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In Reply Refer To:
AESO/SE
02-21-04-F-0022

April 6, 2005

Memorandum

To: Field Manager, Bureau of Land Management, Safford Field Office, Safford, Arizona

From: Field Supervisor

Subject: Formal Consultation Pursuant to Section 7 of the Endangered Species Act on the Effects of Existing Land Management Practices on Reestablished Populations of Gila Topminnow and Desert Pupfish in the Aravaipa Creek Watershed

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 June 1, 2004, and received by us on June 3, 2004. At issue are impacts that may result from on-going grazing, recreation, and other land-management programs on the populations of endangered Gila topminnow (*Poeciliopsis occidentalis occidentalis*) and endangered desert pupfish (*Cyprinodon macularius*) proposed to be reestablished in Aravaipa Creek Watershed, Pinal and Graham counties, Arizona. In addition, the issue of the impacts of the reestablishment of these listed fish species on the existing populations of the threatened spikedace (*Meda fulgida*) and threatened loach minnow (*Tiaroga cobitis*) that exist downstream within the watershed is considered in this Biological Opinion (BO). The proposed action and on-going grazing, recreation, and other land-management programs may affect, and are likely to adversely affect the endangered Gila topminnow and the endangered desert pupfish. You further requested our concurrence that the proposed action may affect, but is not likely to adversely affect the threatened spikedace and the threatened loach minnow. Our concurrence is found in Appendix A. Critical habitat for these species was designated on April 25, 2000 (65 FR 24328). However, it was remanded to FWS for voluntary vacature by court order on August 31, 2004, and will not be addressed in this consultation (New Mexico Cattle Growers vs. USFWS, No. CIV 02-0199 JB/LCS).

This biological opinion is based on information provided in the June 1, 2004, revised biological evaluation, 1997 Programmatic Biological Opinion for the Safford and Tucson Field Offices' Livestock Grazing Program, Southeastern Arizona (USFWS 1997), BO for the amendments to the Land Use Plan on fire use, fire suppression, and prescribed fire (USFWS 2004), native fish survey and monitoring data from Aravaipa Watershed, and other sources of information as detailed in the consultation history and literature cited. 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

- August 12, 2003 - Received Biological Assessment and request to initiate consultation on the reestablishment of Gila topminnow and desert pupfish into the Aravaipa Creek watershed.
- November 21, 2003 - Memorandum to the Bureau of Land Management (BLM) requesting additional information.
- June 1, 2004 - Received revised Biological Evaluation addressing the request for additional information.
- August 18, 2004 - Memorandum initiating formal consultation.
- September 27, 2004 - Telephone conversation concerning a need for current range condition and trend data, prescribed fire monitoring information, the prescribed fire plan, and a request for a 30-day extension.
- October 1, 2004 - Memorandum to BLM formally requesting the 30-day extension and information requested on September 27, 2004.
- November 5, 2004 - Meeting to discuss issues concerning recreation impacts.
- November 19, 2004 - Memorandum to BLM formally requesting an additional 30-day extension.
- December 22, 2004 - Memorandum to BLM formally requesting an additional 30-day extension.
- December 27, 2004 - Memorandum granting the additional 30-day extension.
- December 29, 2004 – Telephone call and email to request that BLM confirm the action we are covering in the BO and consider changing the effects determination for loach minnow and spikedace based upon our draft effects analysis.
- December 29, 2004 – Received memo confirming the actions covered by the BO and revising the effects determination for loach minnow and spikedace to may affect, not likely to adversely affect.
- February 1, 2005 - Draft Biological Opinion transmitted to BLM for review and comments.
- March 30, 2005 – Memorandum with comments on Draft Biological Opinion received.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The fishes of the Gila River system are all biologically imperiled to various degrees and are found on Federal, State, and BLM sensitive species lists. Reasons for decline of these species are well documented in published peer-review literature and recovery plans (Douglas et al. 1994; Miller 1961; Minckley 1985; USFWS 1984, 1986a, 1986b, 1986c, 1991a, 1993, 1994; Weedman 1999; Williams et al. 1985). The widespread introduction, spread, and establishment of nonnative aquatic species, along with habitat alteration and destruction, has resulted in native fish species being displaced. On-going conservation and recovery efforts have done little to reduce or eliminate the decline of these species.

The BLM Safford Field Office, Arizona Chapter of the Nature Conservancy (TNC), and Arizona Game and Fish Department (AGFD), jointly propose to establish Gila topminnow and desert pupfish into multiple springs and streams that lie within the watershed of the south rim of Aravaipa Canyon. The proposed project area includes all aquatic habitats on the south rim of Aravaipa Canyon managed by BLM and TNC and, although not inclusive, includes the tributaries of Aravaipa Creek such as Oak Grove Canyon (T.7S R.18E), Garden Spring Canyon (T.7S R.19E), Parson Canyon (T.7S R.18E, T.6S R.18E), Turkey Creek (T.7S R.18E, T.6S R.18E), and Virgus Canyon (T.7S R.18E, T.6S R.18E) (Figure 1). This BO covers only those sites proposed on BLM-managed lands, including Virgus Canyon, Parsons Grove, Middle Oak Grove Canyon, and Lower Oak Grove Canyon (Appendix A).

Approximately 500 desert pupfish and 500 Gila topminnows will be collected from captive donor sites, however, population sizes at donor sites may not be able to sustain the removal of 500 individuals at one time. In this event, populations will be augmented over time until self-sustaining populations become established. The number of desert pupfish and Gila topminnows collected and stocked will depend on the size and health of the donor population. Fish will be collected from several different captive localities to increase genetic diversity and to reduce the likelihood of genetic drift and population bottlenecks. The genetic lineage and origin of Gila topminnow and desert pupfish stock for introduction will be consistent with the draft revised Gila topminnow recovery plan (Weedman 1999) and the desert pupfish recovery plan (USFWS 1993a). The multi-year stockings will provide new genetic material to the transplanted population in the event of delayed and/or extensive mortalities. The effects of these activities have been analyzed as part of the section 10(a)(1)(A) research and recovery permit held by AGFD (TE-821577), and will not be included in this analysis.

Existing Management

The proposed action area is located inside the Turkey Creek Riparian Area of Critical Environmental Concern (ACEC) and the Table Mountain Research Natural Area (RNA) ACEC. The Turkey Creek Riparian ACEC was established to protect and enhance sensitive resources, which require special management. Turkey Creek and Oak Grove Canyon contain riparian, wildlife, cultural, and scenic values that require special management of recreation, livestock, access, and vegetation to improve ecological conditions of two riparian woodlands. The Table Mountain RNA ACEC was established to prioritize management of two important plant

communities, an alligator juniper savanna and a white oak woodland containing Mexican blue oak.

Approximately eleven miles of Aravaipa Creek were proposed for designation in the National Wild and Scenic Rivers System. The area provides high-quality habitat for a variety of fish and wildlife species. The aquatic habitat consists of shallow riffles, deep pools, and sandy and gravelly bottoms. Aravaipa Creek supports seven native fish species: loach minnow, spikedace, longfin dace, speckled dace, roundtail chub, Sonora sucker, and desert sucker. Two species, the loach minnow and spikedace, are listed as threatened under the Act.

Livestock Management

The project area falls within the South Rim Allotment of the Winkelman Planning Unit. The Allotment is divided by Virgus Canyon into two units, West South Rim and East South Rim. The South Rim Allotment Management Plan (4529), when signed in 1989, authorized the use of 5,796 Animal Unit Months (AUMs) with a grazing period from March 01-February 28. However, the final notice of decision in the 1991 BLM Safford District Resource Management Plan/Environmental Impact Statement (RMP/EIS) called for immediate initiation of a 50% suspension (2,890 AUMs) on the South Rim Allotment in order to accelerate rehabilitation of uplands and riparian areas.

In 1995, TNC received a 10-year grazing lease on the South Rim Allotment. Between 1996 and 2001, TNC requested non-use to improve resource conditions on the public lands. This request was approved by the Safford Field Office. The Arizona Chapter of TNC also requested non-use for the 2002 grazing year so that prescribed burns could be conducted on the allotment. BLM, along with cooperators from TNC, conducted a prescribed burn on the South Rim allotment during spring 2003. The BLM would like to modify the existing livestock grazing plan on the South Rim Allotment to winter use only (November 01 through March 01) and resume at the authorized levels (as mentioned above) by spring of 2005. Livestock utilization standards within the riparian areas will average less than 40%; whereas, bank alteration will average less than 20%, woody species seedling apical stem browse rate will not exceed 30%, and upland utilization will not exceed 40%. Livestock grazing on the BLM-administered South Rim Allotment (as mentioned above) may be modified by implementation of the BLM's Standards and Guides for Rangeland Health or other BLM efforts designed to improve or maintain upland and riparian habitat conditions if needed.

Past grazing activities on private lands precipitated bank erosion, creating cut banks of 10 to 15 feet. However, since the period of non-use (includes the private portions of the project area, as well as the BLM-administered portions), the banks have begun to stabilize with a diversity of riparian vegetation filling in ground cover. The upper portion of Oak Grove Canyon owned by TNC is still accessible to livestock, but could be fenced if negative effects are caused by cattle. The portion of the upper reach of Oak Grove Canyon owned and managed by BLM is not accessible to livestock because of steep terrain, waterfalls, and large rocks in the drainage. The lower and middle reaches of Oak Grove Canyon are also not accessible to livestock due to the steep and rocky nature of the terrain.

Livestock grazing on the BLM-administered lands within the project area will continue at authorized levels as delineated in the 1991 BLM Safford District RMP/EIS which called for

immediate initiation of a 50% suspension (2,890 AUMs) on the South Rim Allotment (4259) to allow the uplands and riparian areas to improve. Grazing use may be modified by implementation of the BLM's Standards and Guides for Rangeland Health or other BLM efforts designed to improve or maintain upland and riparian habitat conditions. A five-year conservation lease was authorized in 1996, allowing non-use through 2001. Subsequent non-use was approved due to prevailing drought conditions.

Grazing within this allotment has been suspended since 1996. Due to prevailing drought conditions the suspension is likely to continue indefinitely unless habitat conditions show improvement. If cows are permitted back, utilization levels will be set at an average of 40% and will remain until conditions improve.

Recreation Management

Recreational use in the South Rim allotment within the vicinity of the proposed action area is increasing due to adjacent landowners locking their gates to prevent access to other nearby areas. The majority of use is dispersed recreation associated with hunting, off-highway-vehicle traffic, hiking, camping, and equestrian use. The downstream portion of the action area includes the Aravaipa Canyon Wilderness. BLM Wilderness Area permits are required to access both the east and west ends of the Aravaipa Canyon Wilderness. The BLM issues up to 50 permits per day to hike in this area.

Prescribed Fire

Included in the proposed action is prescribed burning within the Aravaipa Creek watershed, consistent with the Aravaipa Prescribed Burn Plan and associated environmental assessment (EA) # AZ-040-08-25, approved in March 1999. The Turkey Creek prescribed burn was conducted in the spring of 2003 and included the lower portions of Virgus and Parson Canyons. The purpose of the burn was to decrease the shrub canopy (mesquite, white thorn acacia, catclaw acacia, and snakeweed) to less than 20% and to increase the cover of perennial grasses to 30%.

Construction and Maintenance of Check Dams

Several check dams may be constructed in the future to reduce runoff velocity and erosion within the project area. Check dams are small dams constructed in an open channel or drainage way. Check dams may be temporary or permanent barriers made of logs, brush, straw bales, stone, or other materials. Impacts from the construction of these check dams will be minimal and, in addition to preventing erosion, the dams may also provide additional habitat for native fish.

Conservation Measures

As part of the proposed reestablishment of these fish and ongoing actions, your office has committed to implementing certain measures devised to reduce effects of the proposed actions on listed species.

Desert pupfish and Gila topminnow

The proposed action is a conservation measure designed to contribute toward the recovery of these species. The following are part of the proposed action that the BLM will take to benefit desert pupfish and Gila topminnow.

- In coordination and cooperation with the FWS, TNC, and AGFD, BLM will monitor all stocked populations of desert pupfish and Gila topminnow at least annually;
- No action will be taken that would result in increased grazing pressure at the proposed project sites;
- BLM will monitor grazing activities at all occupied pupfish and topminnow locations located on the South Rim Allotment. The South Rim Allotment is classified as an “T” allotment and is typically monitored every five years;
- BLM will monitor utilization limits for upland and riparian vegetation, and streambank alteration and ensure that livestock are moved prior to exceeding these limits. BLM will incorporate this into the annual operating instructions to the permittee. No grazing is currently occurring in the South Rim allotment. When and if cattle are permitted back, utilization estimates can be visually collected during desert pupfish and Gila topminnow sampling;
- Activities that may result in take of desert pupfish or Gila topminnow, or destruction of their habitat will be evaluated, monitored, and modified as needed to reduce potential adverse impacts to pupfish and topminnow;
- Salting will not occur within ¼ mile of water, riparian areas, stream channels, areas of high erosion potential, or projects;
- BLM will ensure that negative watershed effects to desert pupfish and Gila topminnow habitat on the South Rim Allotment do not increase;
- BLM will conduct information and environmental education programs pertaining to native fish and their habitats;
- BLM will coordinate with the FWS and AGFD on any pupfish and topminnow locations that no longer support the species, and on any recommendations on habitat suitability and extant/extirpated population status.

STATUS OF THE SPECIES

GILA TOPMINNOW

We listed the Gila topminnow as endangered on March 11, 1967, without critical habitat (USFWS 1967). The reasons for decline of this fish include past dewatering of rivers, springs and marshlands, impoundment, channelization, diversion, regulation of flow, land management practices that promote erosion and arroyo formation, and the introduction of predacious and competing nonindigenous fishes (Miller 1961, Minckley 1985). Life history information can be

found in the 1984 recovery plan (USFWS 1984), the draft revised Gila topminnow recovery plan (Weedman 1999), and references cited in the plans and in this biological opinion.

Gila topminnow was listed in 1967 as *Poeciliopsis occidentalis*. The species was later revised to include two subspecies, *P. o. occidentalis* and *P. o. sonoriensis* (1969, 1973b). *P. o. occidentalis* is known as the Gila topminnow, and *P. o. sonoriensis* is known as the Yaqui topminnow. *Poeciliopsis occidentalis*, including both subspecies, are collectively known as the Sonoran topminnow. Both subspecies are protected under the Act. Recent information presented by Minckley (1999) and others (Minckley 1973b, Quattro *et al.* 1996), considers the two subspecies to be separate species. Regardless of their taxonomy, both species or subspecies are protected under the Act.

Male Gila topminnows are smaller than females, rarely greater than one inch [25 millimeters (mm)] in total length, while females are larger, reaching two inches (50mm total length). Body coloration is tan to olivaceous, darker above, lighter below, and often white on the belly. Breeding males are usually darkly blackened, with some golden coloration of the midline, and with orange or yellow at base of the dorsal fins. Fertilization is internal and sperm packets are stored which may fertilize subsequent broods. The brood development time is 24 to 28 days. Two to three broods in different stages develop simultaneously in a process known as superfetation. Gila topminnows give birth to one to 31 young per brood (Schoenherr 1974). Larger females exhibit greater fecundity and produce more offspring (Minckley 1973b).

Gila topminnows mature a few weeks to many months after birth depending on when they are born and water temperature. They breed primarily from March to August, but some pregnant females occur throughout the year (Schoenherr 1974). Some young are produced in the winter months. Minckley (1973b) and Constantz (1980) reported that Gila topminnow eat bottom debris, vegetation, amphipods, and insect larvae when available.

Gila topminnow and many other poeciliids can tolerate a wide variety of physical and chemical conditions. They are successful colonizers in part because of this tolerance and in part because one gravid female can start a population (Meffe and Snelson 1989). Minckley (1969, 1973b) described their habitat as edges of shallow aquatic habitats, especially where abundant aquatic vegetation exists. Gila topminnows rarely co-occur with mosquitofish (*Gambusia affinis*), as the latter is aggressive and preys upon young topminnow and harasses adults (Schoenherr 1974, Minckley *et al.* 1977).

Gila topminnows are known to occur in streams fluctuating from 43 to 97° Fahrenheit, pH from 6.6 to 8.9, dissolved oxygen levels of 2.2 to 11 milligrams/liter, and can tolerate salinities approaching those of sea-water (Meffe *et al.* 1983). Topminnow can burrow under mud or aquatic vegetation when water levels decline (Deacon and Minckley 1974, Meffe *et al.* 1983). Sonoran topminnows, *Poeciliopsis occidentalis*, regularly inhabit springheads with high loads of dissolved carbonates and low pH (Minckley *et al.* 1977, Meffe 1983, Meffe and Snelson 1989). This trait has helped protect small populations of topminnows from mosquitofish which are usually rare or absent under these conditions.

To summarize Gila topminnow habitat requirements, this fish needs: 1) unpolluted water that can have wide variation in temperature, pH, and salinity; 2) shallow water with abundant aquatic plants including algae that provide cover and habitat for invertebrate prey; 3) channel

morphology that prevents habitats from scouring severely, which otherwise may remove this weak swimmer from its habitat; 4) habitat areas free of nonnative competitors and predators; and 5) areas with slow currents and soft bottoms.

Gila topminnows are highly vulnerable to adverse effects from nonindigenous aquatic species (Johnson and Hubbs 1989). Predation and competition from nonindigenous fishes have been a major factor in their decline and continue to be a major threat to the remaining populations (Meffe *et al.* 1983, Meffe 1985, Brooks 1986, Marsh and Minckley 1990, Stefferud and Stefferud 1994, Weedman and Young 1997). The native fish fauna of the Gila basin and of the Colorado basin overall, was naturally depauperate and contained few fish that prey on or compete with Gila topminnow (Carlson and Muth 1989). With the introduction of many predatory and competitive nonindigenous fish, frogs, crayfish, and other species, Gila topminnow could no longer survive in many of their former habitats, or the small pieces of those habitats that had not been lost to human alteration. Both large (Bestgen and Propst 1989) and small (Meffe *et al.* 1983) nonindigenous fish cause problems for Gila topminnow, as can nonindigenous crayfish (Fernandez and Rosen 1996) and bullfrogs.

Historically, Gila topminnow were abundant in the Gila River drainage and the species was once referred to as "...one of the commonest fishes in the southern part of the Colorado River drainage basinches" (Hubbs and Miller 1941). Gila topminnow eventually declined to only 15 naturally occurring populations. Bagley *et al.* (1991) reported only nine remaining natural topminnow sites. More recently, 15 natural Gila topminnow populations were reported, with 12 considered extant (Table 3) (Weedman and Young 1997). Only three (Cienega Creek, Monkey Spring, Cottonwood Spring) have no nonindigenous fish present and therefore can be considered secure from nonindigenous fish threats (Abarca *et al.* 1994). There have been at least 178 wild sites stocked (sometimes on multiple occasions) with Gila topminnow; however, topminnows persist at only 20 of these localities. Of the 20, one site is outside topminnow historical range and four now contain nonindigenous fish (Weedman and Young 1997). Of the more than 300 reestablishments conducted by the AGFD and others, only 21 remain extant (Brown and Abarca 1992).

The *Sonoran Topminnow Recovery Plan* (USFWS 1984) established criteria for down- and de-listing. Criteria for downlisting were met for a short period; however, due to concerns regarding the status of several populations, downlisting was delayed. Subsequently, the number of reestablished populations dropped below that required for downlisting, where it has remained. A draft revised recovery plan for the Gila topminnow is available (Weedman 1999). The plan's short-term goal is to prevent extirpation of the species from its natural range in the US and reestablish it into suitable habitat within historical range. Downlisting criteria require a minimum of 82 reestablished populations, some of which must persist at least 10 years.

The status of the species is poor and declining. Gila topminnow has gone from being one of the most common fishes of the Gila basin to one that exists at no more than 32 localities (12 natural and 20 stocked). Many of these localities are small and highly threatened, and topminnow have not been found in some recent surveys at these sites.

Gila topminnows historically occupied larger streams and rivers including the Gila, Salt, Santa Cruz, San Pedro, San Carlos, and many of their tributaries. Although not documented from the Verde, Hassayampa, or Agua Fria rivers, they likely occurred in the lower elevation (<1500 m)

reaches of those rivers. BLM lands support a large proportion of the Gila topminnow's former range, several of the currently occupied sites, and much of the remaining suitable, but unoccupied habitat.

Currently, there are 14 remaining natural topminnow sites (Weedman 1999). In addition, twenty-one stocked populations persist and cooperative efforts by the BLM, FWS, and AGFD to reestablish topminnow into historical habitats are on-going.

Our information indicates that, rangewide, more than 64 consultations have been completed or are underway for actions affecting both Gila topminnow. The majority of these opinions concerned the effects of grazing (approximately 11 percent), roads and bridges (approximately 6 percent), agency planning (approximately 16 percent), or recovery (approximately 23 percent). The remaining 44 percent of consultations dealt with, fire, flooding, recreation, realty, animal stocking, water development, border security, and water quality issues.

DESERT PUPFISH

We listed the desert pupfish as an endangered species, with critical habitat, on April 30, 1986 (USFWS 1986a). The desert pupfish recovery plan was finalized in 1993. The objective of the recovery plan is to downlist the species, as delisting the species is not considered feasible in the foreseeable future. In order to attain this objective the following actions are necessary: protection of natural populations, reestablishment of new populations, establishment and maintenance of refuge populations, development of protocols for the exchange of genetic material between stocked pupfish populations, determination of factors affecting population persistence, and information and education to foster recovery efforts (USFWS 1993a). The name desert pupfish is often incorrectly applied to all 10 pupfish species in the American Southwest (Williams *et al.* 1989, Pister 1996). In Arizona, there are three pupfish species: desert pupfish (*Cyprinodon macularius*); Quitobaquito pupfish (*C. eremus*, Echelle *et. al.* 2000); and an extinct form, the Santa Cruz pupfish (*C. arcuatus*, Minckley *et. al.* 2002). Critical habitat has been designated in Arizona at Quitobaquito Spring and in California along parts of San Felipe Creek, Carrizo Wash, and Fish Creek Wash (USFWS 1986a) in the vicinity of the Salton Sea (Moyle 2002). Critical habitat for desert pupfish is not located within the action area.

The desert pupfish is a member of the family Cyprinodontidae. Desert pupfish are usually less than 3.0 inches in total length (TL); adults are more often 1.6-2.0 inches TL. Males are larger than females and become bright blue during the breeding season.

Under the proper conditions, desert pupfish may begin breeding as early as six weeks of age, but most breeding does not occur until their second summer (Moyle 2002). Male pupfish are intensely territorial during the breeding season. The males patrol and defend individual territories that are 5.4 to 22 square feet and in water less than 3 feet deep (Barlow 1961, Minckley 1973b, Moyle 2002).

The desert pupfish breeding system includes consort-pair breeding and territoriality (USFWS 1993a). Territoriality develops in large habitats with high primary productivity, limited breeding substrates, and high population densities. Consort-pair breeding usually occurs in habitat with low primary productivity, low population density, or abundant breeding habitat (Kodric-Brown 1981). Female desert pupfish lay only one egg at a time (Constantz 1981). One female may

produce 50-800 eggs in one season (Crear and Haydock 1971). The life span of an individual is one to three years in the wild (Minckley 1973b, Moyle 2002, Kynard and Garrett 1979).

Larval desert pupfish feed on invertebrates (Crear and Haydock 1971). Adult pupfish are omnivorous and may feed on algae, invertebrates, detritus, and plants (Cox 1966, 1972; Naiman 1979). Pupfish are active during the day. Desert pupfish have been found in a variety of habitats, from the margins of large rivers to springs and cienegas. Pupfish can survive extremely harsh conditions that are lethal to most other fishes. They can survive temperatures up to 113°F (Lowe *et al.* 1967), dissolved oxygen concentrations to 0.1-0.4 mg/l (Barlow 1958), and high salt concentrations of 68 g/l (Lowe *et al.* 1967). Pupfish can also tolerate sudden changes in both temperature and salinity (Kinne 1960, Lowe and Heath 1969).

Historical distribution of desert pupfish included the Gila River basin, lower Colorado River, Rio Sonoyta basin, Salton Sink basin, and Laguna Salada basin (Eigenmann and Eigenmann 1888, Garman 1895, Gilbert and Scofield 1898, Evermann 1916, Thompson 1920, Jordan 1924, Coleman 1929, Jaeger 1938, Miller 1943, Minckley 1973b, 1980; Black 1980, Turner 1983, Miller and Fuiman 1987). Historical collection localities occurred in Mexico in Baja California and Sonora and in the United States in California and Arizona. Populations and distribution probably expanded and contracted historically as regional and local climatic conditions varied.

Thirteen natural populations persist; nine of these are in Mexico. Approximately 20 transplanted populations exist in the wild (USFWS 1993a), though this number fluctuates widely due to climatic variation and the establishment (and failure) of refugium populations (Moyle 2002). Many natural and transplanted populations are imperiled by one or more threats. Threats to the species include loss and degradation of habitat through groundwater pumping or diversion, contamination of agricultural return flows, predation and competition from nonnative fish species, populations outside of historical range, populations of questionable genetic purity, restricted range, small populations, and environmental contaminants (USFWS 1986a, Moyle 2002).

Aspects of the natural history and habitat of desert pupfish in Arizona are similar to those of the Gila topminnow. In Arizona, desert pupfish and Gila topminnow were historically known from similar habitats, though the former was not as widespread, and the two species are managed together by the AGFD (Weedman and Young 1997, Voeltz and Bettaso 2003). The primary difference in life history between these fish is that desert pupfish lays eggs and Gila topminnow are live-bearers.

Our information indicates that, rangewide, more than 63 consultations have been completed or are underway for actions affecting desert pupfish. The majority of these opinions concerned the effects of grazing (approximately 11 percent), roads and bridges (approximately 1 percent), agency planning (approximately 15 percent), or recovery (approximately 25 percent). The remaining 47 percent of consultations dealt with timber harvest, fire, flooding, recreation, realty, animal stocking, water development, recovery, and water quality issues.

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.

Description of the Action Area

The Aravaipa watershed area is approximately 537 mi² (14,000 km²), with an elevation range of 2,160-8,441 ft. In the upper watershed, surface flow is ephemeral to intermittent in a broad alluvial valley between the Pinaleño and Santa Teresa mts. to the east, and Galiuro mts. to the west. The creek becomes perennial at Aravaipa Spring, at the head of Aravaipa canyon near Stowe Gulch, and cuts westward through the Galiuros (Draper and Turner 2004). Average annual precipitation ranges from 14 inches at Klondyke to 20 inches in the upper watershed, and is winter-dominated (Norgren and Spears 1980).

Aravaipa Creek's 17-mile-long perennial-flow stretch is considered to have the best remaining assemblage of desert fishes in Arizona, with seven native species, including two federally listed threatened species: spikedace (*Meda fulgida*) and loach minnow (*Tiaroga cobitis*). Other wildlife using the canyon include the threatened Mexican spotted owl (*Strix occidentalis lucida*) and candidate western yellow-billed cuckoo (*Coccyzus americanus occidentalis*). Several side tributaries coming in from the south rim of Aravaipa Canyon are a mixture of perennial and intermittent stream reaches. It is these perennial reaches that have been identified as potential reestablishment sites for Gila topminnow and desert pupfish.

Riparian habitats along the creek and its tributaries support mixed forests of sycamore, cottonwood, willow, walnut, ash, and white oak. Mesquite bosques line higher terraces above the floodplain. Low-elevation upland areas are dominated by Sonoran desert scrub with creosote, palo verde, diverse shrubs, and saguaro. Mid-elevation slopes have semidesert grassland/scrub with native perennial grasses. Steeper slopes at middle and upper elevations support evergreen woodlands of oak and juniper and mixed chaparral.

BLM manages the Aravaipa Canyon Wilderness and two Areas of Critical Environmental Concern within this area. This area is a popular backpacking and hiking area. BLM issues up to 50 permits per day for entry to the wilderness area. The land use within the watershed is predominately rural rangeland, with several rural residents along the downstream portion of Aravaipa Creek. Two fish barriers have been constructed to prevent upstream movements of nonnative aquatic predators in the San Pedro River from entering the upper watershed. While some nonnative aquatic predators and competitors exist above the fish barriers, they have not become well established in the upper watershed. These nonnative predators and competitors entered the watershed from livestock tanks in the upper watershed and potentially from illegal stocking. Efforts are ongoing to identify and mitigate the sources of these nonnative species.

Status of the Species within the Action Area

Gila Topminnow

The range of the Gila topminnow is considered to be the Gila River watershed. The sites in the tributaries proposed for reestablishment are a fraction of the entire historical range. However, the proposed reestablishment sites would provide four additional population sites if they are successful. Currently, there are approximately 12 extant natural sites and 20 extant reestablishment sites. This project would increase this by four sites if the reestablishment is successful.

Within the Aravaipa watershed, native fish surveys have been conducted from 1943 to present, and Gila topminnow have never been collected. A cienega condition existed in Aravaipa Creek above the canyon. This would have provided ideal habitat for Gila topminnow, which are known from the San Pedro Watershed. However, this habitat type, in the upstream portion of the Aravaipa drainage, was gone before the first fish sampling began in 1943. It was likely that topminnow occupied the cienega, but uncontrolled grazing, channelization and erosion destroyed this habitat (Stefferdud and Reinthal 2004). The sites proposed for reestablishment of Gila topminnow are currently void of fish species. Downstream movements to other perennial reaches of the tributaries and Aravaipa Creek are likely to occur through voluntary dispersal or the result of flooding. While they may become established within the tributaries, it is unlikely that Gila topminnow would persist in Aravaipa Creek due to the presence of exotic predators and competitors and the general lack of suitable habitat.

Desert Pupfish

The range of the desert pupfish has been drastically reduced. The species is currently found in only about 12 localities in the United States and Mexico. BLM lands represent a large proportion of the former range of the desert pupfish, the only two extant reestablished sites, and much of the remaining suitable, but unoccupied, habitat. The status of the desert pupfish in the action area is therefore similar to the status of the species throughout its range. No natural populations of desert pupfish remain in Arizona, although two wild, re-established populations currently exist (AGFD, unpublished data).

The desert pupfish is currently known from two sites, Cold Springs along the Gila River near Safford, and Lousy Canyon in the Agua Fria drainage on the Agua Fria National Monument; both are on lands administered by BLM (Voeltz and Bettaso 2003). These sites represent the only two extant reestablished desert pupfish sites in Arizona. The Cold Springs and Lousy Canyon sites are managed by the BLM's Safford and Phoenix field offices, respectively, and represent critical efforts in the recovery of the desert pupfish. Both sites appear stable, with Lousy Canyon being notable in containing an intact ichthyofauna of desert pupfish, Gila topminnow, and Gila chub.

Within the Aravaipa watershed, native fish surveys have been conducted from 1943 to present, and desert pupfish have never been collected. A cienega condition existed in Aravaipa Creek above the canyon. This is ideal habitat for desert pupfish, which are known from the San Pedro Watershed. However, this habitat type in the upstream portion of the Aravaipa drainage was gone before the first fish sampling began in 1943. It was likely that topminnow occupied the cienega, but uncontrolled grazing, channelization and erosion destroyed this habitat (Stefferdud and Reinthal 2004). The sites proposed for reestablishment of desert pupfish are currently void of fish species. Downstream movements to other perennial reaches of the tributaries and Aravaipa Creek are likely to occur through voluntary dispersal or the result of flooding. While

they are liable to become established within the tributaries it is unlikely that desert pupfish would persist in Aravaipa Creek due to the presence of exotic predators and competitors and the general lack of suitable habitat.

Factors Affecting Species Environment within the Action Area

The action area as described above includes both Federally managed lands and privately owned lands. The BLM's Phoenix District Resource Management Plan guides the land management activities to be implemented on the Federal lands in the action area. The Federally managed lands include the Aravaipa Wilderness Area, the Turkey Creek Riparian ACEC and the Table Mountain Research Natural Area ACEC. The Turkey Creek Riparian ACEC was established to protect and enhance sensitive resources which require special management.

Livestock grazing on the BLM-administered lands within the project area will continue at authorized levels as delineated in the 1991 BLM Safford District RMP/EIS which called for immediate initiation of a 50% suspension (2,890 AUMs) on the South Rim Allotment (4259) to allow the uplands and riparian areas to improve. Grazing use may be modified by implementation of the BLM's Standards and Guides for Rangeland Health or other BLM efforts designed to improve or maintain upland and riparian habitat conditions.

This allotment has been in non-use since 1996. If cows are permitted back, utilization levels will be set at an average of 40% and will remain until conditions improve. Past grazing activities on private lands had precipitated bank erosion, creating cut banks of 10 to 15 feet. However, since the period of non-use (includes the private portions of the project area, as well as the BLM administered portions), the banks have begun to stabilize with a diversity of riparian vegetation filling in as ground cover.

Under the Phoenix RMP a prescribe burn plan was developed. The Aravaipa Prescribed Burn Plan was approved in March 1999, with the purpose of improving watershed conditions and reducing erosion. There have been four prescribed fires implemented within the watershed under this plan. The West Virgus Prescribe Burn was carried out in June 1999. It included approximately 6,177 acres, two thirds of which are within the wilderness area. In June 2003, three prescribe burns were ignited. The Turkey Creek prescribe burn included the south rim above the reestablishment sites and was planned to cover 7,756 acres. The Javelina and PZII prescribe burns, located on the north rim of Aravaipa Canyon, burned within planning boundaries of 1,261 and 2,269 acres respectively. All four prescribe burns in this area burned in a highly irregular pattern within their boundaries. This was due to fuels being sparse and discontinuous. The Aravaipa Prescribed Burn Plan identifies a 6 to 8 year return interval, but no plans have been developed for future, prescribe burns within the watershed.

Currently, the primary factor affecting fish species in Aravaipa Canyon may be the permitted hiking that occurs in Aravaipa Creek. Hikers access this canyon through Aravaipa Creek. Hikers traveling in the upper creek reaches may be affecting native fish production during the fall and late winter-early spring spawning period. There is the potential for eggs and young fry to be killed from hikers traveling through these spawning beds. Access to the Aravaipa Canyon Wilderness is administered by the BLM Safford Office. BLM Wilderness Area permits are required to access both the east and west ends of the Aravaipa Canyon Wilderness. The BLM

issues up to 50 permits per day to hike in this area. Much of the canyon is traveled by routes on the flood plain and upper terrace.

Several state and Federal actions have been implemented to limit or control non-native fish in Aravaipa Creek. Two fish barriers were constructed by the Bureau of Reclamation in 2001 in the lower reaches of Aravaipa Creek to prevent non-native fishes in the San Pedro River from entering this area. Surveys of stock tanks on Federal lands have occurred in the upper watershed to identify additional sources of non-native species. In 1987, two stock tanks were identified as sources of exotic fish. In August 1987, one of the tanks was chemically renovated. The other was on private land and renovation was not possible. However, that tank reportedly went dry in summer 2003 (Stefferdud and Reinthal 2004). BLM has financed surveys of the livestock tanks in the upper watershed with an aim of identifying the potential sources of non-native fish and to develop plans for renovation of these sites.

The action area includes adjacent private lands. The land owners are currently implementing management that could result in impacts to this species, including erosion control, vegetation monitoring and a prescribed fire program. These activities are primarily beneficial to the listed species, but may have short-term negative impacts, e.g. increased sediment flows after fires. Many of these activities are done in conjunction with BLM and are thus part of Federal activities, eg. prescribed burns. Some downstream private property owners have agricultural diversions, livestock, and homes adjacent to Aravaipa Creek. While there may be impacts from sedimentation during maintenance of diversions, livestock moving in the creek, and general recreation activities around these homes, the major impacts to the native fish in the area are the presence of exotic predatory fish in this lower portion of the action area. A change in the current effects to the covered species in this area is unlikely. Occasional construction and maintenance of structures occurs, but no major new changes in land use are anticipated.

The native fish community within Aravaipa Creek has been monitored at least annually in recent years, if not more often, by a combination of state and Federal agencies, academic institutions, and TNC. It is considered to have one of the most stable populations of loach minnow and spikedace in Arizona. A large portion of the Federal management activities are aimed at maintaining the native fish community and improving the watershed condition. The management of the private property in the watershed seems to be consistent with the Federal management on the TNC properties. On the properties in the lower watershed, there is little or no impact currently on the native fish community. It is unlikely that the current management of the watershed is contributing to any change in the status of the loach minnow and spikedace populations in Aravaipa Creek. The greatest threat to the continued existence of loach minnow and spikedace, as well as the success of the reestablishment of Gila topminnow and desert pupfish, is the presence of exotic predators and competitors in Aravaipa Creek.

In addition to the programmatic consultation on the Resource Management Plan (RMP), the Southeastern Arizona Grazing Plan, and the Aravaipa Prescribed Burn Plan, which authorize the management practices discussed above, there have been 11 informal consultations and three formal consultations for actions within the Aravaipa watershed. The informal consultations covered actions for the enhancement and protection of the watershed, repair of flood damage, removal of exotic fish, and enhancement of recreation facilities. The three formal consultations were for flood damage repair and flood control actions by Federal Emergency Management Administration and the Army Corps of Engineers, respectively.

EFFECTS OF THE ACTION

Effects of the action refer to 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, which 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. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Gila Topminnow and Desert Pupfish

Direct Effects

Up to 500 desert pupfish and Gila topminnows will be removed from self-sustaining captive populations and used to establish new populations at stocking sites along the South Rim of Aravaipa Canyon. The desert pupfish and Gila topminnow will be stocked into the perennial portions of the stocking sites, which that are currently void of fish. The establishment of these fish populations will add a measure of security to the genetic lineage of these fish. The overall effect of the proposed action, if successful, would be beneficial to the survival and recovery of the desert pupfish and Gila topminnow. Establishment of these populations would assist in recovery of the species, as identified in the desert pupfish recovery plan (USFWS 1993a) and the draft Gila topminnow recovery plan (Weedman 1999). The effects of these activities have been analyzed as part of the section 10(a)(1)(A) research and recovery permit held by AGFD (TE-821577), and will not be included in this analysis.

Indirect Effects

Livestock Grazing

Livestock grazing may eventually resume on the South Rim allotment. While it is BLM's intent to reduce the level or prevent livestock impacts to the project area, it is a certainty that some limited level will occur despite the inaccessibility of some sites, such as Middle and Upper Oak Grove Canyon, and the option of placing fencing around a site, such as Parson Spring. It is nearly certain that fence integrity will become compromised from time to time from multiple factors, including recreation. Also, there is nothing in the proposed action that will reduce livestock impacts in the Virgus Canyon site other than management of livestock utilization levels and monitoring.

The ecological principles that link grazing to changes in fisheries habitat via alteration of riparian and upland conditions can be applied to many areas in the southwest. Other than a cow directly causing injury or mortality to eggs or larvae by stepping on them (Roberts and White 1992), or through incidental ingestion while drinking, most effects are related to changes in habitat. Livestock grazing can directly affect fisheries by altering shape and form of the stream channel, riparian soils and vegetation composition, density, and structure, water quality, quantity, and flow patterns, and aquatic faunal assemblage composition (Kauffman and Krueger 1984; Fleischner 1994, Trimble and Mendel 1995; Belsky, et al. 1999).

It is well documented that incorrect or improper livestock grazing practices in the southwestern U.S. alter the species composition of plant communities, disrupt ecosystem functioning, and alter ecosystem structure (Fleischner 1994). The main direct impacts from cattle are the grazing of plants and trampling of vegetation and soil (Platts 1991). These impacts can affect both riparian zones and uplands (Fleischner 1994 and Platts 1991).

Livestock grazing in locations where large numbers of animals congregate can impair water quality and can result in nonpoint source pollution throughout an allotment. Cattle waste products can deteriorate water quality resulting in alteration of fish communities or fish kills. The impact generally comes from increased levels of ammonia (NH₃) and nitrite (NO₂) and decreased levels of dissolved oxygen (O₂) (Taylor, et al. 1991 and Cross 1971). The effects of this type of pollution are increased under conditions of limited water supply such as in small ponds and springs. Sedimentation from erosion caused by livestock can impair spawning areas and reduce aquatic productivity, which can affect food production (Ward 1992 and Meehan 1991).

However, grazing at utilization levels appropriate for specific vegetation communities can reduce these impacts and is consistent with Gila topminnow and desert pupfish recovery. If the aquatic habitat were adversely impacted, which would be detected through monitoring, corrective actions would be initiated as is required by the BLM's implementation of rangeland standards and guidelines.

Recreation

Recreational use of the watershed is controlled by a permit system in the wilderness area and by limited accessibility to the non-wilderness areas. The primary season of use is fall through spring, due to milder temperatures and the timing of hunting seasons. Currently recreational use is relatively light, but is likely to increase with the loss of access to neighboring properties.

Picnickers, campers, hunters, hikers, and off-highway vehicle users may use sites within the action area for cleaning and bathing. If soap or other such products are used, water quality may be degraded impacting the Gila topminnow, desert pupfish, and their aquatic invertebrates prey base. Concentrated recreation activity along the project site, such as wading, splashing, and walking up and down the creek within wetted sections can injure fish if contact is made, or displace and stress fishes such as desert pupfish and Gila topminnow, which are sensitive to frequent disturbances. This disturbance is not likely to reach levels leading to indirect mortality through stress, which predisposes fish to disease and predation. It is possible that stream banks and spawning areas may be damaged by excessive use from hikers and sightseers. Currently, the level of recreation in the area is so light that stream bank and spawning area damage is largely undetectable.

Motorized vehicles driving through wetted sections of the project area have the potential to disrupt normal behavior of and injure fish and macroinvertebrates, increase turbidity, and destroy fish eggs and larvae. In addition, mechanical action of vehicles can cause damage to existing vegetation and prevent the establishment of vegetation, which affects habitat quality. This is possible at the lower Oak Grove Canyon site, as the road runs through the creek at this reestablishment site and has several crossings down stream. This road also crosses Virgus

Canyon and Parsons Canyon, but it is a mile or more away from the reestablishment sites. These crossings may become occupied by topminnow and pupfish anytime water is present and thus, may be sites of potential mortality.

Small quantities of motor fluids (fuel, engine oil, brake system fluid, transmission fluid, or antifreeze) may leak from motorized vehicles crossing wetted sections, which may enter project areas and degrade the water quality and negatively impact the Gila topminnow and desert pupfish. Wear and damage to vehicles is a common problem but the level of contamination of surface water is anticipated to be minor, as parking generally occurs away from the surface water and is favored where parking space is more abundant.

Prescribed Fires

In the southwest, the fire season begins around March and ends around June. The fire season is followed by the summer monsoon season of July to August. Prescribed burns may result in short-term influxes of sediments, should heavy rains fall immediately after burning. However, all efforts will be taken to burn before the start of monsoonal rains. The long-term effects of prescribed burns would improve watershed function by producing more ground cover to protect the soils and facilitate groundwater infiltration.

Buffer zones along riparian areas will be delineated and maintained to stabilize soils and decrease stream sedimentation during prescribed burns. Prescribed burns in riparian areas will only be used when necessary and during higher soil and vegetative moisture conditions to minimize soil heating and organic matter loss, and to aid vegetation recovery. If control of a prescribed fire was lost, damage or loss of riparian or upland vegetation may occur which would result in decreased channel stability, increased erosion and sediment and ash levels within and adjacent to the stream channel, increased water temperature, degraded water quality, reduced riparian and instream habitat cover and woody debris necessary for properly functioning riparian areas and aquatic habitat, decreased and altered composition and abundance of aquatic and terrestrial invertebrates.

Prescribed fire and fire-related activities were recently consulted on through amendments to the Land Use Plan (USFWS 2004; 02-21-03-F-0210), including fire use for resource benefit and fire suppression. In this consultation, a framework for consulting on prescribe fire plans was outlined. The Land Use Plans were consulted on as the decision document to developed Fire Management Plans (FMP), but a FMP would not be consulted upon. Instead, the prescribed burn plans that are the implementation planning documents for the FMP would be consulted on, if there were effects to listed species. Therefore, the effects of the existing FMP on Gila topminnow and desert pupfish will not be addressed, until a prescribed burn plan is proposed that may affect one or both of these species. At that time, your office should request initiation of consultation for all potentially affected species.

Construction and Maintenance of Check Dams

The construction of check dams will occur within the project area. Check dams will not be constructed in areas where there is perennial flow or in areas where native fish are located and or stocked. The majority of material used for the construction of the check dams will be natural and gathered at the site. Materials commonly used and available at a site will include, but are not

limited to, rock, logs, and other stable debris. Routine maintenance will include removing large debris, trash, and leaves that get trapped in the check dam. Natural material will be moved and placed away from the channel or drainage way. Trash will be collected and removed from the site and deposited in appropriate receptacles. Check dams will be removed after the drainage area has been stabilized. All accumulated sediment will be removed prior to removing the check dam to prevent excessive sediment from moving downstream.

It is not anticipated that direct mortality of Gila topminnow or desert pupfish will occur from construction or maintenance of check dams, as these activities will not be done in drainages with perennial flow or in areas where native fish are located or stocked. Short-term increased sedimentation from disturbed soils following construction or maintenance of check dams may result in covering and suffocating desert pupfish eggs and larval-stage individuals of both species in downstream habitats. The long-term effects of check dams are expected to be beneficial to the watershed and aquatic habitats through the stabilization of soils, reduced sedimentation, and increased water retention. This would protect desert pupfish spawning areas, and nursery habitats, and potentially increase the area of perennial flow within the watershed.

Nonnative Species

Most introductions of nonnative fish have been done legally by State fish and wildlife agencies to establish sport fisheries. However, the public occasionally makes illegal introductions of nonnative fishes, frogs and crayfish. The release of nonnative fish by the public has been a major factor in the spread of these species (Moyle 1976a, 1976b). Nonnative fish are transported for bait and sporting purposes (Moyle 1976a, 1976b), for mosquito control (Meffe, et al. 1983), and release of aquarium fishes (Deacon, et al. 1964). The likelihood of this occurring at the project sites is negligible due to inaccessibility. However, there is no way to determine the likelihood of surreptitious releases and little opportunity to prevent them.

Once established within the project sites, some desert pupfish and Gila topminnow are likely to move downstream, either passively or actively, into Aravaipa Creek, particularly during periods of high runoff. Predation and competition with both native and nonnative fish in Aravaipa Canyon is likely to occur. These effects are not the result of any discretionary action of your office and, therefore, these impacts are not included in the incidental take statement below. Your office should, however, continue to work with our office, AGFD, other government agencies, and non-government organizations to remove nonnative predators and competitors from the watershed. It would assist in the management of the entire native fish community of the Aravaipa watershed and promote recovery of listed native fish and amphibian species.

Interrelated/Interdependent Effects

The proposed reestablishment of Gila topminnow and desert pupfish will not result in any interrelated or interdependent effects to desert pupfish or Gila topminnow that have not already been analyzed. The effects of the grazing management on the associated private lands will be covered in the Safe Harbor Agreement with TNC and the effects associated with the capture, movement and release of these fish will be analyzed as part of the Research and Recovery permit held by AGFD.

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 action area includes both Federal and private lands. The private lands within the action area are owned by TNC, with whom we are working on a Safe Harbor Agreement which will address reestablishment of Gila topminnow and pupfish on these lands. We will address the effects of topminnow and pupfish from related actions through an Intra-Service Section 7 consultation associated with the enhancement of survival section 10(a)(1)(A) permit. Downstream of the action area are several private landowners who may have existing water diversions and withdrawals, but are not likely to alter current conditions. Further, suitable habitat is scarce in the lower perennial reaches of the watershed and populated by nonnative fish that will prey on, or out-compete, Gila topminnow and desert pupfish in these habitats. Therefore, Gila topminnow and desert pupfish are unlikely to become established in these areas and thus, not likely to be affected by downstream, non-Federal activities.

Urban and agricultural development may encroach upon and change land-use patterns around the upper reaches of Aravaipa Canyon. The fragmentation, modification, or destruction of upland or riparian vegetation may negatively affect water quality and quantity in Aravaipa Creek. Increased development, current agricultural, and livestock grazing practices may result in the drainage, development, or diversions of wetland and aquatic habitats that reduce water quantity and quality, and destroy spawning and other important habitats. If Gila topminnow and desert pupfish, however improbable, do become established in upper Aravaipa Creek, these impacts could result in local loss of some individuals and reproductive potential.

CONCLUSION

Gila topminnow and desert pupfish

After reviewing the current status of the Gila topminnow and desert pupfish, the environmental baseline for the action area, the effects of ongoing management activities, and the cumulative effects, it is our biological opinion that the reestablishment of Gila topminnow and desert pupfish, as proposed, is not likely to jeopardize the continued existence of the Gila topminnow or desert pupfish. No critical habitat is designated for these species; therefore, none will be affected. We base this conclusion on the following:

- The reestablishment of additional populations within the historical range is consistent with recovery actions outlined in the existing recovery plans for these species.
- Impacts to source populations will be minimized through the use of refuge populations and evaluation of impacts to any wild population used as a source of individuals for this action.
- The reestablishment of Gila topminnow and desert pupfish populations into the same sites should not prevent reestablishment of either species.

- The effects of removing fish from source populations should be off set by the reproductive potential of Gila topminnow and desert pupfish, once the populations are established.

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 BLM so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The BLM has a continuing duty to regulate the activity covered by this incidental take statement. If the BLM (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 BLM must report the progress of the action and its impact on the species to the FWS as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Gila topminnow and desert pupfish

We anticipate incidental take of Gila topminnow and desert pupfish will be difficult to detect for the following reasons: these species have a small body size, losses may be masked by seasonal fluctuations in numbers or other causes (e.g., oxygen depletions for aquatic species), and the species occurs in habitat that makes detection difficult; therefore finding a dead or impaired specimen is unlikely. The level of anticipated take will be quantified differently depending upon the action: 1) livestock management, 2) recreation management, 3) prescribed fire, and 4) construction and maintenance of check dams.

Livestock Management

Incidental take from the ongoing livestock management on the South Rim allotment is expected to occur both as direct mortality of individual Gila topminnow and desert pupfish, and as indirect

loss resulting from habitat modification and destruction (harm) in the Virgus Canyon Site, but potentially at the Parsons Spring and the Oak Grove Canyon sites, as well. Direct mortality may occur during reconstruction or maintenance of existing cross-channel fences or check dams in occupied habitat, during trampling of stream channels by livestock in Virgus Canyon and within the proposed enclosure at Parsons Canyon, when fences are periodically washed out, cut or damaged and are not quickly replaced, from the occasional presence of livestock in the Oak Grove Canyon sites, and from the maintenance of degraded conditions in intermittent or ephemerally flowing migration areas between subpopulations of Gila topminnow and desert pupfish that may develop within the watershed. Harm may result from reduction in surface flows due to water development and watershed degradation, alterations in the hydrograph that result in flashier stream flows, and maintenance of watershed conditions that result in an unstable stream channel at all sites.

1. For general on-going livestock grazing and its management, Gila topminnow and desert pupfish within reestablishment sites, and any sites where they become established through dispersal, could be taken through direct mortality if livestock have access to these sites. Since these sites are generally remote, monitoring will be intermittent relative to the duration of the action, the Gila topminnow and desert pupfish are small body organisms, and the probability of detecting direct take is small; the condition of habitat as measured by utilization of the riparian browse species and bank alteration will be used as a surrogate measure of take. Vegetation utilization and bank alteration by livestock is related to livestock numbers and the duration of time in which they are present at a site. This is directly proportional to the probability of take occurring through trampling and harm through habitat alteration. Therefore, take will be considered to have been exceeded if the following conditions occur:

- a. Livestock grazing occurs within a site at a level resulting in more than 30 percent utilization of woody riparian species (measured as percentage of apical meristems within 2 m (6 ft) of the ground grazed) and trampling, chiseling, or other physical impact by livestock on more than 20 percent of the alterable stream banks by length and livestock have contributed to these habitat modifications; or
- b. An enclosure fence is cut, down, open, or non-functional for more than two weeks while permitted livestock are in any adjacent pasture next to the enclosure, or for more than two months in any given year if livestock are in a pasture that is not adjacent to the enclosure; or
- c. Livestock gain access to what are perceived to be inaccessible sites (Middle and Lower Oak Grove Canyon) and are present for more than two weeks continuous, or more than a total of two months in any given year.

2. For on-going livestock management, all Gila topminnow and desert pupfish in periodically occupied habitat could be taken through harm from livestock grazing. In addition, direct take of Gila topminnow and desert pupfish will occur when livestock are within occupied habitat. Take will be considered to have been exceeded if the following conditions occur:

- a. Livestock grazing occurs within a pasture with occupied or periodically occupied habitat resulting in more than 40 percent utilization of upland vegetation.

Recreation Management

Incidental take from ongoing recreational activities in the project area is expected to occur both as direct mortality of Gila topminnow and desert pupfish, and as indirect loss resulting from habitat modification and destruction (harm). Direct mortality could occur when vehicles are driven through wet portions of the stream channel in areas where Gila topminnow or desert pupfish are present. Habitat modification and destruction of occupied sites could occur from off-road travel, widening stream crossings, oil spills, soap and other chemicals introduced into the water. Since these sites are generally remote, monitoring will be intermittent relative to the duration of the action, the Gila topminnow and desert pupfish are small body organisms, and the probability of detecting direct take is small; the condition of habitat as measured impacts to the riparian vegetation and bank alteration will be used as a surrogate measure of take. The utilization and bank alteration by recreational activities is related to number and type of recreationists and the duration of time in which they are present at a site. This is directly proportional to the probability of take occurring through crushing and harm through habitat alteration.

1. For general on-going recreation management within the Aravaipa Watershed, all Gila topminnow and desert pupfish within reestablishment sites and any sites where they become established through dispersal, may be taken if recreation activities occur at these sites. Take will be considered to have been exceeded if the following conditions occur:

- a. If more than 20 percent of the alterable stream bank by length is modified or destroyed and recreational activities have contributed to these habitat modifications, this will result in unacceptable impacts to occupied habitat and individual Gila topminnow or desert pupfish; or
- b. If more than 20 dead or dying fish of any species are observed near or within 0.5 km (600 yards) downstream of road crossings during or following three day weekends, and other large recreational periods; or
- c. Any OHV or motorized vehicle in the stream channels outside of existing road crossings will result in unacceptable impacts to occupied habitat and individual Gila topminnow or desert pupfish.

Construction and Maintenance of Check Dams

We do not anticipate that direct mortality of Gila topminnow or desert pupfish will occur from construction or maintenance of check dams, as these activities will not be done in drainages with perennial flow or in areas where native fish are located or stocked. Short-term increases in sedimentation from disturbed soils following construction or maintenance of check dams may result in covering and suffocating desert pupfish eggs and larval-stage individuals of both species in downstream habitats. The long-term effects of check dams are expected to be beneficial to the watershed and aquatic habitats, through the stabilization of soils, reduced sedimentation, and increased water retention. This would protect desert pupfish spawning areas, nursery habitats and potentially increase the area of perennial flow within the watershed.

1. For construction, development, or maintenance of check dams, we anticipate that take in the form of harm to Gila topminnow and desert pupfish will occur at a level that will result in no more than 20 dead or dying fish of any species being observed near the activity, or within 0.5 km (600 yards) downstream of the activity, during implementation or within three hours of completion; or
2. For construction, development, or maintenance of check dams, we anticipate that take in the form of harm to desert pupfish eggs will occur at a level that will result in no more than 20% increase of fine sediments, by area, in the nearest occupied habitat downstream; as compared to preconstruction conditions. The source of the sediments must be confirmed to be from active erosion in at construction site, such as presence of new rills and gullies, and not from existing poor rangeland condition.

EFFECT OF THE TAKE

In the accompanying biological opinion, we find the anticipated level of incidental take is not likely to result in jeopardy to Gila topminnow or desert pupfish because of the inaccessibility of two sites (Middle and Lower Oak Grove Canyon), the willingness to build an enclosure at Parsons Spring, the reproductive potential of Gila topminnow and desert pupfish, and the beneficial nature of the recovery action of reestablishing new populations of both Gila topminnow and desert pupfish.

Further, we anticipate no incidental take of loach minnow or spikedace from the proposed reestablishment of Gila topminnow and desert pupfish.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the BLM must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

We believe the following reasonable and prudent measures are necessary and appropriate to minimize take of Gila topminnow and desert pupfish. In order to be exempt from the prohibitions of section 9 of the Act, you must comply with their accompanying terms and conditions with regard to the proposed action. The terms and conditions are nondiscretionary and implement the reasonable and prudent measure as described.

1. You shall conduct all proposed actions in a way that will minimize direct mortality of, or harm to, Gila topminnow and desert pupfish.

The following terms and conditions will implement reasonable and prudent measure 1:

- a. In years when livestock are present on the South Rim allotment, annual monitoring of utilization of woody riparian vegetation and physical impacts on streambanks will be done by permittee and / or BLM before, during, and after cattle have been in the pasture. A fenced riparian enclosure will be constructed if utilization in the area exceeds 30 percent of woody riparian species (measured as a percentage of apical meristems within 2

m (6 ft) of the ground grazed) or trampling, chiseling, or other physical impact by livestock on more than 20 percent of the alterable streambanks by length occurs in any two out of three years. If an enclosure becomes necessary under these terms, it shall be designed in cooperation with us and AGFD. BLM shall include results of monitoring in an annual report to our office, due by March 1 of each year, starting in March 2006. This report can be combined with the reporting requirement of other existing BOs for ease in reporting. If the dates differ, please contact our office with the date that we can expect the combined report from your office.

- b. During the winter grazing period, inspect and monitor each reestablishment site and any sites that are occupied through dispersal.
 - c. Inspect and maintain any enclosure a minimum of three times per year; inspection reports from the permittee may be used to accomplish this term and condition. The permittee will report their inspection and maintenance work annually. Livestock will be removed from the Oak Grove Canyon sites or the potential enclosure of Parsons Springs, if built, immediately upon the permittee learning of such an event. Notify us of any enclosure fence damage and any livestock intrusion into these sites within 48 hours of your knowledge of such an event. Notification may be by telephone, electronic transmission, facsimile, or letter. Include a brief summary of such events in your annual reports to us.
 - d. During any activities that involve work in the stream channel (fence, road, or water development activities), continue all reasonable efforts to manage activities within the channel to minimize mortality and harm to Gila topminnow and desert pupfish. No heavy equipment shall be used within wetted areas or channels. All reasonable efforts shall be made to ensure that no pollutants enter surface waters during any activities.
 - e. All contacts with AGFD and academic institutions and data collected should be included in your annual report to us.
2. Conduct all proposed actions to minimize harm (loss and alteration) to occupied Gila topminnow and desert pupfish habitat.

The following terms and conditions will implement reasonable and prudent measure 2:

- a. Monitor recreational use of roads and road conditions through the action area. If the road condition deteriorates and results in excess sediment run off, corrective action should be taken to control erosion. Any wildcat roads that are created shall be closed as soon as they are discovered. Wherever possible, any illegal road or track should be rehabilitated. Roads can negatively affect watershed function and hydrological processes and also allow human access. Human access and proximity to roads is a factor in the spread of nonnative aquatic species.
- b. For all construction, development, or maintenance projects within the watershed, best management practices will be used to control soil movement from newly exposed, erodible soils. Monitoring of sedimentation in downstream occupied habitats shall occur before, during and after the project is completed to document successful erosion control.

- c. Include all activities under these terms and conditions within the annual report.
3. Continue to monitor and document dates and levels of direct incidental take (mortality) and adverse effects to occupied and periodically occupied habitat; include this information in your annual report.

The following terms and conditions will implement reasonable and prudent measure 3:

- a. Spot monitoring by a biological monitor is acceptable for long-duration projects outside the channel of water (such as fence construction, road work, or water development or improvements) in the Aravaipa Watershed. The biological monitor shall monitor for the presence of dead or dying fish within the surface waters downstream of the project activity. Our office and AGFD shall be notified immediately by telephone or e-mail upon detection of more than 20 dead or dying fish of any species. This will be a clear indicator something is wrong and does not require specialized biological knowledge, as opposed to the skills needed to identify (specifically) Gila topminnow or desert pupfish. This does not apply to activities associated with routine fence maintenance. For work conducted in water, a biological monitor will always be present during project operations.
 - b. Continue coordination through AGFD, our office, and participating academic institutions for the annual monitoring of the Aravaipa fish communities. Include in the annual monitoring all sites where Gila topminnow and desert pupfish are reestablished. Results of the annual monitoring should be included in your annual report.
4. Maintain a complete and accurate record of actions which may result in take through mortality of fish and adverse effects to occupied and periodically occupied Gila topminnow and desert pupfish habitat.

The following terms and conditions will implement reasonable and prudent measure 4:

- a. Records of enclosure and gap fence construction, maintenance, and monitoring shall be maintained. A brief summary on enclosure construction, maintenance, repair, livestock intrusion, and other relevant information will be furnished in the annual report.
- b. In the annual report, briefly summarize for the previous calendar year; 1) implementation and effectiveness of the terms and conditions, 2) documentation of take, if any, and 3) actual livestock use (head, animal months, dates of pasture use, utilization measurements, etc.) with a description of any variations from the proposed action. If other monitoring or research is completed pertaining to Gila topminnow and desert pupfish or conditions of rangeland, riparian areas, or soil, a copy of the relevant reports shall be included.

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

and review with the AESO the need for possible modification of the reasonable and prudent measures.

Disposition of Dead or Injured Listed Species

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

CONSERVATION RECOMMENDATIONS

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

1. We recommend that BLM work with AGFD to verify presence or absence of nonnative aquatic species on all BLM lands in the Aravaipa watershed. If nonnative aquatic species are found, work with AGFD and our office to develop a plan or outline to remove nonnative aquatic species from the BLM lands in this watershed.
2. We recommend that BLM coordinate with AGFD and our office in efforts to work with upstream private landowners to renovate any source populations of nonnative aquatic species from their lands.
3. We recommend that BLM collect flow data to apply for instream flow rights with the Arizona Department of Water Resources in occupied Gila topminnow, desert pupfish, loach minnow, and spikedace habitats, if such rights have not been previously obtained.

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

REINITIATION NOTICE

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

species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

We appreciate your efforts to identify and minimize effects to listed species from this project. For further information please contact Marty Tuegel (520) 670-6150 (x232) or Sherry Barrett (520) 670-6150 (x223). Please refer to the consultation number, 02-21-04-F-0022, in future correspondence concerning this project.

/s/ Steven L. Spangle

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
(Attn: Sarah Rinkevich)
Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ

Bob Broscheid, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ (Attn: Joan Scott)

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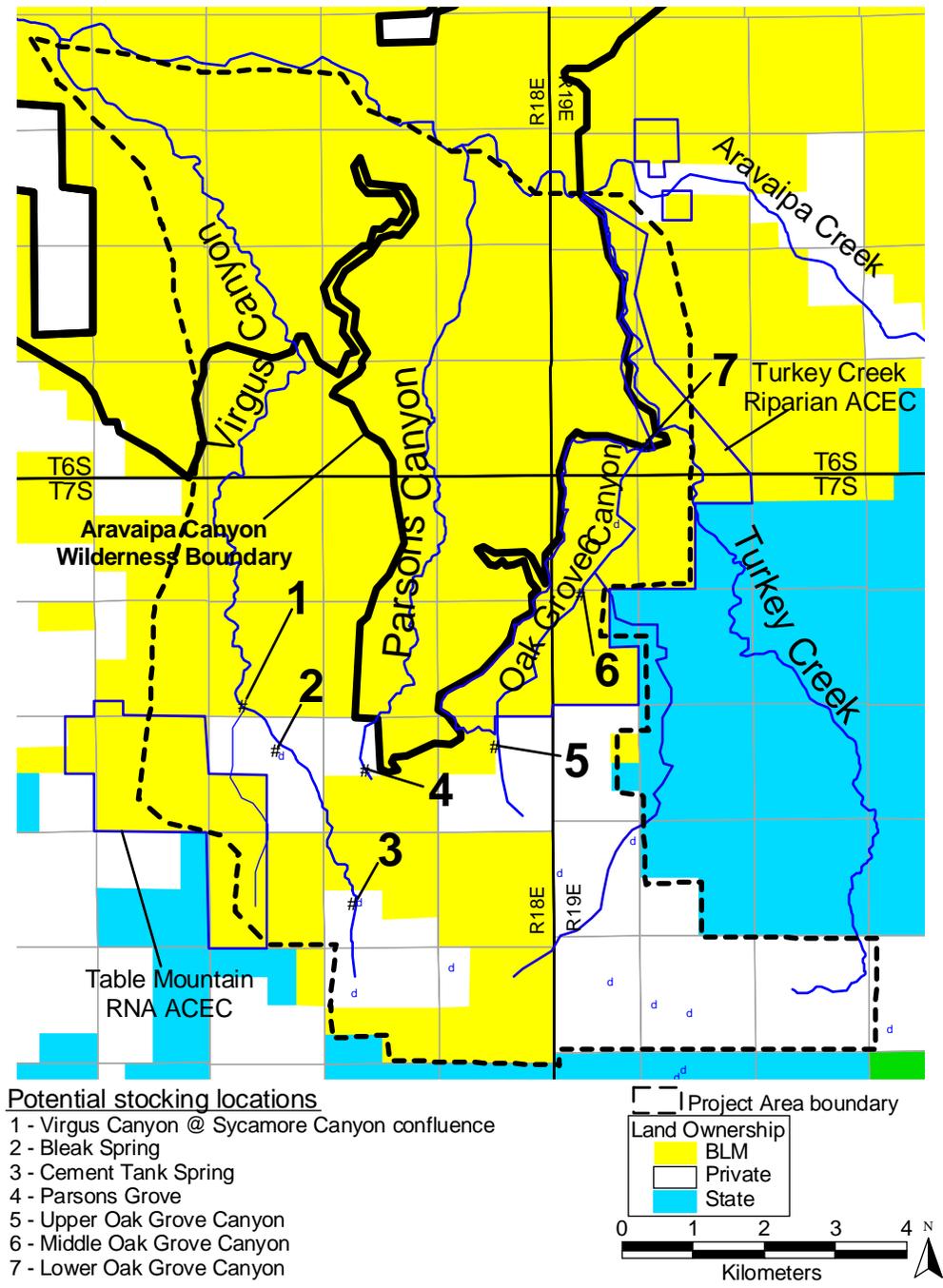
Table 1. Summary of effects determination by proposed reestablishment sites for Gila topminnow and desert pupfish on BLM managed lands within the Aravaipa Watershed.

Location	Gila topminnow	Desert Pupfish
Middle Oak Grove Canyon	<p>Limited livestock accessibility due to rough terrain.</p> <p>Low volume of fuels available to carry fire to sensitive areas.</p> <p>Vegetation will catch ash and reduce the amount of ash reaching wetted portions of oak grove canyon.</p> <p>Dispersed recreational activities.</p> <p>Desert pupfish may disperse into Aravaipa creek.</p> <p>Determination: may affect, likely to adversely affect</p>	<p>Limited livestock accessibility due to rough terrain.</p> <p>Low volume of fuels available to carry fire to sensitive areas.</p> <p>Vegetation will catch ash and reduce the amount of ash reaching wetted portions of oak grove canyon.</p> <p>Dispersed recreational activities.</p> <p>Gila topminnow may disperse into Aravaipa creek.</p> <p>Determination: may affect, likely to adversely affect</p>
Lower Oak Grove Canyon	<p>Limited livestock accessibility due to rough terrain.</p> <p>Low volume of fuels available to carry fire to sensitive areas.</p> <p>Vegetation will catch ash and reduce the amount of ash reaching wetted portions of oak grove canyon.</p> <p>Dispersed recreational activities.</p> <p>Desert pupfish may disperse into Aravaipa creek.</p> <p>Determination: may affect, likely to adversely affect</p>	<p>Limited livestock accessibility due to rough terrain.</p> <p>Low volume of fuels available to carry fire to sensitive areas.</p> <p>Vegetation will catch ash and reduce the amount of ash reaching wetted portions of oak grove canyon.</p> <p>Dispersed recreational activities.</p> <p>Gila topminnow may disperse into Aravaipa creek.</p> <p>Determination: may affect, likely to adversely affect</p>

Table 1. cont.

Location	Gila topminnow	Desert Pupfish
Parsons Canyon	<p>Accessible to livestock. Will likely be fenced to exclude livestock.</p> <p>Dispersed recreational activities.</p> <p>Desert pupfish may disperse into Aravaipa creek.</p> <p>Determination: may affect, likely to adversely affect</p>	<p>Accessible to livestock. Will likely be fenced to exclude livestock.</p> <p>Dispersed recreational activities.</p> <p>Gila topminnow may disperse into Aravaipa creek.</p> <p>Determination: may affect, likely to adversely affect</p>
Virgus Canyon	<p>Accessible to livestock. Will likely be fenced to exclude livestock.</p> <p>Dispersed recreational activities.</p> <p>Desert pupfish may disperse into Aravaipa creek.</p> <p>Determination: may affect, likely to adversely affect</p>	<p>Accessible to livestock. Will likely be fenced to exclude livestock.</p> <p>Dispersed recreational activities.</p> <p>Gila topminnow may disperse into Aravaipa creek.</p> <p>Determination: may affect, likely to adversely affect</p>

Figure 1. Map of proposed project area within the Aravaipa watershed.



APPENDIX A

CONCURRENCES

This section contains our concurrence with your determination that the proposed action may affect but is not likely to adversely affect the loach minnow and spikedace.

LOACH MINNOW and SPIKEDACE

Loach Minnow

We listed the loach minnow as a threatened species on October 28, 1986 (USFWS 1986b). The Loach Minnow Recovery Plan was completed in 1991 (USFWS 1991a). Habitat destruction and competition and predation by nonnative aquatic species have severely reduced its range and abundance. Although the loach minnow is currently listed as threatened, we have found that a petition to up-list the species to endangered status contained sufficient information identifying that such a change is warranted. A reclassification proposal is pending; however, work on this reclassification is precluded due to work on other higher priority listing actions (USFWS 1994).

Loach minnow occur in small to large perennial streams. They are a bottom-dwelling inhabitant 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). They are rare or absent from habitats where fine sediments fill the interstitial spaces (Propst and Bestgen 1991). Loach minnow feed exclusively on aquatic insects (Schrieber 1978, Abarca 1987). 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.

The status of loach minnow is declining rangewide. It is currently restricted to 419 miles of streams, which represents only 15 to 20 percent of its historical range (USFWS 2000). In occupied areas, loach minnow may be common to very rare. Loach minnow are common only in Aravaipa Creek, the Blue River, and limited portions of the San Francisco, Upper Gila, and the Tularosa rivers in New Mexico (USFWS 2000).

Aravaipa Creek supports the most protected loach minnow populations due to special use designations on BLM land, substantial ownership by TNC, and constructed fish barriers to prevent invasion of nonnative fish species. Intensive monitoring at Aravaipa Canyon has demonstrated that loach minnow are currently stable in numbers. They are found from the downstream non-native fish barriers upstream to Turkey Creek and above (Peter Rienthal, U. Arizona, pers. commun. October 13, 2004).

Spikedace

We listed the spikedace as a threatened species on July 1, 1986 (USFWS 1986c). A recovery plan was also completed in 1991 (USFWS 1991b). Although the spikedace is currently listed as threatened, we found that a petition to up-list the species to endangered status contained sufficient information indicating that such a change is warranted. A reclassification proposal is pending; however, work on it is precluded due to work on other higher priority listing actions (USFWS 1994). Habitat destruction along with competition and predation from introduced nonnative species are the primary causes of the species decline (Miller 1961, Williams *et al.* 1985, Douglas *et al.* 1994).

Spikedace live in moderate to large perennial streams with flowing water of 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 begin spawning 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 studies of captive fish 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). They feed primarily on aquatic and terrestrial insects (Schreiber 1978, Barber and Minckley 1983, Marsh et al. 1989).

Spikedace historically occurred throughout the mid-elevations of the Gila River drainage, but is currently known only from the Middle Gila and Upper Gila rivers, and Aravaipa and Eagle creeks (Barber and Minckley 1966, Minckley 1973a, Anderson 1978, Marsh et al. 1990, Sublette et al. 1990, Jakle 1992, Knowles 1994, Rinne 1999). The status of spikedace is declining range wide. It is now restricted to approximately 289 miles of streams, and its present range is only 10 to 15 percent of its historical range. Within occupied areas, it is common to very rare, but is presently common only in Aravaipa Creek and some parts of the Upper Gila River in New Mexico (USFWS 2000). Aravaipa Creek supports the most protected spikedace populations due to special use designations on BLM land, substantial ownership by TNC, and construction of fish barriers to prevent invasion of nonnative fish species. Intensive monitoring at Aravaipa Canyon has demonstrated that spikedace are currently stable in numbers. They are found from the mid point of the canyon at Horse Camp Wash upstream to Turkey Creek and above (Peter Rienthal, U. Arizona, pers. comm. October 13, 2004). It is believed that spikedace did occur throughout the canyon at one time.

You determined that the proposed action was not likely to adversely affect either loach minnow or spikedace. This determination is based upon the following:

- The area proposed for reestablishment of Gila topminnow and desert pupfish are not occupied by loach minnow or spikedace; and
- There is a small possibility of successful dispersal of Gila topminnow and desert pupfish into the portions of Aravaipa Creek occupied by loach minnow and spikedace; and
- If successful dispersal occurs, long-term establishment of Gila topminnow and desert pupfish in Aravaipa Creek is improbable due to the presence of native and non-native competitors and predators and a lack of suitable habitat; and
- If successful dispersal occurs, Gila topminnow and desert pupfish are generalized feeders and Loach minnow and spikedace feed on aquatic and terrestrial insects; and
- Furthermore, if successful dispersal occurs, encounters between Gila topminnow or desert pupfish and loach minnow or spikedace would be extremely rare due to differences in habitat preferences.

Therefore, we concur with your determination that the proposed action may affect, but is not likely to adversely affect either the loach minnow or spikedace. No critical habitat is designated for these species; therefore, none will be affected. We base this determination on the following:

- It is improbable that Gila topminnow and desert pupfish would survive a dispersal event from the reestablishment sites to Aravaipa Creek, where loach minnow and spikedace are known to occur.
- It is improbable that Gila topminnow and desert pupfish would survive in Aravaipa Creek with the number of exotic aquatic competitors and predators present in the creek.
- It is improbable that Gila topminnow and desert pupfish would become reestablished in Aravaipa Creek, based upon the scarcity, size and fragmented nature of suitable habitat for Gila topminnow and desert pupfish in Aravaipa Creek.
- It is improbable that adhesive eggs or larval-stages of loach minnow and spikedace in gravel-rocky riffle would be encountered by Gila topminnow or desert pupfish, much less preyed upon by either species.
- It is improbable that there would be any competition for food resources between Gila topminnow and desert pupfish, and loach minnow and spikedace based upon the large degree of habitat partitioning and the non-limiting nature of prey items for all these species in the creek.

Therefore, any effects of the reestablishment of Gila topminnow and desert pupfish on loach minnow and spikedace populations within the Aravaipa watershed are expected to be insignificant and discountable.