RECLAMATION
Managing Water in the West

Final Environmental Assessment

Redfield Canyon Fish Barrier

Graham County, Arizona

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

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Mission Statements

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

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

ACRONYMS AND ABBREVIATIONS

ADEQ	Arizona Department of Environmental Quality
AD	Anno Domini
AGFD	Arizona Game and Fish Department
AgL	Livestock Watering
ASLD	Arizona State Land Department
A&Ww	Warm Water Aquatic Community
BA	Biological Assessment
BLM	Bureau of Land Management
BO	Biological Opinion
CAA	Clean Air Act
CAP	Central Arizona Project
CE	Conservation Easement
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFS	Cubic Feet Per Second
CMA	Cooperative Management Area
COE	U.S. Army Corps of Engineers
CWA	Clean Water Act
cy	Cubic yard
DOI	Department of the Interior
DM	Departmental Manual
EA	Environmental Assessment
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FBC	Full Body Contact
FC	Fish Consumption
FONSI	Finding of No Significant Impact
FR	Federal Register
FWCA	Fish and Wildlife Coordination Act
FWS	U.S. Fish and Wildlife Service
GHG	Greenhouse Gas
MBTA	Migratory Bird Treaty Act
Mg/L	Milligram per Liter
mm	Millimeter
MSO	Mexican Spotted Owl
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
OHWM	Ordinary High Water Mark
PL	Public Law
$PM_{2.5}$	Particulate matter with a diameter of 2.5 microns or less
PM_{10}	Particulate matter with a diameter less than 10 microns
RCRA	Resource Conservation and Recovery Act
Reclamation	Bureau of Reclamation
SHPO	State Historic Preservation Office
TNC	The Nature Conservancy
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service

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CHAPTER 1 -- PURPOSE AND NEED

1.1 INTRODUCTION

The Bureau of Reclamation and the cooperating agencies listed below have prepared this environmental assessment (EA) to analyze the potential environmental effects of construction and operation of a proposed fish barrier in Redfield Canyon, Graham County, Arizona. The proposed action would be implemented pursuant to sections 7(a)(1) and 7(a)(2) of the Endangered Species Act (ESA); Public Law (PL) 93-205, as amended, and the Colorado River Basin Project Act (PL 90-537, as amended).

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

This document is organized into eight chapters and appendices:

- ***Chapter 1 - Purpose and Need***. Chapter 1 presents information on the history of the project proposal, the purpose of and need for the project, and the lead agency's proposal for achieving that purpose and need. This chapter also describes public involvement in the NEPA process and lists environmental issues that were raised during internal and external scoping. .
- ***Chapter 2 - Comparison of Alternatives, including the Proposed Action***. Chapter 2 provides a detailed description of the lead agency's proposed action to meet the stated purpose and need.
- ***Chapter 3 - Affected Environment and Environmental Consequences.*** Chapter 3 describes the environmental effects of implementing the proposed action and no action. Within each section, the affected environment is described first, followed by a discussion of the potential effects of no action and the proposed action.
- ***Chapter 4 - Mitigation Measures***. Chapter 4 identifies measures taken to reduce or compensate for impacts of the project.
- ***Chapter 5 - Consultation and Coordination.*** Chapter 5 identifies persons who contributed to the preparation of this EA and lists agencies and persons consulted during the NEPA process.
- ***Chapter 6 - List of Preparers.*** Individuals who prepared or contributed to preparation of the EA.
- ***Chapter 7 - Environmental Laws and Directives.*** Chapter 7 lists Federal environmental laws and directives that are relevant to the project.
- ***Chapter 8 - Literature Cited***: Chapter 8 lists documents used in preparation of this EA.
- ***Appendices -*** The appendices provide more detailed information to support the analysis presented in this EA.

1.2 BACKGROUND

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

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

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

Human-induced physical impacts to aquatic habitats of the Gila River Basin have resulted from construction of dams for water storage, hydroelectric production, and flood control; dewatering of streams due to surface diversions and groundwater pumping for municipal, industrial, and agricultural purposes; and watershed perturbations arising from historic grazing by domestic livestock, harvesting of timber, mining of commercially valuable ores; and habitat loss due to expansion of human populations (Dobyns 1981, Bahre 1991). Concurrent with these physical impacts has been the widespread introduction and establishment of nonnative aquatic organisms that have biologically polluted native fish

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[1] The 2008 biological opinion on CAP water transfers to the Gila River basin is available at http://www.fws.gov/southwest/es/arizona/Biological.htm.

habitats (Miller 1961, Moyle et al. 1986, Minckley 1991, Fuller et al. 1999, Schade and Bonar 2005, Minckley and Marsh 2009, Stefferud et al. 2009).

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

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

A prominent ichthyologist and conservationist summarized this dire situation by stating: "Native fishes of the American West will not remain on earth without active management, and . . . control of nonnative, warmwater species is the single most important requirement for achieving that goal" (Minckley 1991). Practical and effective alternatives for dealing with nonnative biota are presently limited to chemical or mechanical removal or depletion of undesirable taxa. Inevitably, however, such controls are temporary unless accompanied by measures to prevent their reinvasion. The only viable remedy against reinvasion is to protect a stream drainage with a fish barrier. When accompanied by control of nonnatives upstream, a barrier can effectively segregate natives from nonnatives found downstream. Although there may be potential long-term negative impacts to native biota that can arise from such isolation (see Section 3.4.6), the immediate need is to protect remaining populations against imminent local extirpation. Two reports that specifically reviewed fish barriers in the Gila River basin concluded that barriers are often the only feasible technology to segregate and protect imperiled native fishes (Carpenter and Terrell 2005, Clarkson and Marsh 2010). The same approach to recovery planning for federally-listed trouts across the West has improved or minimally halted further deterioration of their conservation status (Rinne and Turner 1991, Young 1995, Thompson and Rahel 1998, Avenetti et al. 2006, Pritchard and Cowley 2006).

Reclamation's barrier construction program emphasizes streams that can be secured to prevent extinction and stabilize existing rare stocks of native fishes, or that can be renovated to replicate rare stocks of native fishes, especially loach minnow and spikedace that appear to be declining at a faster rate than many other species.[2] Among the streams considered, Redfield Canyon is particularly noteworthy because it sustains a rare population of, and designated critical habitat for, endangered Gila chub.

1.3 PURPOSE AND NEED FOR ACTION

The proposed action is needed to meet a key conservation measure of the 2008 BO, which requires a fish barrier in Redfield Canyon "to protect existing populations of Gila chub and Chiricahua leopard frog and facilitate replication of Aravaipa Creek populations of spikedace and loach minnow" (FWS 2008). Between 2007 and 2010, the native fish assemblage in Redfield Canyon was supplemented with loach minnow, spikedace, Gila topminnow, and desert pupfish. Construction of the proposed barrier would protect the resident and repatriated[3] populations of federally listed fishes and Chiricahua leopard frog against potential future upstream invasion of nonnative aquatic organisms from the San Pedro River. Sustaining viable populations of these species in Redfield Canyon would be an important step toward their conservation and recovery.

1.4 PROJECT LOCATION

Emplacement of the fish barrier is proposed on Redfield Canyon Creek in Section 36 of Township 11 S, Range 19 E, of the Gila and Salt River Baseline and Meridian (Figures 1 and 2). The proposed site is approximately 8.2 linear miles (9.5 stream miles) upstream of the confluence with the San Pedro River. A potential contractor use area for staging construction materials and equipment has been identified along a two-track road on the south rim of Redfield Canyon in NE¼ SW¼ of Section 36 (Figure 2). Access to the staging area would require use of this road by construction personnel. Lands that would be affected by staging activities along the south rim are owned and administered by the Arizona State Land Department (ASLD).

1.5 DECISION FRAMEWORK

The Responsible Official for implementing the proposed action is the Area Manager of Reclamation's Phoenix Area Office. The Area Manager must decide whether to authorize the expenditure of funds to implement the proposed action, modify the action, or take no action. If the EA demonstrates that there are no significant effects, the Area Manager would record this determination in a Finding of No Significant Impact (FONSI) and approve funding for construction of the fish barrier and acquisition of land. A decision to implement the proposed action would be posted on Reclamation's Phoenix Area Office web site at http//:www.usbr.gov/lc/phoenix.

[2] The status of loach minnow and spikedace is declining rangewide, and the FWS has found that petitions to uplist these species to endangered is warranted (Federal Register 59(131):35303-35304).
[3] Repatriation is defined as the intentional release of individuals of a species into an area formerly occupied by that species (Reinert 1991).

1.6 PUBLIC INVOLVEMENT

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

A scoping notice soliciting public comment on the proposed fish barrier was distributed to potentially interested individuals, organizations, and agencies on October 8, 2010. Reclamation also posted the scoping notice on its Phoenix Area Office web site and submitted news releases regarding the proposal to 13 news media outlets including the *Arizona Republic*. Nine comment letters and emails were received by Reclamation in response to the scoping notice.

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

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

- Effects of the project on livestock access. See Section 3.1.
- Effects of the project on soils and geology. See Section 3.2.
- Effects of the project on water quality and quantity. See Section 3.3.
- Effects of the project on biological resources. See Section 3.4.
- Effects of the project on cultural resources. See Section 3.5.

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

Draft EA. A draft EA was distributed to potentially affected or interested individuals and agencies for public review during a formal comment period from May 26, 2011, to June 27, 2011. The draft EA was also posted on Reclamation's Phoenix Area Office web site. Reclamation received 7 comment letters and e-mails on the draft EA (see Appendix C). Comments generally expressed support for the proposed action and/or provided recommendations for reducing disturbances during construction.

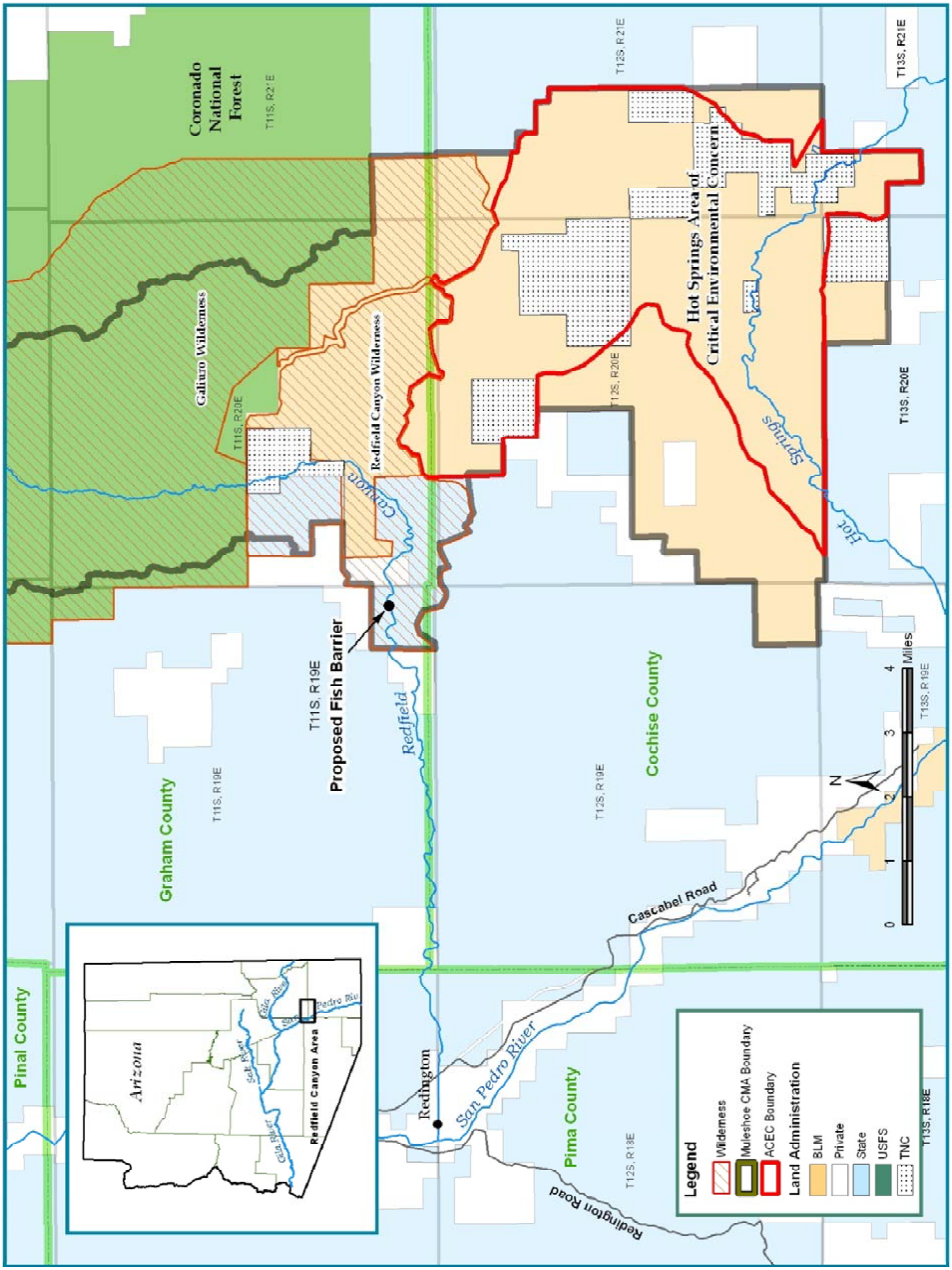

Figure 1. Project location.

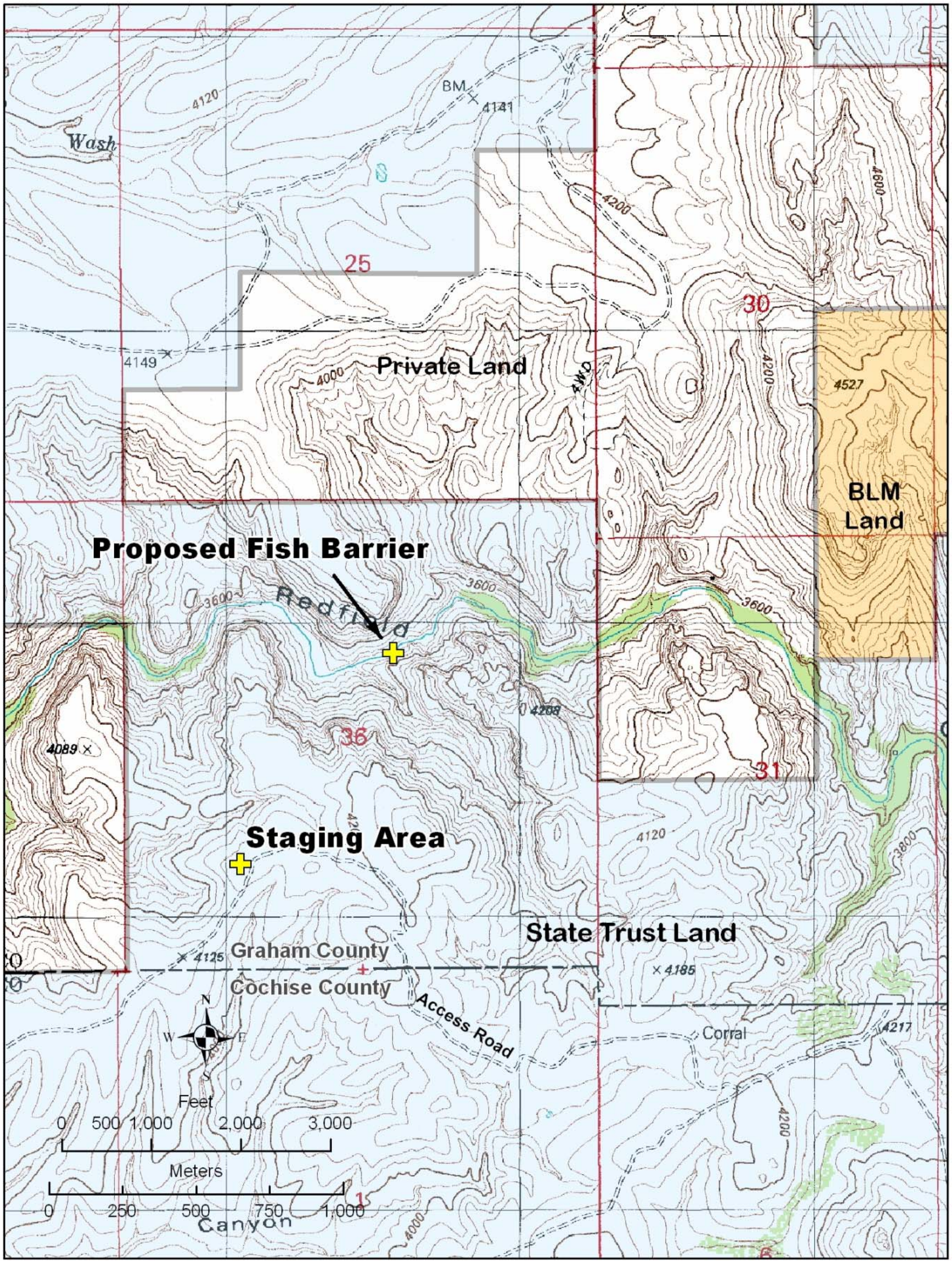

Figure 2. Location of the proposed fish barrier and staging area.

CHAPTER 2 -- DESCRIPTION OF THE ALTERNATIVES

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

2.1 NO ACTION

Section 102(2)(E) of NEPA requires that no action must be considered as an alternative in an environmental review whenever there are unresolved conflicts about the proposed action with respect to alternative uses of available resources. A description of no action is also customarily used in an EA to provide the baseline for comparison of environmental effects of the action alternatives against conditions that are representative of the status quo. As considered in this EA, if no action is taken, Reclamation would not acquire land in Redfield Canyon and construct the proposed fish barrier.

2.2 PROPOSED ACTION

2.2.1 Land Acquisition. Prior to construction, Reclamation would acquire from ASLD the parcel of land on which the fish barrier would be emplaced. The parcel would need to be of sufficient size to facilitate construction and long-term inspection and maintenance. Reclamation has identified a 6-acre parcel that would meet the logistical requirements of the project (see section 1.4 and Appendix A, Figure A-1).

Acquisition would be accomplished through condemnation or relinquishment to the Federal government.[4] The ASLD and Reclamation have determined “friendly” condemnation would be preferable to relinquishment. Condemnation proceedings would be executed in accordance with Rule 71A of the Federal Rules of Civil Procedure (28 U.S.C.), which govern proceedings to condemn real property by eminent domain.[5] Under the condemnation process, ASLD would be paid the appraised fair market value of the land that is acquired. Conversely, under the relinquishment process, a tract of property of similar size and value that is owned by the United States would be exchanged for the desired tract of State Trust Land. Presently, there are no available Arizona lands owned by the United States that the ASLD desires to take in exchange.

2.2.2 Fish Barrier Construction. A construction crew consisting of 4-5 workers would camp on the canyon-floor in an area designated for contractor use (Figure 5). The camp would be equipped with chemical toilets. A second contractor use area would be designated for helicopter landings. Both contractor use areas would be situated on the 6-acre tract of land acquired by Reclamation.

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[4] Reclamation is required to pay the appraised fair market for land it acquires. This requirement precludes submission of bids under the public auction process used by ASLD to sell trust lands.

[5] The property condemnation process is authorized by the Act of August 1, 1888 (25 Stat. 347, 40 U.S.C Sec. 257).

The reinforced, concrete fish barrier would be constructed in four sections to plug the gaps between three 15- to 20-foot diameter boulders and the canyon walls (Appendix B, Figures B-1 and B-2). Each section would have a 4-foot drop onto a sloped, concrete apron. Three sections (2, 4, and 10 feet wide, respectively) would include buried concrete scour walls; a fourth section (21 feet wide) would be built mostly on exposed bedrock. The scour walls would extend to a depth of approximately 10 feet into the channel alluvium. Backfill would be placed along the upstream side of the barrier to prevent impoundment of water. The barrier would be designed to withstand forces associated with a 100-year frequency flood.

The sequence of construction would consist of mobilization (delivery of equipment and setup of the staging area), site preparation (stream diversion, excavation, and dewatering the excavation), construction of formwork, placement of concrete, placement of backfill, and demobilization (site restoration and removal of equipment). Stream flow, if present, would be piped around the active work area. Standard excavation methods would be used to prepare the foundation trench for placement of formwork and concrete. Fluvial material extracted from this trench would be temporarily stockpiled for reuse as backfill. Alluvial deposits adjacent to the foundation trench would be dewatered with shallow subsurface pumps to keep the excavation free of water during construction. Water from these pumps would be discharged to the channel immediately downstream of the work area.

A livestock ramp would be constructed at the right (north) abutment of the fish barrier. The crest elevation of the ramp would be slightly higher than the top of the barrier. Rock would either be mechanically removed or blasted from the sloping canyon wall to provide a suitable walking surface for livestock. Use of explosives by the contractor would need to be approved by Reclamation and comply with Section 24 of the latest edition of Reclamation's Safety and Health Standards. The objective of constructing the ramp is to accommodate the movement of livestock and horses between pastures within ASLD grazing lease 05-83. Without this ramp, the barrier would hinder access through the canyon to permitted grazing areas.

The proposed site is not accessible by roads or trails. Construction materials and equipment would be staged at a road accessible location on State Trust Land along the south rim of Redfield Canyon. Work crews, materials, and equipment (including a small excavator and/or loader) would be airlifted into the canyon by helicopter. Batched concrete would be delivered by commercial mixer trucks to the staging area, where it would be transferred to a sling-load bucket and transported to the work area by helicopter. Concrete would be placed directly from the sling-load bucket into the formwork of the fish barrier. The land requirement for staging is not expected to exceed 0.25 acre. Construction would require approximately 6 weeks. Temporary use of State Trust Land for construction access and staging would require a right of entry from the ASLD.

As an alternative to helicopter transport, the contractor may be permitted to construct a temporary cable tram from the south rim near the staging area to the stream. At least two tram towers would be erected to support the cable and trolley. Equipment, material, and possibly batched concrete would be trammed to the worksite. A tram would substantially decrease the need for helicopter support. The tram would be disassembled and removed following construction. The staging area requirement for this option is also estimated to be approximately 0.25 acre. Temporary use of State Trust Land for this staging option would require a right of entry from the ASLD.

At the end of construction, dewatering pumps would be removed, and any surplus stockpiles of excavated alluvium would be spread in conformance with the predominant contours of the ground surface. All unused construction material would be removed when the project is finished.

2.2.3 Fish Barrier Operation and Maintenance. The fish barrier would become a feature of the CAP. Inspection and maintenance would be performed by the Central Arizona Water Conservation District. Operation of the structure would require annual inspections and inspections after major flood events (5-year frequency or greater). Inspectors would either hike to the barrier from the nearest road-accessible location, or use helicopter transport. Any substantial maintenance or repair requiring materials and equipment that could not be carried to the site would be performed using measures and techniques similar to those described in the above section for barrier construction, staging, and access. Use of State Trust Land to access the fish barrier would require a right of entry from ASLD.

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

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

The optimum barrier design was determined through prior Reclamation experience with construction of similar barriers and criteria developed by the National Marine Fisheries Service (NMFS 2008).

2.2.5 Fish Community Monitoring. A 5-year monitoring program would be established after the fish barrier is constructed to detect any incursion of new nonnative fishes and to monitor success of native fish repatriations. This monitoring would be funded by Reclamation and developed in cooperation with the AGFD, FWS, Bureau of Land Management (BLM), and The Nature Conservancy (TNC). Monitoring by BLM and TNC would likely continue for the foreseeable future as part of the native fish recovery program that was instituted under the Muleshoe Ecosystem Management Plan.

2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Other potential sites for emplacement of a fish barrier were considered but eliminated from detailed analysis during the planning process. Most of the stream channel in Redfield Canyon on State Trust and BLM lands, beginning in Section 34, T11S, R19E, and upstream to Section 31, T11S, R20E, was examined for potential fish barrier sites. The downstream-most site in Section 34 exhibited acceptable bedrock abutments on both sides of the stream, but it was much wider than the proposed site and would have had greater environmental effects. This site was dropped from consideration due to its greater costs. Other potential sites in Section 36 (T11S, R19E) and Section 31 (T11S, R20E) were also wider and hence more expensive to construct. Relative to others, the proposed site appears the most cost-effective and least damaging to environmental resources, while concomitantly providing suitable biological benefit to native fishes and amphibians.

CHAPTER 3 – ENVIRONMENTAL CONSEQUENCES

Resource areas of primary concern that could be affected by the proposed fish barrier project include the following: land use, geology and soils, water quantity and quality, biological resources, cultural resources, and air quality. This chapter describes the existing condition of these resources within the project area and the potential environmental consequences resulting from the construction and operation of the proposed barrier. The consequences of no action also are described for each of the resources identified above. Socioeconomic resources are not expected to be affected and are not discussed in this EA.

3.1 LAND USE AND OWNERSHIP

3.1.1 Affected Environment

The project area is situated on undeveloped and uninhabited State Trust Land, which is owned and administered by the ASLD. This area is within the boundary of the Muleshoe Cooperative Management Area (CMA) and the Redfield Canyon Wilderness. State Trust Lands within the wilderness boundary are not managed as wilderness, nor are they afforded special protection by the ASLD. According to the ASLD mission statement, Arizona State Trust Land is managed to enhance value and optimize economic return to the Trust beneficiaries, consistent with sound land stewardship. Public access requires a State-issued permit, lease, or hunting license, depending on the type of use.

The fish barrier would be constructed in a narrow and remote section of Redfield Canyon with no direct access to roads or trails. There are no records of recreational activity in this section of canyon, and any permitted use is likely to be very light. Travel in the canyon is restricted to foot or horseback only. Approximately 4,000 and 3,000 feet of stream separate the proposed barrier site from the closest downstream and upstream private properties, respectively.

The two-track road that skirts the south rim of Redfield Canyon is legally accessible only to those entities that have authorization to enter State Trust Land. Traffic volumes on that road are quite low. Predominant uses of State Trust Land along the south rim include hunting and grazing. The project area straddles the boundary between ASLD grazing leases 05-83 and 05-679.

There are no prime or unique farmlands, public facilities, wildlife refuges, park lands, or other unique or rare lands within the project area.

3.1.2 Environmental Consequences

No Action

Under the no action alternative, there would be no direct impact to land use, since no project would be constructed. It is assumed that no substantial changes in land use would occur and that current ASLD land-management practices would continue for the foreseeable future.

Proposed Action

Under the proposed action, 6 acres of State Trust Land along the stream would be acquired by Reclamation for construction and long-term operation and maintenance of the fish barrier. This 6-acre tract would be removed from grazing lease 05-83, which represents a 0.003 percent reduction of the 45,514-acre leased area. Land acquired for the project would remain unfenced and accessible to livestock. Temporary use of State Trust Land for construction access and staging along the south rim would be coordinated with the ASLD. Reclamation would obtain a right-of-entry from ASLD to authorize access to, and temporary use of, the staging area. Depending on the method of material and equipment delivery (helicopter vs. aerial tram), the staging area would temporarily occupy approximately 0.25 acre of land within grazing lease 05-679. Activities associated with staging would not substantially affect grazing or other land uses on the leased area. Land use on private property would not be affected.

The fish barrier would present an impediment to movement of livestock and horseback riders within Redfield Canyon. Livestock and horseback riders could access the upper leased segment in the canyon by following higher terrain and side drainages along the north rim; however, travel along this route would be difficult. The south rim of the canyon is much steeper with significant amounts of loose rock, and access to the stream from this approach is more problematic. Consequently, Reclamation proposes to construct a ramp above the right abutment of the fish barrier to accommodate the movement of horses and livestock between permitted grazing areas in the canyon.

The fish barrier would provide an indirect benefit to land use values associated with native aquatic biota on lands administered by TNC, the BLM, and the U.S. Forest Service (USFS) within the upper watershed. Implementation of the project would protect wilderness and other land use values associated with natural ecological processes and functions that otherwise would decline as a result of upstream incursion of nonnative aquatic fauna.

Cumulative Effects – Land Use

Protection of land use values associated with a native fish community would be cumulative to other past, present, and reasonably foreseeable management actions implemented by BLM, USFS, TNC, and others within the Redfield Canyon drainage. The project would have a negligible cumulative effect on other land uses.

3.2 GEOLOGY AND SOILS

3.2.1 Affected Environment

Redfield Canyon lies within the Basin and Range physiographic province, which is characterized by elongated mountain ranges trending northwest to southeast separated by broad alluvial valleys that were produced by a Miocene extensional collapse. Elevations within the Redfield Canyon watershed range from 2,880 feet near the San Pedro River to more than 7,000 feet in the Galiuro Mountains. Tertiary volcanics and conglomerates are predominant rock types in the watershed. Within the project area, steeply sloped rocky escarpments composed mostly of grayish-pink tuff rise more than 500 feet above the stream, creating a narrow, bedrock-lined canyon.

The project area is located in the TS6 soils mapping unit, termed the Lithic Torriorthents-Lithic Haplustolls-Rock Outcrop Association (Hendricks 1985). This association consists of shallow, gravelly and cobbly, strongly sloping to very steep soils and rock outcrop on hills and mountains. Upland soils are formed in residuum weathered from many rock types including basalt, rhyolite, tuffs, gneiss, granite, sandstone, and limestone. Floodplain substrates consist of fluvial deposits and boulders eroded from the surrounding highlands.

Sheer rock walls and massive boulders constrict the stream channel and form the abutments to which the fish barrier would be anchored (Figure 3). At this location, the canyon-floor is approximately 75 feet wide. Flood flows carry a high level of energy through this narrow reach of canyon, which is reflected in the coarse nature of the fluvial deposits. In the project area, the streambed alluvium consists primarily of gravel, cobbles, and boulders with lesser amounts of sand (Figure 4).

3.2.2 Environmental Consequences

<u>No Action</u>

Under the no action alternative, there would be no direct impact to soils and geologic features, since no project would be constructed. Sedimentation from slope erosion and other land surfaces and flood-induced scour would continue to affect soils in the canyon. These effects include aggradation and degradation of the active channel.

<u>Proposed Action</u>

Construction would directly affect approximately 0.78 acre in Redfield Canyon. Within the construction zone, approximately 100 cubic yards (cy) of alluvium would be excavated to construct the scour walls and apron. This material would be stockpiled for reuse as backfill. Construction of the livestock ramp would require the removal of approximately 30 cy of rock from the canyon-wall at the right abutment. Rock extracted from the abutment would be combined with approximately 470 cy of alluvium removed from an adjacent gravel bar (borrow area) to backfill the channel on the upstream side of the fish barrier (see Figure 5; Appendix B, Figure B-2). Backfill would be placed in the channel for a distance of 250 feet upstream of the fish barrier to prevent impoundment of water when surface flow is present. Fill depth would be approximately 4 feet at the barrier and diminish to less than 2 feet at a distance of approximately 50 feet upstream. Beyond this point, the fill would be placed only within the scoured portions of the channel to a maximum depth of 2 feet.

Following construction, flood-transported coarse material would be immobilized immediately upstream of the barrier, forming a shallow layer of bedload deposits over the backfill and existing channel substrates. Local effects include a 0.2 percent reduction in gradient (from 1.5 to 1.3 percent) and aggradation of the active stream channel for approximately 840 feet upstream of the barrier (Figure 5). Short-term capture of relatively small volumes of bedload sediment would have a negligible effect on sediment transport within the stream. Redfield Canyon, like many other desert streams, carries relatively high coarse sediment loads during floods, and the amount of bedload that would be immobilized at the barrier is small compared to the total volume transported within the drainage. Total sediment yield downstream would be consistent with pre-project conditions once streambed aggradation at the barrier has stabilized. No long-term impact on sediment transport within the stream would occur.

Hydraulic changes induced by the barrier are expected to alter scour and depositional patterns in the channel for a distance of approximately 200 feet downstream. Beyond that point, no discernable change in fluvial morphology is anticipated.

Upland effects would be limited to soil disturbances and potential temporary increases in erosion at the staging area.

Cumulative Effects – Soils and Geology

The effects of the proposed project on soils and sedimentation would be incremental to historic, ongoing, and future uses of the watershed. During the past century, natural slope erosion, wildfire, and anthropogenic influences such as livestock grazing have affected rates of sedimentation in Redfield Canyon. In recent decades, grazing has been curtailed in riparian areas on lands managed by BLM and the USFS, but continues to be a prominent use on private property and State Trust Lands within the drainage. TNC has not grazed the Muleshoe Ranch since they acquired it in 1982. The proposed project would not add substantially to the cumulative impacts of these other past, present, and reasonably foreseeable future actions on soils because of the limited scope of the proposal (short implementation duration and relatively small area affected).

Figure 3. Site of proposed fish barrier, looking downstream.

Figure 4. Fluvial deposits downstream of the proposed fish barrier.

3.3 WATER RESOURCES

3.3.1 Affected Environment

Redfield Canyon Creek is a tributary to the San Pedro River, flowing generally south and west approximately 24 miles from the northern portion of the Muleshoe CMA on the Coronado National Forest. The Redfield Canyon watershed covers 62 square miles and encompasses Federal, state, and private lands. Approximately 50 percent of Redfield Canyon occurs on Federal lands within the Redfield Canyon (BLM) and Galiuro (USFS) wilderness areas and on the TNC-managed Muleshoe Ranch CMA. Major tributaries to Redfield Canyon include Gold Gulch and Swamp Springs, Muleshoe, Mitchell, Sycamore, Bear, and Jackson canyons.

There are 7.5 miles of perennial stream within the Redfield Canyon watershed upstream of the proposed fish barrier site (BLM 1998). Approximately 9.5 miles of ephemeral, intermittent, and nearly perennial stream occur between the barrier site and the San Pedro River. Stream flow in the project area is intermittent. A surface water connection is periodically established between perennial reaches in Redfield Canyon and the San Pedro River. Depending on the severity of runoff from winter and monsoon storms, this connection can be sustained from several days to several weeks. In perennial reaches upstream of the project area, average stream flow is estimated to be 3.9 cubic feet per second (cfs) based on data collected by BLM (1998). These data indicate flows are highly variable across seasons and exhibit flashy responses to moderate and major storm events (BLM 1998). Flood flows carry a high sediment load because of erosion from exposed upland slopes and entrainment of soils from channel scour (BLM 1998).

Peak flood flows in Table 1 were estimated by Reclamation using the regression equations from the Arizona Department of Transportation "Methods for Estimating Magnitude and Frequency Floods in Arizona" (Roeske 1978).

Table 1. Estimated peak flood flows at the fish barrier.

Recurrence Interval	Instantaneous Peak Flow (cfs)
2 year	853
5 year	1,916
10 year	2,868
25 year	4,349
50 year	5,652
100 year	7,106

At the proposed fish barrier site, there is an array of boulders that has created a water drop of varying height across the channel. The proposed barrier would plug the gaps between 3 massive boulders within this array and provide a uniform 4-foot drop to ensure that fish cannot migrate upstream beyond the site. Flood flows over the existing boulder jumble have created a shallow scour hole that extends approximately 100 feet downstream.

The Arizona Department of Environmental Quality (ADEQ) sets narrative and numeric water standards for a variety of water pollutants based on the uses people and wildlife make of the water. In Redfield Canyon, uses are designated for fish consumption (FC), agricultural livestock watering (AgL), warm-water aquatic community (A&Ww), and full body contact (FBC). The 2006/2008 Integrated 305(b) Assessment and 303(d) Listing Report indicated that there were no exceedances of water quality standards in Redfield Canyon, although the results were considered inconclusive because of insufficient sampling events during the assessment period (ADEQ 2008).

There are no wetlands, special aquatic sites, or streams that are designated, or recommended for designation, as Wild and Scenic or Outstanding Arizona Waters in the project area.

3.3.2 Environmental Consequences

No Action

Under the no action alternative, there would be no change to existing conditions because no project would be implemented. Environmental factors such as slope erosion and channel scour would continue to affect water resources in the area.

Proposed Action

The U.S. Army Corps of Engineers (COE) regulates the discharge of fill material to waters of the United States, pursuant to Section 404 of the Clean Water Act (CWA), and issues permits for actions proposed within such waters. Jurisdictional, non-tidal waters of the United States regulated by the COE are defined in 33 CFR 328.4 (c) as those that comprise the area of a water course that extends up to the ordinary high-water mark (OHWM), in the absence of wetlands. Based on Reclamation's delineation of the OHWM, approximately 0.23 acre of jurisdictional waters would be affected by the placement of fill material during construction of the fish barrier. This material would consist of 15 cy of structural concrete and 500 cy of coarse alluvium (sand, gravel, and cobbles) and abutment rock redeposited as backfill along the upstream face of the fish barrier. A Clean Water Act (CWA) Section 404 permit and Section 401 water quality certification have been issued for the placement of fill material associated with construction of the proposed fish barrier (see Chapter 5 for additional CWA information).

Stream flow, if present, would be piped around the work area. This bypass would prevent inundation of the work area and minimize the discharge of suspended sediment to flowing water. Streambed disturbances would affect mostly coarse alluvial deposits, which are generally immobile under lower flow conditions (i.e., flow less than a 2-year flood event). Bank disturbances would be confined to bedrock and boulders. During floods, the pattern of localized scour and sediment deposition would be affected by hydraulic changes induced by the barrier. Changes in scour and bedload deposition could affect approximately 200 feet of channel downstream of the barrier. These effects, however, are not expected to be substantially dissimilar to channel scour and deposition that already occur in the stream during high flow events. No change in post-construction suspended sediment concentration in stream water would result.

The placement of backfill along the upstream side of the fish barrier would prevent any impoundment of water and thereby obviate the need to apply to the Arizona Department of Water Resources for a surface water right. There would be no measurable effect on the volume of surface flow available to holders of surface water rights downstream of the fish barrier.

The fish barrier's foundation would be situated on coarse alluvial material, which forms the floor of the canyon throughout the project area. Any shallow subsurface flows that are interrupted by the barrier would pass through deeper, underlying alluvium, or become surface flow that spills over the top of the structure and then is reabsorbed by channel substrates further downstream. There would be no effect on ground-water supplies downstream of the project area.

Cumulative Effects – Water Resources

Historically, livestock grazing, wildfire, and slope instability have influenced the rate of sedimentation and affected water quality in Redfield Canyon. Watershed conditions on BLM-managed portions of the watershed were rated only fair in the 1980s (BLM 1998). Current watershed management on Federal, state, and private lands have improved watershed conditions and water quality is now considered good. Sediment discharge from the project site during construction would be cumulative to other past or present sources of sediment production within the watershed. There would be no long-term cumulative effect on water quality or quantity.

3.4 BIOLOGICAL RESOURCES

3.4.1 Affected Environment – Vegetation

Two major vegetation communities as delineated by Brown (1994 pp 181-203; pp 123-131) occur within the project area: Sonoran Desertscrub and Semidesert Grassland. The Arizona Uplands subdivision of the Sonoran Desertscrub biotic community occurs adjacent to the canyon bottom and extends toward the foothills. The Semidesert Grassland habitat occurs on the ridgetops and mesas. The intermittent and perennial flows within Redfield Canyon sustain a narrow corridor of riparian habitat.

The Sonoran Desertscrub is one of the most diverse deserts in North America. The lower elevation mesa tops and hotter south- and west- facing slopes of Redfield Canyon are dominated by foothill paloverde (*Parkinsonia microphylla)*, saguaro (*Cereus giganteus*), catclaw acacia (*Acacia greggii*), ocotillo (*Fouquieria splendens*), barrel cactus (*Ferocactus acanthodes*), and cholla (*Opuntia*) species. Typical shrub species include triangle-leaf bursage (*Ambrosia deltoidea*), creosotebush (*Larrea tridentata*), and saltbush (*Atriplex* spp.).

The Semidesert Grassland habitat is characterized by biseasonal (summer and winter) precipitation. Representative plant species include: desert spoon (*Dasylirion wheeleri*), beargrass (*Nolina microcarpa*), desert hackberry (*Celtis pallida*), jojoba (*Simmondsia chinensis*), side-oats grama (*Bouteloua curtipendula*), and curly mesquite (*Hilaria belangeri*).

A third biotic community occurs along the stream. The Sonoran Riparian Deciduous Forest and Woodland community (Brown 1994; pp 269-273) along the portion of lower Redfield Canyon that includes the project area consists of mixed stands of Fremont cottonwood (*Populus fremontii*), Goodding willow (*Salix gooddingii*), Arizona sycamore (*Platanus wrighttii*), and velvet ash (*Fraxinus velutina*) with velvet mesquite (*Prosopis velutina*) on the terraces. Redfield Canyon is a steep sided, narrow canyon which restricts the riparian habitat to a narrow band.

3.4.2 Environmental Consequences - Vegetation

No Action

Under the no action alternative, there would be no change to vegetation because no project would be implemented. In the project area, the existing pattern of vegetation loss and regeneration associated with natural flood events would prevail.

Proposed Action

A total of approximately 1.13 acres (Figure 5, Table 2) of riparian habitat would be impacted as a result of implementation of the proposed action. Less than 0.01 acre of stream channel would be permanently impacted by the barrier footprint. Temporary impacts would occur at the contractor use areas; borrow site, barrier construction zone, and the sedimentation zone. Approximately 0.04 acre of stream channel, from the fish barrier to approximately 30 feet downstream, would be utilized for excavation of the barrier site and stockpiling of the materials. The majority of construction activities upstream of the barrier would occur within the sedimentation zone. Barrier construction would impact a mixed stand of riparian trees (velvet ash, Goodding willow, Fremont cottonwood, Arizona sycamore and velvet mesquite) within approximately 30 feet upstream of the fish barrier. Stream diversion and dewatering could potentially impact trees located just outside of the construction zone. However, construction would occur during the fall and/or winter when stream flow in this section of canyon is less likely. Finally, the livestock ramp would be constructed on exposed bedrock resulting in very little impact to vegetation.

In order to preclude water retention upstream of the barrier, the sedimentation zone would partly be backfilled during construction. Most of the fill material would be removed from a small deposition area located approximately 50 feet downstream of the proposed barrier site on river left. The borrow site extends for a distance of 220 feet downstream. Approximately 0.14 acres of stream bottom (including riparian vegetation) would be disturbed by borrow activities. Approximately 500of fill would be deposited in

the channel for a distance of approximately 250 feet upstream of the fish barrier.
No trees would be removed beyond those needed for construction access approximately 30 feet upstream of the fish barrier.

Two contractor use areas (0.6 acres) would be established on the canyon floor to support helicopter operations and afford the construction crew an opportunity to camp onsite. These activities would be situated downstream of the fish barrier (Figure 5). Impacts would be limited to trampled vegetation; no vegetation clearing would be permitted.

Following construction, a zone of sediment deposition would extend approximately 840 feet upstream from the fish barrier, affecting 0.34 acre. Shallow accumulations of sediment would have no long-term impact on mature trees; consequently the greatest impact within the sedimentation zone would be primarily located within the first 50 feet upstream of the barrier where up to 4 feet of backfill would be placed. Revegetation of the sedimentation zone would occur naturally upon stabilization of the stream system.

Table 2. Vegetation impacts (acres) to riparian habitat.

Impact	Riparian
Permanent	
Barrier	0.01
Temporary	
Construction Zone	0.04
Sedimentation Zone	0.34
Contractor Use Areas	0.60
Borrow Area	0.14
Total Acres	1.13

In accordance with a CWA Section 404 permit, all anticipated vegetative impacts (including the entire sedimentation zone) have been mitigated through offsite habitat protection at a 10:1 ratio (refer to Section 3.4.9 for additional information). Seasonal stream flow would re-establish aquatic habitat after the project is completed.

The staging of equipment and supplies along the south rim would result in localized trampling or crushing of vegetation. These effects would be limited to an area encompassing approximately 0.25 acre. Depending on the severity of impacts, the staging may require reseeding with a native plant mixture following construction.

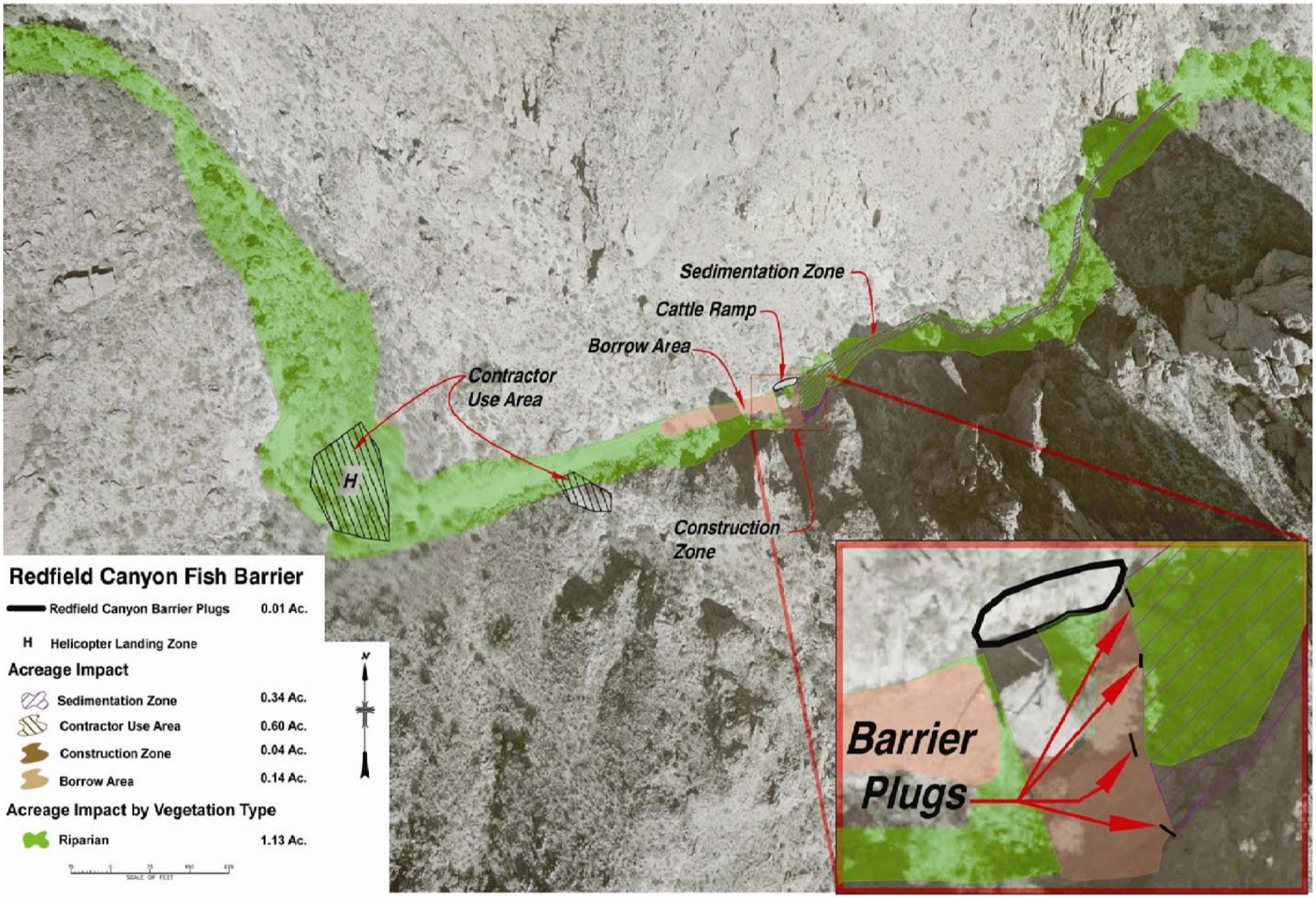

Figure 5. Construction impact zones in Redfield Canyon.

Cumulative Effects – Vegetation

Project effects on vegetation would be incremental to past, present and reasonably foreseeable future actions. Natural and anthropogenic actions that have affected vegetation in the project area include wildfire, drought, flood, and grazing. Vehicle use of roadside areas along the south rim is also evident. The effect of the proposed project on vegetation, when incrementally combined with other natural or human-induced impacts, would be minor and limited in size, scope and duration. Any long-term effect, outside of the footprint of the barrier, would be rendered largely undetectable due to natural regeneration and/or flood cycles.

3.4.3 Affected Environment – Terrestrial Wildlife

Sonoran Riparian Deciduous Forest and Woodland - Riparian vegetation provides habitat for 60-75 percent of Arizona's resident wildlife (Arizona Riparian Council 1994). Wildlife use of riparian habitat is disproportionate to the amount of habitat actually available (Ohmart and Anderson 1986). Although 60 to 75 percent of Arizona's resident wildlife is dependent on riparian habitats, riparian areas occupy less than 0.5 percent of the State's total land area (Arizona Riparian Council 1994).

Riparian areas have been recognized as important habitat for neotropical migrants such as the summer tanager (*Piranga rubra*), Bell's vireo (*Vireo bellii*), yellow-billed cuckoo (*Coccyzus americanus*), and yellow warbler (*Dendroica petechia*).

Large mammals such as black bear (*Ursus americanus*), collared peccary (*Tayassu tajacu*), bobcat (*Felis rufus*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), white-nosed coati (*Nasua narica*), and mule deer (*Odocoileus hemionus*) may utilize riparian habitat as movement corridors. Small mammals typically found in low elevation riparian areas include white-throated woodrat (*Neotoma albigula*), Arizona cotton rat (*Sigmodon arizonii*), striped (*Mephitis mephitis*) and spotted (*Spilogale gracilis*) skunks.

Sonoran Desertscrub - This community is particularly noted for its rich bird life. Some characteristic species include the white-winged dove (*Zenaida macroura*), elf owl (*Micrathene whitneyi*), and pyrrhuloxia (*Cardinalis sinuatus*). Other wildlife species include: mule deer, collared peccary, white-throated woodrat, nectar-feeding bats such as the federally endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuinae*) and Mexican long-tongued bat (*Choeronycteris mexicana*), desert tortoise (*Gopherus agassizzi*), regal horned lizard (*Phrynosoma solare*), western whiptail (*Apidoscelis tigris*), Gila monster (*Heloderma suspectum*), Arizona coral snake (*Micruroides euryxanthus*), and the tiger rattlesnake (*Crotalus tigris*).

Semidesert Grassland - Generally, grassland species have fared less well than their scrub-adapted competitors. Antelope, for example, are now totally absent from large areas of their former range in semidesert grassland, whereas mule deer and collared peccary have extended their ranges (Brown 1994). Wildlife characteristic of the

Semidesert Grassland include: black-tailed jackrabbit (*Lepus californicus*), scaled quail (*Callipepla squamata*), Swainson's hawk (*Buteo swainsoni*), poor-will (*Phalaenoptilus nuttallii*), Scott's oriole (*Icterus parisorum*), ornate box turtle (*Terrapene ornate luteoloa*), desert grassland whiptail (*Apidoscelis uniparens*), and the Mexican hognose snake (*Heterodon nasicus kennerlyi*).

3.4.4 Environmental Consequences – Terrestrial Wildlife

No Action

Under the no action alternative, there would be no new effect to terrestrial wildlife because no project would be implemented. In the project area, existing levels of human-induced disturbances to wildlife species would prevail.

Proposed Action

The area of potential effect to wildlife during construction would be limited to a small portion of Redfield Canyon and the upland staging area. Injury and death of smaller and less mobile mammals and reptiles could result from the operation of equipment. There would also be temporary noise-related disturbances to wildlife from construction and campsite activities. Following construction, there would be a permanent loss of habitat (0.01 acre) for these species at the barrier site.

A fall and/or winter construction schedule is anticipated and therefore impacts to breeding birds would be avoided. However, if construction occurs during the spring, there could be some disruption to nesting avian species near work areas. These impacts would be localized and would vary depending on the individual species' sensitivity to disturbance. For instance, Bell's vireos continued to sing throughout the 2008 breeding season adjacent to the Bonita Creek fish barrier construction site (Diane Laush, Reclamation, personal observation). In order to reduce impacts to raptors and other nesting avian species (if construction occurs during the breeding season), Reclamation would require the contractor to avoid over-flights of the riparian corridor when maneuvering the helicopter between the staging area and the barrier site. If the cable tram option is utilized, there would be minimal impacts to wildlife from construction of the support structures.

The fish barrier would create a hindrance to upstream and/or downstream movement for a limited number of reptiles (primarily snakes, Gila monster and desert tortoise) and small mammals. These impacts would be localized as the home ranges of species potentially affected are relatively small, and many species are capable of overland travel along the slopes of the canyon and adjoining uplands. The presence of a livestock ramp, however, would lessen the impediment to travel along the canyon-bottom for many species. The barrier would have a negligible impact on large mammals.

Cumulative Effects – Terrestrial Wildlife

The cumulative effects to terrestrial wildlife would be directly proportional to the amount of habitat disturbed and the importance or uniqueness of that habitat in the context of the overall landscape. The minor loss of habitat and incremental effect of the proposed project on local wildlife would be predominately short term in nature and negligible.

3.4.5 Affected Environment - Fish and Aquatic Wildlife

The existing native fish assemblage in Redfield Canyon consists of speckled dace, longfin dace, Sonora sucker, desert sucker, and Gila chub. The endangered Gila topminnow and desert pupfish, and threatened spikedace and loach minnow, among others, historically had access to Redfield Canyon, although there are no records of collections of these species from the stream. Following completion of appropriate environmental compliance requirements, AGFD stocked spikedace, loach minnow, desert pupfish, and Gila topminnow into localities in the Redfield Canyon drainage in 2007-2010. All stocking locations were far upstream of the proposed fish barrier site.

Each of these repatriated species has persisted in the Redfield Canyon system through 2010, and there is indication that reproduction and recruitment has occurred (Robinson, AGFD, personal communication). Additional augmentations and monitoring of these species are planned in 2011, and beyond. Although it is not yet known if any of the repatriated federally-listed species have definitively established self-sustaining populations, Reclamation considers them in the context of this EA as established and extant within the Redfield Canyon system. However, the proposed fish barrier site is at an intermittently-watered reach well downstream of the perennially-watered reach of Redfield Canyon, and fishes could access the barrier area only seasonally. This fact is equally relevant to all aquatic and most semi-aquatic species treated in this section.

Lowland leopard frog and Sonora mud turtle are known additional obligate-aquatic vertebrates that inhabit perennial reaches of Redfield Canyon that could be affected by the proposed action. Although Chiricahua leopard frog is shown on AGFD and FWS maps as being in or very near Redfield Canyon, the visual record (likely from the confluence with Jackson Canyon approximately 7 miles upstream of the proposed barrier site) is considered questionable (J. Rorabaugh, FWS [retired], personal communication). In addition, upper Redfield Canyon is within Recovery Unit 4 of the Chiricahua leopard frog recovery plan, but not within the management area that surrounds extant populations and potential recovery sites (FWS 2007). Therefore, we consider Redfield Canyon presently unoccupied by Chiricahua leopard frog, and do not treat the species here.

We consider more common semi-aquatic species such as canyon treefrog, red-spotted toad, Sonoran Desert toad, and black-necked gartersnake to be present near the proposed project area, but we do not treat them here as they are not special status species. The rarer Mexican gartersnake has been recorded from the upper San Pedro River drainage, but there are no records from middle San Pedro River region (Rosen and Schwalbe 1988, Rosen et al. 2001, Holycross et al. 2006).

Nonnative fishes that have been recorded from Redfield Canyon are shown in Table 3. Based on recent surveys it appears that only green sunfish has maintained a small population within the drainage. That species is being actively managed against via ongoing mechanical removal efforts.

Table 3. Nonnative fish species occurrences in Redfield Canyon based on capture records, showing the most recent year of record.

Species	Year
Fathead minnow	1998
Black bullhead	1998
Green sunfish	2010

3.4.6 Environmental Consequences - Fish and Aquatic Wildlife

No Action

In the absence of the proposed project, the potential for upstream invasion by nonnative fishes from the San Pedro River into Redfield Canyon will remain a threat to the persistence of native fishes.

Proposed Action

The proposed 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 Redfield Canyon. These effects should also benefit leopard frog, garter snake, and Sonoran mud turtle populations, in that they have also been shown to be negatively impacted by presence of nonnative fishes (Rosen et al. 1995, Rosen and Schwalbe 1988, 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, because the proposed fish barrier site is downstream of the perennially-flowing reach of Redfield Canyon, this effect is confined to seasonal periods when flows reach the barrier. Thus, minimal genetic effects to fish populations are anticipated.

At the species level, the fish barrier would prevent movements and integration of genetic materials of native fishes derived from other stream systems to Redfield Canyon populations. Genetic communication among diverse populations is desirable to maintain long-term (hundreds 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 San Pedro River). Presence of an array of nonnative fish predators in mainstem rivers like the San Pedro River, coupled with fragmentation of river drainages via stream diversions, channelization, ground-water pumping, reservoirs, and other human-induced changes in flow patterns render long-distance movements of fishes among streams within a drainage unlikely (Fagan et al. 2002). The dire conservation status of many native fishes has rendered the need to protect remaining populations more immediate than ensuring that longer-term evolutionary needs are met (Novinger and Rahel 2003). If obstacles presented by the presence of nonnatives can be removed in the future, the need for the barrier would be eliminated, and it could be removed.

Downstream drift of larvae of native fishes past the barrier could 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 to 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. Fish drift measured in a variety of Salt and Gila River tributaries during May 1985 exhibited similar patterns, with a large majority of drift accounted by suckers (Bestgen 1985).

Distances drifted by native fish species in Redfield Canyon have not been determined, but three lines of evidence suggest that drift losses over the proposed barrier would be negligible. First, drift of larval stages of these species has not been shown to be a significant feature of their life histories, and most drift that occurs is during daylight when drift distances are short (Bestgen et al. 1985). Second, a study of native fish drift in Aravaipa Creek, Arizona, determined that drift of longfin dace, desert sucker, and Sonora sucker was relatively short (on the order of tens of meters; Remington 2002). Third, the proposed fish barrier location in Redfield Canyon is downstream of perennial water, further limiting the potential for fish drift over the barrier. Therefore, unless drift transport distances are relatively long (several kilometers or more) and flows during larval grow-out periods reach the barrier site, large losses from this avenue are not expected.

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

As with early life stages of native fishes, floods that occur during larval development of leopard frogs have the potential to decimate a given year’s cohort. Such effects would occur with or without the presence of the fish barrier, however. In the absence of flooding during larval development, downstream losses of larvae of leopard frogs over the barriers should be minor, since sites of oviposition and larval rearing are in areas of slack water with relatively little potential for entrainment in currents that could transport larvae downstream. Significant downstream drift of amphibian larvae in streams has not been noted in the scientific 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. It is not expected that the Redfield Canyon fish barrier would form a complete barrier to upstream movements by terrestrially mobile adult frogs, gartersnakes, Sonora mud turtle, beaver, or other aquatic and semi-aquatic vertebrates. The ramp proposed to be constructed to facilitate passage by livestock past the right abutment will also accommodate movements of other species. Other impacts to aquatic reptiles and amphibians would be similar to those just described for fishes.

Impacts to instream 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 immediately upstream of the barrier. Decreases in mean sediment size, and increases in channel sinuosity and braiding are other possible localized effects associated with lower gradient. Gradient of Redfield Canyon at the proposed barrier site is about 0.2 percent, limiting the extent of streambed aggradation to approximately 840 linear feet.

Cumulative Effects - Fish and Aquatic Wildlife

Under the no action alternative, there would be no direct impact to fish and aquatic wildlife, since no project would be constructed or implemented. There would be short-term benefit to the native fish assemblage in upstream waters if ongoing nonnative fish removal efforts are successfully conducted by AGFD. However, without emplacement of a fish barrier, nonnative fishes would likely continue to move upstream into the Redfield Canyon and suppress native populations of fish, amphibians, and semi-aquatic reptiles. The no action alternative would allow ongoing and increasing adverse impacts that could contribute to an increased need for Federal listing of unlisted species and increase the likelihood of continued decline of listed species.

3.4.7 Affected Environment – Federally Listed Species

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

Table 4. Federally listed and candidate species in Graham County.

Common Name	Scientific Name	Status
Apache trout	*Oncorhynchus apache*	Threatened
Arizona cliffrose	*Purshia subintegra*	Endangered
Chiricahua leopard frog	*Lithobates [Rana] chiricahuensis*	Threatened
Desert pupfish	*Cyprinodon macularius*	Endangered
Desert tortoise	*Gopherus agassizii*	Candidate
Gila chub	*Gila intermedia*	Endangered
Gila topminnow	*Poeciliopsis occidentalis*	Endangered
Headwater chub	*Gila nigra*	Candidate
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	Endangered
Loach minnow	*Tiaroga cobitis*	Threatened
Mexican spotted owl	*Strix occidentalis lucida*	Threatened
Mount Graham red squirrel	*Tamiasciurus hudsonicus grahamensis*	Endangered
Northern Mexican gartersnake	*Thamnophis eques megalops*	Candidate
Razorback sucker	*Xyrauchen texanus*	Endangered
Roundtail chub	*Gila robusta*	Candidate
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered
Spikedace	*Meda fulgida*	Threatened
Yellow-billed cuckoo	*Coccyzus americanus*	Candidate
Wet Canyon talussnail	*Sonorella macrophallus*	Conservation Agreement

Due to the lack of suitable habitat in the project area and/or because the current range for the species is outside of the project, we have determined that the following species do not occur in the project area and are not considered further: Apache trout, Arizona cliffrose, Chiricahua leopard frog, headwater chub, Mount Graham red squirrel, Northern Mexican gartersnake, razorback sucker, and roundtail chub.

The 2008 CAP BO addressed impacts to aquatic species for barrier construction. The FWS determined in the BO that further Section 7 consultation on listed aquatic species covered under the opinions was not required for fish barrier construction (Doug Duncan, FWS, pers. comm.). Consequently, the following fish species are discussed in this EA but are not considered in the Biological Assessment (BA): Gila chub, desert pupfish, Gila topminnow, loach minnow, and spikedace. A BA submitted to the FWS in May 2011 (for informational purposes only) concluded “no effect” to the Mexican spotted owl, southwestern willow flycatcher, and lesser long-nosed bat. All federally protected species that may occur in the project area are discussed below.

Lesser long-nosed bat - The lesser long-nosed bat is one of three leaf-nosed bats in Arizona (Hoffmeister 1986; p 64). This species was listed as endangered on September 30, 1988 (53 FR 38456). The lesser long-nosed bat belongs to the Phyllostomidae family. It is distinguished from all non-Phyllostomids in Arizona by its elongated snout tipped with a triangular leaf-shaped flap of skin. It is distinguished from the other two Phyllostomids by greatly reduced tail membrane and lack of a tail (Hinman and Snow 2003; p 22). In Arizona, this species is found from the Picacho Mountains to the Agua Dulce Mountains in the southwest and the Galiuro and Chiricahua mountains in the southeast (Hinman and Snow 2003; p 22).

Lesser long-nosed bats are found in desert grassland and shrubland up to the oak transition zone. They forage in habitat that includes saguaro, ocotillo, paloverde, organ pipe cactus (*Cereus thurberi*), and later in the summer among agaves (*Agave* sp.). Lesser long-nosed bats feed on nectar and pollen from saguaros and agaves (Hinman and Snow 2003 p 23). They feed on ripe cactus fruits at the end of the flowering season. They cannot tolerate prolonged exposure to cold, do not hibernate, and spend winters in Mexico. Daytime and maternity roosts are located in caves and abandoned mines. Lesser long-nosed bats have been known to forage long distances from their roost sites. Bats from caves located in the Pinacate Mountains in Mexico forage at Organ Pipe Cactus National Monument, approximately 50 miles away due to the lack of foraging habitat near the roost site. The FWS considers 40 miles a reasonable foraging distance (Scott Richardson, FWS, personal communication).

Threats to this species include disturbance of roost sites, loss of food resources through over harvesting of agaves in Mexico, spread of agriculture, and livestock grazing.

The nearest lesser long-nosed bat roost locations are located 34 miles to the south (Cecilia Schmidt, AGFD, personal communication). Foraging habitat for the lesser long-nosed bat occurs on the hillsides adjacent to Redfield Canyon.

Mexican spotted owl - The Mexican spotted owl (MSO) was listed as threatened on March 16, 1993 (58 FR 14248), with critical habitat listed on August 31, 2004 (69 FR 53182). The MSO occupies mixed conifer and ponderosa pine (*Pinus ponderosa*) and gambel oak (*Quercus gambelii*) vegetation types, usually characterized by high-canopy closure, high-stem density, multi-layered canopies within the stand, numerous snags, and downed woody material. Much of the time, suitable nesting and roosting habitat are located on steep slopes or in canyons with rocky cliffs where dense vegetation, crevices, or caves provide cool moist microsites for nest and roosts.

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

The closest nesting record is 5 miles to the northeast (Sabra Schwartz, AGFD, personal communication). No MSOs have been observed at that recorded site since 1999 (Bob Rogers, TNC, personal communication).

Southwestern willow flycatcher - The southwestern 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. Critical habitat was re-designated on October 19, 2005 (70 FR 60886). No critical habitat is designated in Redfield Canyon. However, critical habitat has been designated on the San Pedro River from the confluence with the Gila River, past Redfield Canyon, to approximately 5 miles upstream of the Hot Springs Canyon confluence.

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; FWS 2002). 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 ground-water pumping, channelization and bank stabilization, phreatophyte control, livestock grazing, agricultural development, urbanization, and recreation (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 10-13 feet aboveground. Willow flycatchers can occupy habitat within 3-5 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). Southwestern willow flycatchers arrive in Arizona in late April to early May and begin nest construction in mid-to-late May. Egg laying and incubation begins in early June. Young are reared from mid-June through early August. Fledging can occur from late June through early August with birds departing for migration between August and mid-September (Sogge et al. 2010).

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 Rivers (FWS 2002). Presently, the highest density of nesting willow flycatchers occurs approximately 31 miles downstream of the barrier location, near the confluence of Aravaipa Creek and the San Pedro River.

No willow flycatcher surveys were conducted by Reclamation due to the lack of suitable nesting habitat in the project area. The closest nesting territories occur approximately 7 miles southwest of the project area.

Gila Chub - Gila chub was federally listed as endangered in 2005 because of extensive habitat loss and establishment of nonnative fishes throughout most of its range (70 FR 66664). Critical habitat was designated for 25 streams in the Gila River Basin and included Redfield Canyon both upstream and downstream from the proposed fish barrier site. A recovery plan for Gila chub has not yet been developed. A Gila River basin endemic, Gila chub is a moderate-sized, thick-bodied species characteristic of deeper pools in small streams, ciénegas, 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). A resident population of Gila chub is extant in portions of Redfield Canyon.

Females achieve lengths of 250 millimeters (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, Shultz and Bonar 2006a). Propagation techniques for Gila chub in hatchery conditions were investigated by Shultz and Bonar (2006b). Gila chub often is reclusive, hiding in deep water among roots and other cover (Minckley 1973) but may also utilize shallower and swifter waters (Shultz and Bonar 2006a).

Desert pupfish - Desert pupfish was listed as endangered on March 31, 1986, with critical habitat (51 FR 10842). The species formerly was widespread throughout lower elevations of the Gila River Basin among mainstem river backwaters, springs, ciénegas, 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 are 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/L (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 ongoing. 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 state-wide Safe Harbor Agreement that could facilitate such activity has recently been developed. Guidelines for the genetic management of re-established populations also are now available (Echelle et al. 2007). Repatriations to Swamp Spring Canyon within the Redfield Canyon drainage occurred in 2007 and 2008, but it is too soon to determine if a self-sustaining population has become established.

Gila topminnow - Gila topminnow was federally listed as endangered on March 11, 1967 (32 FR 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 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 2 months and can produce up to ten 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). A state-wide Safe Harbor Agreement that could facilitate such activity recently has been developed, but a much-needed recovery plan revision has been stalled. Repatriations to Swamp Springs Canyon within the Redfield Canyon drainage occurred in 2007 and 2008. The species has persisted in relatively large numbers through 2010; and the species seems established, at least in the short-term (A.T. Robinson, AGFD, personal communication).

Loach minnow - Another Gila River basin endemic, loach minnow was federally listed as threatened on October 28, 1986 (51 FR 39468). Recently-proposed critical habitat (75 FR 66482) includes six stream complexes in the Verde, White, San Pedro (including Redfield Canyon), San Francisco, Blue, and upper Gila rivers, and Bonita and Eagle creeks. The historical distribution of loach minnow 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 relatively large populations only in Aravaipa Creek and Blue River, Arizona, and in the main stem and West Fork of the Gila River in New Mexico (Marsh et al. 1990, FWS 1991a, Propst 1999, Paroz and Propst 2007). It persists as relatively small populations in about one-half dozen other streams in the basin and is estimated to be lost from about 85 percent of its historic range (FWS 1991a). The FWS has determined that uplisting to endangered status is warranted.

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

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

Spikedace - Spikedace was federally listed as threatened on July 1, 1986 (51 FR 23769). Recently-proposed critical habitat includes five stream complexes in the Verde, Tonto, San Pedro (including Redfield Canyon), Blue, San Francisco, and upper Gila rivers, and Bonita and Eagle creeks (75 FR 66482). 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, FWS 1991b). In Arizona, spikedace remains only in Aravaipa Creek, a portion of the upper Verde River, and in Eagle Creek (Marsh et al. 1990), but the species has not been detected in the two latter streams in recent years. In New Mexico, it inhabits the Gila River and its major forks, but is declining there also (Propst 1999, Paroz and Propst 2007). The FWS has determined that uplisting of spikedace 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 (Desert Fishes Team 2003). Recovery activities that have been implemented to date for spikedace are construction of fish barriers on Aravaipa Creek to protect an existing population; construction of a barrier on, renovation of, and repatriation to Fossil and Bonita Creeks; and repatriations to Redfield and Hot Springs Canyons and San Francisco River. It is too soon to determine if self-sustaining populations have established in any of these repatriated systems.

3.4.8 Environmental Consequences – Federally Listed Species

No Action

The potential for upstream movement of nonnative fishes from the San Pedro River would continue to threaten extant and repatriated native fishes in Redfield Canyon. Spread of nonnative fishes into Redfield Canyon could result in potential loss of the existing native fish assemblage and adversely affect amphibians and semi-aquatic reptiles within the riparian corridor.

Proposed Action

Lesser long-nosed bat - Impacts associated with this project are primarily located within the riparian zone of Redfield Canyon. Only the helicopter staging area (or tram location) would be located in the upland habitat on the rim of the canyon. Approximately 0.25 acre of upland habitat will be impacted by either staging option. The upland staging area is vegetated with mesquite, creosote bush, white-thorn acacia (*Acacia constricta*), desert spoon, ocotillo, prickly pear (*Opuntia* sp.), barrel cactus, agave (*Agave* sp.), hedgehog and pincushion cacti. No saguaros occur in the staging area or will be impacted by any portion of the proposed project. Agave plants are scattered throughout the area and some plants could potentially be impacted by the proposed project depending upon the exact location of the contractor use area. However, loss of a few agaves will not affect foraging opportunities for the lesser long-nosed bat. Construction activities would occur only during daylight hours. The nearest lesser long-nosed bat roost is located approximately 34 miles away. There would be no impact to the lesser long-nosed bat from this project.

Mexican spotted owl - There have been no documented breeding or sight records of MSOs in Redfield Canyon. The nearest breeding occurrence is approximately 8 miles southeast of the project area. Although vertical canyon walls are present in Redfield Canyon, they are not heavily vegetated nor do they provide the shaded microclimate which MSOs prefers. The helicopter flight line would not cross any MSO Primary Activity Centers. There would be no impact to the MSO from implementation of this project

Southwestern willow flycatcher - Riparian vegetation in the project area does not provide the necessary structure or density to support willow flycatcher breeding. There would be no impact to the willow flycatcher from implementation of this project.

Gila chub - Although the proposed project is in an intermittent reach of Redfield Canyon, Gila chub has been observed at the proposed fish barrier site during times when surface flows reached the area (Reclamation data). Therefore, depending on surface flow conditions during the period of construction, it is possible there could be direct, indirect, and/or interrelated/interdependent effects to Gila chub from implementation of the proposed project. If Gila chub did move into the stream reach at the barrier site during the construction period, they would either be forced to move upstream or downstream during actual construction, and some direct mortality is possible. In the longer term, however, the fish barrier would prevent predation and competition impacts from nonnative species and provide added protection for Gila chub throughout the upper stream system. Once operational, the fish barrier is likely to enhance the critical habitat of Gila chub by reducing threats from nonnative aquatic species.

Desert pupfish - As desert pupfish was stocked only recently, and far upstream of the proposed fish barrier construction site, it is unlikely there would be direct, indirect, or interrelated/interdependent effects to desert pupfish from implementation of the proposed project. If desert pupfish did move into the stream reach at the barrier site during the construction period, they would either be forced to move upstream or downstream during actual construction, and some direct mortality is possible. In the longer term, however, the fish barrier would prevent predation and competition impacts from nonnative species and provide added protection for desert pupfish throughout the stream system.

Gila topminnow - As Gila topminnow was stocked only recently, and far upstream of the proposed fish barrier construction site, it is unlikely there would be direct, indirect, or interrelated/interdependent effects to Gila topminnow from implementation of the proposed project. If Gila topminnow did move into the stream reach at the barrier site during the construction period, they would either be forced to move upstream or downstream during actual construction, and some direct mortality is possible. In the longer term, however, the fish barrier would prevent predation and competition impacts from nonnative species and provide added protection for Gila topminnow throughout the stream system.

Loach minnow - As loach minnow was stocked only recently, and far upstream of the proposed fish barrier construction site, it is unlikely there would be direct, indirect, or interrelated/interdependent effects to loach minnow from implementation of the proposed project. If loach minnow did move into the stream reach at the barrier site during the construction period, they would either be forced to move upstream or downstream during actual construction, and some direct mortality is possible. In the longer term, however, the fish barrier would prevent predation and competition impacts from nonnative species and provide added protection for loach minnow throughout the stream system.

Spikedace - As spikedace was stocked only recently, and far upstream of the proposed fish barrier construction site, it is unlikely there would be direct, indirect, or interrelated/interdependent effects to spikedace from implementation of the proposed project. If spikedace did move into the stream reach at the barrier site during the construction period, they would either be forced to move upstream or downstream during actual construction, and some direct mortality is possible. In the longer term, however, the fish barrier would prevent predation and competition impacts from nonnative species and provide added protection for spikedace throughout the stream system.

3.4.9 Affected Environment -- Special Status Species

The AGFD in a draft publication dated March 16, 1996, has identified various species (Table 5) within the State that are considered "Wildlife of Special Concern in Arizona". Those species that may occur in the project area are discussed below.

Table 5. Special status species that may occur within the project area (AGFD 1996)

SPECIES	SCIENTIFIC NAME
Mexican long-tongued Bat	*Choeronycteris Mexicana*
Western Red Bat	*Lasiurus blossevillii*
Western Yellow Bat	*Lasiurus xanthinus*
California Leaf-nosed Bat	*Macrotus californicus*
Western Yellow-billed Cuckoo	*Coccyzus americanus*
Peregrine Falcon	*Falco peregrines*
Gray Hawk	*Buteo nitidus*
Common Black Hawk	*Buteogallus anthracinus*
Sonoran Desert Tortoise	*Gopherus agassizii*
Catalina Beardtongue	*Penstemon discolor*
Sonora Sucker	*Catostomus insignus*
Desert Sucker	*Catostomus clarkia*
Longfin Dace	*Agosia chrysogaster*
Speckled Dace	*Rhinichthys osculus*
Lowland Leopard Frog	*Rana yavapaiensis*
Arizona Toad	*Bufo microscaphus*
Canyon Spotted Whiptail	*Aspidoscelis burti stictogrammus*

Mexican long-tongued bat - The Mexican long-tongued bat ranges from southwestern United States south into South America. In Arizona, the Mexican long-tongued bat inhabits the southeastern part of the State from the Chiricahua Mountains north and west to the Santa Catalinas (Hinman and Snow 2003). There is some overlap with the lesser long-nosed bat, but Mexican long-tongued bats are most often found between 4000 and

6000 ft in elevation (Hinman and Snow 2003). The nearest occurrence is 15.5 miles southeast of the project area (Cecilia Schmidt, AGFD, personal communication).

Western red bat – The western red bat ranges from southern Canada through the entire western United States south into Panama and South America. A solitary roosting species, this bat will migrate in groups and forage in close association with others (AGFD 2011a). Red bats forage and roost in broad-leaf deciduous riparian forests. Western red bats have been captured along waterways among oaks, sycamores, and walnuts in the Huachuca and Graham mountains; cottonwoods along Bright Angel Creek not far from the Colorado River; and the pine-fir forest of the Sierra Anchas Mountains (Hoffmeister 1986). They also have been documented foraging near city streetlights (AGFD 2011a). Reclamation has netted red bats (2005, 2006, 2007, and 2009) at 3 Links Farm approximately 18 miles south of the project area (Diane Laush, Reclamation, personal observation).

Western yellow bat – The western yellow bat ranges from southern Arizona, southern California, south Texas, and extreme southwest New Mexico south through Central America into Argentina and Uruguay (Hinman and Snow 2003). Western yellow bats are a solitary roosting species that are presumably year-round residents of Arizona (AGFD 2011b). They have primarily been found in Phoenix and Tucson where they are associated with palm trees. Records of this species have also been recorded in Yuma, Sasabe, Bill Williams River, and in the Chiricauhua Mountains (AGFD 2011b). AGFD records indicate the closest record to the project area is about 10 miles southeast of the project area (Cecilia Schmidt, AGFD, personal communication).

California leaf-nosed bat – In Arizona, California leaf-nosed bats are found primarily in the Sonoran desertscrub habitat where they utilize caves and mines (Hoffmeister 1986). This medium-sized, year-round resident requires warm roosts because it does not hibernate (Hoffmeister 1986). It can be differentiated from similar species by an upright projection (nose-leaf) on its nose and its large ears. This species of bat feeds mainly on night-flying insects, as well as gleaning insects from bushes and fruit (Hoffmeister 1986). Little is known about their home or seasonal ranges. The main threats to this species are the loss of roosting habitat (mines and caves) through destruction and blocking, and human disturbance of roost sites (Hinman and Snow 2003). The nearest record is a roost located approximately 35 miles northwest of the project area (Cecilia Schmidt, AGFD, personal communication).

Western yellow-billed cuckoo – On July 25, 2001, the FWS published notice in the *Federal Register* (66 FR 38611) 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 (Johnson et al. 2008). Research (Murrelet Halterman, Southern Sierra Research Station, personal communication) 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). The nearest breeding occurrence is approximately 9 miles southeast of the project area (Cecilia Schmidt, AGFD, personal communication).

Peregrine falcon – The peregrine falcon was removed from the endangered species list on August 25, 1999 (64 FR 46542). This species is found nearly worldwide. In Arizona, both resident and winter visitors occur throughout the State in suitable habitat (Glinski 1998b). Peregrine falcons in the southwest inhabit cliffs and river gorges near water. Eyries occur on cliffs which generally exceed 200 feet in height. Eyries are situated on open ledges and a preference for a southern exposure increases with latitude (FWS 1984). Peregrine falcon eyries have been found on rock ledges 56 feet high, previously considered unsuitable. The greatest concentration of peregrine falcons occurs in the Grand Canyon (Burger 2005). The nearest breeding occurrence is 1.5 miles east of the project area (Cecilia Schmidt, AGFD, personal communication).

Gray hawk – The northern gray hawk ranges from the Amazon Basin north through Central America into southern Arizona, New Mexico, and Texas (Glinski 1998a). Within Arizona, this species nests almost exclusively along lowland riparian areas such as occurs along the San Pedro and Santa Cruz Rivers and Cienega and Sonoita Creeks (Corman 2005b). Breeding bird atlas records found the gray hawk to be locally common from Cascabel to Winkelman along the San Pedro River (Corman 2005b). Gray hawks forage primarily on lizards of the *Sceloporus* genus, gartersnakes, small birds, and some small mammals (Glinski 1998a, AGFD 2000). The nearest breeding occurrence is 7 miles southwest of the project area (Cecilia Schmidt, AGFD, personal communication).

Common black hawk – The majority of common black hawks in Arizona occur along the streams draining the Mogollon Rim which include the Virgin, Big Sandy and Bill Williams Rivers and both the upper and middle Gila and Salt Rivers (Latta et al 1999). This large raptor is a riparian obligate species nesting along perennial drainages with mature gallery forests (Corman 2005c). More than 90 percent of all breeding bird atlas records were reported from two main riparian habitat types: Arizona sycamore dominated drainages and Fremont cottonwood dominated drainages (Corman 2005c).

Common black hawks feed on a variety of prey species including invertebrates, fish, frogs and larvae, reptiles, birds and small mammals (Latta et al 1999). This species is dependent upon mature, relatively undisturbed habitat supported by a permanent flowing stream. They prefer to nest in large trees (primarily cottonwood and sycamore) within a grove (Latta et al. 1999). There is one breeding record 1.5 miles east of the project area (Cecilia Schmidt, AGFD, personal communication).

Sonoran Desert Tortoise – The FWS published a 12-Month Finding on the Petition to List the Sonoran Population of the Desert Tortoise as Endangered or Threatened in the *Federal Register* (75 FR 78094) on December 14, 2010. The *Federal Register* notice stated that listing the Sonoran population of the desert tortoise was warranted but precluding by higher priority listing actions. The Sonoran population was placed on the Candidate List, but as such it receives no official protection under the ESA. The AGFD has assembled a team of responsible management agencies and is currently working on preparation of a Conservation Agreement for this species.

In Arizona's Sonoran Desert, the desert tortoise typically occurs in the paloverde-cacti-mixed scrub series (75 FR 78094, Barrett 1990). Rangewide, the desert tortoise is typically found at elevations of 984 to 3500 feet. They are usually inactive from mid-November until February. There are typically three seasons of activity for the Sonoran desert tortoise. Spring (March through June) is characterized by increasing temperature, decreasing rainfall and variable tortoise activity (Averill-Murray et al 2002; page 137). Summer (July through October) is hot and generally includes peak rainfall and peak tortoise activity (Averill-Murray et al 2002; page 137). Moderate tortoise activity occurs in October as temperatures begin to decline (Averill-Murray et al 2002; page 138). Activity increases during and after rains and they will visit depressions in which rain water has collected (Averill-Murray et al 2002; page 140). The Sonoran desert tortoise eats a variety of plants, including grasses, forbs, succulents, and shrubs but the staple diet in the Arizona Uplands is primarily grasses, desert vines and mallow (Van Devender et al. 2002; pp 159-193). Both exotic and native plant species are consumed.

Current threats to the Sonoran population of the desert tortoise include loss, modification, and fragmentation of habitat. The incidence of Mycoplasmosis (Upper Respiratory Tract Disease) in the Sonoran population is not considered a significant impact due to the disjunct (marked by a separation) nature of the tortoise populations (Dickinson et al. 2002; pp 256-257). Cutaneous dyskeratosis (formerly called shell necrosis) was first described in the Mohave Desert near Riverside, California. Shell disease may not be a serious problem among Sonoran tortoises (Dickinson et al. 2002; pp 257-258). There are three occurrences of desert tortoise within 3 miles of the project area with the nearest being 1.5 miles away (Cecilia Schmidt, AGFD, personal communication).

Catalina Beardtongue – Catalina beardtongue is a small woody shrub in the snapdragon family. It grows on bedrock openings in chaparral or pine-oak woodlands (4,400-7,200 ft) in elevation (Arizona Rare Plant Committee No Date). Plants are rooted in rock cracks on thin soil pockets on granite bedrock or outcroppings of whitish volcanic tuff. The nearest population occurrence is approximately 2 miles northeast of the project area (Cecilia Schmidt, AGFD, personal communication).

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

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

Redfield Canyon supports populations of Sonora sucker, but the proposed project is in an intermittent reach of Redfield Canyon, and thus populations there are transitory, Sonora sucker has been observed at the proposed fish barrier site during visits when surface flows reached the area (Reclamation data).

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

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

Redfield Canyon supports populations of desert sucker, but the proposed project is in an intermittent reach of Redfield Canyon, and thus populations there are transitory, Desert sucker has not been observed in the project area during visits when stream flows were present (Reclamation data).

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

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

Redfield Canyon supports populations of longfin dace, but the proposed project is in an intermittent reach of Redfield Canyon, and thus populations there are transitory. Longfin dace has been observed in the project area during visits when stream flows were present (Reclamation data).

Speckled dace - 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 ESA.

Whereas the closely related loach minnow usually inhabits interstices of rubble bottoms, speckled dace typically occupies 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).

Redfield Canyon supports populations of speckled dace, but the proposed project is in an intermittent reach of Redfield Canyon, and thus populations there are transitory. Speckled dace has not been observed in the project area during visits when stream flows were present (Reclamation data).

Lowland leopard frog – Although the conservation status of lowland leopard frog is relatively good in comparison to other species of leopard frog described from Arizona in recent decades, it has been lost from the lower Colorado and Gila rivers and likely southeastern California (Clarkson and Rorabaugh 1989, Jennings and Hayes 1994). In addition, it has declined in southeastern Arizona (Sredl et al. 1997), and it is extirpated from most of its range in southwestern New Mexico (Sredl 2005). It remains largely intact in central Arizona. The species also ranges into northern Sonora, Mexico, but its status there is largely unknown. Introduction of nonnative bullfrog and nonnative predatory fishes is the most serious known threat, and invasion of the nonnative Rio Grande leopard frog is cause for concern to some populations (Platz et al. 1990, Rorabaugh et al. 2002). A chytrid fungus infection also is increasingly suspect in losses of populations (Bradley et al. 2002).

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

Redfield Canyon supports populations of lowland leopard frog, but the proposed project is in an intermittent reach of Redfield Canyon, and thus populations there are transitory. Lowland leopard frog has not been observed in the project area during visits when stream flows were present (Reclamation data).

Arizona toad – The Arizona toad was recently afforded full species status from what formerly was considered a complex of subspecies that inhabited several disjunct ranges along coastal southern California and northern Baja California, Mexico, in the Sierra Madre Occidental of Mexico in Sonora, Chihuahua, Sinaloa, and Durango, and in southeastern Nevada, southwestern Utah, and across central Arizona into west-central New Mexico (Gergus 1998). Threats to the Arizona toad include habitat alterations associated with construction of impoundments, and hybridization with Woodhouse’s toad that appears to be displacing some populations (Sullivan 1986, Sullivan and Lamb 1988).

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

Canyon spotted whiptail – This is the largest of the whiptail lizards, exceeding total lengths of 17 inches. The species is found in southeastern Arizona, southwestern New Mexico, and Sonora in mountain canyons, arroyos, and mesas in arid and semi-arid regions, entering lowland desert along stream courses (Stebbins 1985). It is found in dense shrubby vegetation often among rocks near permanent and intermittent streams in riparian habitat dominated by sycamore, cottonwood, ash and various grasses and forbs, bosque thickets consisting primarily of mesquite, hillside thornscrub, and mixed chaparral-oak-upland desert (AGFD 2001, Rosen et al. 2002). Where the species occurs in desert valleys, it is associated with perennial or high-ground-water watercourses with fully developed bosque and/or true riparian gallery forests (Rosen 2003).

Canyon spotted whiptail is a slowly maturing lizard and exhibits rapid growth, large size, and long adult life (Rosen 2003). Reproduction occurs in late spring and early summer, with egg clutch sizes of three to five; the species is capable of producing more than one clutch in a reproductive season (Goldberg 1987). Diet consists mostly of insects and spiders (Paulissen and Walker (2006). Although not specifically recorded from Redfield Canyon, Rosen et al. (2002) believed the species almost certainly occurs there based on the presence of extant populations in nearby environments.

3.4.10 Environmental Consequences – Special Status Species

No Action

Under the no action alternative, there would be no direct impact to special status species since no project would be constructed. However, aquatic and semi-aquatic species would not be afforded protection from potential invasion of predatory nonnative fish.

Proposed Action

No impacts would occur to any of the bat species. No roost sites would be disturbed. Construction activities would occur during daylight hours and therefore would not affect foraging behavior. Although some trees would be removed at the barrier location, there are sufficient trees for roosting throughout Redfield Canyon.

Both common black and gray hawks utilize large trees for nesting. The trees proposed for removal during construction of the barrier are too small to support nesting raptors. Due to the small size of the construction area, sufficient foraging habitat is available both upstream and downstream of the project area for both the common black and gray hawk.

There are suitable nesting cliffs for the peregrine falcon near the project area; however construction is proposed to occur outside of the breeding season. Yellow-billed cuckoos most likely utilize the area on a transient basis; the riparian vegetation in the project area does not support the habitat characteristics necessary to support breeding.

There is potential for the fish barrier to hinder desert tortoise movement through the drainage. However, the canyon is very steep, narrow and littered with large boulders. The barrier would be similar to other natural obstacles already present along the drainage. Construction of the ramp to aid cattle and horse movement between pastures may also facilitate desert tortoise movement. Although AGFD records indicate 3 occurrences within 3 miles of the barrier, we do not know if these occurrences were along the canyon bottom or the more suitable habitat along the ridgetops.

No suitable habitat for the Catalina beardtongue would be impacted by the proposed project.

If any of the aquatic or semi-aquatic special status species moves into the stream reach at the barrier site during the construction period, they would either be forced to move upstream or downstream during actual construction, and some direct mortality is possible. In the long term, however, barrier construction would prevent predation and competition impacts from nonnative species and provide added protection for native fishes, amphibians, and semi-aquatic reptiles throughout the stream system. Any potential impacts to canyon spotted whiptail would be similar and short-term in nature.

Cumulative Effects – Special Status Species

Anthropogenic disturbances to special status species in areas affected by the proposed action are relatively minor. Recreational (primarily hunting) use is light and dispersed, and grazing intensity is very light in the section of canyon encompassing the project area. The cumulative effect of the proposed action on non-aquatic special status species is relatively minor. The project, however, would provide substantial benefit to aquatic special status species by precluding future upstream incursion of nonnative fishes.

3.4.11 Summary of Impacts to Biological Resources

Effects of the project are summarized in Table 6. The proposed action would result in a permanent loss of less than 0.01 acre of stream channel within the footprint of the barrier. Temporary impacts from sedimentation and construction activities would impact approximately 1.12 acres of riparian habitat. There may be short-term disruptions of breeding activities for local wildlife species due to noise disturbance if construction occurs during the breeding season. There would be a potential loss of slow-moving mammals and reptiles in the construction zone. The barrier would hinder movement in the canyon for lowland leopard frog, canyon spotted whiptail, Arizona toad, desert tortoise and Gila monster. There would be no effect to federally listed terrestrial species. The project would provide long-term beneficial effects to native fish and other aquatic and semi-aquatic vertebrates (lowland leopard frog, Arizona toad) by preventing the incursion of predatory nonnative fish into perennial waters of Redfield Canyon.

Table 6. Summary of impacts to biological resources.

ATTRIBUTE	NO ACTION	PROPOSED ACTION
VEGETATION	No impact.	Permanent loss of <0.01 acre of streambed habitat. Temporary impact to approximately 1.2 acres from sedimentation accumulation and construction activities.
TERRESTRIAL WILDLIFE	Short term disturbances from recreational and hunting activities.	There may be temporary disruption due to noise disturbance and minor loss of slow-moving small mammals and reptiles from construction. The barrier would restrict movement of snakes and Gila monsters.
AQUATIC WILDLIFE	Potential for nonnative fish to move upstream from the San Pedro River and threaten survival of existing native populations.	Beneficial effects to native fishes and lowland leopard frog by excluding predatory nonnative fish and increasing potential prey for the black-necked gartersnake. The barrier would restrict movement of Sonora mud turtle, lowland leopard frog, and beaver, as well as prevent upstream movements of native fishes.
T&E AND SPECIAL STATUS SPECIES	Short term disturbances from recreational and hunting activities. Potential for nonnative fish to move upstream from the San Pedro River and threaten survival of existing populations.	Potential obstruction of Sonoran desert tortoise movement. Beneficial effects to aquatic fish and wildlife through elimination of threats from nonnative fish.

3.5 CULTURAL RESOURCES

3.5.1 Affected Environment

The cultural resources background of Redfield Canyon is directly tied to that of the Lower San Pedro River Valley which it joins near the community of Redington. Archaeological surveys within the Lower San Pedro Valley have largely been limited to the area along the river and adjacent road while the non-riverine areas have only been sampled by linear surveys associated with various utility rights-of-way and similar projects. There is a lack of evidence from the Lower San Pedro Valley related to prehistoric occupations dating to periods prior to about AD 800. As a result, a review of culture history of the project area necessarily includes data from a wider portion of southern Arizona, while a more focused review is possible for the later prehistoric and historic occupations of the lower valley.

Background research undertaken prior to fieldwork indicated that no known archaeological surveys have taken place within a mile of the proposed fish barrier site. One prehistoric artifact scatter (AZ BB:11:15(ASM)) has been previously identified in a location over ½ mile northeast of the project area on the north rim of the canyon. In general, very little land situated away from the San Pedro River has been archaeologically surveyed, allowing only a general understanding of how cultural resources in the non-riverine settings within the valley relate to developments closer to the river.

The project area, including potential staging areas, was surveyed on May 14, 2009, under Arizona Antiquities Act Blanket Permit 2009-082bl. Further survey for a possible temporary tram to supply materials took place on November 4, 2010, under Arizona Antiquities Act Blanket Permit 2010-061bl. No cultural resources were noted during either survey. The proposed barrier site is within a narrow, steep-sided portion of Redfield Canyon that is subject to high seasonal floods that impact a major portion of the canyon floor and terraces in the project area. It provides a less than optimal setting for cultural resources both in terms of the narrow, inhospitable setting and the poor preservation of any possible *in situ* deposits due to seasonal, high-flow flooding. Areas on the south canyon rim that would be used as staging and/or temporary tram locations were also devoid of cultural materials.

As a Federal project, the proposed action is subject to compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), as implemented through 36 CFR 800. Section 106 requires federal agencies to consider the effects of their actions on properties that are eligible for, or included in, the National Register of Historic Places (NRHP). The Section 106 regulations outline a process of inventory, evaluation and consultation to meet the federal agency's requirements under NHPA.

On August 3, 2009, the Arizona State Historic Preservation Office (SHPO) concurred with a finding of *no effect to historic properties* by the proposed action for areas covered by the 2009 survey. In 2010, Reclamation's Phoenix Area Office and the SHPO established a new, expedited process for reporting negative findings. Rather than corresponding about individual projects with negative findings subsequent to survey completion, all projects with negative findings would be compiled in a list to be reviewed by SHPO once a year. Survey reports would continue to be written by the Phoenix Area Office and supplied to the SHPO for review with the aforementioned list. The negative finding for the survey portion completed in 2010 was provided to SHPO in accordance with the new protocol.

In order to streamline the consultation process with Native American tribes with possible concerns in the Redfield Canyon area, tribal consultation as stipulated in Section 106 of the NHPA is combined with consultation required by NEPA. Nine tribes were included in the combined NEPA/NHPA consultation (see Chapter 4).

3.5.2 Environmental Consequences

<u>No Action</u>

If no action is taken, there would be no change in existing conditions. Environmental and anthropomorphic factors, such as livestock trampling and surface and channel erosion, would continue to affect any resources in the area.

Proposed Action

A review of known cultural resources in the project area indicates that no archaeological sites will be affected by the proposed construction or related activities. A Class III survey of the area of potential effect confirmed the lack of cultural resources within the project area. Almost all of the area of potential effect from the barrier itself is located within the active flood zone of Redfield Canyon and those areas above the flood zone, such as the potential camp site or helicopter land zone, do not contain any cultural resources. Staging and tram locations on the canyon edge area are more stable but equally devoid of cultural remains. No sacred sites have been identified in the project area.

Cumulative Effects

There would be no cumulative effect on cultural resources.

3.6 AIR QUALITY

3.6.1 Affected Environment

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

The area encompassing Redfield Canyon is in attainment for all regulated NAAQS (http://www.epa.gov/oar/oaqps/greenbk/ancl3.html). Potential local sources of air pollutants include PM_{10} from wildfire, vehicular travel on unpaved roads, agricultural activity along the San Pedro River, and natural events such as windstorms. Ambient air quality in the project area is good.

The CAA provides special protection for visibility and other air quality related values in specially designated Class 1 areas where the cleanest and most stringent protection from air quality degradation is considered important. These areas include National Parks and Wilderness Areas which have been specifically designated Class 1 under Section 162(a) of the CAA. Class 1 designation allows almost no degradation in air quality. The closest Class 1 airshed is associated with the 76,317-acre Galiuro Wilderness approximately

2.3 miles north of the project area.[6] The Redfield Canyon Wilderness and all other areas within the region are designated Class 2, which allows moderate levels of decline.

Executive Order (EO) 13514 directs Federal agencies to promote pollution prevention and reduce emissions of greenhouse gases (GHGs) that result from their actions. In accordance with this EO, the CEQ defines GHGs as carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The CEQ has proposed an annual reference threshold of 25,000 metric tons of carbon dioxide (CO_2)-equivalent GHG emissions as a useful indicator for agencies to consider when analyzing potential action-specific GHG emissions in NEPA documents (CEQ 2010). This threshold was considered relevant by CEQ because it is a minimum standard for reporting GHG emissions from specified industries under the CAA (EPA's Mandatory Reporting of Greenhouse Gasses Final Rule, 74 FR 56260). According to the CEQ draft guidance, no quantitative analysis of GHGs is necessary if emissions from a proposed action are not likely to exceed the annual presumptive threshold of 25,000 metric tons of CO_2-equivalent GHGs. In the project area, principal local sources of GHGs include combustion emissions from heavy equipment and light vehicles used in farming/ranching, construction, and personal transportation.

3.6.2 Environmental Consequences

No Action

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

Proposed Action

The release of fugitive dust during project implementation would have a minor transient effect on ambient air quality within the project area and along construction haul routes. Dust picked up and dispersed by periodic construction traffic on unpaved roads would increase the concentration of total suspended particulates along travel routes, but traffic volumes would be low and emissions sporadic and brief. Only relatively small amounts of fugitive dust would be emitted from ground-based construction activities at the barrier site.

Within the project area, the greatest amount of fugitive dust would be generated by helicopter rotor wash during landings and takeoffs from upland sites, where soils have a relatively higher content of fine material that can be entrained by turbulent air currents. At the fish barrier site, minor amounts of dust would be generated during takeoffs/ landings and long-line delivery of material and equipment due to the low percentage of fine soil particles in the fluvial deposits (Figure 6). Emissions from flight operations

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[6] Under the CAA, the Federal land manager with direct responsibility is required to protect air quality related values of a Class 1 airshed. Three air quality related values have been established for the Galiuro Wilderness: flora, water, and visibility.

would be highly localized and transitory, persisting only during periods when material and crews are being transported to the work site. There are no sensitive receptors to airborne dust identified within the project area. County and State requirements for control of dust emissions would be complied with during construction.

The operation of construction equipment would generate minor amounts of engine combustion products such as nitrogen oxides, carbon monoxide, and reactive organic gases. These emissions would not produce measurable changes in ambient concentrations of regulated pollutants or result in a change in attainment status for the air quality region. Intermittent release of small quantities of combustion products or fugitive dust during construction would not measurably degrade air quality within the region or affect air quality related values associated with the Galiuro Wilderness Class 1 airshed.

Cumulative Effects – Air Quality

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

Figure 6. Dust from helicopter rotor wash during takeoff from bottom of Redfield Canyon.

3.7 HAZARDOUS MATERIAL AND SOLID WASTE

3.7.1 Affected Environment

No sites contaminated with hazardous or non-hazardous solid wastes are known to occur within the 6-acre land-acquisition area (http://www.epa.gov/enviro). A hazardous materials site assessment would be conducted prior to land acquisition, in accordance with 602 Departmental Manual 2 (Real Property Pre-Acquisition Environmental Site Assessments).

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.

3.7.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no direct impact regarding use of hazardous materials, since no project would be constructed or implemented. Existing conditions would prevail within the project area.

Proposed Action

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

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

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

Cumulative Effects - Hazardous Material and Solid Waste

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

3.8 ENVIRONMENTAL JUSTICE

3.8.1 Affected Environment

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

The project area is located on uninhabited State Trust Land. There is no minority or low-income communities located within or near the project area.

3.8.2 Environmental Consequences

No Action

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

Proposed Action

There would be no disproportionately high and adverse health or environmental effects on communities or populations described under EO 12898.

Cumulative Effects – Environmental Justice

There would be no cumulative effects on EO 12898 communities.

3.9 INDIAN TRUST ASSETS

3.9.1 Affected Environment

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

The project area is located on uninhabited State Trust Land administered by the ASLD. No Indian trust assets have been identified in this area.

No Action

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

3.9.2 Environmental Consequences

Proposed Action

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

Cumulative Effects – Indian Trust Assets

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

CHAPTER 4 – MITIGATION MEASURES

1. Pursuant to the CWA Section 404 permit for the 12 fish barriers required under the 2001 and 2008 CAP BOs, Reclamation agreed to mitigate impacts for all the barriers in one location prior to actual construction activities. In 2003, Reclamation purchased a Conservation Easement (CE) on 1,420 acres of land encompassing 300 acres of riparian habitat, creating a "mitigation bank." The property, currently owned by TNC and two private landowners is known as 3 Links Farm. It 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). 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.

   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 ground-water 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 reach was approximately 500-feet wide. The remaining riparian habitat gradually narrowed until only a small linear strip of habitat remained along the banks of the channel.

   TNC has subdivided 3 Links Farm into five parcels and placed identical easement restrictions on the remaining two 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 ground-water 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, wood cutting, vehicular traffic, and development. Vegetation enhancement of the riparian corridor has begun to occur following cessation of ground-water 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 has conducted limited surveys on the mitigation property since acquisition of the easement. In 2004, Reclamation documented the southernmost-known breeding population of southwestern willow flycatchers. Since willow flycatcher surveys began in 2004, there has been a 300 percent increase in the number of adult birds and territories.

Impacts to terrestrial habitat along Redfield Canyon 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 1.13 acres of habitat would be impacted at Redfield Canyon. Consequently, a total of 11.3 acres will be subtracted from the "mitigation bank."

2. 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.

3. Contractor-use areas affecting undisturbed upland habitat would be scarified, recontoured, and revegetated with species that are native to the general project area.

4. 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 and the campsite. The amount of land needed for contractor use would be minimized to the maximum extent practicable.

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

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

7. The fish barrier would include a ramp to accommodate the movement of livestock, horses, and wildlife.

CHAPTER 5 – CONSULATATION AND COORDINATION

List of Agencies and Persons Contacted

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

Indian Communities:

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

Congressional Delegation

Senator John McCain
Senator Jon Kyl

County Agencies:

Graham County Board of Supervisors

State Agencies:

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

Federal Agencies:

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

Conservation, Environmental, and Recreation Organizations:

American Rivers
Arizona Riparian Council
Arizona Trail Association
Arizona Wilderness Coalition
Center for Biological Diversity
Desert Fishes Council
Desert Voyagers
Friends of Arizona Rivers
Friends of Pronatura
Redington Natural Resource Conservation District
Sierra Club
Sky Island Alliance
The Nature Conservancy

Libraries and Schools

Eastern Arizona College Library

Grazing Organizations:

Arizona Cattle Growers Association

CHAPTER 6 - LIST OF PREPARERS

List of Preparers

Rob Clarkson, Bureau of Reclamation, Fish Biologist
Marci Donaldson, Bureau of Reclamation, Archaeologist
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Other Contributors

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CHAPTER 7 - RELATED ENVIRONMENTAL LAWS/DIRECTIVES

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

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

The National Environmental Policy Act (NEPA) of 1969, as amended, 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.

Scoping information was posted on Reclamation's Phoenix Area Office web site and distributed to potentially interested individuals, organizations, and agencies on October 8, 2010. Public comments were considered during preparation of the EA. News releases soliciting public input during the scoping phase and then later announcing the availability of the EA were sent to 13 news media outlets. The scoping document and EA were also available on Reclamation's Phoenix Area Office web site.

The Fish and Wildlife Coordination Act (FWCA) of 1958, as amended, 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 has concluded in a memorandum dated March 31, 2011, that the current level of coordination among the agencies is sufficient to meet any regulatory needs required by the FWCA.

The Endangered Species Act (ESA) of 1973, as amended, 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(a)(1) of this law requires all federal agencies to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Section 7(a)(2) requires federal agencies to ensure that their activities do not jeopardize the continued existence of threatened or endangered species or adversely modify designated critical habitat.

Construction of the proposed fish barrier is a conservation measure specified by the FWS in the 2001 and 2008 BOs. The FWS determined in these BOs that further ESA section 7(a)(2) consultation on listed aquatic species covered under the opinions was not required for fish barrier construction. In addition, the FWS concluded in the 2008 BO that the proposed fish barrier is likely to enhance the critical habitat of Gila chub by reducing threats from nonnative aquatic species. Possible effects to non-aquatic listed species resulting from project implementation were examined in a BA (dated May 2011) prepared by Reclamation. The BA concluded that the proposed project will have no effect to the lesser long-nosed bat, Mexican spotted owl or southwestern willow flycatcher.

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. The MBTA prohibits the take, possession, import, export, transport, selling, or purchase of any migratory bird, their eggs, parts, or nests.

Construction of the fish barrier would begin in the fall and last approximately 1.5 months, thus avoiding the breeding seasons of most avian species. No adverse affect to MBTA-protected species is anticipated.

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

Short-term construction emissions (particulate matter and greenhouse gasses) associated with the project would have localized and minor effects on air quality in the project area. The project is not located in a nonattainment area or Class I airshed. County and State requirements for control of dust emissions would be complied with during construction.

The Clean Water Act (CWA) of 1977, as amended, 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. Actions that require a permit to discharge into waters of the U.S. also require a CWA Section 401 water quality certification. In addition, construction sites where one or more acres are disturbed require coverage under a CWA Section 402, National Pollutant Discharge Elimination

System (NDPES), general permit to authorize storm water discharges. The EPA has delegated responsibility to administer water quality certification and NPDES programs in Arizona to ADEQ.

Reclamation received a conditional 401 water quality certification from the ADEQ and a 404 permit from the COE for fish barriers that are constructed pursuant to the 2001 CAP BO (superseded by the 2008 BO). This permit/certification coverage includes the Redfield Canyon fish barrier. All special conditions of the 401 certification and 404 permit would be implemented. Coverage under the Section 402 Arizona Pollutant Discharge Elimination System General Permit for construction activities would be obtained prior to construction.

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

Archaeologists from Reclamation conducted Class III surveys of the area of potential effect for the proposed project. No cultural resources were identified within the area potentially affected by construction of the fish barrier. Findings of “no historic properties affected” was determined by Reclamation following surveys of the area of potential effect.

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

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

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

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

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

There are no wetlands in the project area.

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

Acquisition would affect uninhabited lands owned and administered by the ASLD; consequently, no low-income or minority populations, defined by EO 12898 would be affected.

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

Acquisition would affect uninhabited lands owned and administered by the ASLD. No Indian trust assets have been identified in the project area; consequently, no effects to trust assets are anticipated.

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

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

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APPENDIX A

Proposed Land Acquisition

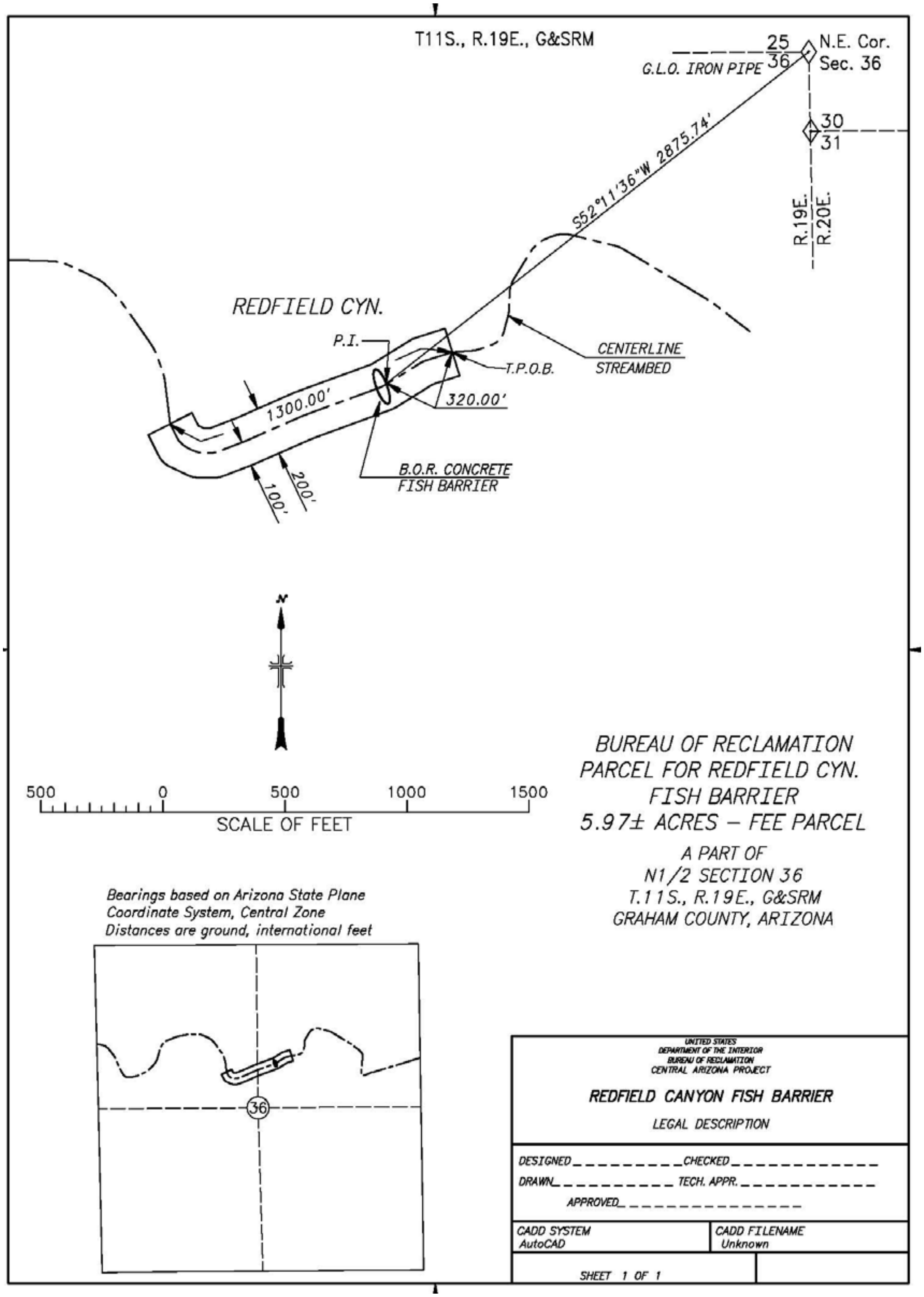

Figure A-1. Proposed parcel of land to be acquired from the Arizona State Land Department. The parcel consists of a strip of land, 200 feet in width, lying 100 feet on each side of the centerline of the Redfield Canyon streambed, and 1,300 feet along the centerline of the streambed, containing an area of 5.97 acres.

APPENDIX B

Fish Barrier Design

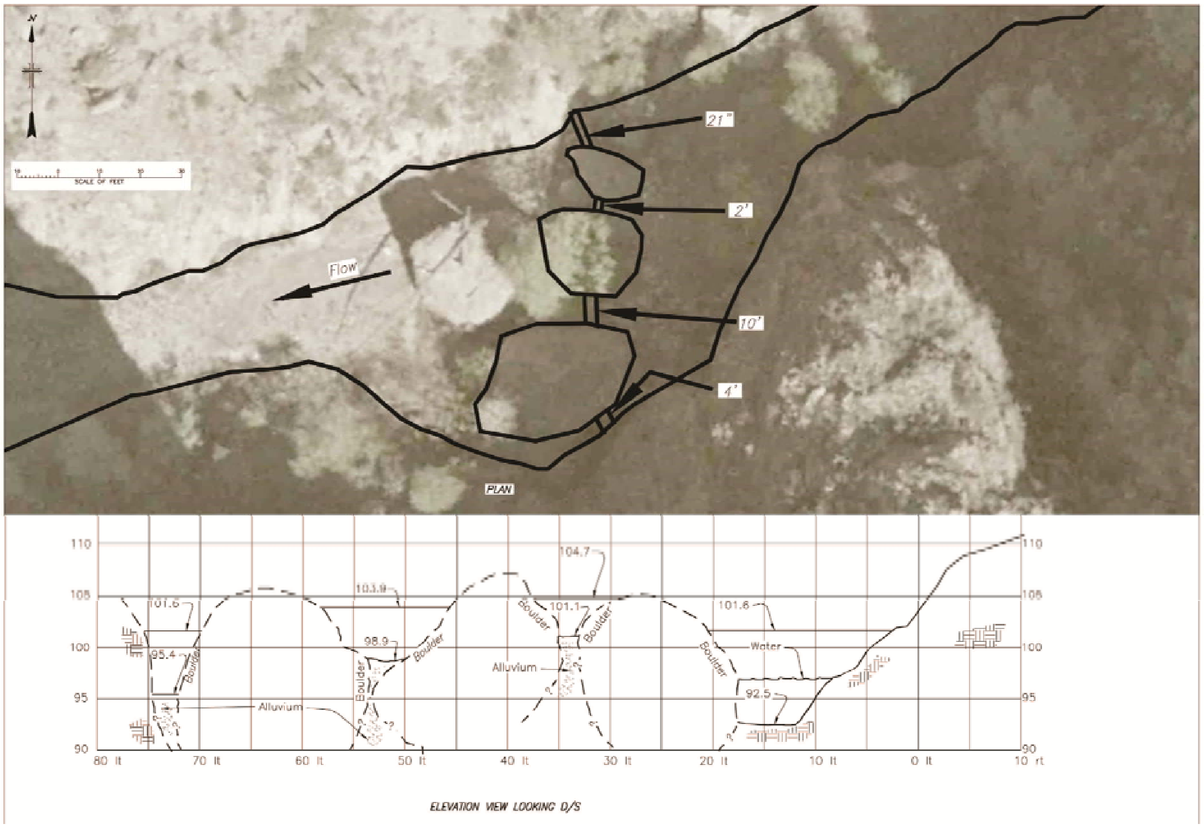

Figure B-1. Plan and elevation views of fish barrier.

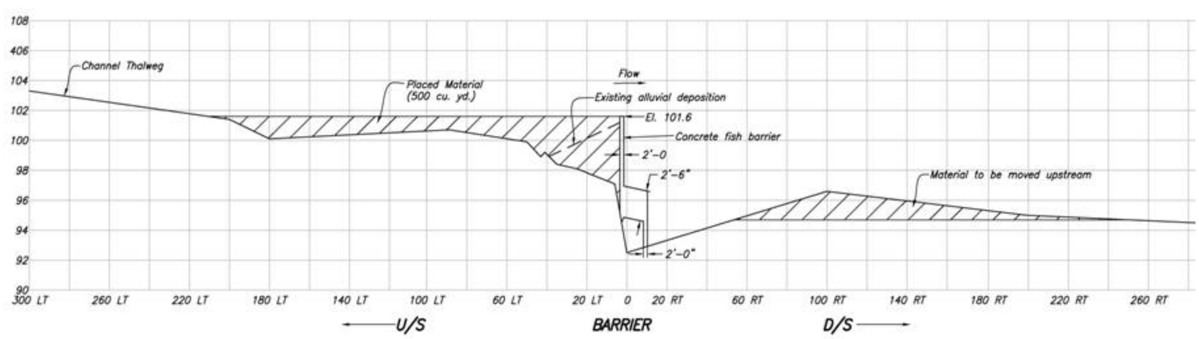

Figure B-2. Stream channel profile with fish barrier. Downstream hatched area is material that would be moved to the upstream hatched area to eliminate water retention behind the barrier.

APPENDIX C

Synopsis of Public Comments

Table C-1. Public comments on the draft EA and agency responses.

Commenting Entity	Comment	Agency Response
Gila River Indian Community	The Tribal Historic Preservation Office concurs with the finding of no effect to historic/archaeological resources.	Your comment is noted.
Arizona Department of Environmental Quality (separate comments from the Air Quality and Water Quality Divisions)	Recommended measures to reduce disturbances to air quality. Noted that permit coverage under CWA 404 and 401 may be needed for the project.	As noted in the EA, several measures will be implemented to reduce dust emissions including minimization of land disturbances and revegetation of disturbed sites. A CWA 404 permit and 401 certification have already been obtained.
Arizona State Land Department	Agreed with proposed action.	Your comment is noted.
Paul Marsh	Supports proposed action. Project will benefit native fishes.	Your comment is noted.
Sierra Club	Supports proposed action. Project will benefit native fishes. Reclamation should attempt to minimize the impacts of construction and contractor use. Disturbed areas should be revegetated with native plants. Supports five year monitoring program and fish barrier inspections.	Your comments are noted. Every effort will be made to minimize impacts during construction. Disturbed areas will be stabilized with native vegetation to the maximum extent that is practicable.
Harold Lackner	Opposes proposed action.	Your comment is noted.