conditions, the perennial reach is slowly increasing in length.

Reclamation conducted limited surveys on the mitigation property for the past 3 years. In 2004, Reclamation documented the southernmost-known breeding population of southwestern willow flycatchers. A total of six nesting territories were observed on 3 Links Farm (three of which were on Reclamation's easement). In 2005, a total eight nesting territories were documented (five on Reclamation's easement). A total of 12 nesting territories were identified during the 2006 surveys (eight on Reclamation’s easement).

Impacts to terrestrial habitat along Bonita Creek from project construction would be mitigated at a ratio of 10:1 at 3 Links Farm. This mitigation ratio is stipulated in the CWA 404 permit. Approximately 2.6 acres of habitat would be impacted at Bonita Creek. Consequently, a total of 26 acres will be subtracted from the "mitigation bank."

- If any federally listed species (other than fish) are identified in the project area, construction activities would be halted until appropriate 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 revegetated 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.

- Construction personnel would be instructed not to collect, disturb, or molest wildlife species.

- Contractor would comply with the statutes of the Arizona Native Plant law.

- Reclamation would conduct 1 year of post-project, yellow-billed cuckoo surveys to observe potential changes in yellow-billed cuckoo territory locations.

- Safford would consult with the BLM prior to constructing any temporary roads, relocating roads, diverting stream flow, breaching beaver dams, and clearing vegetation beyond the 15-foot pipeline limit or if nesting wildlife is found.

3.6 Cultural Resources

3.6.1 Affected Environment

Cultural resources recorded in Bonita Creek canyon consist of numerous historic and prehistoric cultural sites, including well-preserved cliff dwellings, cliff art (both petroglyphs and pictographs), scatters of chipped stone and pottery, and old homestead sites (BLM 1994). Historic use of the canyon has resulted in degradation of cultural sites from pilfering, vandalism, and ground-disturbing activities.

A Class I survey (literature review) indicated that six historic and three prehistoric sites occur within a 1-mile radius of the proposed fish barrier site. Most of these are located within the Bonita Creek canyon, but none are in the area to be affected by the barrier construction. Some Arizona State Museum (ASM) and BLM site numbers overlap, particularly for the historic sites located at the mouth of Bonita Creek. In this area AZ CC:3:2(ASM), also recorded as AZ CC:3:31(BLM), appears to include both the 1846 Kearney Camp Site (listed on the National Register of Historic Places) as well as nearby historic buildings. These historic buildings include the Bonita Creek Stone House that has also been recorded as AZ CC:3:109(ASM) and AZ CC:3:56(BLM) as well as a collapsed structure. Twelve small archaeological surveys have been undertaken by BLM within 1 mile of the barrier site, but none were in the immediate fish barrier area. A house foundation with the remains of out-buildings and corrals is situated upstream and outside of the area of potential effect for fish barrier construction. This may be the

Bienes-Chacon Ranch (Site BC-4) noted by Hadley et al. (1993) in their ethnoecological study of the Bonita Creek watershed.

A Class III survey (intensive inventory) of the proposed fish barrier site and surrounding area of potential effect identified no cultural resources. Much of the affected area is in the active floodplain and streambed of Bonita Creek, with most stable surfaces to be found on terrace remnants along the canyon edges. The canyon faces were checked for small rock shelters and rock art as well, but none were located. No cultural material was detected at the two potential upland contractor-use areas.

Nine Native American tribes were contacted by mail to determine their interest in the proposed project. The aim of these contacts was to open a dialogue with tribes that might have historical or ancestral affiliation to the area in order to identify traditional cultural properties or sacred sites that may be affected by the project. No responses were received from these tribes.

3.6.2 Environmental Consequences

No Action

Cultural resource monitoring and protection measures and providing educational information would continue to be implemented on an as-needed basis.

Proposed Action

No historic or prehistoric cultural resources, artifacts, or features were identified during the intensive survey of the area of potential effect for fish barrier construction. Much of the area is within a relatively active floodplain where recurrent erosion and aggradation have negatively affected the integrity of surviving strata. No cultural resources were noted on the more stable terrace remnants or visible cliff walls. Construction of the fish barrier would have no effect on cultural resources.

Application of the piscicide would require utilization of an existing public road to transport personnel and equipment along 1.7 miles of stream. Pedestrian traffic between the road and stream during fish salvage and treatment operations would have a trampling effect on soils within the active floodplain. Like the fish barrier site, substrates within the affected streamside corridor have been substantially altered by depositional and erosional forces associated with floods and lateral migration of the stream channel. Consequently, no effect on cultural resources is anticipated from piscicide treatments.

Implementation of the MOU concerning operation, maintenance, and possible expansion of the Bonita water system would not affect cultural resources within the Bonita Creek watershed. The MOU does contain actions specifically pertaining to cultural resource monitoring and protection, and the education of cultural resources through law enforcement and park ranger patrol, visitor contact, and an outdoor classroom lesson plan.

Cumulative Effects

There are no cumulative effects of the project on cultural resources.

Mitigation

No mitigation is recommended.

3.7 Environmental Health and Public Safety

3.7.1 Affected Environment

Bonita Creek canyon is an unpopulated and relatively remote feature of the RNCA. Public access to the project area is provided by Bonita Creek Road, which crosses Bonita Creek approximately 700-feet upstream from the proposed fish barrier site then proceeds north through the canyon to the infiltration gallery. Bonita Creek Road also goes south 5 miles to Bull Gap Road intersecting the barrier site along the way. Bonita Creek Road is accessible only by high clearance, four-wheel-drive vehicles.

3.7.2 Environmental Consequences

No Action

Existing conditions would prevail into the foreseeable future. Routine access roads and other facility operation and maintenance and possible water system expansion work could lead to visitor accidents.

Proposed Action

The fish barrier site would be closed to the public during construction to obviate potential visitor accidents. Following construction, the public would be alerted to the presence of the barrier by cautionary signage placed along the segment of road leading to the site.

The piscicides rotenone and antimycin have been widely used in the United States and Canada for several decades. Despite the lack of any known public health effects from use of these pesticides for fisheries management, concerns have been raised regarding potential public safety and health risk. As with any pesticide, direct exposure to piscicides at full strength can produce harmful effects on humans. Public health issues surrounding the use of rotenone and antimycin in fisheries management have been studied extensively (see Appendix C). In general, the EPA through Federal Insecticide, Fungicide, and Rodenticide Act certification has concluded the use of rotenone and antimycin for fish control in accordance with label instructions does not present a risk of unreasonable adverse effects to humans and the environment (Finlayson et al. 2000).

Neither piscicide persists in the environment. Antimycin degrades rapidly in stream water because of the oxidation action created by stream turbulence, interaction with organic substances, and exposure to sunlight (Lee et al. 1971). Higher water temperature and pH also increase the efficacy and rate of degradation of antimycin (Chapman et al. 2003). In warm-water streams, oxidation of antimycin can be complete within 24 to 96 hours (Walker et al. 1964, Lennon 1970). A detailed review conducted for Catron and Grant Counties in New Mexico found that antimycin posed no known threat to public health when applied according to label instructions at concentrations used for fish control.

Rotenone is also very unstable in stream water (half-life measured in days) and completely breaks down within 1 to 4 weeks depending on pH, alkalinity, temperature, dilution, and exposure to sunlight (Schnick 1974b). In addition to EPA's general finding of no unreasonable adverse effects, Finlayson et al. (2000) noted the California Environmental Protection Agency found that "adverse impacts from properly conducted, legal uses of liquid rotenone formulations in prescribed fish management projects were nonexistent or within acceptable levels."

Rapid neutralization occurs when antimycin (Marking and Bills 1975) and rotenone (Engstrom-Heg 1971, 1972, 1973; Finlayson et al. 2000; Lay 1971) are mixed with permanganate compounds such as potassium or sodium permanganate. Application of permanganate compounds would prevent migration of the piscicide outside the treatment area. The breakdown components of the piscicides and permanganate compounds have no known deleterious environmental effects when used in concentrations for fisheries management.

The major risks to human health from rotenone and antimycin come from accidental exposure during application. This is the only time when humans (applicators) are potentially exposed to high concentrations of the piscicide. Personal protective equipment is required by the product labels and material safety data sheets to reduce respiratory and dermal exposure. For liquid and powder formulation application, personnel must wear approved safety gear, including goggles, rubber gloves, and protective clothing to avoid direct exposure to undiluted chemical media.

Any potential threats to public health during piscicide application would be ameliorated through temporary closure of the treatment area. Proper warning through news releases, cautionary signing at access points, and personnel stationed in the treatment area would be adequate to prevent public exposure to treated water.

Implementing the MOU would limit water system operation, maintenance, and possible capacity upgrade to weekdays, if at all possible. This action would reduce the potential for visitor accidents that might result from water system-related work during the highest use periods on the weekends.

Cumulative Effects

There would be no cumulative effects.

Mitigation

- Applicators would be trained and certified to apply the piscicide in use.
- Piscicide application would adhere strictly to the product label instructions.
- Supplemental detoxification stations using permanganate compounds would rapidly neutralize the piscicide at the lower end of the treatment area.
- The treatment area would be closed to the public during application of the piscicide (2 to 3 days in total).
- Dead fish would be collected and buried on site.

3.8 Air Quality

3.8.1 Affected Environment

Air quality is determined by the ambient concentrations of pollutants that are known to have detrimental effects. The U.S. Environmental Protection Agency (EPA) 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 by EPA 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. Graham County is in attainment for all criteria pollutants. Ambient air quality in the project area is considered good.

The EPA has also established classes of air quality. Class 1 status under Section 162(a) of the Clean Air Act is designated for specified geographic areas where the cleanest and most stringent protection from air quality degradation is considered important. Class 1 areas include national parks over 6,000 acres and national wilderness areas over 5,000 acres. There are no Class 1 airsheds near the project area.

The area encompassing the RNCA is representative of climates associated with high desert in Arizona. Traffic on unpaved roads emits sporatic and highly localized increased levels of fugitive dust. On a regional scale, wildfires and high winds can contribute to temporary increases in the levels of atmospheric particulate matter.

3.8.2 Environmental Consequences

No Action

Existing conditions would prevail into the foreseeable future. Short-term dust emissions from routine use of access roads and other facility operation and maintenance and the possible system expansion would continue.

Proposed Action

During construction of the fish barrier, fugitive dust emissions would result from excavation and grading of alluvium within the stream channel. Dust emissions would be expected to vary depending on the level of activity, specific operation and location, and level of moisture encountered in floodplain soils. The majority of direct effect to air quality would result from construction vehicles transporting employees and equipment over unpaved roads. Integration of dust suppression BMPs would minimize the impact of particulate emissions on air quality. In addition, the operation of construction vehicles and equipment would produce tailpipe combustion products such as nitrogen oxides, carbon monoxide, sulfur oxides, and reactive organic gases which would have a minor, short-term affect on air quality.

Under the MOU, disturbances would continue from routine access road maintenance and construction and other facility maintenance and operation. Dust and emission impacts to air quality would be short term.

There would be no long-term, adverse impacts to air quality that would result from the Proposed Action.

Cumulative Effects

Emissions from implementation activities would be incremental to other sources of air pollution within the project area and regional airshed. The cumulative effects of the project on air quality would be low.

Mitigation

- Roads and active construction areas would have watering requirements to limit dust generation.

- Corrective repairs or adjustments would be required for construction equipment and vehicles that show excessive tailpipe exhaust emissions.

3.9 Noxious Weeds

3.9.1 Affected Environment

Under Executive Order 13112, dated February 3, 1999, projects which occur on Federal land or receive Federal funding must use relevant programs and authorities to: (1) prevent the introduction of invasive plant species, (2) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner, (3) monitor invasive plant species populations accurately and reliably, and, (4) provide for restoration of native plant species and habitat conditions in ecosystems that have been invaded.

Noxious weeds are species of invasive plants identified by governmental agencies as exerting substantial negative environmental or economic impact. The term "noxious weed" is a legal classification, not an ecological term. Infestations of noxious weeds are most likely to occur in disturbed areas such as construction sites, road shoulders, and fallow agricultural fields.

The project area is not located in a designated Weed Management Area or areas of known noxious weed populations.

3.9.2 Environmental Consequences

No Action

Disturbances produced from routine access road maintenance and construction and other facility operation and maintenance may lead to the inadvertent spread of noxious weeds.

Proposed Action

The proposed native fish restoration project introduces low risk for noxious weed spread. Preventative measures would be employed to prevent importation of noxious weeds into the project area.

Implementation of the MOU would stipulate power-washing vehicles and heavy equipment before beginning maintenance work on the water system, which would lower the risk of weed introduction.

Cumulative Effects

There would be no cumulative effects of the project on noxious weed populations.

Mitigation

- Heavy construction vehicles and equipment would be power washed before entering the project area.

- Weed-free erosion control material (hay bales, ground matting, etc.) would be used.

- Contractor-use areas on upland sites would be reseeded with a weed-free native seed mix.

3.10 Hazardous Material and Solid Waste

3.10.1 ffected Environment

The project area consists of a relatively pristine stream and riparian corridor surrounded by high desert. No sites contaminated with hazardous or non-hazardous solid wastes are known to occur within the area potentially affected by the project. 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.

3.10.2 Environmental Consequences

No Action

Existing conditions would prevail into the foreseeable future. Use of power generators in the floodplain for emergency operation of the water system may lead to diesel fuel contamination in the stream if the generators are overwhelmed by a large flood. Safford would follow spill procedures as contained in 40 CFR 112.7, 112.21 and 29 CFR 1910.120 (q).

Proposed Action

The project would require the short-term use of limited quantities of fuels, lubricants, and other fluids that would be used to power and operate construction equipment. These materials would be managed in accordance with Federal and state regulations. Any spills or leaks of hazardous material would require immediate corrective action and cleanup to minimize the impact on sensitive resources.

If on-site storage occurs, lubricants and fuel would be placed in temporary, clearly marked, aboveground containers, which would be provided with secondary containment. Storage of petroleum and other chemicals would occur outside of the 100-year floodplain of Bonita Creek. Construction equipment would be maintained and inspected regularly. Any soil contaminated by fuel or oil would be removed and disposed of by a contractor to an appropriately permitted disposal facility.

Minor amounts of nonhazardous solid waste would be generated by construction. This waste would be disposed of in a state-approved, solid waste landfill. 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.

Use of power generators in the floodplain for emergency operation of the water system may lead to diesel fuel contamination in the stream, if the generators are overwhelmed by a large flood. Safford would follow spill procedures as contained in 40 CFR 112.7, 112.21, and 29 CFR 1910.120 (q).

Cumulative Effects

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

Mitigation

- A Spill Containment Plan would be prepared for the proposed native fish restoration project.

- All construction equipment used in construction of the fish barrier would be periodically inspected for leaks. Any significant leaks would be promptly corrected. No vehicle maintenance would be performed within the 100-year floodplain.

- Secondary containment would be provided for all on-site hazardous materials and hazardous waste storage, including fuels and lubricants used in construction of the fish barrier. In particular, fuel storage (for construction vehicle and equipment) would be a temporary activity occurring only for as long as is needed to support construction activities. All storage would occur at the designated contractor-use areas outside the 100-year floodplain of Bonita Creek.

- A storm water pollution prevention plan would be required for the fish barrier construction site to ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water and other media.

- All waste would be removed from the fish barrier site following construction and transported to an appropriately permitted disposal facility.

CHAPTER 4 - AGENCIES AND PERSONS CONSULTED

List of Preparers

John McGlothlen, Reclamation, Environmental Protection Specialist
Robert Clarkson, Reclamation, Fishery Biologist
Diane Laush, Reclamation, Wildlife Biologist

Other Contributors

Andrew Ashby, Reclamation, Civil Engineer
Richard Boston, Reclamation (formerly), Archaeologist
Bryan Lausten, Reclamation, Archaeologist
Brad Prudhom, Reclamation, Geologist
Heidi Blasius, BLM, Fishery Biologist
Jeff Wilbanks, BLM, Lead Outdoor Recreation Planner
Melissa Amentt, BLM, Hydrologist
Tim Goodman, BLM, Wildlife Biologist

List of Agencies and Persons Consulted

Chamber of Commerce:

Graham County Chamber of Commerce
Greenlee County Chamber of Commerce

County Agencies:

Graham County (Board of Supervisors)
Graham County (County Manager)
Greenlee County (County Manager)
Greenlee County (Board of Supervisors)

Indian Communities:

Ak-Chin Indian Community
Fort Sill Apache Tribe
Gila River Indian Community
Mescalero Apache Tribe
Salt River Pima-Maricopa Indian Community
San Carlos Apache Tribe
The Hopi Tribe
Tohono O'odham Nation
White Mountain Apache Tribe

Libraries:

Duncan Public Library
Eastern Arizona College Library
Morenci Library
Safford/Graham County Public Library

Towns and Cities:

City of Safford (City Council)
City of Safford (Mayor)
City of Safford (Public Works Director)
City of Pima
Town of Clifton
Town of Duncan
Town of Thatcher

State Agencies:

Arizona Department of Environmental Quality
Arizona Department of Water Resources
Arizona Game and Fish Department
Arizona Office of Tourism
Arizona State Historic Preservation Office
Arizona State Land Department

Federal Agencies:

Bureau of Indian Affairs (San Carlos Agency)
Natural Resources Conservation Service
USDA Forest Service (Coronado and Apache-Sitgreaves National Forests)
U.S. Fish and Wildlife Service
U.S. Army Corps of Engineers
U.S. Geological Survey

Congressional and State Representatives:

Honorable Jon Kyl, Member, U.S. Senate
Honorable John McCain, Member, U.S. Senate
Honorable Rick Renzi, Member, U.S. House of Representatives
Honorable Jack Flake, Member, U.S. House of Representatives
Representative Bill Konopnicki, Member, Arizona House of Representatives

Conservation and Environmental Organizations:

American Fisheries Society (Arizona Chapter)
American Rivers
Arizona Riparian Council
Arizona Wildlife Federation
Center for Biological Diversity
Desert Fishes Council
Friends of Arizona Rivers
Gila Water Partnership
Sierra Club (Southwest Chapter)
Sky Island Alliance
Southern Sierra Research Station (Murrelet Halternman)
The Nature Conservancy (Arizona Chapter)
The Wildlife Society (Arizona Chapter)

Recreation Organizations:

Arizona State Association of 4-Wheel Drive Clubs
Arizona Trails Association
Blue Sky Expeditions
Central Arizona Paddlers Club
Gila Outdoor
Huachuca Hiking Club
Prowlers Off-Road Club
Southern Arizona Hiking Club
Southern Arizona Mountain Bike Club

Resource Advisory Organizations:

BLM Arizona Resource Advisory Council
Gila Box Advisory Committee

Grazing Permittees and Organizations:

Arizona Cattle Growers Association
Leland Stevens (Bull Gap and Tollgate Allotments)
Carolyn Manuz (Twin C Allotment)
Jeff Menges (Zorilla/Smuggler/Bonita Creek/ Johnny Creek Allotments)
Ruskin Lines, Jr. (Turtle Mountain/Morenci Allotments)

CHAPTER 5 - RELATED ENVIRONMENTAL LAWS/DIRECTIVES

The following is a list of Federal laws, Executive Orders, and other directives that apply to the action alternatives discussed in this EA:

National Environmental Policy Act (NEPA) of 1969, as amended - This law 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.

This EA was prepared in accordance with the requirements of NEPA. Scoping information was distributed to more than 160 individuals, organizations, and agencies on June 9, 2005. In addition, a public scoping meeting was held at the Graham County General Services building in Safford on July 14, 2005. Thirty-five people attended the Safford meeting.

Fish and Wildlife Coordination Act (FWCA) of 1934, as amended - The FWCA 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.

Endangered Species Act (ESA) of 1973, as amended - The ESA 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 a fish barrier in Bonita Creek is a required measure of the 2001 CAP biological opinion. The possible effects to listed species resulting from implementation of the Proposed Action were addressed in a biological assessment prepared by Reclamation and BLM and submitted to the FWS in February 2007. The biological assessment concluded a no effect determination to the southwestern willow flycatcher; a may affect not likely to adversely affect the bald eagle; and a may affect will likely adversely affect the Gila chub, loach minnow, spikedace, desert pupfish, and Gila topminnow.

Coordination and consultation with FWS under Section 7(a)(2) of the ESA have been conducted by BLM on other project-level actions that were prescribed in the RNCA Management Plan. Formal consultation has been reinitiated on the RNCA Management Plan (2-21-92-F-070) regarding potential effects of future resource management actions on native fishes proposed for reintroduction.

Migratory Bird Treaty Act (MBTA) of 1918, as amended – The MBTA is the domestic law that implements the United States' commitment to the protection of shared migratory bird resources. The MBTA prohibits the take, possession, import, export, transport, selling, or purchase of any migratory bird, their eggs, parts, or nests.

Implementation of this project would impact approximately 2 acres of riparian habitat. If construction occurs during the breeding season, the project may result in disturbance to nesting birds protected under the MBTA. No vegetation known to contain active nests would be removed.

Clean Air Act (CAA) of 1963, as amended - The CAA requires that 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 associated with the proposed action would have localized and minor effects.

Clean Water Act (CWA) of 1977, as amended - The CWA 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 404 permit for construction of fish barriers required under the 2001 CAP biological opinion, including Bonita Creek, on October 30, 2003. All terms and conditions of the 404 permit would be implemented.

Reclamation received Section 401 Water Quality Certification of the project from ADEQ on June 24, 2003. The 401 Certification was amended with new terms and conditions on March 9, 2006. Coverage under the Section 402 Arizona Pollutant Discharge Elimination System General Permit for construction activities would be obtained prior to construction.

National Historic Preservation Act (NHPA) of 1966, as amended - Federally-funded undertakings that have the potential to affect historic properties are subject to Section 106 of the NHPA. Under this act, Federal agencies are responsible for the identification, management, and nomination to the National Register of Historic Places of cultural resources that would be affected by Federal actions. Consultation with the Advisory Council on Historic Preservation and the State Historic Preservation Office (SHPO) is required when a Federal action may affect cultural resources on, or eligible for inclusion on, the National Register.

Cultural resource surveys of the area of potential effect were conducted by Reclamation in accordance with NHPA Section 106. No significant cultural resources or areas of traditional cultural importance are known in the project area. The SHPO concurred with the no effect determination on December 28, 2004.

Wild and Scenic Rivers Act (WSRA) of 1968, as amended – The WSRA designated the initial components of a National Wild and Scenic Rivers System and established a procedure for selecting additional rivers possessing outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values and preserving them in a free-flowing condition. Free-flowing is defined by the WSRA as: ". . . any river or section of a river . . . existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway. The existence, however, of low dams, diversion works, and other minor structures at the time any river is proposed for inclusion in the national wild and scenic river system shall not automatically bar its consideration for such inclusion; provided, that this shall not be construed to authorize, intend, or encourage future construction of such structures. . . ."

The proposed action was assessed for potential impacts to segments of Bonita Creek and the Gila River that are suitable for inclusion in the national WSRA system. The action would not affect suitability of any listed stream segment.

Resource Conservation and Recovery Act (RCRA), as amended - RCRA 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 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 EPA-approved landfill. Spills and disposal of contaminated media would be managed in accordance with State and Federal requirements.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended – FIFRA requires all persons who apply pesticides classified as restricted use be certified or that they work under the direct supervision of a certified applicator. Aquatic applicators must demonstrate a practical knowledge of the secondary effects that can be caused by improper application rates, incorrect formulations, and faulty application of restricted pesticides. Applicators must have a practical knowledge concerning potential effects on plants, birds, beneficial insects, and other organisms that may be present in aquatic environments.

Piscicides have been used by fisheries managers in the United States for stream and lake renovation projects since the 1930s. Antimycin A and rotenone are registered by EPA for general piscicide use in the United States under FIFRA. Application of antimycin A or rotenone would be under the direction of a certified applicator in accordance with an approved safety plan. The applicator would be charged with ensuring that all label and safety requirements are met. Piscicide applications would be consistent with relevant requirements of FIFRA.

Executive Order 11988 (Floodplain Management) - This Presidential directive encourages 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 project is necessary for the protection of the existing native fish community and potential recovery of listed species. Because the nature of the project requires minor construction in an active channel, no practicable alternative exists. Floodplain effects would be highly localized and minor.

Executive Order 11990 (Wetlands) - This Order directs Federal agencies, in carrying out their land management responsibilities, to take action that will minimize the destruction, loss, or degradation of wetlands and take action to preserve and enhance the natural and beneficial values of wetlands.

There are some very small patches of cattail and bulrush habitat within and near the construction impact area that could be lost due to redirection of stream flow. The impact from the loss of this habitat would be negligible. Redevelopment of this habitat on sites with suitable hydrology is likely following construction. Application of piscicides would not affect wetland plants, functions, or values.

Executive Order 12898 (Environmental Justice) – This Executive Order (EO), dated February 11, 1994, established requirements to address Environmental Justice concerns within the context of Federal agency operations. As part of the NEPA process, agencies are required to identify and address disproportionately high and adverse human health or environmental effect 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 uninhabited land within the RNCA administered by BLM and the City of Safford. No disproportionate impact to low income or minority populations as defined by EO 12898 would result.

Executive Order 13045 (Protection of Children from Environmental Health Risks and Safety Risks) - Requires that proposed Federal projects identify and assess the environmental health risks and safety risks that may disproportionately affect children.

The project area encompasses uninhabited land within the RNCA administered by BLM and the City of Safford. No disproportionate impact to children as defined by EO 13045 would result.

Secretarial Order 3175 (Indian Trust Assets) - Indian Trust Assets are legal interests in assets held in trust by the U.S. Government for Indian tribes or individual Indians. Trust Assets are anything owned that has monetary values, including lands, minerals, water rights, hunting rights, other natural resources, money, or claims.

The project area encompasses land within the RNCA administered by BLM and the City of Safford. The proposed action would not affect Indian Trust Assets.

CHAPTER 6 – LITERATURE CITED

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