# United States Department of the Interior

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In Reply Refer to:

AESO/SE
22410-2007-F-0197

February 26, 2010

Mr. Joseph P. Stringer
Acting Forest Supervisor
Coconino National Forest
1824 South Thompson Street
Flagstaff, Arizona 86001-2529

RE: Clarified Biological Opinion for the Fossil Creek Range Allotment Management Plan

Dear Mr. Stringer:

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 July 7, 2008, and received by us on July 10, 2008. We received additional information we requested from you on November 5 and 24, 2008. This consultation concerns the possible effects of the proposed livestock grazing and management activities on the Fossil Creek Range Allotment (FCRA) located on the Red Rock Ranger District in Yavapai County, Arizona. The Forest Service has determined that the proposed action may affect the threatened Chiricahua leopard frog (*Lithobates {=Rana} chiricahuensis*) (CLF), endangered razorback sucker (*Xyrauchen texanus*), threatened loach minnow (*Tiaroga cobitis*), and threatened spikedace (*Meda fulgida*).

You also requested our concurrence that the proposed project may affect, but is not likely to adversely affect, the threatened bald eagle (*Haliaeetus leucocephalus*), threatened Mexican spotted owl (*Strix occidentalis lucida*) (MSO) and its critical habitat, endangered southwestern willow flycatcher (*Empidonax trailli extimus*) (SWWF), endangered Yuma clapper rail (*Rallus longirostris yumanensis*), Verde River experimental, nonessential population of Colorado pikeminnow (*Ptychocheilus lucius*), endangered desert pupfish (*Cyprinodon macularius*), endangered Gila topminnow (*Poeciliopsis occidentalis occidentalis*), and razorback sucker critical habitat. Additionally, the Forest determined that the proposed project is not likely to jeopardize the candidate yellow-billed cuckoo (*Coccyzus americanus*) and candidate headwater chub (*Gila nigra*). We concur with your determinations. The basis for our concurrences is found in Appendix A.

This biological opinion is based on information provided in the original July 7, 2008, Biological Assessment and Evaluation (BAE), the November 5 and 24, 2008, amendments to the BAE, the March 7, 2008, Environmental Assessment (EA), meetings, conversations and electronic correspondence with your staff, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

**Consultation History**

Details of the consultation history are summarized in Table 1.

**Table 1.** Summary of Consultation History

| Date | Event |
|---|---|
| June 2002 to present | Ongoing discussions, meetings, and on-the-ground work have occurred with the FWS, Arizona Game and Fish Department (AGFD), Forest Service, and livestock permittee regarding livestock grazing and CLF habitat management on the FCRA. |
| September 30, 2002 | We issued a biological opinion analyzing the effects to spikedace and loach minnow critical habitat on eight allotments and one sheep driveway on the Coconino National Forest. This opinion included the FCRA. |
| October 2004 | Due to drought and a decline in range and watershed conditions, livestock were voluntarily removed from the FCRA. |
| October – November 2004 | Fossil Creek Native Fish Restoration Project implemented. |
| March 2005 | Six stock tanks within FCRA and Hackberry/Pivot Rock Range Allotment treated by FWS to remove non-native fish. |
| June 2005 | Full flows returned to Fossil Creek. |
| October 20, 2006 | The Forest Service requested our concurrence that authorization of livestock to graze seven pastures on the FCRA may affect, but would not likely adversely affect the CLF. |
| November 13, 2006 | We concurred with the above determination. |
| November 2006 | Livestock were returned to seven pastures on the FCRA. |
| November 14, 2006 | The Forest Service initiated National Environmental Policy Act (NEPA) analysis for the FCRA. This process has been ongoing since this time. |
| May 9, 2007 | The Forest Service requested our concurrence to add an additional three pastures to their October 20, 2006, request. |
| May 31, 2007 | We concurred with the above determination. |
| March 7, 2008 | The Forest Service requested comments regarding the FCRA EA. |

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| April 7, 2008 | We provided our comments on the FCRA EA to the Forest Service. |
| July 10, 2008 | The Forest Service requested formal consultation for potential adverse affects to the CLF, razorback sucker, loach minnow, and spikedace resulting from implementation of the FCRA allotment management plan (AMP). |
| August 8, 2008 | We acknowledged your request for formal consultation with a 30-day letter. In this letter we also requested additional information regarding two candidate species. |
| November 5, 2008 | We received the information we requested in our August 8, 2008, letter regarding the candidate yellow-billed cuckoo. |
| November 24, 2008 | We received the information we requested in our August 8, 2008, letter regarding the candidate headwater chub. |

## DESCRIPTION OF THE PROPOSED ACTION

The FCRA is located on the Red Rock Ranger District, Coconino National Forest, Yavapai County, Arizona. The allotment is approximately five to 15 miles southeast of Camp Verde and is roughly bounded by Highway 260 on the north and Fossil Creek on the east. Elevations range from approximately 3,000 feet to 6,300 feet and vegetation regimes adhere to the typical elevation regimes: ponderosa pine stringers are present at the highest elevations, pinyon-juniper woodlands and chaparral dominate mid-elevations, and semi-desert grasslands/desert scrub vegetation types are typical at the lower elevations. The FCRA is approximately 42,200 acres in size, divided into 31 main grazing pastures and 26 small livestock management pastures and water lots. The entire allotment is located within the Fossil Creek watershed, a tributary to the Verde River. In addition, two pastures border the Verde River (Chalk Springs and Surge pastures), but fencing prevents livestock from accessing the river corridor.

The action area for this project is defined as all areas affected directly or indirectly by the Federal action. Thus, the action area is larger than the boundaries of the proposed project because impacts may be carried downstream with flows and may also affect upstream areas. Watersheds and subwatersheds are comprised of numerous interconnected upland and riparian areas that function together as an ecological unit. Therefore, we are defining the action area as the entirety of Fossil Creek, from Fossil Springs down to the confluence with the Verde River, and the Verde River, approximately five miles upstream of the confluence to the northern boundary of the Chalk Springs pasture, and approximately one mile downstream of the confluence. The action area includes the 100-year floodplain of the Verde River and Fossil Creek within these areas. Included within this action area are all tributaries of Fossil Creek originating on the Coconino National Forest within the allotment boundary, and the uplands that drain into these tributaries and Fossil Creek. The consultation covers a period of 10 years.

The Red Rock Ranger District proposes to implement the Proposed Action Alternative of the FCRA EA for reauthorizing livestock grazing on the FCRA. The proposed action consists of the following components: Authorization, Improvements, Monitoring, Adaptive Management, and Mitigation. These components are described in more detail below. The proposed action follows

current guidance from Forest Service Handbook 2209.13, Chapter 90 (Grazing Permit Administration; Rangeland Management Decision making, February 2004).

**Authorization**

Permitted livestock numbers will be a maximum of 5,800 animal unit months (AUMs) (483 animal units [AUs] yearlong). This is the maximum number of AUMs that the Forest Service has determined can be supported during times of favorable climate (e.g., precipitation) once the desired conditions for vegetation and soil have been reached. Current conditions will not support this level of grazing (BAE, page 2). Initial permitted livestock numbers will be a maximum of 3,600 AUMs (300 AUs yearlong) until soil and vegetation conditions improve. Annual authorized livestock numbers would be based on existing conditions, available water and forage, and predicted forage production for the year. Adjustments to the annual authorized livestock numbers (increase or decrease) may occur during the grazing year, based on conditions and/or range inspections.

Season of use would be yearlong and grazing would occur through a rotational management system (either deferred or rest-rotation grazing) that would allow for plant growth and recovery. A management guideline of 30-40% forage utilization, as measured at the end of the growing season, would be employed to maintain or improve rangeland vegetation and long term soil productivity. Within riparian areas (Forest Service Management Area 12), allowable use would not exceed 20% on the woody vegetation.

Grazing intensity is defined as the amount of herbage removed through grazing or trampling during the grazing period. Grazing intensity would be managed to allow for the physiological needs of plants. Generally, moderate grazing intensity (40-50%) would be managed for in the late spring to early summer months when sufficient opportunity exists for plant regrowth. During the remainder of the year, grazing intensity would be managed at conservative levels (30-40%) when the potential for plant regrowth is limited.

The grazing period within each pasture would be based upon weather/climate conditions, current growing conditions, and the need to provide for plant regrowth following grazing. The length of the grazing period within each pasture would also consider and manage for desired grazing intensity and utilization guidelines. The grazing period per pasture would generally not exceed 30 days. Generally pastures would be grazed only once during the grazing year. However, if the need arises to provide rest (or deferment) for other pastures, a pasture may be used twice provided there has been sufficient vegetative growth/regrowth and grazing is managed within the intensity and utilization guidelines.

For this action, riparian areas are defined as any designated Management Area 12, perennial and intermittent streams, springs and seeps, and perennial pools (BAE, pages 3-4). To protect and enhance woody riparian vegetation, pastures with riparian areas that are grazed during the critical growth period for woody riparian species (March 1 through April 30) during one year would not be grazed during the critical growth period the following year. However, if livestock exclosure fences are constructed at spring/seep riparian areas (as identified in the Structural Improvements

section below), alternate year livestock deferment during the critical growth period would not be necessary in pastures that have only spring/seep types of riparian areas.

In addition, the proposed action states that water would be left in stock tanks for wildlife use after domestic livestock have been removed from the grazing unit. Critical water tanks for wildlife include: Doren's Defeat, Herbies, Hogback, Natural, Needed, Mail Trail Tank #2, Middle, Pine, Tanque Aloma, and others (BAE, Appendix A, Figure 1).

**Improvements**

The following structural improvements are included as part of the proposed action:

1. Fences would be built at five stock tanks identified by FWS and AGFD, to improve wildlife habitat. Livestock would be allowed access into the stock tanks via fenced lanes (BAE, Appendix A, Figure 1). Livestock would not have access to tanks that are occupied by CLFs until these fences are constructed. The fencing plan was developed by FWS, AGFD, and the permittee. These sites would be monitored by FWS, AGFD, and the FS.

2. Improvements and erosion control measures previously implemented to improve soil and vegetative conditions around stock tanks would be maintained or upgraded with fencing to exclude livestock as needed.

3. Remove unneeded electric fences that divide North and South Salmon Lake pastures and North and South Natural pastures (BAE, Appendix A, Figure 1).

4. Construct three fenced, livestock water access lanes along Fossil Creek: two locations in the Stehr Lake pasture and one location in the Boulder pasture (BAE, Appendix A, Figure 1). Livestock currently have unrestricted access to Fossil Creek at the two locations in Stehr Lake pasture. The proposed livestock watering access lane in the Boulder pasture would be a new watering location. Livestock grazing in Boulder and Stehr Pastures would not be authorized until these improvements are constructed. These three lanes would be the only access points that livestock have to Fossil Creek. Livestock would not have any access to the Verde River.

5. Construct about 0.75 mile of new allotment boundary fence along the eastern edge of the recently decommissioned Stehr Lake (BAE, Appendix A, Figure 1). This fence is necessary to keep livestock out of the adjacent grazing allotment.

6. Livestock exclosure fencing may be constructed at spring/seep riparian areas if desired conditions are not achieved through the control of livestock grazing. Annual implementation monitoring following livestock use of these areas would be used to evaluate whether fencing needs to be constructed. Exclosure fencing would be designed and constructed to protect important riparian vegetation while still providing for livestock watering. Pastures with springs or seeps include: Chalk Springs, Sally Mae, Surge, Sycamore Canyon, and Lower Wilderness (BAE, Appendix A, Figure 1).

## Monitoring

Two types of rangeland monitoring would be used, implementation and effectiveness monitoring:

- Implementation monitoring would be conducted on an annual basis and would include: livestock actual use data, grazing intensity evaluations during the grazing season (within key areas), utilization at the end of the growing season (within key areas), and visual observation of vegetation and ground cover trends.

- Effectiveness monitoring to evaluate the success of management in achieving the desired objectives would occur within key areas on permanent transects at an interval of 10 years or less. Effectiveness monitoring may also be conducted if data and observations from implementation monitoring (annual monitoring) indicate a need. The need for this data could be triggered by drought (or other environmental cause) or following input from partner agencies. Two to three years of initial baseline monitoring would occur as part of the proposed action. Initial baseline effectiveness monitoring has occurred in 2006 and 2007.

Both qualitative and quantitative monitoring methods would be used in accordance with the Interagency Technical References, and the Region 3 Rangeland Analysis and Management Training Guide, and the Region 3 Allotment Analysis Handbook (USDA – Forest Service 1997). See the BAE, Appendix B, Monitoring and Adaptive Management for further information on the proposed rangeland monitoring. Additional monitoring required for other resources is described below.

*Range Resources*

- The following would be monitored: permit compliance; actual livestock use, grazing intensity, grazing utilization, forage production and vegetative ground cover, vegetation condition and trend, noxious weeds and precipitation (See DEA, Chapter 4, "Monitoring and Adaptive Management," for more information).

*Soil, Watershed and Fisheries Resources*

- The Forest Service would conduct soil condition assessments at least once every ten years, with the exception of unsatisfactory soils in the Boulder and Stehr Lake pastures. In these pastures, baseline soil condition data would be collected along established transects prior to implementing the first year of authorized grazing. After the baseline data has been collected, soil condition would be monitored every two years to determine extent of soil improvement, if any. If monitoring indicates soil conditions are not improving towards satisfactory, current livestock grazing utilization and intensity would be immediately adjusted and may include pasture deferral or reduced grazing utilization and intensity. In all other pastures, transects would be read at least every 10 years by Forest Service personnel to assess the effects of grazing. If monitoring indicates that soil conditions are not improving towards satisfactory conditions, the current livestock grazing strategy would be adjusted using the adaptive management strategy.

- Vegetation transects would be monitored at least once every ten years within each Terrestrial Ecosystem Map Unit using 20 meter transects (with a 30 x 50 cm hoop read every two meters for a total of ten readings per 20 meter transect). Species composition, effective ground cover, and species diversity would be read from each 30 x 50 cm hoop. Monitoring sites would be placed in key areas representative of the map unit. Key areas would be more than 0.25 mile from water.

- Riparian areas within the allotment would continue to be monitored for Proper Functioning Condition (PFC). Sycamore Canyon and Mud Tanks Draw would all be monitored in the first year of the permit and all other reaches would be monitored at least once every ten years.

- Aquatic habitat monitoring would be conducted on all perennial streams in the allotment using established regional protocols. This monitoring would establish the condition and trends of the aquatic habitat in response to grazed riparian and upland areas. The frequency for this monitoring is unknown.

- Vegetation conditions at livestock water access points along Fossil Creek would be monitored annually using established regional protocols which may include a combination of measurements, observations and photo points.

*Wildlife*

- The Forest Service would periodically monitor water quality in water bodies (especially tanks and springs) where livestock have access. Parameters that may be monitored include (but are not limited to) nitrates, nitrites, ammonium, coliform, pH, dissolved oxygen, and the presence of amphibian Chytrid fungus (Bd). There is no protocol at this time. The Forest Service states they would use the initial baseline data to compare to the available literature that cites tolerable limits of these parameters for aquatic and amphibian species.

*Wild and Scenic Rivers*

- The Forest Service proposes to monitor effects to bank stability and riparian vegetation at existing and proposed livestock water access points on Fossil Creek during and following livestock use of these areas.

*Heritage Resources*

- The Forest Service would periodically monitor known archaeological sites to ensure they have been avoided.

*Noxious and Invasive Weeds*

- Noxious and invasive weeds would be monitored during regular range allotment monitoring. As noxious weed populations are found they would be mapped and entered into the Invasive Plants database. Control or treatment options would be considered and implemented depending on the class and priority of identified weeds and funding.

## Adaptive Management

The proposed action includes adaptive management, which provides a menu of management options that may be needed to adjust management decisions and actions to meet desired conditions as determined through monitoring. If monitoring indicates that desired conditions are not being achieved, management would be modified in cooperation with the permittee. Adaptive management allows the Forest Service to adjust the timing, intensity, frequency and duration of grazing; the grazing management system; and livestock numbers. If the Forest Service determines that adjustments are needed, changes would be implemented through the Annual Operating Instructions (AOI). Adaptive management would also allow for the construction of rangeland improvements if they have been identified and are determined, through annual implementation monitoring, to be necessary for achieving desired conditions.

## Conservation Measures

*Range Management*

- The Forest Service proposes during drought conditions, and in periods of drought recovery, to adjust grazing timing, intensity, frequency, numbers, and the management system as necessary to protect the upland vegetation resource.

*Soil, Watershed and Fisheries Resources*

- If woody riparian vegetation utilization exceeds 20% for two consecutive grazing periods, riparian sites would be fenced prior to the next graze period. Fencing would better maintain riparian vegetation and maintain age-class distribution of woody riparian vegetation.

- Utilize the Forest Drought policy to manage utilization levels and stocking during and immediately following drought. When implemented, this would minimize the effects of drought thereby reducing soil erosion and maintaining soil productivity and water quality and improving plant production.

*Noxious and Invasive Weeds*

- A weeds assessment and inventory was completed for this analysis. Weed species of concern in the allotment would be treated as necessary following guidelines in the "Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds" (USDA 2005).

- Identify and treat noxious or invasive weed populations that may occur in areas of proposed structural improvements and mitigate impacts to threatened, endangered and R3 Regional Forester's sensitive (TES) plants by reducing the risk of noxious or invasive weed infestations in populations or habitats.

*Wildlife, Fisheries and Rare Plants*

- Prior to construction of the proposed structural improvements, survey areas for TES plants and noxious or invasive weeds. Identify populations and mitigate impacts of management actions if needed.

- Avoid TES plants during the construction of structural improvements.
- All open storage tanks and drinkers would be constructed with entry and escape ramps for wildlife.
- In order to minimize the risk for introducing and spreading disease among aquatic systems, approved protocols would be followed when conducting work in earthen livestock tanks. This protocol would be attached to the AOI.
- Biologists would be given at least 60 days notice prior to conducting work in earthen tanks. This notice would allow for surveys, if needed, and/or mitigation to reduce adverse affects to amphibians.
- Fences would be constructed to meet wildlife standards.

## STATUS OF THE SPECIES

### Chiricahua leopard frog

We listed the CLF as a threatened species without critical habitat on June 13, 2002 (USFWS 2002a). We included a special rule to exempt operation and maintenance of livestock tanks on non-Federal lands from the section 9 take prohibitions of the Act. A recovery plan was completed in April 2007 (USFWS 2007a). This frog is distinguished from other members of the *Lithobates pipiens* complex by a combination of distinctive morphological and genetic characters, and a distinctive call (Platz and Mecham 1979, Davidson 1996, Stebbins 2003). Threats to CLF include predation by nonnative organisms, especially bullfrogs (*Lithobates catesbeiana*), fish (including fish in the family 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. CLF 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, FWS files). Loss of CLF 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 CLF is an inhabitant of cienegas, pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations of 3,281 to 8,890 feet in central and southeastern Arizona; west-central and southwestern New Mexico; and in Mexico, northern Sonora, and the Sierra Madre Occidental of Chihuahua (Platz and Mecham 1984, Degenhardt et al. 1996, Sredl et al. 1997, Sredl and Jennings 2005). In New Mexico, of sites occupied by CLFs from 1994-1999, 67 percent were creeks or rivers, 17 percent were springs or spring runs, and 12 percent were stock tanks (Painter 2000). In Arizona, slightly more than half of all known historical localities are natural lotic

systems, a little less than half are stock tanks, and the remaining locations are lakes and reservoirs (Sredl et al. 1997). Sixty-three percent of populations extant in Arizona from 1993-1996 were found in stock tanks (Sredl and Saylor 1998).

Northern populations of the CLF along the Mogollon Rim and in the mountains of west-central New Mexico are disjunct from those in southeastern Arizona, southwestern New Mexico, and Mexico. Recent genetic analyses support describing the northern populations as a distinct species (Benedict and Quinn 1999, Platz and Grudzien 1999, Goldberg et al. 2004). Goldberg et al. (2004) present evidence that *L. subaquavocalis* (Ramsey Canyon leopard frog) and *L. chiricahuensis* may be conspecific.

The species is still extant in most major drainages in Arizona and adjacent areas of New Mexico where it occurred historically, with the exception of the Little Colorado River drainage in Arizona and possibly the Yaqui drainage in New Mexico (Painter 2000, Sredl et al. 1997, FWS files). However, it has not been found recently in many rivers, valleys, and mountain ranges, including the following in Arizona: White River, West Clear Creek, Tonto Creek, Verde River mainstem, San Francisco River, San Carlos River, upper San Pedro River mainstem, Santa Cruz River mainstem, Aravaipa Creek, Babocomari River mainstem, and Sonoita Creek mainstem. In southeastern Arizona, no recent records (1995 to the present) exist for the following mountain ranges or valleys: Pinaleno Mountains, Peloncillo Mountains, Sulphur Springs Valley, and Huachuca Mountains. Moreover, the species is now absent from all but one of the southeastern Arizona valley-bottom cienega complexes. In many of these regions, CLFs were not found for a decade or more despite repeated surveys. Recent surveys suggest that the species may have recently disappeared from some of the major drainages in New Mexico (R. Jennings, pers. comm. 2004).

Disruption of metapopulation dynamics is likely an important factor in regional loss of populations (Sredl et al. 1997, Sredl and Howland 1994). CLF populations are often small and habitats are dynamic, resulting in a relatively low probability of long-term population persistence.

The dispersal abilities of CLFs are key to determining the likelihood that suitable habitats will be colonized from a nearby extant population. Evidence exists to show substantial movements of leopard frogs and passive movement of tadpoles along stream courses. Current guidance supported by scientific literature suggests dispersal of CLF can be up to one mile overland, three miles within intermittent drainages, and five miles within perennial drainages. Dispersal of this species is largely thought to occur during the summer monsoon.

Within the last decade, a chytridiomycete skin fungus (*Batrachochytrium dendrobatidis*) has been recognized as an important contributor to global declines of frogs, toads, and salamanders (Speare and Berger 2000, Longcore et al. 1999, Berger et al. 1998, Daszak 2000, Hale 2001). The amphibian chytrid fungus does not have an airborne spore, so it must spread via other means. Amphibians in the international pet trade (Europe and USA), outdoor pond supplies (USA), zoo trade (Europe and USA), laboratory supply houses (USA), and species recently introduced (*Bufo marinus* in Australia and bullfrog in the USA) have been found infected with chytrids, suggesting human-induced spread of the disease (Daszak 2000, Mazzoni et al. 2003).

Free-ranging healthy bullfrogs with low-level amphibian chytriodiomycosis infections have been found in southern Arizona (Bradley et al. 2002). Other native or nonnative frogs may serve as disease vectors or reservoirs of infection, as well (Bradley et al. 2002). If amphibian chytrid fungus was introduced to the Southwest via escaped or released African clawed frogs, then the disease may have spread across the landscape by human introductions or natural movements of secondarily-infected American bullfrogs, tiger salamanders, leopard frogs, or other anurans.

Amphibian chytrid fungus could also be spread by people (and terrestrial animals) moving among various tanks and/or by personnel sampling aquatic habitats (Halliday 1998). The fungus can exist in water or mud and could be spread by wet or muddy boots, vehicles, cattle, and other animals moving among aquatic sites, or during scientific sampling of fish, amphibians, or other aquatic organisms.

Numerous studies indicate that declines and extirpations of CLFs are at least in part caused by predation and possibly competition by nonnative organisms, including fish in the family Centrarchidae, bullfrogs, tiger salamanders (*Ambystoma tigrinum mavortium*), crayfish, and several other species of fish (Fernandez and Rosen 1996 and 1998, Rosen et al. 1994 and1996, Snyder et al. 1996, Fernandez and Bagnara 1995, Sredl and Howland 1994, Clarkson and Rorabaugh 1989).

The Recovery Plan for CLF (USFWS 2007a) delineated eight recovery units (RUs) in key areas that were targeted as valuable in the recovery of this species. The action area for this proposed action lies within RU 5, which lies above and below the western and central portions of the Mogollon Rim of Arizona. On the west, it is bordered by the Verde River southeast of Camp Verde, to the north the boundary is roughly along the interface between the forested mountains and the grasslands and pinyon-juniper woodlands of the Colorado Plateau. On the east RU 5 terminates at the border of RU6, where elevations rise into the White Mountains. The boundary on the south is based roughly on where elevations drop below about 4,000 feet, which corresponds to the presumed lower limit of the frog's distribution in the RU. The vegetation communities of RU5 are primarily ponderosa and mixed conifer forest, and pinyon-juniper at the lower elevations. Land management is primarily by the San Carlos and White Mountain Apache Tribes, and portions of the Tonto, Coconino, and Apache-Sitgreaves National Forests.

Historically, there are records of CLF scattered across the western and southern portions of the RU. The relative lack of localities compared to RUs 6-8 may in part reflect a lack of historical survey data, but is also probably a reflection of the relatively dry nature of much of RU5. Today, the species is confirmed present at only one livestock tank in the Buckskin Hills area of the Coconino National Forest (Fossil Creek drainage) and on the Tonto National Forest in the Cherry and Couch Creek area near Young, and at Ellison Creek.

Additional information about the CLF can be found in Painter (2000), Sredl et al. (1997), Jennings (1995), Degenhardt et al. (1996), Rosen et al. (1994, 1996), Sredl and Howland (1994), Platz and Mecham (1979, 1984), Sredl and Jennings (2005), and USFWS (2007a).

Given the range of this species, several Federal actions affect this species every year. A complete list of all consultations affecting this species can be found on our website

(http://www.fws.gov/southwest/es/arizona/) by clicking on the "Document Library" tab and then on the "Section 7 Biological Opinions" tab. Survey work and recovery projects also occur periodically, and are summarized in the appropriate land-management agency, FWS, or AGFD documents, as well as in the BAE associated with this project.

**Razorback sucker**

We listed the razorback sucker as endangered on November 22, 1991 (USFWS 1991). The Razorback Sucker Recovery Plan (USFWS 1998) and recovery goals were approved in 2002 (USFWS 2002b). Critical habitat was designated in 1994, which included the Verde River from the Prescott National Forest boundary to Horseshoe Dam (46 river miles) (USFWS 1994a). Primary constituent elements for the species' critical habitat described in the Federal Register upon designation were addressed within three general categories: water, physical habitat, and biological environment (USFWS 1994a).

The razorback sucker is the only representative of the genus *Xyrauchen* and is distinguished from all others by the sharp edged, bony keel that rises abruptly behind the head. The body is robust with a short and deep caudal peduncle (Bestgen 1990). The razorback sucker may reach lengths of 3.3 feet and weigh between 11 and 13 pounds (Minckley 1973). Razorback suckers are long-lived, reach the age of at least the mid-40's, and historically occurred at elevations ranging from 181 – 5,000 feet (McCarthy and Minckley 1987, AGFD 2003).

Adult razorback suckers use most of the available riverine habitats, although there may be an avoidance of whitewater type habitats. Main channel habitats used tend to be low velocity ones such as pools, eddies, nearshore runs, and channels associated with sand or gravel bars (Bestgen 1990). Adjacent to the main channel, backwaters, oxbows, sloughs, and flooded bottomlands are also used by this species.

Data from radio-telemetered razorback suckers in the Verde River showed they used shallower depths and slower velocities than in the upper Colorado River basin. They avoided depths of less than 1.3 feet, but selected depths between 2.0 and 3.9 feet, which likely reflected a reduced availability of deeper waters compared to the larger upper Colorado River basin rivers. However, use of slower velocities (mean = 0.1ft/sec) may have been an influence of rearing in hatchery ponds. Similar to the upper Colorado River basin, razorback suckers were found most often in pools or runs, over silt substrates, and avoided substrates of larger material (Clarkson et al. 1993).

Razorback suckers also use reservoir habitat, where the adults may survive for many years. In reservoirs, they use all habitat types, but prefer backwaters and the main impoundment (USFWS 1998). Much of the information on spawning behavior and habitat comes from fishes in reservoirs where observations can readily be made.

Habitat needs of larval and juvenile razorback sucker are reasonably well known. In reservoirs, larvae are found in shallow backwater coves or inlets (USFWS 1998). In riverine habitats, captures have involved backwaters, creek mouths, and wetlands. These environments provide

quiet, warm water where there is a potential for increased food availability. During higher flows, flooded bottomland and tributary mouths may provide these types of habitats.

Spawning takes place in the late winter to early summer along gravelly shorelines or bays, depending upon local water temperatures (AGFD 2003). One female is joined by 2 to 12 males that nudge the female with their heads to entice gamete release marked by vibrating movements and a subsequent cloud of silt and sand (Minckley 1973).

Razorback sucker diet varies depending on life stage, habitat, and food availability. Larvae feed mostly on phytoplankton and small zooplankton, and in riverine environments, on midge larvae. Diet of adults taken from riverine habitats consisted chiefly of immature mayflies, caddis flies, and midges, along with algae, detritus, and inorganic material (USFWS 1998).

Razorback suckers are somewhat sedentary; however, considerable movement over a year has been noted in several studies (USFWS 1998). Spawning migrations have been observed or inferred in several locales (Minckley 1973, Osmundson and Kaeding 1989, Bestgen 1990, Tyus and Karp 1990). During the spring spawning season, razorbacks may travel long distances in both lacustrine and riverine environments, and exhibit some fidelity to specific spawning areas (USFWS 1998a). In the Verde River, radio-tagged and stocked razorback suckers tend to move downstream after release. Larger fish did not move as much from the stocking site as did smaller fish (Clarkson et al. 1993).

The razorback sucker is adapted to widely fluctuating physical environments characteristic of rivers in the pre-settlement Colorado River Basin. Adults can live 45-50 years and, once reaching maturity between two and seven years of age (Minckley 1983), apparently produce viable gametes even when quite old. The ability of razorback suckers to spawn in a variety of habitats and flows and over a long season are also survival adaptations. In the event of several consecutive years with little or no recruitment, the demographics of the population might shift, but future reproduction would not be compromised. Average fecundity recorded in studies ranges from 46,740-100,800 eggs per female (Bestgen 1990). With a varying age of maturity, and the fecundity of the species, it would be possible to quickly repopulate after a catastrophic loss of adults.

Many species of nonnative fishes occur in occupied habitat of the razorback sucker. These nonnative fishes are predators, competitors, and vectors of parasites and diseases (Tyus et al. 1982; Pacey and Marsh 1999). Many researchers believe that nonnative species are a major cause for the lack of recruitment (e.g., Minckley 1983). There are reports of predation of razorback sucker eggs and larvae by common carp (*Cyprinus carpio*), channel catfish, smallmouth bass (*Micropterus dolomieu*), largemouth bass, bluegill (*Lepomis macrochirus*), green sunfish, and redear sunfish (*Lepomis microlophus*) (Langhorst 1989). Marsh and Brooks (1989) reported that channel catfish and flathead catfish were major predators of stocked razorback sucker in the Gila River. Juvenile razorback sucker (average total length 6.7 inches) stocked in isolated coves along the Colorado River in California, suffered extensive predation by channel catfish and largemouth bass (Langhorst 1989).

Reintroduction efforts were initiated in the Verde River in 1980s and have continued periodically since that time. Razorback suckers are generally stocked at Beasley Flats and Childs. Early on, millions of razorback larvae were stocked and it is assumed that none of these fish survived due to predation or other factors. In 1993, managers began stocking larger individuals at lengths of at least 12" (Hyatt 2004). Initially, very few stocked fish were recaptured in subsequent years, despite considerable monitoring effort. Loss of these fish was due primarily to predation from nonnative fishes within hours after stocking (Marsh and Brooks 1989, Hyatt 2004). Laboratory tests indicated that larger sub-adult or adult suckers (>12 in.) may have a better chance of avoiding predators and surviving (Johnson et al. 1993). Between 1994 and 2003, 19,745 adult razorback suckers were released into the Verde River near the Childs power plant (Weedman 2003). During the 1990s, the increase in the number of razorback suckers captured during monitoring efforts has been steady (Jahrke and Clark 1999).

Clarkson et al. (1993) noted high infestation levels of the nonnative parasite *Lernaea cyprinacea* (anchorworm) on reintroduced razorbacks in the Verde River near Perkinsville. They suspected that high levels of parasitism increased mortality of the reintroduced fish and considered that this could represent another obstacle to reestablishment of the species. Robinson et al. (1998) found that levels of parasitism on both native and nonnative fishes were higher at Perkinsville than at Childs, but rated all fishes examined as "healthy," and concluded that parasitism was not seriously impacting Verde River fishes.

**Loach Minnow**

Loach minnow was listed as a threatened species on October 28, 1986 (USFWS 1986a). Critical habitat was designated on March 21, 2007 (USFWS 2007b). In Arizona, the current designation includes portions of the Black River, East Fork Black River, North Fork East Fork Black River, and Boneyard Creek; Aravaipa Creek and its tributaries Deer and Turkey creeks; the San Francisco River, Eagle Creek, and the Blue River and its tributaries, Campbell Blue Creek and Little Blue Creek. In New Mexico, the current designation includes portions of the Blue River; the San Francisco River and its tributary Whitewater Creek; the Tularosa River and its tributary, Negrito Creek; Campbell Blue Creek; Dry Blue Creek and its tributaries Frieborn and Pace creeks; the Gila River, including portions of its West, Middle, and East forks.

Loach minnow is a small fish from the minnow family Cyprinidae. Loach minnow are olivaceous in color, and highly blotched with darker spots. Whitish spots are present at the front and back edges of the dorsal fin, and on the dorsal and ventral edges of the caudal fin. A black spot is usually present at the base of the caudal fin. Breeding males have bright red-orange coloration at the bases of the paired fins and on the adjacent body, on the base of the caudal lobe, and often on the abdomen. Breeding females are usually yellowish on the fins and lower body (Minckley 1973, USFWS 1991).

Loach minnow are endemic to the Gila River basin of Arizona and New Mexico within the United States, and Sonora, Mexico, where they were recorded only in the Rio San Pedro. Historically, loach minnow in Arizona were found in the Salt River mainstem near and above the Phoenix area, the White River, East Fork White River, Verde River, Gila River, San Pedro River, Aravaipa Creek, San Francisco River, Blue River, and Eagle Creek, as well as some

tributaries of these streams. In New Mexico, loach minnow historically occupied the Gila River including its West, Middle, and east Forks, the San Francisco River, the Tularosa River, and Dry Blue Creek (Minckley 1973, Minckley 1985).

Loach minnow are bottom-dwelling inhabitants of shallow, swift water over gravel, cobble, and rubble substrates (Rinne 1989, Propst and Bestgen 1991). Loach minnow use the spaces between, and in the lee of, larger substrate for resting and spawning (Propst et al. 1988, Rinne 1989). The loach minnow is rare or absent from habitats where fine sediments fill the interstitial spaces (Propst and Bestgen 1991). Some studies have indicated that the presence of filamentous algae may be an important component of loach minnow habitat (Barber and Minckley 1966). Loach minnow feeds exclusively on aquatic insects (Schrieber 1978, Abarca 1987). Loach minnow live two to three years with reproduction occurring primarily in the second summer of life (Minckley 1973, Sublette et al. 1990). Spawning occurs March through May (Britt 1982, Propst et al. 1988); however, under certain circumstances loach minnow also spawn in the autumn (Vives and Minckley 1990). The eggs of loach minnow are attached to the underside of a rock that forms the roof of a small cavity in the substrate on the downstream side. Limited data indicate that the male loach minnow may guard the nest during incubation (Propst et al. 1988, Vives and Minckley 1990).

The limited taxonomic and genetic data available for loach minnow indicate there are substantial differences in morphology and genetic makeup between remnant loach minnow populations. Tibbets (1993) concluded that results from mitochondrial DNA (mtDNA) and allozyme surveys indicate variation for loach minnow follows drainage patterns, suggesting little gene flow among rivers. The levels of divergence present in the data set indicated that populations within rivers are unique, and represent evolutionarily independent lineages. The main difference between the mtDNA and allozyme data was that mtDNA suggest that the San Francisco/Blue and Gila groups of loach minnow are separate, while the allozyme data places the Gila group within the San Francisco/Blue group. Tibbets (1993) concluded that the level of divergence in both allozyme and mtDNA data indicated that all three main populations (Aravaipa Creek, Blue/San Francisco Rivers, and Gila River) were historically isolated and represent evolutionarily distinct lineages.

Actions that may adversely affect the species can include road crossing construction and maintenance, livestock grazing, water withdrawals, contaminants, recreational activities, and nonnative aquatic species. Our information indicates that, approximately 275 consultations have been completed or are underway for actions affecting spikedace and loach minnow. The majority of these opinions concerned the effects of grazing, roads and bridges, or agency planning. Additional consultations dealt with timber harvest, fire, flooding, recreation, realty, animal stocking, water development, recovery (including loach minnow reintroduction efforts), and water quality issues.

The status of loach minnow is declining rangewide. Although it is currently listed as threatened, the FWS determined in 1994 that a petition to uplist the species to endangered status is warranted (USFWS 1994b). The FWS confirmed this decision in 2000 (USFWS 2000a). A reclassification proposal is pending. However, work on this decision is precluded due to work on other higher priority listing actions (USFWS 1994b).

**Spikedace**

Spikedace was listed as a threatened species on July 1, 1986 (USFWS 1986b). Critical habitat was designated on March 21, 2007 (USFWS 2007b). Critical habitat includes portions of the Verde River, the middle Gila River, the upper San Pedro River, and Aravaipa Creek in Arizona, and portions of the upper Gila River and its West, Middle and East Forks in New Mexico.

Spikedace is a small silvery fish whose common name alludes to the well-developed spine in the dorsal fin (Minckley 1973). Spikedace historically occurred throughout the mid-elevations of the Gila River drainage in Arizona and New Mexico (Barber and Minckley 1966, Minckley 1973, Anderson 1978, Marsh et al. 1990, Sublette et al. 1990, Jakle 1992, Knowles 1994, Rinne 1999, Paroz et al. 2006, Propst 2005). The two remaining stable spikedace populations occur in Aravaipa Creek and portions of the upper Gila River in New Mexico (AGFD 2004, Arizona State University 2002, Propst 2002, Propst et al. 1986, Rienthal 2008). Based upon the available maps, we estimate its present range to be approximately 10 to 15 percent or less of its historical range. Spikedace reintroduction projects have placed spikedace in Fossil Creek (tributary to the Verde River), Hot Springs and Redfield canyons (tributaries to the San Pedro River), and Bonita Creek (tributary to the Gila River) in Arizona, and in the upper San Francisco River in New Mexico. These populations were reintroduced in 2007 and 2008.

Spikedace live in flowing water with slow to moderate velocities over sand, gravel, and cobble substrates (Propst et al. 1986, Rinne and Kroeger 1988). Specific habitat for this species consists of shear zones where rapid flow borders slower flow, areas of sheet flow at the upper ends of mid-channel sand/gravel bars, and eddies at the downstream riffle edges (Propst et al. 1986). Spikedace spawn from March through May with some yearly and geographic variation (Barber et al. 1970, Anderson 1978, Propst et al. 1986). Actual spawning has not been observed in the wild, but spawning behavior and captive studies indicate eggs are laid over gravel and cobble where they adhere to the substrate. Spikedace live about two years with reproduction occurring primarily in one-year old fish (Barber et al. 1970, Anderson 1978, Propst et al. 1986). It feeds primarily on aquatic and terrestrial insects (Schreiber 1978, Barber and Minckley 1983, Marsh et al. 1989).

Recent taxonomic and genetic data on spikedace indicate there are substantial differences in morphology and genetic makeup between remnant spikedace populations. Remnant populations occupy isolated fragments of the Gila basin and are isolated from each other by unsuitable habitat and long distances. Anderson and Hendrickson (1994) found that spikedace from Aravaipa Creek is morphologically distinguishable from spikedace from the Verde River, while spikedace from the upper Gila River and Eagle Creek have intermediate measurements and partially overlap the Aravaipa and Verde populations. Mitochondrial DNA and allozyme analyses have found similar patterns of geographic variation within the species (Tibbets 1992, Tibbets 1993).

Actions that may adversely affect the species can include road crossing construction and maintenance, livestock grazing, water withdrawals, contaminants, recreational activities, and nonnative aquatic species. Our information indicates that, approximately 275 consultations have been completed or are underway for actions affecting spikedace and loach minnow. The

majority of these opinions concerned the effects of grazing, roads and bridges, or agency planning. Additional consultations dealt with timber harvest, fire, flooding, recreation, realty, animal stocking, water development, recovery (including spikedace reintroduction efforts), and water quality issues (USFWS 2001).

The status of spikedace is declining rangewide. Although it is currently listed as threatened, the FWS determined in 1994 that a petition to uplist the species to endangered status is warranted (USFWS 1994b). The FWS confirmed this decision in 2000 (USFWS 2000a). A reclassification proposal is pending. However, work on this decision is precluded due to work on other higher priority listing actions (USFWS 1994b).

## 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.

### Chiricahua leopard frog

The FCRA contains currently occupied, previously occupied, and suitable unoccupied CLF habitat. The habitat consists entirely of stock tanks and possibly some habitat within the ephemeral drainages on the allotment. The entire allotment is located within the "Buckskin Hills Conservation Management Area" for CLF and until 2002 the area appeared to contain a functioning metapopulation of leopard frogs. These recently and currently occupied sites on the Coconino National Forest are all earthen stock tanks, so the presence of these grazing improvements has aided the population as its habitat in the watershed has been fragmented by habitat degradation, spread of invasive aquatic species, and disease. Following the 2002 drought, many occupied sites "died out" as the waters dried and animals became extremely susceptible to other factors (e.g., predation, possibly disease, etc.). The FWS and AGFD have continued to monitor the decline of CLF in the Buckskin Hills and the FCRA since this time. However, the FWS, in cooperation with the Phoenix Zoo and AGFD, established a captive breeding program in October 2005 with one female and three males we collected from Sycamore Basin Tank. These animals, and CLF collected from Gentry Creek, Tonto National Forest, produced the frogs that we released into Middle Tank on April 10, 2008 (26 subadult, pure Buckskin Hills CLF released) and October 15, 2008 (18 subadults and 48 tadpoles of Buckskin Hills/Gentry Creek mixed lineage, 1 adult frog originally from Sycamore Basin Tank released). Other sites that may still be occupied include Sycamore Basin, Buckskin, Black (due to movement from Middle Tank since these areas are connected when wet), and possibly Walt's Tank. The FWS and AGFD, in cooperation with the permittee and the CNF, intend to continue stocking CLF into these sites, and possibly others, in order to improve the status of the species within the action area.

Previously occupied sites are those areas where CLF were present in the 1990's and early 2000's but no longer occur as a result of drought, crayfish, non-native fish, or other unknown disturbances. There are approximately 8 stock tanks within the FCRA that meet this definition (e.g., Contractor, Divide, Pine, Mud Tank No. 2, Tanque Aloma, Gnat, Natural, and Road Tanks). Suitable, unoccupied sites are those areas where suitable conditions exist (permanent water, no crayfish or non-native fish, and within the elevation range expected for this species), but that have not had frogs detected during any surveys. There are approximately 13 sites considered suitable habitat within the FCRA per Table 4 in the BAE (pages 28-29) (e.g., Buck, Doren's Defeat, Little Buckskin, Partnership, Salmon Lake, Pete's/Turkey, Wan, Ernies, Herbies, Tin Can, Blue, Yvette, and Needed Tanks). Other habitats may exist but may have become inhospitable to CLF due to crayfish, non-native fish, disease or other factors. Managing these habitats for CLF will continue to be a challenge due to the movement (both natural and human-aided) of these species and amphibian Chytrid fungus.

**Fossil Creek Environmental Baseline**

All of the fish species described below plus headwater chub, roundtail chub (*Gila robusta*), longfin dace (*Agosia chrysogaster*), speckled dace (*Rhinichthys osculus*), desert sucker (*Catostomus clarki*), Sonora sucker (*Catostomus insignis*), and Gila topminnow are located within Fossil Creek on the FCRA, and there are no other perennial drainages within the allotment.

In order to understand how the proposed action may affect fish, it is important to understand the current conditions of the creek itself. In 2004, a fish barrier was constructed and all non-native fish above the barrier were removed using piscicide. Following the native fish renovation project, full flows were returned to Fossil Creek resulting in an increase in flows from 2 cubic feet per second (cfs) to 43 cfs. The increased flow resulted in an increase in the size of the wetted streambed. Effects from the increased flow have resulted in modifications to the streamside vegetation, increased travertine formation and deposition, provided additional habitats for aquatic species, and may have indirectly affected recreation levels.

The effects to streamside riparian vegetation from the return of full flows have been both short- and long-term. Over the short-term, the saturation tolerance of some of the existing vegetation (e.g., large trees) along Fossil Creek has been exceeded and that vegetation has been lost in places. However, over the long-term, the increase in the amount of water in the streambed is expected to allow for riparian vegetation to grow farther from the water's edge in places, which may provide greater protection from high-flow events. However, the Fossil Creek canyon is fairly narrow and it is likely that the width of the riparian area will be constrained by geology, regardless of the increase in flows.

Higher flows in Fossil Creek are resulting in increased travertine formation and deposition. The calcium carbonate precipitation that forms travertine is a combination of inorganic processes that are accelerated in the presence of algae. The process of travertine formation begins when water saturated with calcium carbonate and a relatively high concentration of carbon dioxide (compared to atmospheric concentrations) emerges from the limestone bedrock at Fossil Springs. As this water flows downstream, carbon dioxide gas is released and the pH increases, causing the

calcium carbonate to precipitate and form travertine. Precipitation of travertine typically occurs at, or immediately below, areas of turbulence, where the greatest amount of carbon dioxide is released (Herman and Hubbard 1990). With lower flows, turbulence is more uniformly distributed in the stream, and consequently, travertine deposition is more uniform. In contrast, by increasing flow, the turbulence has concentrated in areas with more pronounced slope changes and seems to be precipitating more travertine in these more turbulent areas. However, in reality, the long-term effect of increased flows on the size, shape, and placement of travertine cannot be predicted exactly due to the dynamic nature of the system. This is especially true because as travertine develops, the structures themselves will change the streambed morphology.

The largest effect that return of full flows has had is its profound positive effect on the restoration opportunities for native aquatic and riparian fauna and flora. The native fish fauna in most streams in Arizona has dwindled in abundance and diversity during the past century due to human activities, including damming and diversions of streams. Water is an ever-increasingly rare resource in the American Southwest. The return of full flows to Fossil Creek after almost 100 years appears to be resulting in increased habitat complexity through increases in travertine formation and deposition, although habitat surveys should be completed to confirm this observation.

However, because water is such a rare resource in Arizona, the return of full flows has also greatly increased recreation in Fossil Creek. Discontinuing the hydroelectric project and removing most of the above-ground facilities significantly increased public interest in the Fossil Creek area, and visitation in the late spring through early fall months has been significant. Recreational activities in the project area include swimming, hiking, camping, and wildlife viewing. Recreationists can degrade and destroy riparian habitat by trampling vegetation or by harvesting wood for campfires. These impacts can affect cover around important pool habitats. In addition, an increase in recreationists may result in decreased water quality resulting from human waste and littering. Trampling of vegetation, compaction of stream banks, loss of cover near pools, and deposition of human waste and litter are all evident impacts from the concentrated recreation along Fossil Creek.

Arizona Public Service (APS), as part of the hydropower plant decommissioning activities, recently removed the top 14 feet of the Fossil Springs Dam. This activity occurred during the fall of 2008 and was completed in December 2008. Lowering the dam by 14 feet will allow for an estimated 25,000 cubic yards of sediment to be transported as suspended sediment and bedload downstream during high flows. As of November 2008, winter storms have begun the process of moving this sediment downstream and have resulted in modification to the channel both above and below the dam area. The sediment transport model APS used to make these estimates predicted that most of the eroded sediments would initially be deposited in the pools immediately below the diversion dam site. Ultimately, multiple storm events will redistribute the sediments further downstream, along with the normal sediment yield of the watershed.

In addition to the above potential sediment inputs, there is also an extensive road network within the Fossil Creek watershed that contributes sediment to the creek. APS conducted road maintenance for the 708 Forest Road that goes from Highway 260 east of Camp Verde to Fossil Creek and out to Strawberry when the hydropower plants were in operation and have continued

to conduct these activities as the decommissioning process progresses. However, there are still several areas that regularly move sediment from the road to Fossil Creek and this likely will continue into the future.

**Razorback sucker**

The status of razorback suckers in Fossil Creek prior to August 2004 is thoroughly discussed in our August 17, 2004 biological opinion on the Surrender of License for the Childs and Irving Hydropower Plants (USFWS 2004). Since this time, following the removal of non-native fishes and the subsequent restoration of full-flows in Fossil Creek, the AGFD and FWS stocked 99 razorback suckers on April 15, 2008, downstream of the old Irving hydropower facility. In addition, 480 suckers were stocked into Fossil Creek (approximately the same location) on December 4, 2008. Fish reared in standing water commonly experience downstream displacement (Mueller and Foster 1999, Mueller et al. 2003), are rarely captured again (Modde et al. 1995), or suffer high predation mortality (Marsh and Brooks 1989) when stocked into flowing water. Laboratory studies have shown that exercise conditioning can increase swimming ability of pond reared razorback suckers (Ward and Hilwig 2004, Mueller et al. 2007), but no information is available on whether this increase in swimming ability would reduce post stocking downstream displacement. The existing fish barrier at Fossil Creek provides a unique opportunity to easily evaluate downstream dispersal of stocked fish without using telemetry. The suckers stocked in December 2008 are part of a research project conducted by AGFD, FWS, and Northern Arizona University (NAU) to determine if exercising the fish prior to release may assist them with their ability to remain in Fossil Creek. Unfortunately, what we have learned predominately from the release is that river otters ate many of the suckers. We were able to determine this after finding the pit tags for the fish in otter scat. More information regarding this study is currently being summarized by NAU.

**Loach Minnow**

Despite the lack of documentation of the presence of loach minnow in the Verde River for the last several decades, the Verde River and its tributaries, such as Fossil Creek, are critically important habitat for the eventual re-introduction and recovery of the species. It is likely that loach minnow were historically common throughout the Verde River basin but were extirpated as a result of human activities (e.g., development, agriculture, water diversions, etc.) resulting in reduction of riparian habitat, altered species composition, increased presence of exotic fish, decreased surface water availability, changes in stream morphology, and other deviations from historical conditions. Surveys for the species continue (FWS, unpublished data). Thus, a primary concern with loach minnow in the action area is to ensure the protection and improvement of its historical habitat. There is no critical habitat for loach minnow in the Verde watershed.

Following the removal of non-native fishes and the subsequent restoration of full-flows in Fossil Creek, the AGFD and FWS stocked loach minnow into Fossil Creek on four separate occasions between November 2007 and November 2008. The details are summarized in Table 2 below. Detailed information regarding the stocking locations is located in our files. Currently, these are the only known loach minnow in the entire Verde watershed.

**Table 2.** Loach minnow stocking information for Fossil Creek (November 2007–January 2009).

| Date | Approximate number of fish stocked | Stocking location |
|---|---|---|
| November 2, 2007 | 124 | Above Fossil Springs Dam |
| March 7, 2008 | 500 | Approximately half of the fish were stocked above the Fossil Springs Dam and half below. |
| May 21, 2008 | 504 | Fish were stocked into two sites below the Fossil Springs Dam |
| November 24, 2008 | 1,000 | Fish stocked at three sites below the Fossil Springs Dam, but above the High Falls. |

NAU researchers have re-sighted loach minnow in Fossil Creek on at least one occasion (Matthew O'Neill, personal communication, November 21, 2008). We believe that in the absence of non-native fishes and with the potential habitat available that loach minnow may thrive in Fossil Creek. However, at this time, very few fish have been stocked and monitoring for the success of these introductions will not begin until March 2009, so the success of these introductions will not be known for some time.

**Spikedace**

Spikedace were last detected in the Verde River in 1999. Because of the species' small size and low numbers, it is difficult to detect; however, we believe that spikedace, while rare, still likely persist in the uppermost reaches of the Verde River. In addition, critical habitat is currently designated on the Verde River from Sullivan Dam (headwaters of the Verde River) to the Prescott and Coconino National Forests boundary with private lands (43 miles). There is no critical habitat for spikedace within the defined action area.

Following the removal of non-native fishes and the subsequent restoration of full-flows in Fossil Creek, the AGFD and FWS stocked spikedace into Fossil Creek on two occasions between November 2007 and November 2008. The details are summarized in Table 3 below. Detailed information regarding the stocking locations is located in our files. At this time, very few fish have been stocked and monitoring for the success of these introductions will not begin until March 2009, so the success of these introductions will not be known for some time.

**Table 3.** Spikedace stocking information for Fossil Creek (November 2007–January 2009).

| Date | Approximate number of fish stocked | Stocking location |
|---|---|---|
| November 2, 2007 | 125 | Above Fossil Springs Dam |
| November 24, 2008 | 600 | Upstream of Irving (above High Falls), but below Fossil Springs Dam |

## EFFECTS OF THE ACTION

Effects of the action means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

### Chiricahua leopard frogs

The proposed action is expected to result in benefits to the CLF. The stock tank habitat fencing strategy and FWS/AGFD plans for additional reintroductions of the species within the action area will contribute to the species conservation within the action area. However, livestock grazing can cause a decline in diversity, abundance, and species composition of riparian herpetofauna communities from direct or indirect threats including: (1) declines in the structural richness of the vegetative community; (2) losses or reductions of the prey base; (3) increased aridity of habitat; (4) loss of thermal cover and protection from predators; and (5) a rise in water temperatures to levels lethal to larval stages of amphibian and fish development (Szaro et al. 1985, Schulz and Leininger 1990, Belsky et al. 1999). Livestock grazing may also lead to a loss in soil fertility from erosion and gaseous emissions spurred by a reduction in vegetative ground cover, particularly at lower elevations (Schlesinger et al. 1990). Specific attributes of ecosystems, such as composition, function, and structure, have been documented as being altered by improper livestock management through a variety of means including: (1) decreasing the density and biomass of individual species, reducing species richness, and changing biological community organization; (2) interfering with nutrient cycling and ecological succession; and (3) changing vegetation stratification, contributing to soil erosion, and decreasing availability of water to biotic communities (Fleischner 1994).

The CLF Recovery Plan (USFWS 2007a) provides a lengthy discussion of potential effects to CLF from livestock grazing activities, with an emphasis on effects to CLF during the warmer periods of the year when the species is assumed to be surface-active and/or reproductive. Livestock are adapted to mesic habitats and select riparian habitats for water, shade, and cooler temperatures. They tend to spend a disproportionate amount of their time in riparian zones and can adversely affect these systems in a number of important ways (see Fleischner 1994, Belsky et al. 1999, Jones 2000, and references therein).

Both direct and indirect adverse effects may occur through a variety of means during the non-active (i.e., non-breeding) seasons of the year for CLFs, including trampling of hibernating frogs or tadpoles; erosion and/or siltation of stream courses; elimination of undercut banks that provide cover for frogs; loss of wetland and riparian vegetation and backwater pools; and spread of disease and non-native predators (Arizona State University 1979, Hendrickson and Minckley 1984, Ohmart 1995, Jancovich et al. 1997, Belsky et al. 1999, Ross et al. 1999, USFWS 2000b, Sredl and Jennings 2005). Increased watershed erosion caused by grazing can accelerate sedimentation of deep pools used by frogs (Gunderson 1968). The indirect effects of grazing in the FCRA on CLF habitat may also include increases in sedimentation generated by grazing

levels. Sediment can alter primary productivity and fill interstitial spaces in drainage materials with fine particulates that impede water flow, reduce oxygen levels, and restrict waste removal (Chapman 1988). These effects may occur but are expected to be attenuated through consistent monitoring and adaptive management as proposed by the Coconino National Forest in their livestock management plan for the FCRA.

Direct mortality of amphibian species, in all life stages, from being trampled by livestock has been documented in the literature (see Bartelt 1998, Ross et al. 1999), but most likely occurs to egg masses. Trampling of CLF by livestock has not been documented; however, it likely occurs, particularly in confined, simple habitats such as stock tanks. Juvenile and adult frogs can probably often avoid trampling when they are active; however, leopard frogs are known to hibernate on the bottom of ponds (Harding 1997) where they may be subject to trampling during the winter months. We are reasonably certain that increased risks of trampling hibernating frogs, carry-over tadpoles from last year that have not yet metamorphosed, or egg masses may occur at sites that may become occupied by CLF due to dispersal from nearby sites during the life of the project. Frogs are known to inhabit the action area and we expect that over the life of the action, there will be more occupied sites across the allotment as allotment condition improves and implementation of CLF habitat enhancement actions occurs. With respect to the effects of the action on the frog, we believe there is a potential for impacts to frogs during tank maintenance activities such as dredging or silt removal; injury at tanks due to transmission of disease by livestock or ranch hands; and direct or indirect mortality at those tanks grazed by livestock as a result of cattle wading into stock tanks, removing shoreline or aquatic cover at egg deposition sites, and increasing turbidity. However, the Forest Service and permittee have agreed to work with us and AGFD to build "frog fences" at the five likely occupied tanks in order to provide livestock-free habitat for frogs, while still providing livestock access to water. This action should reduce the opportunity for livestock to accidentally trample frogs, but would not completely remove the threat.

In review of the potential effects to occupied CLF habitat and individual frogs discussed above, and in acknowledgement of the head-starting for the reintroduction activities planned for CLF in this area, we are reasonably certain that trampling of egg masses, early-stage tadpoles, or dormant-season metamorphosed frogs will occur at some rate over the life of the grazing permit. Additionally, we are reasonably certain that adverse effects to bankside and aquatic vegetation in occupied habitat, causing loss of cover for frogs, will also occur at some level during the duration of this proposed action. We anticipate these direct and indirect effects could occur on any of the current or future habitat areas within the FCRA.

While watershed effects such as increased siltation are often associated with livestock grazing of upland habitats, we are reasonably certain that monitoring, conservative use, and adaptive management proposed by the Coconino National Forest for the FCRA will minimize potential effects of upland grazing on occupied habitat in the area of reintroduction sites.

**General Direct Effects of Grazing to Aquatic Habitat and Fish**

Aquatic habitat may be altered by the direct removal of riparian vegetation from livestock grazing and altered channel morphology from bank shearing by trampling hooves. While these

effects are often localized, they can contribute to more deleterious indirect effects. The proposed action allows for three water access points in Fossil Creek; all other potential livestock access to Fossil Creek and the Verde River is fenced off. These are not crossing locations, but are designed to provide drinking water for livestock. These access points were chosen to minimize disturbance to the streambank and channel, and fencing and natural barriers will control livestock access to the creek as recommended by the Natural Resource Conservation Service (Berg and Wyman 2001). All three access points are located many miles downstream of the loach minnow and spikedace stocking locations. The razorback sucker stocking location is very near the Stehr pasture (powerline) water access point. Since this is the lowest water access point on the creek, most razorback suckers remaining in the creek are likely downstream of the other two access points. Regardless of where fish were initially stocked in the stream, we would assume that over the life of the project, listed and sensitive fish species could occur throughout the stream as habitat and other factors allow.

- The Boulder Pasture water access is located just north of the bridge that crosses Fossil Creek on the 708 Road (Township 12 North, Range 7 East, Section 29, SE ¼). This is a new access point and is approximately 150 to 200 feet wide along the stream channel. Temporary fences would be constructed to tie into an existing pasture fence to make a lane into Fossil Creek. Use would be in the early winter during the woody dormant period in December (20 to 30 days) and in May (15 days). At the watering location the stream is characterized by a shallow pool. There is a well-used swimming hole upstream of this access point and downstream of the lane are rapids.

- The Stehr Pasture water access (north) is located on Fossil Creek between Sally May Wash and Boulder Canyon (Township 12 North, Range 7 East, Section 31, NW ¼). This is an existing livestock water location and livestock would be contained by natural barriers upstream (large rocks in stream), and temporary fencing would be used to block livestock access downstream. The permittee noted that cattle typically do not move downstream as the boulders on the stream bank make walking difficult. Livestock enter the site via a short road spur. The width of the lane is approximately 150 feet and would be used in December (20 to 30 days) and May (15 days). The stream channel is characterized by deep pools and ends at a small rapids. Travertine is being deposited on the rocks at the bottom of the channel. This is a high-use recreation site and the north side of Fossil Creek here is characterized by several road spurs along the creek terrace leading to dispersed camping sites.

- The Stehr Pasture water access (powerline) is located on Fossil Creek downstream of the confluence with Sally May Wash, under the powerlines (Township 12 North, Range 7 East, Section 31, NE ¼). This is an existing livestock water location and it is accessed by a spur road. The width of the lane is approximately 150 feet and would be used at the same time as the Stehr Pasture water access north. The upstream and downstream portions of the lane would be temporarily fenced to keep livestock contained. This area is used extensively by recreationists and there are many spur roads and dispersed camping sites on the stream terrace near this access point.

The proposed action states that livestock use of woody riparian vegetation would not exceed 20% and that unless exclosures are built, livestock grazing in these areas would be allowed only every other year during the critical growth period for riparian vegetation. The construction of three water lanes on Fossil Creek would limit the riparian damage that could occur from grazing to the localized area, and they would serve to protect the majority of the riparian habitat within the allotment. In addition, riparian vegetation utilization would be limited to 20%, and if a riparian area is grazed during the critical growth period one year, it would not be grazed during that same time period the following year. Due to the confined areas where livestock would have access to the stream, these areas would receive proportionately greater use resulting in localized damage to stream banks and riparian vegetation. Except for these access points, there is no potential for direct effects to listed fishes. However, even at these three access points, the potential for livestock to directly impact fish (i.e., by trampling them) is extremely unlikely due to the cows' limited access to habitat and the amount and velocity of water flowing in Fossil Creek that likely allows for little direct contact between livestock and listed fishes. Water is traveling at a relatively high velocity at all three access points, and temporary fencing and natural barriers (rock seams, boulders, etc.) inhibit livestock access into the actual creek. The fenced lanes would also limit livestock access to riparian habitat along the creek, and consequently the majority of overhanging vegetation and streambanks within the areas of these access points would be protected. In addition, it would be difficult to attribute all riparian impacts at these watering sites to livestock as all three areas receive heavy recreational use year-round that is currently resulting in adverse impacts to the riparian and aquatic habitats.

**General Indirect Effects of Grazing to Aquatic Habitats and Fish**

Most indirect effects to aquatic habitat and biota from livestock management are the result of upland terrestrial changes that result in changes to sediment and water transport in the watershed. These indirect effects may include: increased sediment, loss of riparian vegetation, altered macroinvertebrate assemblages, lowering of groundwater tables and decreased perennial flows, increased stream temperature, larger peak flows, and changes in channel form (Belsky et al. 1999, Fleischner 1994). The following is a general discussion of the potential indirect effects that can occur to aquatic habitat and fishes from improper livestock management.

Sedimentation and erosion are natural processes, and ecosystems have evolved to handle the natural background levels. Grazing of upland vegetation can contribute to the deterioration of soil stability and porosity, and may increase erosion and compaction. Poorly managed livestock grazing may reduce the roughness coefficient of watersheds, resulting in more surface runoff, more soil erosion, and larger floods (Fleischner 1994). These factors lead to increased sedimentation into streams and changes in the hydroperiod.

Increased sediment can adversely impact stream fishes by altering fish physiology, impairing growth, shifting blood chemistry, inducing gill trauma, reducing disease resistance, increasing egg mortality, and can even result in direct mortality of juveniles and adults if loads are significant (Anderson 1996, Argent and Flebbe 1999, Bisson and Bilby 1982). Sediment also indirectly affects fish through behavior modifications including increased frequency of the cough reflex, avoidance of suspended sediment, reduction in feeding, and temporary disruption of territoriality. The severity of changes in fish behavior is associated with the timing of

disturbance, the level of stress, and the importance of the habitat that the fish may be excluded from (Anderson 1996, Bisson and Bilby 1982, Rice et al. 2001).

Other indirect effects on stream fishes from sediment can occur from modifications to stream habitat. These changes include: altered channel morphology, loss of spawning habitat, loss of rearing habitat, changes in the food supply (macroinvertebrate assemblage), and decreased over wintering habitat (Lisle 1989, Miller and Benda 2000, Wood and Armitage 1997). Razorback suckers evolved with extreme seasonal variation in levels of sediment in the Colorado River and its associated tributaries (USFWS 1998), so short-term pulses of sediment through a desert stream system such as Fossil Creek are not necessarily detrimental to this fish. As described in the status of the species, loach minnow and spikedace breeding habitats may be impacted by sediment that reduces the availability of this habitat or smothers eggs. However, we do not believe that the amount of sediment generated from the proposed action will result in these types of impacts to loach minnow and spikedace habitat. There is a large amount of sediment from the dam removal that will continue to work its way through the system over some period of time (it may be immediate or occur over a few years, depending upon precipitation events in the watershed). This sediment input, along with the amount generated by recreationists and the existing road system, is much greater than what would be generated as a result of the proposed action.

Watershed hydroperiod can be altered by livestock grazing in the uplands with loss of soil productivity and increased soil compaction. Reductions in soil productivity can limit the vegetation potential resulting in decreased precipitation that is taken up by plants. Increased soil compaction decreases the amount of water infiltration into the soil. Both of these factors may compound to lead to higher surface runoff and higher flood pulses in stream channels (Belsky et al. 1999). Simulations of storm runoff in Arizona found that peak storm runoff events would be two to three times greater when watersheds were "heavily" grazed than when "lightly" grazed, resulting in higher energy erosive floods that would deepen and reshape stream channels (USFWS 1994a, USFWS 1994b). The erosive energy of floods can cause stream channel downcutting or incision, causing water to drain from floodplains into the channel and resulting in lower ground water tables (Belsky et al. 1999). This results in a narrowing or loss of riparian vegetation since it is left in drier soils. Additionally, with less water entering upslope and riparian soils, less water is available to provide late season flows. Therefore, the higher flows during precipitation events are often followed by low or no flow during the drier weather periods (Belsky et al. 1999, Fleischner 1994).

The effects of hydroperiod alterations listed above may result in deleterious effects to aquatic biota. Lower water tables that reduce or eliminate riparian vegetation affect macroinvertebrate communities. Streamside vegetation provides both allochthonous (produced outside stream system) and autochthonous (produced within stream ecosystem) food sources for macroinvertebrates and the quantity and quality of these inputs play a critical role in regulating the macroinvertebrate assemblage that is present in the system (Gregory et al. 1991). In turn, macroinvertebrates are a primary food source for aquatic vertebrates, and alterations to the food web at the lower levels would have repercussions for these higher-level consumers. Additionally, riparian plant communities with rooted plants retard streambank erosion, filter sediments out of the water, build and stabilize streambanks and streambeds, and provide shade

and nutrients for aquatic species. Functioning riparian areas act as "sponges" during high water periods and raise water tables maintaining stream water during dry seasons, resulting in more flow throughout the year (Belsky et al. 1999). Therefore, the loss of riparian vegetation can result in a negative feedback loop where conditions continue to break down until active management is needed to repair or retard degraded areas. However, as stated above, access to Fossil Creek by livestock is extremely limited (three discrete water access points), and impacts to riparian vegetation by livestock will be monitored closely when livestock are in these areas. With the return of full flows, it is likely that increase in travertine is what is driving the presence, absence, and/or abundance of aquatic macroinvertebrate populations in Fossil Creek. An ongoing study (initiated June 2002) conducted by NAU is monitoring six sites on Fossil Creek seasonally, with plans to extend the monitoring period significantly following the return of full flows. Monitored taxonomic groups include primary producers (algae and macrophytes), invertebrates, fish, amphibians, and reptiles. Sites selected for monitoring include ephemeral pools above Fossil Springs, the springs area, directly upstream from the Fossil Springs diversion dam, the dewatered reach below the dam, below Irving, and above the confluence with the Verde River. Though these data are being collected primarily to note changes following the native fish restoration and return of full flows, the macroinvertebrate monitoring data will also inform this process as well.

Stock tanks have been developed on public lands throughout the Southwest for livestock and wildlife use. In many areas, they have both indirect beneficial and detrimental effects on aquatic systems. They benefit aquatic systems by limiting and trapping sediment that otherwise would continue down ephemeral channels into perennial streams. They also may benefit species, such as the CLF, by providing habitat that is currently needed for the species recovery and survival. Stock tanks also capture surface water and precipitation that has the potential to increase the flashiness of a stream during a storm event and allow water to percolate into the soil, providing some recharge of the subsurface aquifer and potentially adding to stream base flows. Stock tanks are detrimental to aquatic systems when the sediment berms that are built to capture overland flows fail and cause acute sediment pulses into aquatic systems. An additional negative impact of stock tanks to aquatic systems is the spread of nonnative organisms including crayfish, nonnative fish, and bullfrogs. These nonnative species can negatively affect native aquatic species that may occur nearby, and the nonnative species can be transported downslope to perennial aquatic systems during high flow events where they can have dramatic negative effects to the native ecosystem. Following the native fish restoration project in Fossil Creek, all stock tanks containing non-natives that drained into the watershed were treated to remove nonnative fishes. This work was repeated at three stock tanks in 2008 (USFWS files), and we will continue to work with the Forest Service to ensure that stock tanks within the FCRA are managed to inhibit the movement of and/or to remove nonnative aquatic species that become established.

The proposed action is a reduction in utilization and intensity from past management and is intended to authorize livestock grazing in a manner that maintains and/or moves the FCRA toward Forest Plan objectives and desired conditions. The BAE notes that studies have found that new grazing systems similar to the proposed action may only serve to slow the rate of degradation of watersheds, not reverse it (Armour et al. 1994, Belsky et al. 1999, Elmore and Kauffman 1994). Under the proposed action, the following indirect effects (described in detail above) may continue if actions to improve vegetative and soil conditions are not implemented as

stated in the EA and BAE. These effects may be reduced if adaptive management and the associated monitoring are adept at making appropriate changes to the AOI in a timely fashion. With utilization, intensity, and AUM's managed at decreased levels until conditions improve, there is a possibility that the proposed action would result in long-term recovery of the watershed. However, these lower levels may not be sufficient to result in measurable benefits to upland watershed conditions over the life of the project, especially given predicted climate variability. If there is continued drought, even the reduced level of utilization and intensity that are proposed may result in continued watershed degradation. Potential improvements to watershed condition by lower initial annual stocking and use rates may be negated if these rates are increased too soon or under inappropriate climatic conditions.

However, we have based our analysis on the Forest Service commitment to implement the proposed action as described in the EA and BAE and to use adaptive management to quickly respond to changing environmental conditions. If the action is carried out as described, in a truly interdisciplinary manner, we believe that the proposed action would result in an insignificant amount of sediment transport from the uplands into Fossil Creek and its associated tributaries.

**Razorback sucker**

The restoration of stream flows to Fossil Creek and the removal of non-natives from the system may have created favorable habitat conditions for razorbacks to inhabit, and potentially establish in Fossil Creek. The BAE states that recently stocked razorback suckers in Fossil Creek may be influenced by sediment contributed by the watershed due to poor soil condition and from the existing road network on the FCRA. If razorback suckers are able to successfully spawn in Fossil Creek, heavy sediment has the potential to negatively affect eggs that are present in the substrate. The majority of scientific studies that discuss potential threats to razorback suckers list habitat modification, water withdrawals, and non-native species as the primary causes for their decline range wide. There are currently no water withdrawals or nonnative fishes impacting razorback suckers in Fossil Creek. Razorbacks evolved with extreme seasonal variation in levels of sediment in the Colorado River and its associated tributaries (USFWS 1998), so we expect that the predicted low level of sedimentation effects to Fossil Creek resulting from the proposed action would not harm the sucker's ability to inhabit Fossil Creek. In addition, as stated above, it would be difficult to tease out the sedimentation also resulting from dam removal, continued recreational disturbance, and the road impacts to sucker habitat.

**Loach minnow**

The BAE states that the direct effects of this alternative include livestock disturbance of spawning locations, including alteration of habitat and disturbance to eggs in the substrate at the livestock access points on Fossil Creek. In addition, the BAE states that the indirect effects of the proposed action may lead to continued or increased sedimentation in Fossil Creek, which has been shown to limit or affect loach minnow habitat by altering macroinvertebrate assemblages. In addition, loach minnow abundances decrease where sediment fills interstitial spaces in the substrate.

The potential effects described above could result in some level of effect to loach minnow since they inhabit Fossil Creek. However, Fossil Creek is a high-gradient, high-flow (43 cfs) travertine system that tends to efficiently move sediment. Upland condition has improved over the last few years. Whether or not implementation of the the proposed action continues to allow watershed conditions to improve over time, we believe that any sediment transport from the uplands into Fossil Creek due to the proposed action would be insignificant. In addition, as stated above, it would be difficult to tease out the sedimentation resulting from dam removal, continued recreational disturbance, and the road impacts to loach minnow habitat.

**Spikedace**

Sedimentation that affects the ability of spikedace eggs to adhere to gravel and sand substrates could negatively affect the species reproductive success. The BAE states that the proposed action may lead to continued or even increased sedimentation into Fossil Creek that could potentially embed the substrates and reduce the reproductive success of this species.

The potential effects described above could result in some level of effect to spikedace. However, Fossil Creek is a big river (43 cfs) and upland effects, though real, have improved over the last few years. Whether or not implementation of the the proposed action continues to allow watershed conditions to improve over time, we believe that any sediment transport from the uplands into Fossil Creek due to the proposed action would be insignificant. In addition, as stated above, it would be difficult to tease out the sedimentation resulting from dam removal, continued recreational disturbance, and the road impacts to loach minnow habitat. In addition, travertine will continue to form along the creek, creating a hard stream bottom in places, which may also modify spawning locations over time.

## CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. 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. The Fossil Creek Watershed is predominately managed by the Coconino and Tonto National Forests and the section of Verde River abutting the FCRA is managed by the Coconino National Forest. Since the land within the action area is almost exclusively managed by the Forest Service, most activities that could potentially affect listed species are Federal activities and subject to additional section 7 consultations.

Future non-federal actions within the project area that may be reasonably certain to occur include the potential development and/or modification of private property in-holdings and unregulated recreation. These activities may result in increased overland flow and/or sedimentation into aquatic species habitat (from construction of impermeable surfaces) and the potential for further non-native aquatic species introductions. There is only one private in-holding on Fossil Creek and the landowners are cooperative and helpful in the management of Fossil Creek.

## CONCLUSION

**Chiricahua leopard frog**

After reviewing the current status of the CLF, the environmental baseline for the action area, the effects of the proposed livestock grazing, and the potential for cumulative effects, it is our biological opinion that implementation of the FCRA AMP, as proposed, is not likely to jeopardize the continued existence of the CLF. No critical habitat has been designated for this species; therefore, none will be affected. We present this conclusion on the CLF for the following reasons:

- The ecological condition of the area should be maintained or improved during the 10-year life of the AMP;

- Full implementation of the AMP (including the conservation measures) is expected to greatly reduce the risk of direct impacts to CLF through fencing and exclusion of livestock from portions of occupied areas.

- A CLF captive breeding and head-start program has been developed in coordination with the Phoenix Zoo, the AGFD, and other stakeholders for reintroduction of the species in the action area. This has resulted in the reintroduction of frogs to Middle Tank and the program is expected to continue to improve the status of the species within the action area over time.

**Razorback sucker**

After reviewing the current status of the razorback sucker, the environmental baseline for the action area, the effects of the proposed action and the potential for cumulative effects, it is our biological opinion that implementation of the FCRA AMP, as proposed, is not likely to jeopardize the continued existence of the razorback sucker. We present this conclusion for the razorback sucker for the following reasons:

- The ecological condition of the area should be maintained or improved during the 10-year life of the AMP. This will lessen the overall impacts to the uplands from livestock grazing, aiding in improved hydrologic conditions within the watershed.

- Livestock have access to a very small portion of the creek and we do not expect the proposed action to result in any direct effects to razorback suckers.

**Loach minnow**

After reviewing the current status of the loach minnow, the environmental baseline for the action area, the effects of the proposed action and the potential for cumulative effects, it is our biological opinion that implementation of the FCRA AMP, as proposed, is not likely to jeopardize the continued existence of the loach minnow. Critical habitat does not occur within the action area. We present this conclusion for the loach minnow for the following reasons:

- The ecological condition of the area should be maintained or improved during the 10-year life of the AMP. This will lessen the overall impacts to the uplands from livestock grazing, aiding in improved hydrologic conditions within the watershed.

- Livestock have access to a very small portion of the creek and we do not expect the proposed action to result in any direct effects to loach minnow. The fenced lanes would also limit livestock access to riparian habitat along the creek and as such the majority of overhanging vegetation and streambanks within the area of these access points would be protected which should result in insignificant indirect effects to habitat from the watering locations.

**Spikedace**

After reviewing the current status of the spikedace, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that implementation of the FCRA AMP, as proposed, is not likely to jeopardize the continued existence of the spikedace. Critical habitat does not occur within the action area. We present this conclusion for the spikedace for the following reasons:

- The ecological condition of the area should be maintained or improved during the 10-year life of the AMP. This will lessen the overall impacts to the uplands from livestock grazing, aiding in improved hydrologic conditions within the watershed.

- Livestock have access to a very small portion of the creek and we do not expect the proposed action to result in any direct effects to spikedace. The fenced lanes would also limit livestock access to riparian habitat along the creek and as such the majority of overhanging vegetation and streambanks within the area of these access points would be protected which should result in insignificant indirect effects to habitat from the watering locations.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any Conservation Measures that were incorporated into the project design.

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 further 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 measures described below are non-discretionary, and must be undertaken by the Forest so that they become binding conditions of any grant or permit issued to the appropriate utility, for the exemption in section 7(o)(2) to apply. The Forest has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest (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 or appropriate utility 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**

Chiricahua leopard frog

We anticipate that the proposed action is reasonably certain to result in incidental take of CLF. However, it is difficult to quantify the number of individual frogs taken because: (1) dead or impaired individuals are difficult to find and losses may be masked by seasonal fluctuations in environmental conditions; (2) the status of the species could change over time through immigration, emigration, and loss or creation of habitat; and (3) the species is small-bodied, well camouflaged, and occurs under water of varying clarity. For these reasons, we will attribute take at the sub-population level (hereinafter referred to as occupied sites) as addressed in the Programmatic Biological and Conference Opinion on the Continued Implementation of the Land and Resource Implementation Plans for the Eleven National Forests and National Grasslands of the Southwest Region (USFWS 2005). We anticipate all of the following forms of take over the life of the project:

1. Direct mortality or injury of a proportion of CLF adults, metamorphs, tadpoles, or egg masses at one occupied livestock tank where maintenance activities result in significant disturbance at the tank (e.g., dredging or silt removal, major repair of berms).

2. Direct mortality or injury through trampling of a proportion of CLF adults, metamorphs, tadpoles, or egg masses at one occupied site in a summer pasture from March through October; and trampling of small tadpoles and overwintering frogs at one occupied site in a winter pasture where livestock have access from November through February.

3. Harm or harassment including lost productivity of a proportion of CLF due to loss of bankline and emergent vegetation cover, increased sedimentation of pools, or other forms of habitat at one occupied site where livestock contribute to erosion within or upstream of these sites.

4. Harassment of a proportion of CLFs at one occupied livestock tank due to unintentional benefit to, or facilitation of, nonnative bullfrogs, fish, salamanders, or crayfish that immigrate to newly constructed livestock tanks from nearby populations, existing or introduced.

A proportion, as used above, is a small enough quantity of the population at the tank that exists when the incidental take occurs to allow recovery of the population to pre-disturbance levels over time.

Occupancy of suitable habitat within a CLF metapopulation is dynamic. Discovery of new populations, recolonizations of or reintroductions to extirpated sites, and extirpation of occupied sites are common occurrences with this species; therefore, we expect that over the life of this proposed action, sites where take may occur (sites occupied by CLFs) will change across the allotment. The above anticipated take considers the dynamic nature of frog occupancy; thus, we do not believe reinitiation is needed whenever a new population of CLFs is found, or frogs in a particular livestock tank are periodically absent. However, take is considered to be exceeded if mortality, injury, harm, or harassment, as described in the scenarios above, continues to the degree that recovery of the population at a tank to pre-disturbance levels is precluded.

We also reviewed the prescriptions for take outlined on pages 270 and 271 of the LRMP BO to identify when take has been exceeded. In the LRMP BO and as of June 10, 2005, the Red Rock Ranger District was identified as possessing two extant populations of CLFs. As provided for in the LRMP BO, the authorized level of incidental take of CLF from the proposed action will be exceeded if, after a period of two consecutive years, there is a decrease in the total number of occupied CLF population sites on National Forest System Lands as a result of the proposed action. In other words and in this example, if after a period of two consecutive years, the species declines below the two extant populations of CLF identified on the Red Rock Ranger District, and such decline can be attributed to livestock management, take will have been exceeded. The amount or extent of take anticipated in this biological opinion may potentially exceed that provided for in the LRMP BO. However, the amount or extent of take anticipated in this biological opinion is predicated upon the reintroduction of CLFs as a result of head-starting activities in progress and anticipated to continue over the next several years. Therefore, over the life of this project, a much larger number of CLF will be extant within the action area and potentially taken through any or all of the means anticipated herein.

Razorback sucker, loach minnow, spikedace

The FWS does not anticipate that the proposed action will incidentally take any razorback sucker, loach minnow, or spikedace as the action is not reasonably certain to result in harm or harassment to these listed fish species in Fossil Creek. The proposed action has the potential to contribute sediment to habitats occupied by these fishes. However, the action is also expected to reduce potential impacts to riparian and perennial habitats from livestock grazing over the next ten years, maintaining or improving the watershed condition, and diminishing the potential for the proposed action to harm or harass listed fishes. In addition, we do not believe that the limited access livestock have to Fossil Creek (three water lanes) is reasonably certain to result in harm or harassment of these species.

The FWS will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. §§ 668-668d), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

## EFFECT OF THE TAKE

In this biological opinion, the FWS determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

## REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

Chiricahua Leopard Frog

The following reasonable and prudent measures are necessary and terms and conditions are appropriate to minimize the effects of the take of CLF for the FCRA.

1. The Forest shall take steps necessary to minimize take from the proposed action.

The following terms and conditions are necessary to implement reasonable and prudent measure one:

1.1 The Forest Service shall ensure that the agreed to frog fencing is constructed at all five identified stock tanks (Middle, Black, Walts, Sycamore Basin, and Buckskin) prior to livestock using these stock tanks.

1.2 The Forest Service shall work with FWS, AGFD, and the permittee to define when conditions warrant fencing of previously implemented improvements and erosion control measures installed to improve soil and vegetative conditions around stock tanks.

1.3 The Forest Service shall work with the FWS, AGFD, and permittee to develop a water monitoring protocol for occupied sites where livestock have access.

1.4 The Forest Service shall provide FWS and AGFD staff at least 60 days notice prior to the permittee conducting work in earthen tanks. This notice will allow for surveys, if needed, and/or mitigation to reduce adverse effects to amphibians.

1.5 The Forest Service shall work with the FWS and AGFD to develop a schedule for aquatic habitat monitoring to be conducted on all perennial streams in the allotment using established regional protocols. This monitoring would establish the condition and trends of the aquatic habitat in response to grazed riparian and upland areas.

1.6 The Forest Service shall modify livestock management in cooperation with the permittee, FWS, and AGFD if monitoring indicates that desired conditions are not being achieved.

2. Personnel education programs and well-defined operational procedures shall be implemented to minimize the contamination of occupied CLF habitat by nonnative species and amphibian chytrid fungus.

The following terms and conditions are necessary to implement reasonable and prudent measure two:

2.1 Live fish, crayfish, bullfrogs, leopard frogs, salamanders, or other aquatic organisms shall not be moved among livestock tanks or other aquatic sites.

2.2 Where new or existing sites occupied by CLF occur, water shall not be hauled to the site from another aquatic site or tank that supports leopard frogs, bullfrogs, crayfish, or fish.

2.3 If nonnative species are detected in stock tanks, the Coconino National Forest shall immediately initiate a multi-stakeholder planning effort to remove the nonnative species from the stock tank as quickly as possible. If a complete drying of a stock tank is deemed as the most effective management tool to address the threat of nonnatives, the Coconino National Forest may time this action so as to not place an unnecessary burden on the permittee.

3. Reporting requirements to our office.

3.1 The Coconino National Forest shall submit an annual summary report to our Flagstaff Suboffice by January 1 each year during project implementation. These reports shall briefly document, for the previous calendar year, the results of any monitoring efforts conducted, a summary of any situations (and their corrective actions) that pertain to the above items, and any other pertinent findings from the previous year. The report shall also make recommendations for modifying or refining these terms and conditions to enhance listed species protection.

3.2 The Coconino National Forest shall notify (written correspondence, e-mail, or phone call) our Flagstaff Suboffice as soon as practicable of the observed occurrence or the discovery of aquatic nonnative species in any stock tank on the FCRA to provide for collaborative emergency planning and corrective action as required in reasonable and prudent measure 2 and its implementing terms and conditions.

3.3 The Coconino National Forest shall notify (written correspondence, e-mail, or phone call) our Flagstaff Suboffice as soon as practicable of any observation of any pasture boundary or exclusion fenceline failure or fenceline disrepair that is adjacent to known occupied habitat within the FRCRA and the corrective actions implemented.

**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 in handling dead specimens to preserve the biological material in the best possible state.

If possible, the remains of intact species shall be provided to this office. If the remains of the species are not intact or are not collected, the information noted above shall be obtained and the carcass left in place. Injured animals should be transported to a qualified veterinarian by an authorized biologist. Should the treated species survive, contact our office regarding the final disposition of the animal.

## CONSERVATION RECOMENDATIONS

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. We recommend that the Forest Service work with us and AGFD to reintroduce the CLF to suitable habitats identified through habitat assessment and surveys conducted throughout the FCRA.

2. We recommend the Forest Service work with us and the AGFD to begin an aggressive program to control non-native aquatic organisms on the Forest, particularly bullfrogs, non-native fish, and crayfish.

3. We recommend that the Forest Service work with us to develop a programmatic environmental assessment and biological opinion to cover tank renovation and maintenance on the Coconino National Forest.

4. We recommend that the Forest Service continue to identify factors that limit the recovery potential of CLF, razorback suckers, loach minnow, and spikedace on lands under their jurisdiction and work to correct them.

## REINITIATION NOTICE

This concludes formal consultation on the action outlined in this biological opinion. As provided in 50 CFR Section 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 that was 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.

Thank you for your continued coordination. In all future correspondence on this project, please refer to the consultation number 22410-2007-F-0197. We also encourage you to coordinate the review of this project with the Arizona Game and Fish Department. Should you require further assistance or if you have any questions, please contact Shaula Hedwall at (928) 226-0614 (x103) or Brenda Smith (x101) of our Flagstaff Suboffice.

Sincerely,

Brenda H. Smith

for Steven L. Spangle
Field Supervisor

cc (electronic copy):
Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Flagstaff, AZ
District Ranger, Red Rock Ranger District, Sedona, AZ
Forest Biologist, Coconino National Forest, Supervisor's Office, Flagstaff, AZ
District Biologist, Red Rock Ranger District, Sedona, AZ
Mary Richardson, Fish and Wildlife Service, Phoenix, AZ
Jim Rorabaugh, Fish and Wildlife Service, Tucson, AZ
Lesley Fitzpatrick, Fish and Wildlife Service, Phoenix, AZ

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## APPENDIX A - CONCURENCES

This appendix contains our concurrences with your "may affect, not likely to adversely affect" determinations for the threatened bald eagle, threatened MSO and its critical habitat, endangered SWWF, endangered Yuma clapper rail, Verde River experimental, nonessential population of Colorado pikeminnow, endangered desert pupfish, endangered Gila topminnow, and razorback sucker critical habitat. In addition, this appendix, also contains your "not likely to jeopardize determinations" for the candidate yellow-billed cuckoo, and candidate headwater chub.

Bald eagle

We concur with your determination that the proposed action may affect, but is not likely to adversely affect the threatened bald eagle. We base this concurrence on the following:

- No bald eagle nest sites are known to occur in Fossil Creek. However, if bald eagles should establish a breeding area (BA) in Fossil Creek, direction will be taken from the Bald Eagle Conservation Assessment and Strategy (Driscoll et al. 2006) to protect eagles from any potential adverse effects associated with the proposed action.

- Bald eagles from the Coldwater BA forage within the project area. However, the proposed action will result in discountable effects to these, and other eagles, ability to forage for fish in Fossil Creek.

Mexican spotted owl and critical habitat

We concur with your determination that the proposed action may affect, but is not likely to adversely affect the threatened MSO. We base this concurrence on the following:

- Within the action area, there are no designated MSO protected activity centers (PACs). Therefore, no human disturbance or construction activities associated with livestock grazing will occur in MSO PACs during the breeding season (March 1 through August 30).

- There are seven acres of MSO protected, steep-slope habitat on the allotment. This protected habitat is located on dry, steep (>40%), rocky slopes that are largely inaccessible to livestock and lack open water; therefore, there should be no effects to this habitat from the proposed action.

- The key habitat components of MSO protected and restricted habitat, and the primary constituent elements of MSO critical habitat will not be adversely affected. Livestock grazing and management activities will provide for levels that provide the woody and herbaceous vegetation necessary for prey species habitat, the residual biomass that will support prescribed natural and ignited fires, and the regeneration of riparian trees.

Southwestern Willow Flycatcher

We concur with your determination that the proposed action may affect, but is not likely to adversely affect the endangered SWWF. We base this concurrence on the following:

- There is no critical habitat, occupied habitat, or suitable habitat within the action area. Therefore, we believe that effects to SWWF are insignificant and discountable.

- Surveys conducted in the 1990's did not detect SWWF in Fossil Creek and habitat was determined to be unsuitable. However, due to the restoration of full flows in 2005, habitat may be developing in Fossil Creek and it is possible that suitable habitat may develop. Under the proposed action, there is no grazing along the Verde River and livestock use in Fossil Creek will be limited to three watering lanes. Use of these lanes will occur for short periods of time and utilization of woody riparian vegetation will be limited to 20% maximum utilization. Therefore, in accordance with the Southwestern Willow Flycatcher Recovery Plan (USFWS 2002, appendix G), there will be either no grazing, or provisional grazing (water lanes), in restorable or regenerating habitat as part of the proposed action.

Yuma clapper rail

We concur with your determination that the proposed action may affect, but is not likely to adversely affect the endangered Yuma clapper rail. We base this concurrence on the following:

- There is marginal habitat for rails along Fossil Creek and the Verde River. Livestock do not access the Verde River from the FCRA; therefore, there would be no direct effects to rails or their habitat should rails ever be located on the Verde River. Livestock will be allowed access at three watering lanes on Fossil Creek; however, rail habitat is marginal at these sites and potential impacts from livestock access should be insignificant and discountable.

Colorado pikeminnow

We concur with your determination that the proposed action may affect, but is not likely to adversely affect the experimental, non-essential population of Colorado pikeminnow in the Verde River. We base this concurrence on the following:

- Livestock will not have access to the Verde River where pikeminnow occur and there are no pikeminnow in Fossil Creek. Therefore, there will be no direct impacts to Colorado pikeminnow from the proposed action.

- There is some potential for increased sedimentation in Fossil Creek from the proposed action. However, the expected increase in sedimentation is so insignificant, according to the BAE, that any effects to aquatic habitat in the Verde River should be discountable.

Desert pupfish

We concur with your determination that the proposed action may affect, but is not likely to adversely affect the endangered desert pupfish. We base this concurrence on the following:

- Desert pupfish have yet to be stocked into Fossil Creek. However, should they be stocked into Fossil Creek, it is unlikely that the proposed action would result in negative impacts to potential habitat. Livestock would not have access to identified potential habitat and any increases in sedimentation from the proposed action are likely to result in insignificant and discountable effects.

Gila topminnow

We concur with your determination that the proposed action may affect, but is not likely to adversely affect the endangered Gila topminnow. We base this concurrence on the following:

- Gila topminnow were stocked into Fossil Creek in 2007 and 2008. Livestock do not have access to areas that contain the best potential topminnow habitat, so there are not likely to be any direct effects from the proposed action to the fish.

- Any potential increases in sedimentation as a result of the proposed action are expected to result in insignificant and discountable effects to topminnow and their habitat.

Razorback sucker critical habitat

We concur with your determination that the proposed action may affect, but is not likely to adversely affect the razorback sucker critical habitat. We base this concurrence on the following:

- Livestock will not have access to the Verde River and designated razorback sucker critical habitat.

- There is some potential for increased sedimentation in Fossil Creek from the proposed action. However, the expected increase in sedimentation is so insignificant, according to the BAE, that any effects to designated critical habitat in the Verde River should be discountable.

Yellow-billed cuckoo

We concur with your determination that the proposed action is not likely to contribute in a trend toward Federal listing, loss of viability, or jeopardize the continued existence of the yellow-billed cuckoo. We base this concurrence on the following:

- Under the proposed action, there will be no grazing along the Verde River; therefore, there will be no effects to yellow-billed cuckoos or their habitat on the Verde River.

- Potential habitat for cuckoos exists on Fossil Creek, as well as within other riparian corridors (Boulder Canyon, Sally May Wash, Hackberry Canyon, Cimarron Creek, and Dorens Defeat Canyon) on the FCRA. However, there is limited livestock access to most of these areas and impacts to riparian vegetation from the proposed action should be insignificant and discountable.

Headwater chub

We concur with your determination that the proposed action is not likely to contribute in a trend toward Federal listing, loss of viability, or jeopardize the continued existence of the headwater chub in Fossil Creek. We base this concurrence on the following:

- Livestock will not have access to any areas occupied by headwater chub. Therefore, there would be no direct effects to the fish from the proposed action.

- The proposed action is expected to result in overall decreased watershed impacts from livestock grazing.

## LITERATURE CITED FOR APPENDIX A

Driscoll, J.T., K.V.Jacobson, G.L.Beatty, J.S. Canaca, and J.G. Koloszar. 2006. Conservation assessment and strategy for the bald eagle in Arizona. Nongame and Endangered Wildlife Program Technical Report 173. Arizona Game and Fish Department, Phoenix, Arizona.

U.S. Fish and Wildlife Service (USFWS). 2002. Southwestern Willow Flycatcher Recovery Plan. Albuquerque, New Mexico. i-ix+ 210 pp., Appendices A-O