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U.S. Fish and Wildlife Service
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In Reply Refer To:
AESO/SE
22410-2008-F-0029
22410-1990-F-0119a

June 13, 2008

Daniel Montez, District Ranger
Sierra Vista Ranger District
Coronado National Forest
5990 South Highway 92
Hereford, Arizona 85615

Dear Mr. Montez:

Thank you for your request for formal consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request was dated August 3, 2007, and received by us on August 6, 2007. At issue are impacts that may result from the proposed construction of a fish barrier in Redrock Canyon and the subsequent removal of nonnative fish and frogs and restoration of a native aquatic fauna. The proposed action may adversely affect the endangered Gila topminnow (*Poeciliopsis occidentalis occidentalis*), the endangered Gila Chub (*Gila intermedia*), the threatened Chiricahua leopard frog (*Lithobates chiricahuensis*), and the endangered Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*). There is no Gila chub critical habitat in the action area, and critical habitat has not been designated for Gila topminnow, Chiricahua leopard frog, or Sonora tiger salamander, thus none will be affected.

In your August 3, 2007, letter, you requested our concurrence that the proposed action is not likely to adversely affect the endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*). We concur with your determination, and have included our rationale in the Appendix.

This biological opinion is based on information contained in: (1) the Biological Assessment (BA) transmitted with your August 3, 2007, letter; (2) the Bureau of Reclamation's (Reclamation) August 2007 *Redrock Canyon Fish Barrier Feasibility Investigations*; (3) Reclamation's September 2007 *Draft Environmental Assessment – Native Fish Restoration Project - Redrock Canyon, Santa Cruz County, Arizona* (Draft EA); (4) discussions at site visits and meetings conducted throughout 2007; and (5) other published and unpublished sources of information. A complete administrative record of this consultation is on file at this office.

CONSULTATION HISTORY

Although the action agency in this biological opinion is the U.S. Forest Service (Forest Service), many actions are being funded and will be carried out by other agencies, primarily the Bureau of Reclamation (Reclamation). However, the Forest Service retains oversight and responsibility for the completion of all aspects of this biological opinion. Several prior consultations with the Forest Service, as well as some with other agencies, are cited and/or incorporated by reference in this biological opinion; all of these biological opinions are available on our FWS Arizona Ecological Services Field Office website at <http://www.fws.gov/southwest/es/arizona>, under Document Library, Section 7 Biological Opinions.

Reclamation

The FWS completed a 1994 biological opinion (file number 02-21-90-F-0119, U.S. Fish and Wildlife Service 1994) that found that operation of the Central Arizona Project (CAP) canal would jeopardize the continued existence of four fishes, loach minnow (*Tiaroga cobitis*), spikedace (*Meda fulgida*), Gila topminnow, and razorback sucker (*Xyrauchen texanus*) and would adversely modify critical habitat for three of those four fishes (no critical habitat has been designated for Gila topminnow). The 1994 opinion included a reasonable and prudent alternative (RPA) that required construction of several fish barriers, among other actions, to ensure project effects would prevent jeopardy to these fish species. This consultation was later reinitiated, and the resulting 2001 biological opinion (file number 02-21-90-F-119a, U.S. Fish and Wildlife Service 2001) added several fish barriers in the proposed action in addition to those in the 1994 RPA. The effects of fish barriers on listed fishes and aquatic organisms were addressed in these opinions, although the Redrock Canyon fish barrier was not specifically addressed.

Reclamation is currently undergoing another reinitiated consultation on CAP effects to aquatic biota to analyze project effects to several newly-listed species, Gila chub, Chiricahua leopard frog, and Sonora tiger salamander, and to incorporate the Santa Cruz River sub-basin into the greater Gila River basin consultation. Reclamation's biological assessment for that consultation included additional conservation measures to construct three tributary fish barriers within the Santa Cruz sub-basin, specifically naming Redrock Canyon as a proposed site. A final biological opinion was signed on May 15, 2008.

Forest Service

The following consultation history has occurred regarding Forest Service management actions in the Redrock Canyon watershed. These consultations are described in more detail in the Environmental Baseline section.

- November 29, 1990: We transmitted a biological opinion, file number 2-21-90-F-169b, to the Forest Service for the Redrock Canyon Action Plan.

- December 23, 1992: We transmitted a biological opinion, file number 2-21-92-F-350, to the Forest Service for the Canelo Pass to Patagonia Segment of the Arizona Trail.
- July 26, 1999: We transmitted a biological opinion, file number 2-21-98-F-399, to the Forest Service for short-term and long-term livestock grazing activities on the Coronado National Forest.
- October 24, 2002: We transmitted a biological opinion, file number 2-21-98-F-399-R1, to the Forest Service for continued ongoing and long-term livestock grazing on the Coronado National Forest.
- January 2, 2004: We transmitted a biological opinion, file number 2-21-98-F-0399-R2 to the Forest Service for issuance of 10-year grazing permits (2003 to 2013) for the Kunde and Papago allotments and implementation of Allotment Management Plans for these allotments.

Actions specific to the consultation history of this biological opinion are:

- November 1, 2006: We met with Reclamation, the Forest Service and the Arizona Game and Fish Department (AGFD) on planning for the Redrock Native Fish Restoration Project.
- March 1, 2007: We conducted a site visit with Reclamation and the Forest Service to Redrock Canyon, and met with the grazing permittees.
- August 6, 2007: We received the August 3, 2007, letter transmitting the biological assessment and requesting consultation.
- September 20, 2007: We received Reclamation's September 14, 2007, memorandum transmitting the Draft EA for the proposed action.
- October 26, 2007: We transmitted a letter requesting a 60-day extension in order to complete formal consultation. We stated that a draft biological opinion would be available on January 3, 2008.
- February 28, 2007: We requested an extension of 60 days to complete the biological opinion.
- April 15, 2008: We requested an extension of 60 days to complete the biological opinion.
- May 15, 2008: We transmitted a draft biological opinion to you.
- June 5, 2008: We received comments from the Forest Service and Reclamation on the draft biological opinion.

BIOLOGICAL OPINION

Description of the Proposed Action

The project area is the watershed of Redrock Canyon in the Canelo Hills. Redrock Canyon proper is approximately 12 miles long, with several major tributaries, and flows seasonally from upstream of Down Under Tank downstream to join with Harshaw Canyon and from there into Sonoita Creek in the town of Patagonia. Sonoita Creek drains into the Santa Cruz River near the town of Rio Rico. There are about 20,000 acres in the watershed, ranging in elevation from 5,900 feet at the crest of the Canelo Hills to 1,250 feet near the confluence. The majority of the stream channels within the Redrock Canyon watershed are of low to moderate gradient, punctuated by bedrock outcrops. Some of these bedrock outcrops form vertical or near-vertical drops from about 4 to 15 feet in height that function as barriers to upstream fish movement.

The Forest Service, Reclamation, FWS, and AGFD are cooperatively proposing a native fish restoration project for Redrock Canyon on the Coronado National Forest, Sierra Vista Ranger District, in Santa Cruz County, Arizona. The purpose of the proposed project is to help recover native aquatic species by removing a primary threat, nonnative aquatic fishes and amphibians, from the action area, and preventing their return. The proposed project includes construction of a fish barrier, removal of nonnative fish and frogs, and restoration of the native fish fauna. Additionally, Chiricahua leopard frog and Sonora tiger salamander will be transplanted pending the availability of appropriate breeding stock and suitable habitat in the project area. These activities will occur over a 4-year period. The project will be located on National Forest lands, with the major actions funded by Reclamation. Reclamation will construct the fish barrier, while removal of nonnative fish and bullfrogs and restoration of native fishes and amphibians will be accomplished by AGFD and FWS. Details of the proposed action are summarized here from the Forest Service biological assessment (U.S. Forest Service 2007) and Reclamation's Draft Environmental Assessment (U.S. Bureau of Reclamation 2007); please see these documents for a more thorough description of barrier construction and other elements of the proposed action.

- Fish barrier – Reclamation will build a reinforced poured-concrete fish barrier in lower Redrock Canyon approximately 4.25 miles upstream of Sonoita Creek. The barrier is intended to create an effective impediment to upstream movement of fish, including fish from Sonoita Creek and Patagonia Lake, both now and in the future. It will also act as a control site for eradication of nonnative fishes upstream in the Redrock Canyon watershed, preventing their reinvasion after removal. Construction disturbance will not exceed 0.12 acres of total disturbed area at the barrier site, and 0.5 acres at the staging site. No hazardous chemicals will be stored at the barrier site. All reasonable efforts will be made to minimize removal of trees, and site rehabilitation will occur following project completion. Construction would require approximately 1.5 months.
- Native species salvage – Prior to stream renovation, Reclamation, Forest Service, AGFD, and FWS personnel will salvage as many of the native fish, amphibians, Mexican garter snakes (*Thamnophis eques*), and native turtles from Redrock Canyon as possible given time and manpower constraints. These will be held temporarily on site or at other appropriate locations and returned to the stream following removal of nonnative species.

- Nonnative fish and frog removal – Nonnative fish, including largemouth bass (*Micropterus salmoides*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), western mosquitofish (*Gambusia affinis*) and bullfrog (*Rana catesbeiana*), will be removed from the Redrock Canyon watershed using an integrated control approach. All nonnative fish will be eradicated from the drainage using the piscicides rotenone and antimycin A. Various mechanical methods will be used to remove adult bullfrogs, including netting, gigging, shooting (firearms), and euthanization. Stock tanks and stream pools will be pumped to lower water levels to facilitate bullfrog removal.
- Restoration of native fishes and amphibians – A suite of five native fish species and two rare amphibians will potentially be restored in all appropriate locations with suitable habitat within the Redrock Canyon watershed. These include longfin dace (*Agosia chrysogaster*), speckled dace (*Rhinichthys osculus*), desert sucker (*Pantosteus clark*), Gila topminnow, Gila chub, Chiricahua leopard frog, and Sonora tiger salamander. In addition, Sonora mud turtle (*Kinosternon sonoriense*) will be salvaged and restocked during treatment. The project may also benefit native Mexican gartersnake, a rare species that may inhabit Redrock Canyon.
- Monitoring – Post-treatment monitoring will be conducted to assess the success of the nonnative removal and native species restoration. Monitoring will continue for a minimum of 5 years after the nonnative removal. Post-treatment monitoring will incorporate results of existing ongoing monitoring efforts in the Redrock Canyon watershed. Also, periodic inspection and maintenance will be required, especially after flooding; the Forest Service will assume responsibility for “first-line” inspection of the fish barrier following flood events. Long-term maintenance of the barrier will be performed by the Central Arizona Water Conservation District (CAWCD). Long-term maintenance could include complete reconstruction of the barrier.

The action area for the proposed action includes all areas that will directly or indirectly be affected by the proposed action, including Redrock Canyon and its watershed, and all or portions of the following grazing allotments within the watershed: Crittenden, Kunde, Papago, and San Rafael.

The purposeful capture, transport, and other forms of intentional take associated with salvage, repatriation and monitoring activities of listed fishes and amphibians (Gila topminnow, Gila chub, Chiricahua leopard frog and Sonora tiger salamander), will be covered under FWS 10(a)(1)(A) Recovery Permits and is not covered under this consultation.

Livestock Grazing

Livestock grazing is also part of the proposed action. Consultation on the effects of livestock grazing on listed species in the action area was evaluated previously, most recently, in our October 24, 2002, programmatic biological opinion on the effects of livestock grazing on listed species on the Coronado National Forest (file number 2-21-98-F-399-R1, U.S. Fish and Wildlife Service 2002a), and in our January 2, 2004, biological opinion on the effects of issuance of 10-year term grazing permits (2003 to 2013) for the Kunde and Papago allotments on the Coronado National Forest (file number 2-21-98-F-399-R2, U.S. Fish and Wildlife Service 2004). We hereby incorporate the Proposed Action sections of those opinions by reference, with the following updates and modifications.

The Redrock Canyon watershed encompasses all or portions of four livestock grazing allotments administered by the Forest Service. These allotments are Crittenden, Kunde, Papago, and San Rafael. Livestock management on each of these allotments is guided by an allotment management plan (AMP). Implementation of the AMP is documented in the Annual Operating Instructions (AOI). The AOI sets forth the maximum permissible grazing use authorized for the upcoming grazing season, the planned sequence of grazing, improvements to be constructed, reconstructed or maintained; allowable use or other standards to be followed by the permittee; and required monitoring for the grazing season. Management of the four allotments is described below.

Crittenden Allotment. The allotment was created by combination of the Crittenden and Seibold Allotments in 2005. The allotment contains ten pastures, of which the following six occur within the Redrock Canyon watershed: Corral Canyon (small part), Red Bear, Oak Grove, Moonshine, East Redrock and West Redrock. The first four are grazed by the main herd as part of a six-pasture rotation. The East and West Red Rock Pastures are grazed with 30 head of heifers and/or cows for up to 90 days during the winter (November-April), except that once every 3 to 5 years the entire herd (130 head) may graze these two pastures for one month in the winter.

Livestock exclosures were constructed around Pig Camp Spring (0.1 mile long) and Gate Spring (0.3 mile long) in the 1990s on behalf of Gila topminnow. Oak Grove Spring was fenced in 2001 with the expectation that excluding livestock grazing would develop habitat for Gila topminnow; however, that expectation has not been realized despite 6 years of near complete exclusion from livestock grazing. The narrow canyon bottom apparently lacks sufficient water storage capacity to develop and maintain the cienega-like aquatic habitat that was predicted to develop. The stream in the West Redrock Pasture was fenced to limit livestock use in 2002. All of these exclosures are maintained and monitored by the grazing permittee and/or Forest Service personnel at least once a year to ensure the fences are functional.

Kunde Allotment. The Kunde Allotment occupies the middle portion of the drainage, and consists of four pastures: Holding, Lower Lampshire, Upper Lampshire and Redrock. Historically, one of the greatest challenges to successful management of the Kunde Allotment has been poor water availability in the rougher pastures and adherence to the grazing rotation schedule. This would often result in over-use of the Redrock Pasture, where reliable water was available. Consequently, livestock management was changed in 1991 to require winter use only in pastures along Redrock Creek. Permitted numbers were reduced from 100 cattle year-long

(CYL) to 53 CYL. The Falls and Gate Springs enclosures, protecting 0.5 and 0.3 miles of stream bottom, respectively, were constructed to protect the only areas of perennial water in the Redrock Pasture. Further reductions in permitted numbers occurred in 2004 with issuance of a 10-year grazing permit. The Redrock pasture was excluded from grazing to reduce impacts to the Gila topminnow and help to improve riparian and watershed conditions in Redrock Canyon.

Permitted numbers of cattle were reduced to 31 CYL to reflect the reduction in available capable acres. The AMP established a three pasture rotational grazing schedule using Upper Lampshire, Lower Lampshire and Holding pastures to allow growing season rest in all pastures, at least every other year. A pipeline was proposed from the Crittenden Allotment storage tanks to the Upper and Lower Lampshire pastures to aid in livestock distribution and improved rangeland and watershed condition over time. The pipeline has not been constructed and the permit has been in non-use status for resource protection purposes since 1998.

Papago Allotment. The allotment consists of a 14-pasture deferred rotation grazing system but Lampshire Pasture is the only pasture within the Redrock Canyon watershed. Lampshire Pasture is grazed annually during December-January or February-March. The main feature in this pasture is Box Canyon, a tributary to Lampshire Canyon, which flows into Redrock Canyon. Perennial water is lacking in Box Canyon and there is no potential for fish habitat (Stefferd and Stefferud 2004).

San Rafael Allotment. The upper part of the drainage is included in the San Rafael Allotment, which is part of the Vaca Ranch headquartered in the San Rafael Valley. There are 23 pastures on the Vaca Ranch but only two are within the Redrock Canyon watershed: North Redrock and South Redrock. These two pastures are grazed in rotation during winter from October through March. Cott Tank (1.9 miles long) enclosure was constructed in the mid-1990s and extended downstream into Redrock Canyon about ¼ mile in the early 2000s.

Complex water delivery systems have been constructed within Redrock Canyon watershed to transport water long distances to service livestock. In addition to the 17 stock tanks listed, approximately 20 wells exist, although some may no longer be in use. Approximately 15 miles of pipeline feed water to many troughs throughout the drainage. About half a dozen trick tanks capture water in various locations. Some water is imported into the Redrock Canyon watershed from wells in the Meadow Valley, Cienega Creek, and Babocomari River watersheds to livestock troughs in upper Redrock Canyon, portions of Oak Grove Spring Canyon, and upper Box Canyon. According to the Forest Service, imported water originates from groundwater with no contact with surface water outside of Redrock Canyon (U.S. Forest Service 2007).

Conservation Measures

The following conservation measures are part of the proposed action. They are intended to minimize or avoid adverse impacts to sensitive species.

- Primary staging of machinery and equipment will occur on two benches above the stream, alongside Forest Road 138.
- All reasonable efforts will be made to avoid removal of trees in the riparian corridor.

- Standard dust abatement best management practices (BMPs) will be used to minimize generation of airborne particulates.
- Sediment and erosion controls will be established where appropriate to protect water quality and soils.
- Signs of vehicle access to the barrier site will be obliterated following construction.
- Reclamation received a Clean Water Act (CWA) Section 404 permit to construct fish barriers pursuant to the CAP biological opinion. Terms and conditions of the permit will be integrated into the project.
- A CWA Section 401 Water Quality Certification has been issued by ADEQ for fish barrier construction. Terms and conditions of the certification will be integrated into the project.
- A Water Control Plan will be prepared with measures to protect water quality and care of the stream during fish barrier construction.
- All construction equipment will be periodically inspected for leaks. Any significant leaks will be promptly corrected.
- Hazardous substances and fuels will be stored outside the 100-year floodplain of Redrock Canyon.
- The Forest Service's Pesticide Use Proposal will clearly describe strict adherence to pesticide labels.
- Pesticide applications will be conducted only during periods of low stream flow by certified applicators.
- Stock pond treatments (pumping and pesticide applications) will be timed to avoid impacting livestock. Alternative water sources will be provided, as appropriate, for livestock affected by pumping of stock tanks or pools.
- All necessary precautions will be utilized to prevent the spread of chytrid fungus (and other nonnative species) utilizing existing protocols.
- During renovation, Reclamation and the Forest Service will make every effort to revive native species found during the treatment, as practicable.

Status of the Species

Gila Topminnow

We listed the Gila topminnow as endangered on March 11, 1967, without critical habitat (U.S. Fish and Wildlife Service 1967). The reasons for decline of this fish include past dewatering of rivers, springs, and marshlands, impoundments, channelization, diversions, regulation of flow, land management practices that promote erosion and arroyo formation, and the introduction of predacious and competing nonnative fishes (Miller 1961, Minckley 1985). Life history information can be found in the 1984 recovery plan (U.S. Fish And Wildlife Service 1984), the draft revised Gila topminnow recovery plan (Weedman 2000), and references cited in the plans and in this biological opinion.

The status of the species has changed little since our November 1, 2007, biological opinion on the effects of continuing and future actions on the proposed reestablishment of desert pupfish and Gila topminnow into Howard and Posey wells wildlife water development exclosures within the San Simon Valley (file number 22410-2007-F-0225, U.S. Fish and Wildlife Service 2007a). We hereby incorporate via reference the Status of the Species section from that biological opinion.

Gila Chub

We listed the Gila chub as endangered with critical habitat on November 2, 2005 (U.S. Fish and Wildlife Service 2005a). Historically, Gila chub have been recorded from rivers, streams, and spring-fed tributaries throughout the Gila River basin in southwestern New Mexico, central and southeastern Arizona, and northern Sonora, Mexico (Miller and Lowe 1967, Rinne and Minckley 1970, Minckley 1973, Rinne 1976, DeMarais 1986, Propst 1999, and Weedman et al. 1996). Today the Gila chub has been restricted to small, isolated populations scattered throughout its historical range. Critical habitat includes approximately 160 miles of stream reaches in Arizona and New Mexico, organized into seven river units (U.S. Fish and Wildlife Service 2005a).

Decline of Gila chub is due to habitat loss from past and current dewatering of rivers, springs, and cienegas (e.g. from diversions, impoundments, and groundwater pumping), poor land management practices (e.g. excessive livestock grazing) resulting in erosion and arroyo formation, and the concomitant introduction of predacious and competing nonnative fish species (Miller 1961, Minckley 1985). Life history information can be found in the status review (Weedman et al. 1996), the final rule (U.S. Fish and Wildlife Service 2005a), and references cited therein.

The status of Gila chub has changed little since our June 28, 2007, Biological Opinion for Restoration of Native Fishes in Lower Bonita Creek and Implementation of a Memorandum of Understanding (MOU) and 10-Year Operation Plan between the Bureau of Land Management (BLM) and the City of Safford (file number 22410-2007-F-0233). We hereby incorporate by reference the Status of the Species section of that biological opinion (U.S. Fish and Wildlife Service 2007b).

Chiricahua Leopard Frog

We listed the Chiricahua leopard frog as a threatened species without critical habitat on June 13, 2002 (U.S. Fish and Wildlife Service 2002b). A final recovery plan was completed in April 2007 (U.S. Fish and Wildlife Service 2007c). Threats to Chiricahua leopard frog include predation by nonnative organisms, especially bullfrogs, fish (including fish in the families Salmonidae and Centrarchidae, such as *Micropterus* spp. and *Lepomis* spp.), and crayfish (*Orconectes virilis* and possibly others); disease; drought; floods; degradation and loss of habitat as a result of water diversions and groundwater pumping, improper livestock management, altered fire regimes due to fire suppression and livestock grazing, mining, development, and other human activities; disruption of metapopulation dynamics; increased chance of extirpation or extinction resulting from small numbers of populations and individuals; and environmental contamination. Chiricahua leopard frog has disappeared from more than 75 percent of its historical localities (Clarkson and Rorabaugh 1989, Jennings 1995, Rosen et al. 1996, Sredl et al. 1997, Painter 2000). Loss of Chiricahua leopard frog populations is part of a pattern of global amphibian decline, suggesting other regional or global causes of decline may be important as well (Carey et al. 2001).

The status of Chiricahua leopard frog has changed little from our May 17, 2007, biological opinion on a ten-year livestock grazing management plan for the Red Lake Allotment on the Pleasant Valley Ranger District of the Tonto National Forest (file number 22410-2007-F-0052). We hereby incorporate via reference the Chiricahua leopard frog's Status of the Species section from that biological opinion (U.S. Fish and Wildlife Service 2007d).

Sonora Tiger Salamander

We listed the Sonora tiger salamander as endangered on January 6, 1997, without critical habitat (U.S. Fish and Wildlife Service 1997a). The final recovery plan was signed in September 2002 (U.S. Fish and Wildlife Service 2002c). Threats to Sonora tiger salamanders include restricted distribution, disappearance of natural standing water habitat, predation by non-native fish, bullfrogs, and crayfish, genetic swamping by introduced, nonnative barred tiger salamanders, disease, low genetic diversity, and collection for bait or translocation by anglers. The Recovery Plan for Sonora tiger salamander calls for removal of nonnative predators at current and historically occupied sites, measures to prevent their invasion, and establishment of new populations if necessary (U.S. Fish and Wildlife Service 2002c).

Little has changed in the status of the Sonora tiger salamander since our June 14, 2007, biological opinion on proposed ongoing and future military operations and activities at Fort Huachuca (file number 22410-2007-F-0132); we hereby incorporate via reference the Sonora tiger salamander's Status of the Species section from that biological opinion (U.S. Fish and Wildlife Service 2007e).

Environmental Baseline

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and

private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

In general, the environmental baseline in the action area is similar to that described in two prior consultations, our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (file number 2-21-98-F-399-R1), and our January 2, 2004, biological opinion on the effects of issuance of 10-year term grazing permits (2003 to 2013) for the Kunde and Papago allotments on the Coronado National Forest (file number 2-21-98-F-399-R2), and we incorporate that information here by reference (U.S. Fish and Wildlife Service 2002a, 2004). Some changes have occurred, primarily in relation to livestock grazing and drought, which are discussed here. Historical changes in Redrock Canyon and Sonotia Creek have been relatively well documented. Land use in the late 1800s, especially overstocking of livestock, and subsequent drought/flooding cycles caused downcutting in stream channels, a change from grassland to higher densities of woody tree species, and a loss of wetland and riparian habitats. Changes are also variously attributed to other human activities such as road use, fuelwood harvest, fire suppression, mining, groundwater pumping, and climate change, activities that still occur. Native aquatic species were further impacted with the introduction of nonnative aquatic species.

Recently, better range management has resulted in marked improvement of riparian and upland conditions throughout the Redrock Canyon watershed. The improvement has been particularly dramatic in many of the riparian areas. As documented by Forest Service photo points and data, and in consultant reports, projects completed during the past decade are improving riparian conditions in Redrock Canyon. A series of photos taken at 1,000-foot intervals through Redrock Canyon in 1989 and repeated in 1996 and 2001 generally illustrate the channel becoming narrower with increased definition of channel banks, substrate particle size increasing (as fine sediments are either captured by streambank vegetation or passed through the system), and recruitment and growth of woody and herbaceous riparian plants (Stefferdud and Stefferud 2001). In livestock grazing exclosures along the canyon bottom, aquatic habitats dramatically improved with increases in overhanging vegetation, establishment of defined streambanks, and a trend toward enhanced channel stability and higher diversity of aquatic habitats. The extent of surface water in time and space, and the extent of riparian vegetation have expanded a considerable distance beyond the exclosures. In some reaches, herbaceous vegetation is beginning to catch and retain fine sediments during over bank flows (Stefferdud and Stefferud 2001, 2008).

Past Consultations in the Action Area.

The Redrock drainage is almost entirely on Forest Service lands of the Coronado National Forest. Previous consultations have all been with the Forest Service. Major section 7 consultations with the Forest Service that have addressed one or more species being addressed in this biological opinion are listed below. These consultations were for actions that were either completely or partially implemented, or are being implemented, in the action area. All concluded that the action would not jeopardize any listed species, nor would critical habitat be adversely modified.

- **Redrock Canyon Action Plan.** Formal consultation was completed and a biological

opinion issued to the Forest Service on November 29, 1990 (file number 2-21-90-F-169b). This consultation addressed the effects of fencing installation, changes in livestock management, development of water sources, road closures, watershed stabilization structures and channel modifications, and planting riparian trees, on Gila topminnow and lesser long-nosed bat. Incidental take of Gila topminnow was anticipated to occur via direct loss from construction of fence crossings, pole plantings, during habitat enhancement and pool excavation at Pig Camp Spring, and through depletion of streamflow from pumping of alluvial subsurface water at Redrock, Redbank, and Silver Tank wells. Incidental take of lesser long-nosed bat was anticipated to occur as harm from loss of foraging habitat (agaves) during construction activities.

- **Canelo Pass to Patagonia Segment of the Arizona Trail.** Formal consultation was completed and a biological opinion issued to the Forest Service on December 23, 1992 (file number 2-21-92-F-350). The biological opinion addressed the effects of construction and use of the Canelo Pass to Patagonia leg of the Arizona Trail on Gila topminnow. Incidental take of Gila topminnow was anticipated to occur as harm from habitat loss due to increased recreational use of the Redrock Canyon area.
- **Short-term and Long-term Grazing Activities on the Coronado National Forest.** Formal consultation was completed and a biological opinion issued on July 26, 1999 (file number 2-21-98-F-399). Within the Redrock Canyon action area, the biological opinion addressed the effects of livestock grazing on Gila topminnow and lesser long-nosed bat. Incidental take of Gila topminnow was anticipated to occur via direct mortality during reconstruction or maintenance of existing cross-channel fences, during trampling of stream channels by livestock, and incidental consumption of small topminnow during livestock watering, or from harm through habitat alteration and loss due to grazing within unfenced occupied habitat; grazing within the exclosures when fences periodically are washed out, cut or damaged; dissemination of predatory and competitive nonnative aquatic species through livestock waters; maintenance of degraded conditions in intermittent or ephemerally flowing migration areas between subpopulations of Gila topminnow; reduction in surface flows due to water development and watershed degradation; alterations in the hydrograph that result in flashier streamflows; and maintenance of watershed conditions that result in an unstable stream channel in Redrock, Lampshire, or Oak Grove Spring Canyons. Incidental take of lesser long-nosed bat was anticipated to occur as harassment from disturbance (access to roost from roads) and harm from loss of foraging habitat (agaves) from livestock grazing.
- **Ongoing and Continued Livestock Grazing on the Coronado National Forest.** Formal consultation was completed and a biological opinion issued on October 24, 2002 (file number 2-21-98-F-399-R1). Within the Redrock Canyon action area, the biological opinion addressed the effects of livestock grazing on Gila topminnow, Chiricahua leopard frog, Sonora tiger salamander, and lesser long-nosed bat. Incidental take of Gila topminnow was anticipated to occur via direct mortality during reconstruction or maintenance of existing cross-channel fences, during trampling of stream channels by livestock, and incidental consumption of small topminnow during livestock watering, or from harm through habitat alteration and loss due to grazing within unfenced occupied habitat; grazing within the exclosures when fences periodically are washed out, cut or

damaged; dissemination of predatory and competitive nonnative aquatic species through livestock waters; maintenance of degraded conditions in intermittent or ephemerally flowing migration areas between subpopulations of Gila topminnow; reduction in surface flows due to water development and watershed degradation; alterations in the hydrograph that result in flashier streamflows; and maintenance of watershed conditions that result in an unstable stream channel in Redrock, Lampshire, or Oak Grove Spring Canyons. Take of Chiricahua leopard frog was anticipated to occur from direct mortality or injury from individuals being crushed or trampled during tank maintenance activities or from livestock using tanks; harm due to unintended introduction of chytrid fungus; and harm from habitat loss due to livestock grazing removing vegetative cover species and sedimentation. Take of Sonora tiger salamander was anticipated to occur from harassment during capture and holding of individuals as part of stock tank maintenance, direct mortality or injury during construction and maintenance of range projects, harm through mortality from spread of nonnative species during maintenance activities, harm from habitat degradation due to reduction in cover from livestock activities, and direct mortality or injury from being trampled by cattle.

- **10-Year Grazing Permits (2003 to 2013) for the Kunde and Papago Allotments.**

Formal consultation was completed and a biological opinion issued on January 2, 2004 (file number 2-21-98-F-399-R2). Within the Redrock Canyon drainage, the biological opinion addressed the effects of livestock grazing, 10-year grazing permits (2003 to 2013) for the Kunde and Papago allotments and implementation of Allotment Management Plans for these allotments, on Gila topminnow, Chiricahua leopard frog, and lesser long-nosed bat. Take of Gila topminnow was anticipated to occur in Redrock Canyon from livestock grazing and its management, including construction, development, or maintenance projects (e.g., reconstruction or maintenance of existing fences across the stream channel or existing road and water development or maintenance in connection with grazing activities) in the form of direct mortality and harm from habitat degradation (bank destabilization and loss of cover).

Gila Topminnow

Historically Gila topminnow has been documented throughout Redrock Canyon since 1978, and in Oak Grove Spring and Lower Lampshire Canyon. The status of the Redrock Canyon Gila topminnow population has declined recently and the species has not been documented since 2005. Although range and riparian conditions have largely improved, the area has been in drought since 1995, and the resulting reductions in habitat as stream channels have dried and perennial habitat has been reduced in extent, along with increases in nonnative species, primarily mosquitofish, have apparently extirpated the Gila topminnow from the drainage. The Gila topminnow appears to be less tolerant of crowding than are mosquitofish, thus giving mosquitofish a competitive edge during drought conditions (Dean 1987). In previous years, Gila topminnow occupied areas at West Redrock, Falls, and Gate Spring, where mosquitofish managed to sustain only small numbers. With drought, those areas are now dry seasonally or retain only very small areas of water during dry months. Gila topminnow have survived major droughts, such as that of the 1950s, but at that time, nonnative fish and frogs were not present and Gila topminnow probably survived by retreating into more permanent waters, such as in Cott Tank drainage. Now those waters also support large populations of mosquitofish and bullfrogs.

Crowded into shrinking pools with aggressive nonnatives, Gila topminnow are apparently unable to survive.

The Gila topminnow's Environmental Baseline in our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (file number 2-21-98-F-399-R1), and our biological opinion on the effects of issuance of 10-year term grazing permits (2003 to 2013) for the Kunde and Papago allotments on the Coronado National Forest (file number 2-21-98-F-399-R2), are also incorporated here by reference (U.S. Fish and Wildlife Service 2002a, 2004). In summary, the notable changes are that Gila topminnow has since been extirpated from the action area and that range and riparian condition has improved somewhat in response to better range management, while nonnative species have become more dominant, and the extent of wetland habitat has decreased due to drought.

Gila Chub

Gila chub does not currently occur in the action area. The proposed action includes reestablishing Gila chub in the action area in suitable habitat. The Cott Tank drainage likely represents the best habitat in the action area for this species, and the proposed action will improve the suitability of that habitat by eliminating nonnative species. No critical habitat for Gila chub occurs in the action area, thus none will be affected.

Chiricahua Leopard Frog

Chiricahua leopard frog is known only from the Oak Grove Spring Canyon tributary of Redrock Canyon, and was first documented in 1995 (Scott 1995). There are earlier anecdotal records of probable leopard frogs in Redrock Canyon, but the identity of those individuals cannot be confirmed. In 2003, Chiricahua leopard frogs were found inhabiting Oak Tank (also referred to as Kunde Tank), the same stock tank in Oak Grove Spring Canyon where Sonora tiger salamanders were also found.

Chiricahua leopard frog has experienced severe declines throughout its range due, in part, to predation and competition by nonnative fishes, bullfrogs, tiger salamanders, and crayfish (U.S. Fish and Wildlife Service 2007). It is likely the species historically occupied much of the surface water within the Redrock Canyon watershed but was reduced by loss of surface water due to drought and human activities (livestock grazing, road use, water withdrawal), the arrival of nonnative fishes by the 1970s, and the 1980s' invasion of bullfrog. Disease is believed to be a significant factor in mortality of leopard frog populations. Chytridiomycosis, a fungal skin disease, has been implicated in catastrophic die-offs of leopard frogs, including Chiricahua leopard frog (USFWS 2007). Air and water pollution may have direct adverse effects to Chiricahua leopard frog and may also facilitate mortality from pathogens. The AGFD recorded a "large die off" of leopard frogs at Oak Tank in February 2003 that may have been due to an outbreak of chytrid fungus.

The Environmental Baseline in the action area for Chiricahua leopard frog has otherwise changed little since completion of our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (file number 2-21-98-F-399-R1), and is incorporated here by reference (U.S. Fish and Wildlife Service 2002a). The notable changes are

that range and riparian condition has improved somewhat in response to better range management, while nonnative species have become more dominant, extent of wetland habitat has decreased due to drought, and the population of Chiricahua leopard frogs in Oak Tank experienced a die off in 2003.

Sonora Tiger Salamander

Sonora tiger salamander was only recently recorded in the Redrock Canyon watershed. In February 2003, Sonora tiger salamanders were found at Oak Tank in the east fork of the north fork of Oak Grove Spring Canyon (unpublished AGFD records – the record is referred to Kunde Tank). There are earlier reports of salamanders in Sink Hole Tank in the upper reaches of an unnamed tributary to Lampshire Canyon, but the ongoing occupation of that tank has not been verified by additional surveys. It is likely the species historically occupied more of the surface waters within the Redrock Canyon watershed but was reduced by loss of surface water due to drought and human activities (livestock grazing, road use, water withdrawal), and the arrival of nonnative species.

The Sonora tiger salamander's Environmental Baseline section from our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (file number 2-21-98-F-399-R1) is incorporated here by reference (U.S. Fish and Wildlife Service 2002a).

Effects of the Proposed Action

Gila Topminnow

In general, the project will benefit Gila topminnow by eliminating or reducing nonnative species that prey on and compete with the species via chemical and mechanical removal, and preventing the future upstream reinvasion of nonnative species into Redrock Canyon from areas downstream via the installation of the fish barrier. At present, nonnative aquatic species that occur downstream include those targeted for removal from Redrock Canyon during the proposed project, western mosquitofish, largemouth bass, green sunfish, bluegill, and bullfrogs, plus others, such as yellow bullhead (*Ameiurus natalis*), which presently occurs in Sonoita Creek (Killeen 2005). The constructed fish barrier will work in conjunction with existing natural barriers within the canyon to achieve the benefits of a multiple-barrier system. Multiple-barrier systems confer advantages in controlling possible future nonnative invasions and are recommended (Carpenter and Terrell 2006). Only one natural barrier, the Falls, exists in the central portion of Redrock Canyon, approximately 1.5 miles upstream of the barrier site. Other natural barriers exist in the upper reaches of most of the tributaries. Constructed barriers also exist in at least two locations: Lampshire Dam and an old cement dam shortly downstream of Down Under Tank.

The proposed barrier will protect approximately 7 miles of stream habitat that is currently unprotected by natural barriers from invasion by nonnatives. Approximately 1.5 miles of this habitat is near-perennial and has historically provided habitat for Gila topminnow and other native fishes, especially speckled dace and desert sucker. Other stretches of stream through the watershed and in the tributaries provide habitat that is mostly ephemeral with short reaches of

water that is perennial even in severe drought. Despite an ongoing drought since about 1995, drought conditions are unlikely to result in complete extirpation of nonnative aquatic species in the Redrock Canyon watershed. While complete loss of water is possible, it is not likely. Some small pockets of water at springs and in-channel upwellings are likely to remain. Mosquitofish can survive under conditions of severe water loss and in waters with low dissolved oxygen and poor water quality (Daniels and Felley 1992; Childs 2006). Because they are quite small, they can use tiny pockets of water trapped in bedrock clefts or under bank overhangs for long periods of time, particularly in the absence of predators. Thus even with drought, renovation is necessary, and in fact low water conditions should facilitate renovation.

Placing a fish barrier in lower Redrock Canyon has some potential for adverse impacts by preventing movement of Gila topminnow. Loss of gene flow, inbreeding, and fragmentation are all possible adverse effects of barriers to fish movement (Sloat 1999). However, the barrier is located at the lower end of known Gila topminnow distribution in the Redrock Canyon watershed. Some upstream movement from Sonoita Creek may occur, similar to the upstream movement into Redrock Canyon demonstrated in 2001 by speckled dace, but the natural barrier will block any such movement at the Falls. Gila topminnow in Redrock Canyon have already experienced substantial fragmentation and blockage of genetic exchange, thus the addition of a constructed barrier is not expected to significantly decrease what can already be characterized as an extremely low likelihood of genetic exchange with populations elsewhere in the Sonoita Creek drainage. As evidence of this, genetic information indicates that Gila topminnow in Redrock Canyon are part of the upper Sonoita Creek management unit composed of three genetically different populations: Coalmine, Sonoita and Redrock Canyon. Further, fish from Redrock Canyon are genetically distinct from all other known populations both in Sonoita Creek and elsewhere (Hedrick et al. 2001), indicating little or no gene flow with the other Sonoita Creek populations.

Once the barrier is in place, Gila topminnow should function as a healthy population genetically. The more ephemeral stream reaches protected behind the barrier (that include short reaches of perennial water) will allow Gila topminnow and other aquatic organisms to increase in population size following a genetic bottleneck¹ event, which often is caused by severe drought. However, population expansion during favorable (wet) watershed conditions should prevent fixation of deleterious genetic variants that are often typical of small populations. Such “genetic rescue”² is an important element in the conservation of rare species (Hedrick 1995, Ingvarsson 2001). The additional stream length protected behind the constructed barrier will enhance metapopulation³ dynamics, thereby benefiting population genetics and population persistence.

If in the future, enhanced genetic interchange is determined to be necessary, this can be accomplished by periodically moving individuals from the downstream segment of Redrock Canyon into upper segments (Waite et al. 2005).

¹ When population numbers are temporarily reduced to a level insufficient to maintain the genetic diversity in the population

² An increase in population fitness owing to immigration of new alleles

³ A set of local populations within some larger area, where typically migration from one local population to another is possible

There is a small chance that Gila topminnow could be present at the barrier site at the time of construction. The probability is low, as construction will likely take place during the driest period. If they are present, Gila topminnow will be salvaged. A few individuals could be missed during salvage and could be killed during barrier construction as a result of construction activities. Likewise, barrier monitoring and maintenance activities could affect Gila topminnow in the future if they are present. For example, if major repairs to the barrier are needed, Gila topminnow could be killed as a result of construction activities, from being crushed by heavy equipment, stranded during flow diversion, exposed to toxic materials such as petroleum products, or smothered by sediment input.

Another potential adverse effects of the fish barrier is the possible loss of Gila topminnow over the barrier. Any fish that might get transported over the barrier during floods will be unable to return upstream and will likely ultimately die as the reach of stream below the barrier regularly becomes dry. Although there will inevitably be some loss of Gila topminnow from this effect, this loss should not affect the overall population above the barrier, and is insignificant relative to the conservation benefit afforded by the fish barrier from protection of nonnative species invasions.

Salvage and restocking of Gila topminnow could result in death of a few individual Gila topminnows during capture, holding, and transport. Substantial experience exists in AGFD and other agencies in transport of Gila topminnow, and mortalities are expected to be quite small. As discussed previously in the Proposed Action section, this element of the proposed action will be covered under FWS 10(A)(1)(a) Recovery Permits. Although as many Gila topminnow will be salvaged as can be found, it is not possible to remove all individuals using existing live-capture techniques. Any Gila topminnow remaining in the waters of Redrock Canyon following salvage will be eliminated during application of piscicides.

The eight native aquatic species proposed for reestablishment or that may have benefits accruing from the proposed action have evolved as an integrated community in other drainages in Arizona and would be expected to coexist in Redrock Canyon. However, even in natural systems, there can be negative inter-specific interactions. Gila chub is predatory and as an adult eats other fish. They have been documented to eat speckled dace in Redfield Canyon (Griffith and Tiersch 1989) and although he found only algae in Gila chub stomachs, Minckley (1969) observed what he believed to be hunting behavior by Gila chub toward Gila topminnow in Monkey Spring. Reintroduction of Gila chub into Redrock Canyon could result in predation of Gila topminnow by Gila chub. However, Gila chub and Gila topminnow were both historically found in Monkey Spring, O'Donnell Creek, and Sheehy Spring, indicating that they are co-evolved species capable of long-term coexistence. They presently coexist as robust populations in Cienega Creek (Voeltz and Bettaso 2003). Although some predation on Gila topminnow might result from stocking both species into Redrock Canyon, all data indicate that the two species were historically sympatric and compatible.

Previous consultations (see Consultation History above) have documented the short and long-term effects to Gila topminnow from ongoing livestock grazing in the project area. No changes to the livestock grazing operation are proposed with this project, and the anticipated effects of grazing to Gila topminnow transplanted to the project area remain the same as those documented previously. The Forest Service has implemented and will continue to implement actions required

under the consultations to minimize take of Gila topminnow. In addition, construction of the fish barrier will implement a conservation recommendation from our 2002 grazing biological opinion (U.S. Fish and Wildlife Service 2002a).

In summary, some Gila topminnow will likely be killed by chemical/and or mechanical treatments to remove nonnative species in Redrock Canyon, and there is a lesser likelihood that some could be killed during construction of the barrier. However, in the long-term, the project will be beneficial to Gila topminnow by removing nonnative predatory fish and bullfrogs and preventing nonnative fish from reinvading approximately 7 miles of potential stream habitat in Redrock Canyon, one of few remaining wild populations of the species.

Gila Chub

Gila chub do not currently occur in the action area, thus the proposed action represents a conservation benefit from the establishment of a new population in this portion of its historic range. There is a small possibility of adverse effects to the species from barrier maintenance activities, and a likelihood of some adverse effects from continued livestock grazing.

Gila chub will be translocated into suitable areas of the proposed action after barrier construction is completed. All take associated with capture, handling and transport will be covered by FWS 10(a)(1)(A) Recovery Permits. Because no Gila chub will be present during barrier construction, there will be no adverse affects to the species from this aspect of the proposed action. However, although the barrier site is typically dry, there is a small chance that Gila chub could occupy this intermittent reach in the future. Should Gila chub or their eggs be present at the barrier site, they could be injured or killed during maintenance activities from being crushed by heavy equipment, stranded during flow diversion, exposed to toxic materials such as petroleum products, or smothered by sediment input. Also, some Gila chub could be lost over the barrier into less suitable habitat and be unable to return upstream, but this loss should be insignificant relative to the conservation benefit of protection against invasion of nonnative fishes.

As with Gila topminnow, placing a fish barrier in lower Redrock Canyon has some potential for adverse impacts by preventing movement of Gila chub. Loss of gene flow, inbreeding, and fragmentation are all possible adverse effects of barriers to fish movement (Sloat 1999). However, the nearest populations of Gila chub to the action area are in distant portions of the Santa Cruz drainage, upstream in the San Rafael Valley, and downstream in the Cienega Creek drainage; both of these are many miles away and movement of fish/genetic exchange with these areas and Redrock Canyon is extremely unlikely, even without the proposed barrier, due to many miles of either dry stream or habitats filled with nonnative species. There appears to be enough habitat for Gila chub in Redrock Canyon, particularly in the Cott Tank drainage, to maintain a genetically healthy population of the species. If in the future, enhanced genetic interchange is determined to be necessary, this can be accomplished by periodically moving individuals from the donor population into Redrock Canyon (Waite et al. 2005).

Gila chub translocated into the action area will be adversely effected by ongoing livestock grazing and management. Because Gila chub is anticipated to occupy the same areas as Gila topminnow, management for Gila chub is not anticipated to be substantially different than that for Gila topminnow. Previous consultations (see Consultation History above) have documented

the short and long-term effects to both Gila topminnow and Gila chub from ongoing livestock grazing: our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (file number 2-21-98-F-399-R1) documented affects to both species and specifically to Gila topminnow in the action area, and our January 2, 2004, biological opinion (file number 2-21-98-F-0399-R2) on issuance of 10-year grazing permits (2003 to 2013) for the Kunde and Papago allotments documented effects to Gila topminnow from livestock grazing in the action area on those two allotments. The Effects of the Action sections for Gila topminnow and Gila chub from those biological opinions are also incorporated herein by reference (U.S. Fish and Wildlife Service 2002a, 2004).

Livestock grazing in Redrock Canyon would result in continuing adverse effects to Gila chub and its habitat through a number of mechanisms: habitat disturbance during reconstruction or maintenance of existing cross-channel fences; bank breakdown (sedimentation increase); reduction in surface flows due to water developments and watershed degradation; alterations in the hydrograph that result in flashier streamflows; spread of predatory and competitive nonnative aquatic species through livestock waters; and maintenance of watershed conditions that result in unstable stream channel conditions (U.S. Fish and Wildlife Service 2002a, 2004). In addition, there is also the potential for livestock to drink occupied Gila chub habitat dry, under certain conditions, completely eliminating all Gila chub habitat and killing any Gila chub present. Vallentine (1989) states that cattle need an average of 12 to 15 gallons of water per day per animal, and that this varies seasonally because of the moisture content of forage, ambient temperature and humidity, and other factors. Gerrish and Davis (1999) state that at 50°F, a cow may consume about five to seven gallons per day, but the amount increases by 0.4 gallons per day for every one-degree increase in air temperature; thus at 95°F the same cow will drink an average of twenty-four gallons per day. Given that small pool habitats like those present in the action area can be as little as several hundred gallons in volume, and have flow so low that inflow is essentially equal to or less than evaporation, several cows can completely dry habitat in a matter of days, especially in times of drought.

Although Gila chub will be considered for introduction into all suitable waters within the action area, it is likely that this will be limited to the Cott Tank or Falls exclosures (U.S. Bureau of Reclamation 2007). The Cott Tank Exclosure was built in 1982 and extended in 1999 such that it now encloses about 1.85 miles of stream. Although cattle have occasionally trespassed into the exclosure, cattle use has usually been light, with heavy use documented only in 1996. The Falls Exclosure, a smaller exclosure providing about 0.35 miles of fenced stream, also has some potential for Gila chub; it has experienced only light use from trespass cattle since 1994, except for one event in 1997 (Stefferd and Stefferud 2008).

The current strategy for management of livestock in the action area, developed in part through past consultations on livestock grazing (see U.S. Fish and Wildlife Service 2002a, 2004) has been to try and maintain livestock exclosures around the best aquatic habitat, while improving upland, riparian, and watershed conditions with reductions in numbers. The strategy has been successful, although the recent increase in the failure of some exclosures and trespass events (cattle entering and grazing in exclosures) suggests the need to improve methods of detecting and removing cattle from exclosures (Stefferd and Stefferud 2008). No changes to the livestock grazing operation are proposed with this project, and the anticipated effects of grazing to Gila chub transplanted to the project area are similar to those documented previously for Gila

topminnow (see U.S. Fish and Wildlife Service 2002a, 2004). Livestock management should continue the trend of improved watershed and stream conditions, and although cattle will inevitably have access to occupied Gila chub habitat, which could kill Gila chub through sedimentation or trampling, or drying of habitat, although these events should be rare because exclosures containing suitable Gila chub habitat have historically been fairly well-maintained (Stefferdud and Stefferud 2008).

Overall, the project will benefit Gila chub by eliminating nonnative predatory fish and bullfrogs and allowing future transplants of Gila chub in the Redrock Canyon drainage. Although grazing by livestock has the potential to impact the species because livestock are not presently excluded yearlong from all areas that may be occupied by Gila chub transplanted into the Redrock Canyon watershed, several perennial reaches are now fenced to exclude livestock. Exclosures are regularly inspected and maintained, thus although cattle could gain access if exclosures become damaged, that has typically not been the case. The conservation measures and other management actions currently being taken to minimize take of Gila topminnow will also act to significantly reduce potential direct and indirect adverse effects to Gila chub where the species co-occur. If Gila chub becomes established in Redrock Canyon, some individuals could be lost over the barrier, and the barrier would inhibit movement, but such losses and adverse effects would be insignificant relative to the conservation benefit of a new population of the species protected from nonnative species invasions.

Chiricahua Leopard Frog

The primary effect of the project will be to remove or reduce the principle threat to the species, predation and competition from nonnative species, and restore Chiricahua leopard frog into appropriate habitats throughout the Redrock Canyon watershed. Implementing an aggressive program to control nonnative aquatic organisms on the Forest, particularly bullfrogs, fish, and crayfish, is a key conservation recommendation from our 2002 grazing biological opinion (U.S. Fish and Wildlife Service 2002a), and a recovery action identified in the recovery plan (U.S. Fish and Wildlife Service 2007).

Benefits to Chiricahua leopard frog from the fish barrier will be increased protection from nonnative invasion from downstream. There will be no adverse effects from the construction and maintenance of the fish barrier, since Chiricahua leopard frog is not known from the vicinity of the proposed construction. Habitat fragmentation and downstream displacement effects that could occur with fish are not a concern for Chiricahua leopard frog. The barrier will be negotiable via overland movement.

Salvage, holding, and restocking of Chiricahua leopard frogs could result in death of a few individuals, but mortalities are expected to be small. All actions associated with salvage, holding, and restocking will be covered under FWS 10(a)(1)(A) Recovery Permits.

Although salvage activities will be carried out prior to application of piscicides, and as many Chiricahua leopard frog will be salvaged as can be found, it is not possible to ensure all individuals will be removed using live-capture techniques. Some individuals may remain in the treatment area where they could be exposed to the piscicide and killed. In areas where rotenone is used, some ability exists to salvage rotenone-affected individuals and revive them by placing

them in fresh water (Finlayson et al. 2000). This technique was effective for the treatment of stock ponds in the San Rafael Valley occupied by Sonora tiger salamander (J. Rorabaugh, FWS, pers. com., August 2006), and will be utilized during this project.

Chiricahua leopard frog larvae remaining after the salvage may suffer adverse effects during piscicide application. Little data exist on effects of rotenone or antimycin to amphibians. Tests of antimycin with northern leopard frog (*Rana pipiens*) found no toxicity to leopard frogs at piscicide application levels commensurate with the label directions (Lesser 1970). Rotenone is somewhat more toxic to frogs and Burress (1982) and Hamilton (1941, as cited in Fontenot et al. 1994) found substantial mortality of northern leopard frog tadpoles at concentrations used for fish removal. Farringer (1972, as cited in Fontenot et al. 1994) found varying results with adult northern leopard frogs, but found much higher concentrations of rotenone were necessary to kill adults than tadpoles. Adult frogs are likely to leave the water and will not be affected by piscicides.

Chiricahua leopard frogs likely coexisted with Gila chub in parts of their range, and lowland leopard frogs currently thrive alongside Gila chub populations in places such as Lousy Canyon. Nevertheless, Gila chub could prey on leopard frog tadpoles in the Redrock Canyon drainage if the two co-occur. Currently Chiricahua leopard frogs occur only in Oak Tank which is not being considered for stocking Gila chub. Should both species become more widespread in the system in the future such that their distributions overlap, we anticipate that predation on Chiricahua leopard frog by Gila chub will have a negligible effect on the overall population of frogs. However, if research or monitoring indicates an incompatibility between leopard frogs and Gila chub, revised management will be evaluated.

Chiricahua leopard frogs transplanted to active grazing allotments in the project area will be exposed to livestock grazing effects. These effects, both direct and indirect, were consulted upon in our October 24, 2002, programmatic biological opinion on the effects of livestock grazing on listed species on the Coronado National Forest (file number 2-21-98-F-399-R1), and in our January 2, 2004, biological opinion on the effects of issuance of 10-year term grazing permits (2003 to 2013) for the Kunde and Papago allotments on the Coronado National Forest (file number 2-21-98-F-399-R2), and the Effects of the Action sections from those biological opinions are hereby incorporated by reference (U.S. Fish and Wildlife Service 2002a, U.S. Fish and Wildlife Service 2004). There will be no changes to the livestock grazing operation on the Kunde, Crittenden, Papago, and San Rafael allotments with this project. These previous biological opinions specify terms and conditions for livestock management activities that are necessary to minimize the take of Chiricahua leopard frog. These measures include requirements to survey for and salvage frogs during stock pond cleaning activities; measures designed to minimize the introduction of non-native species or chytrid contamination into occupied sites; measures to reduce direct mortality and damage to aquatic cover as a result of livestock impacts; and the requirement to monitor and report incidental take. Should Chiricahua leopard frogs become established in any new areas of these allotments in the future, the effects of livestock grazing and management would be the same as in these prior biological opinions (see U.S. Fish and Wildlife Service 2002a, U.S. Fish and Wildlife Service 2004).

In 2005, the Forest Service developed aquatic habitat guidelines for Chiricahua leopard frog that are intended to implement the terms and conditions of the prior biological opinions. The Forest will continue to implement these guidelines on the allotments to insure compliance with the reasonable and prudent measures in our 2002 and 2005 grazing biological opinions and with conservation measure No. 3 of the 2005 Programmatic biological opinion on Continued Implementation of the Land and Resource Management Plans for the Eleven National Forests and National Grasslands of the Southwestern Region (file number 2-22-03-F-366, U.S. Fish and Wildlife Service 2005b). Permittees will continue to be notified of these terms and conditions through annual operating instructions. In addition, construction of the fish barrier will implement a conservation recommendation from our 2002 grazing biological opinion (U.S. Fish and Wildlife Service 2002a).

Sonora tiger salamander

Effects to Sonora tiger salamander from construction of the proposed barrier will be beneficial, through prevention of invasion of nonnative fish from downstream into Redrock Canyon. No salamanders, or suitable habitat, exist at or near the site of the proposed barrier or at the staging area, thus there should be no effect from barrier construction or maintenance.

Some incidental take of Sonora tiger salamander could occur during salvage. Capture, handling, and holding will entail some risk of disease and/or death. Tiger salamanders are easily held in captivity and subspecies other than Sonora tiger salamander are often raised and sold as live bait. Salvage, holding, and return of Sonora tiger salamander was successfully carried out during the recent removal project for San Rafael Valley stock tanks (G. Frederick, Coronado National Forest, pers. com. August 2006). Salvage, holding and return activities will be covered under FWS 10(a)(1)(A) Recovery Permits.

Use of piscicides may harm Sonora tiger salamander larvae. Few data exist on effects of rotenone or antimycin to amphibians. Walker et al. (1964) found that adult tiger salamanders were not affected by antimycin at the levels used for piscicide application. Hamilton (1941, as cited in Fontenot et al. 1994) found that larval and metamorphosing tiger salamanders that had not yet reabsorbed their gills were killed by levels of rotenone at the level prescribed by the label for piscicide use. During the recent nonnative removal project in stock tanks in the San Rafael Valley, larval salamander appeared to be adversely affected by piscicide levels of rotenone (J. Rorabaugh, FWS, and G. Frederick, Coronado National Forest, pers. com., August 2006). Although salvage activities will be carried out prior to application of piscicides, some individuals may remain in the stream, ponds, tanks, and streams and be killed. In areas where rotenone is used, some ability exists to salvage rotenone-affected individuals and revive them by placing them in fresh water (Finlayson et al. 2000). This technique was effective for recent rotenone treatments in Sonora tiger salamander-occupied tanks in the San Rafael Valley (J. Rorabaugh, FWS, pers. com, August 2006), and will be utilized in this project.

Sonora tiger salamander likely coexisted with Gila chub in parts of their range such as the San Rafael Valley. Nevertheless, Gila chub could prey on young salamanders in the Redrock Canyon drainage if the two co-occur. Currently Sonora tiger salamander occur only in Oak Tank, which is not being considered for Gila chub stocking. Should both species become more widespread in the system in the future such that their distributions overlap, we anticipate that predation on Sonora tiger salamander by Gila chub would have a negligible effect on the overall population of salamanders. However, if research or monitoring indicates an incompatibility between leopard frogs and Gila chub, revised management will be evaluated.

Removal of nonnative fish and prevention of their reinvasion from downstream, and reduction of bullfrogs should allow increased recruitment of the Sonora tiger salamander population in Oak Tank, thus increasing the size and health of that population. It will also provide opportunities for establishment of Sonora tiger salamander in other suitable habitats within the Redrock Canyon watershed by stocking captive or translocated individuals. Restoration in the Redrock Canyon watershed through restocking of salvaged and captive-bred, or translocated individuals will increase the abundance and distribution of Sonora tiger salamander in this watershed, and this in turn will contribute to species recovery.

Sonora tiger salamanders transplanted to active grazing allotments within the project area will be exposed to livestock grazing effects. These effects, both direct and indirect, were consulted upon in our October 24, 2002, programmatic biological opinion on the effects of livestock grazing on listed species on the Coronado National Forest (file number 2-21-98-F-399-R1) and the Effects of the Action section from that biological opinion is incorporated here by reference (U.S. Fish and Wildlife Service 2002). Occupied habitats are restricted to earthen stock tanks that are maintained for livestock grazing, and the species has persisted in the presence of livestock grazing for many years. Maintenance of livestock waters has allowed persistence of the species in the apparent absence of suitable natural habitats. No changes to the livestock grazing operation on the Kunde, Crittenden, Papago and San Rafael allotments are proposed with this project. Stock pond management and maintenance guidelines will continue to be implemented on allotments within the known range of the species in compliance with our 2002 grazing biological opinion. Permittees will continue to be notified of these terms and conditions through annual operating instructions. The prior consultation on livestock grazing only considered effects to Sonora tiger salamander in the San Rafael allotment; should Sonora tiger salamanders become established in the Crittenden, Kunde, or Papago allotments in the future, the effects to the species would be the same as described in that prior biological opinion (see U.S. Fish and Wildlife Service 2002a).

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, or local private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Effects of past Federal and private actions are considered in the Environmental Baseline.

Most of the action area is on the Coronado National Forest, with the exception of two small private inholdings, which are located at Redrock Ranch (160 acres) in the center of the basin and

at Cott Tank (60 acres) in the uppermost portion of the basin. No state, tribal, or other lands are included in the project area. Most activities in the action area are federally authorized and thus would be the subject of section 7 consultation. The effects of these activities are not considered cumulative. Actions on private land, such as water use, livestock grazing, and recreation could impact Gila topminnow, Gila chub, Chiricahua leopard frog, or Sonora tiger salamander, although we are not aware of any such specific activities at this time.

Use of the area by undocumented immigrants, smugglers, and associated law enforcement (primarily U.S. Border Patrol) has increased in recent years. These activities create trails, campsites, and may start fires. Also, these actions degrade aquatic habitats through human use of the waters and destruction of vegetation, ash flows, and other effects of wildfires, and could have catastrophic effects to native fish and amphibians.

CONCLUSION

After reviewing the current status of each species, the environmental baseline for the action area, the effects of the proposed action and the interrelated and interdependent actions, and the cumulative effects, it is our biological opinion that restoration of native fishes and amphibians in Redrock Canyon is not likely to jeopardize the continued existence of Gila topminnow, Gila chub, Chiricahua leopard frog, and Sonora tiger salamander. No Critical habitat has been designated for these species, or if designated (i.e. Gila chub), it does not occur in the action area, thus no destruction or adverse modification of critical habitat is anticipated.

The project will have adverse, but largely inconsequential effects to Gila topminnow, Gila chub, Chiricahua leopard frog, and Sonora tiger salamander and will primarily benefit these species by protecting them from adverse effects of invasive nonnative aquatic species that prey on and compete with these species, and by facilitating creation of new populations of Gila topminnow, Gila chub, Chiricahua leopard frog, and Sonora tiger salamander. Ultimately, these species will be better off and closer to recovery with the project than without it.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is defined (50 CFR 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined (50 CFR 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The Forest Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest Service (1) fails to assume and implement the terms and conditions or (2) fails to require the (applicant) to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Forest Service must report the progress of the action and its impact on the species to the FWS as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Gila topminnow

Although it is unlikely that Gila topminnow will be present at the barrier site because that section of the stream is usually dry, take is anticipated to occur if they are present from direct mortality to adult, juvenile, and larval fish due to actions associated with barrier construction and maintenance. Any fish in the construction area that are not salvaged are anticipated to be killed during construction when crushed by heavy equipment, stranded during flow diversion, exposed to toxic materials such as petroleum products, or smothered by sediment input. During fish barrier construction, take of Gila topminnow can also occur via harm due to destruction or alteration of habitat resulting from modification or destabilization of the substrate, channel, streambanks, and riparian vegetation. Such habitat loss would alter behavioral patterns, food availability, access to cover, and availability of habitat, thus reducing survival of individual fish and potentially reducing or precluding reproduction.

The purposeful capture, transport, and other forms of intentional take associated with salvage, repatriation and monitoring activities of Gila topminnow will be covered under FWS 10(a)(1)(A) Recovery Permits and is not covered under this consultation. All Gila topminnow that remain in Redrock Canyon and its tributaries after salvage will likely be taken from direct mortality as a result of the piscicide application or mechanical removal methods during renovation.

We anticipate that actual numbers of Gila topminnow lost from incidental take will be difficult to detect because of the small size of individual fish, the rarity of the species in the action area, the difficulties in detecting dead or dying individuals, the similarity in appearance to mosquitofish, the difficulties in determining population numbers and mortality rates, and the fact that losses may be masked by natural population fluctuations. The anticipated level of take of Gila topminnow from barrier construction and maintenance, and renovation is therefore unquantifiable, but is anticipated to be minimal given the low likelihood that the species will occur at the barrier site, presently appears to be extirpated from the action area, and significant effort will be expended to salvage any topminnow prior to renovation. We will consider take to have been exceeded if any one of the following surrogate measures occur as a result of barrier construction and maintenance: a) any spill of toxic materials occurs in the channel as a result of barrier construction or maintenance (this does not include concrete being poured for the barrier); b) barrier construction activities exceed the anticipated 0.62 acres of total disturbance during construction.

The amount or extent of take of Gila topminnow from livestock grazing and management in the action area has previously been considered in our January 2, 2004, biological opinion on the

effects of issuance of 10-year term grazing permits (2003 to 2013) for the Kunde and Papago allotments on the Coronado National Forest (file number 2-21-98-F-399-R2) and in our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (file number 2-21-98-F-399-R1), and we incorporate that information here by reference (U.S. Fish and Wildlife Service 2002a, 2004).

Gila chub

Gila chub are not currently present in the action area, thus all effects to the species from the proposed action will be from barrier monitoring and maintenance, and from ongoing livestock grazing. Barrier maintenance could include complete reconstruction of the barrier. As with Gila topminnow, the likelihood of Gila chub being present at the barrier site is low because it is usually dry. Should Gila chub be present, take is anticipated to occur from direct mortality to adult, juvenile, and larval fish and fish eggs due to actions associated with barrier maintenance. Fish could be killed during maintenance activities when crushed by heavy equipment, stranded during flow diversion, exposed to toxic materials such as petroleum products, or smothered by sediment input. Take of Gila chub can also occur via harm due to destruction or alteration of habitat resulting from modification or destabilization of the substrate, channel, streambanks, and riparian vegetation. Such habitat loss would alter behavioral patterns, food availability, access to cover, and availability of habitat, thus reducing survival of individual fish and potentially reducing or precluding reproduction.

We anticipate that actual numbers of Gila chub lost from incidental take will be difficult to detect because of the small size of individual fish, the difficulties in detecting dead or dying individuals, the difficulties in determining population numbers and mortality rates, and the fact that losses may be masked by natural population fluctuations. The anticipated level of take of Gila chub from barrier maintenance is therefore unquantifiable, but is anticipated to be minimal given the low likelihood that the species will occur at the barrier site. We will consider take to have been exceeded if any one of the following surrogate measures occur as a result of barrier maintenance: a) any spill of toxic materials occurs in the channel as a result of barrier construction or maintenance (this does not include concrete being poured for the barrier); b) barrier maintenance activities exceed the anticipated 0.62 acres of total disturbance anticipated to be impacted during barrier construction.

The purposeful capture, transport, and other forms of intentional take associated with repatriation and monitoring activities of Gila chub will be covered under FWS 10(a)(1)(A) Recovery Permits and is not covered under this consultation.

Once Gila chub are stocked into suitable waters in the action area, the species will be subjected to effects from ongoing livestock grazing. As mentioned above, effects to Gila chub from ongoing livestock grazing will be very similar to effects to Gila topminnow, considered in our 2002 and 2004 biological opinions on livestock grazing in the action area. Gila chub could be taken via direct mortality or harm as a result of livestock grazing. Direct mortality may occur during reconstruction or maintenance of existing cross-channel fences, or during trampling of occupied habitat by livestock. Indirect take may occur through habitat alteration and loss in Gila chub occupied habitat from water loss (cattle drinking), bank destabilization and subsequent sedimentation increases during livestock operations, or in enclosure areas when fences are

periodically washed out, cut or damaged and livestock access occupied areas within the enclosure; dissemination of predatory and competitive nonnative aquatic species through livestock waters; reduction in surface flows due to water development and watershed degradation; alterations in the hydrograph that result in flashier streamflows; and maintenance of watershed conditions that result in an unstable stream channel.

As with barrier maintenance, the anticipated level of take cannot be quantified as numbers of individual fish because this is difficult to detect. Gila chub are a secretive species, and current fisheries monitoring efforts in Redrock Canyon are insufficient to track population size. In addition, dead fish are seldom found due to their small size and rapid consumption by scavengers. We will consider take to have been exceeded if any one of the following surrogate measures occur as a result of livestock grazing and management in any enclosure containing Gila chub: a) The enclosure fence is cut, down, open, or non-functional for more than two weeks while permitted livestock are in a pasture adjacent to the enclosure, or for more than three months in any given year if livestock are in a pasture that is not adjacent to the enclosure (the concern in regard to the latter scenario is that the potential exists for incidental take by trespass cattle, because fences are not inviolate), or b) livestock grazing occurs within an enclosure occupied by Gila chub at a level resulting in more than five percent utilization of woody riparian species (measured as percentage of apical meristems within six feet of the ground grazed) and trampling, chiseling, or other physical impact by livestock occurs on more than 10 percent of the alterable streambanks by length.

Chiricahua leopard frog and Sonora Tiger Salamander

Chiricahua leopard frog and Sonora tiger salamander are currently known to occupy only Oak Tank in Oak Grove Spring Canyon, a tributary to Redrock Canyon, and have never been detected at the barrier site, and no suitable habitat is present there for either species. Therefore no take is anticipated from barrier construction and maintenance. The purposeful capture, transport, and other forms of intentional take associated with salvage, repatriation, and monitoring activities of Chiricahua leopard frog and Sonora tiger salamander will be covered under FWS 10(a)(1)(A) Recovery Permits and is not covered under this consultation. Take of Chiricahua leopard frog and Sonora tiger salamander is anticipated from renovation of the Redrock Canyon drainage and in particular Oak Tank. Any individuals of either species in the system that are not salvaged may be killed by piscicide application or mechanical removal methods. Take will be considered to have been exceeded if more than 20 dead individuals of either species are detected during renovation.

The amount or extent of take of Chiricahua leopard frog and Sonora tiger salamander from livestock grazing and management was anticipated in our January 2, 2004, biological opinion on the effects of issuance of 10-year term grazing permits (2003 to 2013) for the Kunde and Papago allotments on the Coronado National Forest (file number 2-21-98-F-399-R2) and in our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (file number 2-21-98-F-399-R1), and we incorporate that information here by reference (U.S. Fish and Wildlife Service 2002a, 2004). However, in those consultations, take was only anticipated for Chiricahua leopard frog on the San Rafael (U.S. Fish and Wildlife Service 2002a) and Kunde and Papago allotments (U.S. Fish and Wildlife Service 2004), and take of Sonora tiger salamander was only anticipated on the San Rafael allotment (U.S. Fish and Wildlife

Service 2002a). We hereby apply the take statement from our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (file number 2-21-98-F-399-R1) to the Crittenden Allotment for the Chiricahua leopard frog should they become established in that allotment. We hereby apply the take statement of our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (file number 2-21-98-F-399-R1) for Sonora tiger salamander to the Crittenden, Kunde, and Papago allotments, should Sonora tiger salamander become established in those allotments.

If, during the course of the action, the amount or extent of the anticipated incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Forest Service must immediately provide an explanation of the causes of the taking and review with us the need for possible modification of the reasonable and prudent measures.

EFFECT OF THE TAKE

In this biological opinion, we determine that this level of anticipated take is not likely to result in jeopardy to the Gila topminnow, Gila chub, Chiricahua leopard frog and Sonora tiger salamander. The implementation of the proposed action will ensure that, while incidental take may still occur, it is minimized to the extent that habitat quality and quantity will be maintained in the planning area and the species will be conserved. Further, the proposed action will serve to secure valuable populations of each of these species by eliminating nonnative species from the area, protecting the area from reinvasion of nonnatives, and creating new populations (in the case of Gila chub); what take will occur is insignificant compared to the benefits to these species in helping to achieve their recovery.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service (with Reclamation's assistance) must comply with the terms and conditions of the following reasonable and prudent measures, and report implementation of these terms and conditions to us. These terms and conditions are non-discretionary. The reasonable and prudent measures, with the implementing terms and conditions are designed to minimize or avoid the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided.

Gila topminnow

We believe that the following reasonable and prudent measures are necessary and appropriate to minimize take of Gila topminnow from barrier construction and maintenance activities. In order to be exempt from the prohibitions of section 9 of the Act, you must comply with them and their terms and conditions, which implement the reasonable and prudent measures and outline required reporting/monitoring requirements:

1. Conduct all proposed actions in a manner that will minimize direct mortality of listed Gila topminnow.
 - a. An appropriate spill response kit for cleaning up accidental releases of petroleum products (or other appropriate substances) will be available at the fish barrier site whenever work is ongoing, and at least one person present shall have training in use of that kit.
 - b. The Forest Service shall ensure that any maintenance of the barrier done in the future by CAWCD that is likely to take Gila topminnow will be preceded by an attempt to salvage any Gila topminnow from the area prior to construction activities. Gila topminnow salvaged will be returned to the stream when construction is completed.
2. Conduct all proposed actions in a manner that will minimize loss and alteration of habitat (including the aquatic faunal community) of listed fish species.
 - a. The Forest Service will ensure that Reclamation, and CAWCD with regard to future maintenance, conduct all activities in a manner that minimizes the footprint of construction and/or maintenance as much as possible.
 - b. The methodology for recontouring the channel and floodplain following fish barrier construction will be discussed with FWS prior to implementation.
3. Monitor the effects of the proposed action on the Redrock Canyon aquatic communities and habitat to document levels of incidental take, and report the findings to the FWS.
 - a. The Forest Service shall have available to advise and assist in the application of these terms and conditions a qualified fisheries biologist as funding allows. The biologist does not need to be on-site at all times during activities covered under this opinion, but should be onsite for all salvage, renovation, and fish presence/absence monitoring activities.
 - b. A written report shall be submitted by the Forest Service (with assistance from collaborating agencies) to the FWS annually documenting Redrock Canyon activities for the year that resulted in documented take. The report will include a discussion of compliance with the above terms and conditions and will be due January 1.

Gila chub

We believe that the following reasonable and prudent measures are necessary and appropriate to minimize take of Gila chub from barrier maintenance activities. In order to be exempt from the prohibitions of section 9 of the Act, you must comply with them and their terms and conditions, which implement the reasonable and prudent measures and outline required reporting/monitoring requirements:

1. Conduct all proposed actions in a manner that will minimize direct mortality of listed Gila chub.

- a. An appropriate spill response kit for cleaning up accidental releases of petroleum products (or other appropriate substances) will be available at the fish barrier site whenever maintenance work with heavy equipment is ongoing, and at least one person present shall have training in use of that kit.
 - b. The Forest Service shall ensure that any maintenance of the barrier done in the future by CAWCD that is likely to take Gila chub will be preceded by an attempt to salvage any Gila chub from the area prior to construction activities. Gila chub salvaged will be returned to the stream when construction is completed.
2. Conduct all proposed actions in a manner that will minimize loss and alteration of habitat (including the aquatic faunal community) of listed fish species.
 - a. The Forest Service will ensure that CAWCD will conduct future maintenance activities in a manner that minimizes the footprint of construction and/or maintenance as much as possible.
 - b. The methodology for recontouring the channel and floodplain following fish barrier maintenance will be discussed with the Forest Service and FWS prior to implementation.
3. Monitor the effects of the proposed action on the Redrock aquatic communities and habitat to document levels of incidental take, and report the findings to the FWS.
 - a. The Forest Service shall have available to advise and assist in the application of these terms and conditions a qualified fisheries biologist as funding allows. The biologist does not need to be on-site at all times during activities covered under this opinion, but should be onsite for fish presence/absence monitoring and salvage activities.
 - b. A written report shall be submitted by the Forest Service (with assistance from collaborating agencies) to the FWS annually documenting Redrock Canyon activities for the year that resulted in documented take. The report will include a discussion of compliance with the above terms and conditions and will be due January 1.
4. Conduct all aspects of the proposed action related to livestock management in ways that minimize direct mortality to, or harm of, Gila chub.

- a. Inspect and maintain all exclosures containing Gila chub three times a year. Inspection reports from the permittees may be used to document this term and condition. The permittees will report their inspection and maintenance work annually. Livestock will be removed from any exclosure immediately upon the permittee or Forest Service personnel learning of such an event. The Forest Service will notify us of your knowledge of any exclosure fence damage and any livestock intrusion into the exclosures within 48 hours of your knowledge of such an event. Notification may be by telephone, electronic transmission, facsimile, or letter. Records will be maintained of any downed or damaged exclosure fencing and incidents of livestock intrusion within any exclosure. Reports shall include dates of observations, sightings of any livestock use, number of livestock, area of use, and any other pertinent information. Copies of these reports will be included in the annual report you send to us.
5. Conduct activities to minimize the loss and alteration of occupied Gila chub habitat from livestock management.
 - a. All reasonable effort shall be made to minimize channel and floodplain alteration during any work on any fences. A brief, written report shall be submitted to us and can be included in the annual monitoring report. The report shall include photographs of the project area before and after project implementation.
 6. Monitor mortality of any fish species in the vicinity of livestock management projects in or adjacent to exclosures.
 - a. During any fence construction and maintenance or other projects that involve work in, or that would cause direct disturbance to, reaches of occupied Gila chub habitat, and upon completion of these projects, you shall monitor for and document the presence of dead fish or dying fish in and for 600 yards downstream of the activity area. You will notify us immediately upon detection of any dying fish of any species, including numbers by species.

Chiricahua Leopard Frog

We hereby incorporate the reasonable and prudent measures and terms and conditions for Chiricahua leopard frog from our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (file number 2-21-98-F-399-R1, U.S. Fish and Wildlife Service 2002a) for the Crittenden allotment. In addition, the following reasonable and prudent measures and terms and conditions apply.

1. Monitor the effects of renovation on the Redrock Canyon populations of Chiricahua leopard frog (i.e. Oak Tank, as of this writing) to document levels of incidental take, and report the findings to the FWS.
 - a. A written report shall be submitted by the Forest Service (with assistance from collaborating agencies) to the FWS documenting take from renovation. The report will be due within 1 year of the completion of renovation.

Sonora Tiger Salamander

We hereby incorporate the reasonable and prudent measures and terms and conditions for Sonora tiger salamander from our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (file number 2-21-98-F-399-R1, U.S. Fish and Wildlife Service 2002a) for the Crittenden, Kunde, and Papago allotments. In addition, the following reasonable and prudent measures and terms and conditions apply.

1. Monitor the effects of renovation on the Redrock Canyon populations of Sonora tiger Salamander (i.e. Oak Tank, as of this writing) to document levels of incidental take, and report the findings to the FWS.
 - a. A written report shall be submitted by the Forest Service (with assistance from collaborating agencies) to the FWS documenting take from renovation. The report will be due within 1-year of the completion of renovation.

Review requirement: The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take will represent new information requiring review of the reasonable and prudent measures provided. The Forest Service must immediately provide an explanation of the causes of the taking and review with us the need for possible modification of the reasonable and prudent measures.

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species, initial notification must be made to the FWS's Law Enforcement Office, 2450 W. Broadway Rd, Suite 113, Mesa, Arizona, 85202, telephone: (480) 967-7900 within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Forest Service should work with us on developing and implementing a recovery plan for Gila chub.

2. The Forest Service should work with us on implementing the recovery plan for Gila topminnow once its completed.
3. The Forest Service should work with us on implementing the recovery plans for Chiricahua leopard frog and Sonora tiger salamander.
4. The Forest Service should coordinate with the AGFD and us to implement an aggressive program to control nonnative aquatic species throughout Arizona.

In order for the FWS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action(s) outlined in the (request/reinitiation request). As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if, (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

We appreciate your continued efforts to conserve listed species. For further information, please contact Glen Knowles (602) 242-0210 or (x233) or Lesley Fitzpatrick (602) 242-0210 (x236). Please refer to consultation number (22410-2008-F-0029) in future correspondence concerning this project.

Sincerely,

/s/Mike Martinez for

Steven L. Spangle
Field Supervisor

cc: Assistant Field Supervisor, U.S. Fish and Wildlife Service, Tucson, AZ
Project Leader, Arizona Fishery Resources Office, Pinetop, AZ (Attn: Jeremy Voeltz)
Bureau of Reclamation, Phoenix Area Office, Glendale, AZ (Attn: Rob Clarkson)

Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ (Attn: Joan Scott)
Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ (Attn: Don Mitchell)

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APPENDIX: CONCURRENCES

Concurrence for a Native Fish Restoration Project in

Redrock Canyon, Santa Cruz County, Arizona

FWS File Nos. 2410-2008-F-0029 and 2410-1990-F-0119a

Proposed Project

This appendix contains our concurrence with the determinations made by the Forest Service of effects to lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*) from a joint effort with the Bureau of Reclamation for a Native Fish Restoration Project in Redrock Canyon, Santa Cruz County, Arizona. The proposed Federal action consists of construction of a fish barrier and renovation of the aquatic ecosystem to remove nonnative aquatic species to benefit native aquatic species, and is described in the Proposed Action section of the attached biological opinion. The Forest Service determined that the proposed action may affect, but is not likely to adversely affect, the lesser long-nosed bat. We concur with that determination for the reasons described below.

LESSER LONG-NOSED BAT

Status in the Action Area

The lesser long-nosed bat was listed (originally, as *L. sanborni*; Sanborn's long-nosed bat) as endangered in 1988 (U.S. Fish and Wildlife Service 1988). No critical habitat has been designated for this species. A recovery plan was completed in 1997 (U.S. Fish and Wildlife Service 1997b). Loss of roost and foraging habitat as well as direct taking of individual bats during animal control programs, particularly in Mexico, have contributed to the current endangered status of the species.

The lesser long-nosed bat is migratory and found throughout its historical range, from southern Arizona and extreme southwestern New Mexico, through western Mexico, and south to El Salvador. A medium-sized, leaf-nosed bat, it has a long muzzle and a long tongue, and is capable of hover flight. Lesser long-nosed bat feeds nocturnally on nectar from the flowers of columnar cacti, such as saguaro (*Cereus giganteus*) and organ pipe cactus (*Stenocercus thurberi*) and from paniculate agaves such as Palmer's agave (*Agave palmeri*) and Parry's agave (*Agave parryi*), and have been documented foraging many miles from maternity colonies (Fleming 1997, U.S. Fish and Wildlife Service 2002a). The bat is a seasonal resident in Arizona, usually arriving in early April and leaving in mid-September to early October, with maternity roosts usually active from April through July, and post-maternity roosts active from August through mid-September. Roosting takes place in caves, abandoned mines, and unoccupied buildings.

The closest maternity colony is one suspected of existing on Saguaro National Monument East, 40 miles to the north. Known maternity colonies in other locations are over 100 miles away. Three known post-maternity bat roosts of greater than 250 bats occur in the vicinity of the

proposed project (U.S. Forest Service 2003). The closest roost is at Patagonia Bat Cave, which is typically occupied from mid-July through mid-September (Fleming 1997). Lesser long-nosed bats from these roosts likely forage in the Redrock Canyon watershed. The two cacti used by the bats are not present in Redrock Canyon, but both paniculate agaves are present. The extent to which lesser long-nosed bats use the most common agave in Redrock Canyon, Scott agave or amole (*Agave schottii*) is unknown (U.S. Fish and Wildlife Service 2002a).

Analysis of Effects

Effects to lesser long-nosed bat depend upon the time of year in which the project would be conducted because the species is anticipated to occur in the area only during mid-July through mid-September. The proposed project would not be carried out during this period, because heavy precipitation during application of piscicides would endanger the success of the project. In addition, nonnative species removal would be most easily and successfully carried out during the driest time of year. Thus, piscicide application would not occur during the period when lesser long-nosed bat is expected to use Patagonia Bat Cave and other nearby roosts. Barrier construction and stock tank alteration activities would not be conducted during the monsoon season due to the technical problems of working during heavy rains and wet conditions.

It is possible that foraging bats from maternity colonies could enter Redrock Canyon from April through July. Lesser long-nosed bats have been documented to fly up to 15 miles one-way in Arizona in a night, and up to 38 miles in Mexico (U.S. Fish and Wildlife Service 2002a). The closest maternity colony is one suspected of existing on Saguaro National Monument East, 40 miles to the north. Known maternity colonies in other locations are over 100 miles away, thus the distance from the action area to known maternity roosts is beyond the known foraging range of roosting bats. Some bats likely forage in the vicinity from much closer post-maternity roosts, such as the roost at Patagonia Bat Cave, from mid-July through mid-September. Therefore, because no part of the proposed action would take place from mid-July through mid-September, the likelihood of a lesser long-nosed bat being present during project activities is relatively low.

There is some potential for effects to agaves, thus affecting food resources for lesser long-nosed bat. However, the barrier construction site and access to that site are in the riparian zone, where agaves are uncommon. The staging area is a previously disturbed site and also not likely to have significant numbers of agaves present. Any agaves in the areas to be disturbed by project activities could be damaged or destroyed, but the total number of agaves of all species that could be affected is expected to be less than ten, and this is considered insignificant relative to overall forage resources for the bat in the action area.

Conclusions

After reviewing the status of the lesser long-nosed bat including the environmental baseline for the action area, and the effects of the proposed action, we concur that the proposed action may affect, but is not likely to adversely affect the species based upon the following:

- The likelihood that lesser long-nosed bats will be in the action area during barrier construction or renovation is discountable because these actions will not occur from mid-July to mid-September when nearby post-maternity roosts are occupied, and the distance of the action area to known maternity roosts is beyond the known foraging range of roosting bats.
- Although the possibility exists that some agaves will be destroyed, the total number is expected to be less than 10 and this number is insignificant relative to the total number of agaves available as a forage resource for lesser long-nosed bat within the action area.