

ENVIRONMENTAL ASSESSMENT

DESIGNATION OF CRITICAL HABITAT

FOR THE

SPIKEDACE

(Meda fulgida)

AND THE

LOACH MINNOW

(Tiaroga [=Rhinichthys] cobitis)

Prepared by

U.S. Fish and Wildlife Service
Arizona Ecological Services Field Office
Phoenix, Arizona

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1.0 Purpose for the Action

The purpose for this action is to fulfill our legal obligations in making a determination on where to designate critical habitat for spikedace (*Meda fulgida*) and loach minnow (*Tiaroga* [=*Rhinichthys*] *cobitis*) pursuant to section 4 of the Endangered Species Act of 1973, as amended (Act) by legally designating those areas that are essential to the survival and recovery of these two species and by describing those physical and biological features within those areas that require special management considerations to achieve conservation of the species.

1.1 Need for the Action

The need for critical habitat designation is to assist in achieving long-term protection and recovery of spikedace and loach minnow and the ecosystems upon which they depend, by subjecting areas designated as critical habitat to section 7(a)(2) of the Act, thereby requiring consultation for Federal actions that may affect these areas in order to avoid destruction or adverse modification of this habitat.

Critical habitat previously designated for spikedace and loach minnow was set aside by order of the Federal courts in Catron County Board of Commissioners, New Mexico v. U. S. Fish and Wildlife Service, CIV No. 93-730 HB (D.N.M., Order of October 13, 1994). The court cited our failure to analyze the effects of critical habitat designation under the National Environmental Policy Act (NEPA) as its basis for setting aside critical habitat for the two species. As a result, we removed critical habitat for spikedace and loach minnow on March 25, 1998 (63 FR 14378). More recently, the court directing us to complete designation of critical habitat for spikedace and loach minnow by February 17, 2000 (Southwest Center for Biological Diversity v. Clark, CIV 98-0769 M/JHG). This deadline was later extended to April 21, 2000.

1.2 Background

Spikedace

The spikedace is a small, slim fish less than 80 mm (3 in.) long. It is characterized by very silvery sides and by spines in the dorsal and pelvic fins (Minckley 1973). This species is found in moderate to large perennial streams, where it inhabits shallow riffles with sand, gravel, and rubble substrates, and moderate to swift currents and swift pools over sand or gravel substrates (Barber et al. 1970; Propst et al. 1986; Rinne 1991). 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 downstream riffle edges (Propst et al. 1986; Rinne and Kroeger 1988). Recurrent flooding and a natural hydrograph (physical conditions, boundaries, flow, and related characteristics of waters) are very important in maintaining the habitat of spikedace and in

helping the species maintain a competitive edge over invading nonnative aquatic species (Propst *et al.* 1986; Minckley and Meffe 1987).

The spikedace was first collected in 1851 from the Rio San Pedro in Arizona and was described from those specimens in 1856 by Girard. It is the only species in the genus Meda. The spikedace was once common throughout much of the Gila River basin, including the mainstem Gila River upstream of Phoenix, and the Verde, Agua Fria, Salt, San Pedro, and San Francisco subbasins. It occupies suitable habitat in both the mainstream reaches and moderate-gradient perennial tributaries, up to about 2,000 m (6,500 ft) elevation (Miller 1960; Chamberlain 1904; Gilbert and Scofield 1898; Cope and Yarrow 1875).

Habitat destruction and competition and predation by nonnative aquatic species have severely reduced its range and abundance. It is now restricted to approximately 466 km (289 mi) of stream in portions of the upper Gila River (Grant, Catron, and Hidalgo counties, NM); middle Gila River (Pinal County, AZ); lower San Pedro River (Pinal County, AZ); Aravaipa Creek (Graham and Pinal counties, AZ); Eagle Creek (Graham and Greenlee counties, AZ); and the Verde River (Yavapai County, AZ) (Anderson 1978; Bestgen, 1985; Bettaso *et al.* 1995; Jakle 1992; Marsh *et al.* 1990; Propst *et al.* 1985; Propst *et al.* 1986; Stefferud and Rinne 1996; Sublette *et al.* 1990). Its present range is only about 10-15 percent of the historical range, and the status of the species within occupied areas ranges from common to very rare. At present, the species is common only in Aravaipa Creek and some parts of the upper Gila River in New Mexico.

Loach Minnow

The loach minnow is a small, slender, elongated fish less than 80 mm (3 in.) long. It is olivaceous in color and strongly blotched with darker pigment. The mouth is oblique (slanting) and terminal, and the eyes are markedly directed upward (Minckley 1973). This species is found in small to large perennial streams, using shallow, turbulent riffles with primarily cobble substrate and swift currents (Minckley 1973; Propst and Bestgen 1991; Rinne 1989; Propst *et al.* 1988). Loach minnow uses the spaces between, and in the lee of, larger substrate for resting and spawning. It is rare or absent from habitats where fine sediments fill the interstitial spaces (small, narrow spaces between rocks or other substrate) (Propst and Bestgen 1991). Recurrent flooding and a natural hydrograph are very important in maintaining the habitat of loach minnow and in helping the species maintain a competitive edge over invading nonnative aquatic species (Propst *et al.* 1986; Propst and Bestgen 1991).

The loach minnow was first collected in 1851 from the Rio San Pedro in Arizona and was described from those specimens in 1865 by Girard. The loach minnow was once locally common throughout much of the Gila River basin, including the mainstem Gila River upstream of Phoenix, and the Verde, Salt, San Pedro, and San Francisco subbasins. It occupies suitable habitat in both the mainstream reaches and moderate-gradient perennial tributaries, up to about 2,500 m (8,200 ft) elevation. Habitat destruction and competition and predation by nonnative aquatic species have severely reduced its range and abundance. It is now restricted to approximately 676 km (419

mi) of stream in portions of the upper Gila River (Grant, Catron, and Hidalgo counties, NM); the San Francisco and Tularosa rivers and their tributaries Negrito and Whitewater creeks (Catron County, NM); the Blue River and its tributaries Dry Blue, Campbell Blue, Little Blue, Pace, and Frieborn creeks (Greenlee County, AZ and Catron County, NM); Aravaipa Creek and its tributaries Turkey and Deer creeks (Graham and Pinal counties, AZ); Eagle Creek (Graham and Greenlee counties, AZ); the White River (Apache, Gila, and Navajo counties, AZ); and the Black River (Apache and Greenlee counties, AZ) (Bagley *et al.* 1998; Bagley *et al.* 1996; Barber and Minckley 1966; Bettaso *et al.* 1995; Britt 1982; Leon 1989; Marsh *et al.* 1990; Propst 1996; Propst and Bestgen 1991; Propst *et al.* 1985; Springer 1995). The present range is only 15-20 percent of its historical range, and the status of the species within occupied areas ranges from common to very rare. At present, the species is common only in Aravaipa Creek, the Blue River, and limited portions of the San Francisco, upper Gila, and Tularosa rivers in New Mexico.

Reasons for the Decline of Spikedace and Loach Minnow

Distribution and abundance of both spikedace and loach minnow have been dramatically reduced in the past century (Minckley 1973, Propst *et al.* 1986, USFWS 1991a and 1991b). Past changes in range and density must have occurred in response to natural spatial and temporal variations in the environment, but the current threatened status of spikedace and loach minnow appears to be a direct or indirect result of human activities.

Habitat destruction or alteration and interactions with non-native aquatic species have acted both independently and in concert to extirpate or deplete spikedace and loach minnow populations. Habitat destruction and alteration has occurred due to numerous human uses of the stream, floodplain, and watershed, such as livestock grazing, agriculture, timber harvest, mining, roads, urban and suburban development, irrigation, water diversion, impoundment, flood control and repair, channelization, vegetation manipulation, groundwater pumping, gravel mining, fuelwood harvest, recreation, and others (Miller 1961, Rinne 1975, Minckley and Deacon 1991, USFWS 1991a and 1991b, Cain *et al.* 1997). Erosion, sedimentation, channel downcutting, changes in channel morphology, channel instability, and loss of surface water commonly resulted from human activities causing further loss and alteration of spikedace and loach minnow habitat (Leopold 1946, Dobyms 1981, Williams *et al.* 1985). In the San Pedro and Aqua Fria rivers, plus major reaches of the Salt and Gila rivers, dewatering and other such drastic habitat modifications resulted in demise of most native fishes. Downstream reaches of the Verde, Salt, and mainstem Gila rivers have been affected by impoundments and highly-altered flow regimes. Neither spikedace nor loach minnow persist in reservoirs or other non-flowing waters and downstream from the dams impacts ranged from dewatering to altered chemical and thermal conditions.

Introduction of non-native aquatic species has adversely affected spikedace and loach minnow through predation, competition, habitat alteration, community disruption, and disease (Miller 1961, Propst *et al.* 1986, Propst and Bestgen 1991, Minckley 1991, Douglas *et al.* 1994). Non-native aquatic species that adversely affect spikedace and loach minnow include parasites and diseases, invertebrates, plants, amphibians, and reptiles, although non-native fish have been the

most clearly detrimental, including smallmouth bass (*Micropterus dolomieu*), green sunfish (*Lepomis cyanellus*), red shiner (*Cyprinella lutrensis*), channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictus olivaris*), black and yellow bullhead (*Ameiurus melas* and *natalis*), western mosquitofish (*Gambusia affinis*), brown trout (*Salmo trutta*), and rainbow trout (*Oncorhynchus mykiss*).

1.3 Boundaries and Elements of Critical Habitat

Critical habitat is defined in section 3(5)(A) of the Act as "(i) the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection; and (III) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species." The term "conservation," as defined in section 3(3) of the Act, means "to use and the use of all methods and procedures which are necessary to bring an endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary," i.e., the species is recovered and removed from the list of endangered and threatened species.

In identifying areas as critical habitat, we consider those physical and biological attributes that are essential to a species' conservation. In addition, the Act stipulates that the areas containing these elements may require special management considerations or protection. Such physical and biological features, as outlined in 50 CFR 424.12, include, but are not limited to, the following:

- Space for individual and population growth, and for normal behavior;
- Food, water, or other nutritional or physiological requirements;
- Cover or shelter;
- Sites for breeding, reproduction, or rearing of offspring; and
- Habitats that are protected from disturbances or are representative of the historic geographical and ecological distributions of a species.

2.0 Description of Alternatives

The Service has considered the "No Action" alternative as required by the National Environmental Policy Act (NEPA). The Action Alternative (Proposed Alternative) is to designate critical habitat as published in the Federal Register XX FR XXXXX, April XX, 2000. The Service also considered alternatives to designate additional areas as critical habitat and to exclude certain areas from critical habitat.

2.1 No Action Alternative. The no action alternative is defined as a decision to forgo the designation of critical habitat for spikedace and loach minnow. The alternative serves to delineate the existing environment and conditions that are anticipated to result from the listing of the species, without designation of critical habitat. On September 20, 1999 the

U.S. District Court for New Mexico issued an order compelling the Service to make a determination on critical habitat for spokedace and loach minnow (Southwest Center for Biological Diversity vs. Clark CIV 98-0769M/JHG). This alternative would have no significant impacts beyond those impacts already resulting from the 1986 listing of spokedace and loach minnow (51 FR 23769 and 51 FR 39468 respectively) and associated requirements of section 7 of the Act.

- 2.2 Action Alternative: This, our Proposed Alternative, is to finalize the designation of critical habitat as described in the final rule in the Federal Register (XX FR XXXXX, April XX, 2000). The critical habitat designation includes the 1,448 km (898 mi) of stream channels within the identified stream reaches indicated below and areas in these reaches within the 100 year flood-plain. Both occupied and currently unoccupied areas are designated as critical habitat for spokedace and loach minnow. In accordance with section 3(5)(A)(i) of the Act, areas outside the geographical area occupied by the species may meet the definition of critical habitat upon determination that they are essential for the conservation of the species. The final designation includes all presently known populations of spokedace and loach minnow except those on Tribal lands (and Indian allotted lands).
- 2.3 Designation Identical to the 1994 Final Rules. The 1994 final rules designating critical habitat for spokedace and loach minnow were based on proposed designations published in 1985. Those proposals were based on information about the two fishes that was current in 1983. Seventeen years have passed and there have been substantial changes in the status of the two species and their habitats, the human activities that affect them, the information available, and the technology of habitat restoration. Opportunities have been foreclosed and others have become available. Therefore, a designation of critical habitat that included only those areas proposed in 1985 and finalized in 1994, would not conform to the requirement of the Endangered Species Act to consider all of the best available scientific and commercial information in designation of critical habitat. In addition, there have been substantial changes in policy and court interpretations of critical habitat that require consideration of areas not included in the 1994 designations. The 1994 final rule recognized the need to add areas to the critical habitat designation. For the above reasons this alternative was not considered to be viable and will not be analyzed further.
- 2.4 Designation of the Entire Historical Ranges: After balancing the considerations involved in determining whether tribal lands should be included or excluded from designation as critical habitat, the Service determined that the benefits of promoting self-determination and allowing the tribes to develop conservation management on their lands, outweighed the benefits to be obtained from designating critical habitat for these two species. Exclusion of these lands from the designation will not result in extinction of either species. This alternative was removed from further consideration because we concluded that the action alternative of designating seven geographic complexes, totaling 1,448 km (898 mi) of rivers and creeks, was sufficient to provide for the survival and recovery of all of the

distinct genetic lineages of both species within all major segments of the historical range except for the Agua Fria sub-basin.

- 2.5 Designation of Only The Occupied Portions of Historical Range: Within the analysis of the designation of critical habitat, the Service reviewed whether any discrete portions of river, currently occupied by either species or not, should be deleted from the final designation. The Service believes the areas designated, occupied and unoccupied, are needed for the conservation of spikedace and loach minnow and that recovery of the species will require all of these areas. The designated areas form seven geographic complexes that provide for survival and recovery of each distinct genetic lineage of spikedace and loach minnow within all major segments of the historic range, with the exception of the Agua Fria River subbasin. Omission of any complex would result in loss of distinct genetic and geographic components of the species. Deletions within a complex would undermine the value of the complex due to needs for size, connectivity, and habitat and community diversity. It is important to avoid fragmentation of the critical habitat within the complexes, to the extent possible. In addition, activities on segments excluded from critical habitat will affect both upstream and downstream portions of the critical habitat. Following physical modification, a river channel usually undergoes a series of upstream and downstream adjustments to accommodate the change (Leopold *et al.* 1964, Rosgen 1995). Therefore, exclusion of areas internal to the complexes will substantially decrease the value of the remainder of the complex for conservation of spikedace and loach minnow. No viable alternative deleting portions of the critical habitat in the action alternative has been identified.
- 2.6 Development of Conservation Agreements: Development of conservation agreements with agencies and private land owners to gain similar protection to that which would have been provided by the designation of critical habitat, thereby precluding the need to designate critical habitat, were considered. To preclude the need for designation of critical habitat, conservation agreements would need to be negotiated with numerous agencies and landowners. The development of a multi-state, multi-agency, multi-watershed conservation agreement, involving multiple private landowners, would be problematic, at best and likely not feasible at all. This alternative was rejected.
- 2.7 Land Acquisition/Conservation Easements: Land acquisition and easements to protect habitat in lieu of designation of critical habitat were considered. The logistics and the cost of attempting to acquire land or obtain easements on 1,448 km (898 mi) of rivers and streams would be prohibitive. This alternative was rejected.

Critical Habitat Designation (justification and discussion applicable to the No Action Alternative and the Action Alternative)

In designating critical habitat for spikedace and loach minnow, Service biologists reviewed the overall approach to the conservation of the species since the species' listing in 1986.

Additionally, we solicited information from knowledgeable biologists and recommendations from the Desert Fishes Recovery Team. We also reviewed the available information pertaining to habitat requirements of the two species, including public comments and other material received during critical habitat proposals and previous designations.

We also considered the measures identified as necessary for recovery, as outlined in the species' recovery plans. Due to the need for additional information on the two species, habitats, threats, controllability of threats, restoration potentials, and other factors, no quantitative criteria for delisting spikedace and loach minnow were set forth in the recovery plans. However, the recovery plans recommend protection of existing populations, enhancement and restoration of habitats occupied by depleted populations, and reestablishment of the two species into selected streams within their historical ranges.

Both recovery plans recommend designation of critical habitat for all stream reaches proposed as critical habitat in 1985, plus consideration of additional stream reaches. Except for Eagle Creek, the recovery plans do not identify the specific stream reaches to be considered for critical habitat designation due to the lack of information to support such identifications available at that time. The recovery plans do identify potential areas for reestablishment of spikedace and loach minnow including the San Pedro River and its tributaries, the San Francisco River, Mescal Creek (a middle Gila River tributary), and Bonita Creek. The recovery plans also recommend evaluation and selection of other potential sites. Recovery Team discussions since 1991 identified the need for critical habitat designation in Hot Springs and Redfield canyons; Aravaipa, Eagle, Bonita, Beaver, West Clear, Campbell Blue, and Dry Blue creeks; and the Gila, Verde, San Pedro, San Francisco, Blue, Tularosa, and White rivers.

The designated critical habitat described below constitutes our best assessment of areas needed for the conservation of spikedace and loach minnow and is based on the best scientific and commercial information available. The designated areas are essential to the conservation of the species because they either currently support populations of spikedace and/or loach minnow, or because they currently have, or have the potential for developing, the necessary requirements for survival, growth, and reproduction of the spikedace and/or loach minnow (see description of primary constituent elements, below). All of the designated areas require special management consideration and protection to ensure their contribution to the species' recovery.

Because of these species' precarious status, mere stabilization of spikedace and loach minnow at their present levels will not achieve conservation. Recovery through protection and enhancement of the existing populations, plus reestablishment of populations in suitable areas of historical range, are necessary for their survival. The recovery plans for both species state, "One of the most critical goals to be achieved toward recovery is establishment of secure self-reproducing populations in habitats from which the species has been extirpated" (Service 1991a, 1991b). The Secretary of the Interior therefore determines that the unoccupied areas designated as critical habitat are essential for the conservation of the species.

Important considerations in selection of areas designated in this rule include factors specific to each geographic area or complex of areas, such as size, connectivity, and habitat diversity, as well as rangewide recovery considerations such as genetic diversity and representation of all major portions of the species' historical ranges. Designated critical habitat reflects the need for complexes of sufficient size to provide habitat for spikedace and/or loach minnow populations large enough to be self-sustaining over time, despite fluctuations in local conditions.

Each complex contains interconnected waters so that spikedace and loach minnow can move between areas, at least during certain flows or seasons. The ability of the fish to repopulate areas where they are depleted or extirpated is vital to recovery. Some complexes include stream reaches that do not have substantial spikedace- or loach minnow-specific habitat, but which provide migration corridors as well as play a vital role in the overall health of the aquatic ecosystem and, therefore, the integrity of upstream and downstream spikedace and loach minnow habitats. Each complex includes habitat with a moderate to high degree of complexity, thus providing suitable habitat for all life stages of spikedace and loach minnow under a wide range of habitat fluctuations.

The areas we selected for critical habitat designation include areas containing all known remaining genetic diversity within the two species, with the possible exception of the fish on certain tribal lands, which we believe are capable of persistence without critical habitat designation (see discussion under American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act later in this rule). Areas selected for critical habitat designation include a representation of each major subbasin in the historical ranges of the species.

The designation includes all currently known populations of spikedace and loach minnow, except those on tribal lands. Uncertainty on upstream and downstream distributional limits of some populations may result in small areas of occupied habitat being excluded from the designation. However, based on the best available scientific information, we believe the areas included in this designation will be sufficient to conserve both species.

For loach minnow, the designation includes at least one remnant population for each major subbasin except the Verde subbasin, from which it has been completely extirpated. For spikedace, no remnant populations exist in the Agua Fria, Salt, and San Francisco/Blue subbasins. In those subbasins where no populations of spikedace or loach minnow currently exist, designated critical habitat includes currently unoccupied areas for restoration of the species, with the exception of the Agua Fria subbasin where no suitable areas are known to remain.

The inclusion of both occupied and currently unoccupied areas in the designated critical habitat for spikedace and loach minnow is in accordance with section 3(5)(A)(i) of the Act, which provides that areas outside the geographical area currently occupied by the species may meet the definition of critical habitat upon a determination that they are essential for the conservation of the species. Both spikedace and loach minnow are in serious danger of extinction, and their status is

declining. In 1994, we determined that reclassification of spikedace and loach minnow from threatened to endangered was warranted; however, reclassification was precluded by other higher priority listing actions (59 FR 35303-35304). Although additional populations of loach minnow have been found since that time, they are small and their contribution to the status of the species is offset by declines in other populations. It is essential to protect all designated occupied areas as well as designated unoccupied areas that will provide habitat for reestablishment of the two species.

Both of the 1986 listing rules for spikedace and loach minnow conservatively estimated about 2,600 km (1,600 mi) of stream within the species' historical ranges. Using newer techniques, a more current estimate is approximately 3,000 km (1,800 mi). This critical habitat designation includes approximately half that amount for loach minnow and less than half for spikedace. Although this is less than the historical ranges for both species, we believe that maintenance of viable spikedace and loach minnow populations within the designated areas can achieve recovery of these species.

For each stream reach designated, the up- and downstream boundaries are described below. Critical habitat includes the stream channels within the identified stream reaches and areas within these reaches potentially inundated during high flow events. Where delineated, this will be the 100-year floodplain of the designated waterways as defined by the U.S. Army Corps of Engineers (COE). In areas where the 100-year floodplain has not been delineated or it is in dispute, the presence of alluvial soils (soils deposited by streams), obligate and facultative hydrophytic vegetation (requiring and usually occurring in wetlands, respectively), riparian vegetation, abandoned river channels, or known high water marks can be used to determine the extent of the floodplain. This proposal takes into account the naturally dynamic nature of riverine systems and recognizes that floodplains are an integral part of the stream ecosystem. A relatively intact floodplain, along with the periodic flooding in a relatively natural pattern, are important elements necessary for long-term survival and recovery of spikedace and loach minnow. Among other things, the floodplain and its wetland/riparian vegetation provides space for natural flooding patterns and latitude for necessary natural channel adjustments to maintain appropriate channel morphology and geometry, provides nutrient input and buffering from sediment and pollutants, stores water for slow release to maintain base flows, and provides protected side channels and other protected areas for larval and juvenile spikedace and loach minnow.

Within the delineated critical habitat boundaries, only lands containing, or which have the potential to develop, those habitat components that are essential for the primary biological needs of the species are considered critical habitat. Existing human-constructed features and structures within this area, such as buildings, roads, railroads, and other features, do not contain, and do not have the potential to develop, those habitat components and are not considered critical habitat.

Unless otherwise indicated, the following areas are designated as critical habitat for both spikedace and loach minnow (see the Regulation Promulgation section of this rule for exact descriptions of boundaries). The designation includes portions of 24 and 36 streams for spikedace

and loach minnow, respectively; however, individual streams are not isolated, but are connected with others to form areas or “complexes.” The complexes include those that currently support populations of the fishes, as well as some currently unoccupied by the species, but which are considered essential for reestablishing populations to achieve recovery. The distances and conversions below are approximate; more precise estimates are provided in the Regulation Promulgation section of this rule.

1. Verde River complex, Yavapai County, Arizona. The Verde River complex is currently occupied by spikedace. Its tributary streams are believed to be currently unoccupied by either species. The Verde River complex is unusual in that a relatively stable thermal and hydrologic regime is found in the upper river and in Fossil Creek. Also, spikedace in the Verde River are genetically (Tibbets 1993) and morphologically (Anderson and Hendrickson 1994) distinct from all other spikedace populations. The continuing presence of spikedace and the existence of suitable habitat create a high potential for restoration of loach minnow to the Verde system.

a. Verde River—171 km (106 mi) of river extending from the confluence with Fossil Creek upstream to Sullivan Dam, but excluding lands belonging to the Yavapai Apache Tribe. Sullivan Dam is at the upstream limit of perennial flow in the mainstem Verde River. Perennial flow results from a series of river-channel springs and from Granite Creek. Below Fossil Creek, the Verde River has a larger flow and was thought at the time of the proposal to offer little suitable habitat for spikedace or loach minnow. However, this is historical range for both species and comments from the U.S. Forest Service (USFS) indicate this stretch of the river may offer substantial value for spikedace and loach minnow recovery. We will seek further information regarding the role of this portion of the Verde River for the species and may consider its designation in future potential revisions of the critical habitat.

b. Fossil Creek—8 km (5 mi) of creek extending from the confluence with the Verde River upstream to the confluence with an unnamed tributary. The lower portion of Fossil Creek contains all elements of spikedace and loach minnow habitat at present, except sufficient discharge. Discharge is currently diverted for hydropower generation at the Childs/Irving Hydropower site. However, operators of the Childs/Irving Hydropower project have agreed to provide enhanced flows into lower Fossil Creek, although the amount of that flow restoration is still under negotiation.

c. West Clear Creek—12 km (7 mi) of creek extending from the confluence with the Verde River upstream to the confluence with Black Mountain Canyon. The lower portion of West Clear Creek was historically known to support the spikedace and contains suitable, although degraded, habitat for the fishes. Gradient and channel morphology changes above Black Mountain Canyon make the upstream area unsuitable for either species.

d. Beaver/Wet Beaver Creek—33 km (21 mi) of creek extending from the confluence with the Verde River upstream to the confluence with Casner Canyon. Beaver Creek, and its

upstream extension in Wet Beaver Creek, historically supported spikedace and loach minnow and contains suitable, although degraded, habitat. Above Casner Canyon, gradient and channel morphology changes make the stream unsuitable for either species.

e. Oak Creek—54 km (34 mi) of creek extending from the confluence with the Verde River upstream to the confluence with an unnamed tributary (near the Yavapai/Coconino County boundary). The lower portion of Oak Creek is part of the historical range of the two species and contains suitable, although degraded, habitat. Above the unnamed tributary, the creek becomes unsuitable for either species due to urban and suburban development and to increasing gradient and substrate size.

f. Granite Creek—2.3 km (1.4 mi) of creek extending from the confluence with the Verde River upstream to a spring. Below the spring, which supplies much of the base flow of Granite Creek, there is suitable habitat for loach minnow. As a perennial tributary of the upper Verde River, Granite Creek is considered an important expansion area for spikedace recovery.

2. Black River complex, Apache and Greenlee counties, Arizona. In response to comments received on the suitability of this complex, we have not designated any areas within the complex as critical habitat for spikedace. The basis for this deletion from the proposed rule is biological, given that spikedace are not known to historically occupy areas at this elevation. However, the data on maximum elevation for spikedace are not definitive and if information becomes available that differs from that currently available, the Black River complex may be reevaluated for spikedace critical habitat designation. The Salt River subbasin is a significant portion of spikedace historical range and has no existing population of spikedace. Large areas of the subbasin are unsuitable, either because of topography or because of reservoirs, stream channel alteration by humans, or overwhelming nonnative species populations.

The Salt River subbasin is a significant portion of loach minnow historical range, but loach minnow have been extirpated from all but a small portion in the Black and White rivers. As the only remaining population of loach minnow on public lands in the Salt River basin, the Black River complex is considered vital to survival and recovery of the species.

a. East Fork Black River— Loach minnow only: 8 km (5 mi) of river extending from the confluence with the West Fork Black River upstream to the confluence with Deer Creek. This area is occupied by loach minnow, although the downstream extent of the population is not well known. This population was only discovered in 1996.

b. North Fork of the East Fork Black River— Loach minnow only: 18 km (11 mi) of river extending from the confluence with Deer Creek upstream to the confluence with an unnamed tributary. This area is occupied by loach minnow, although the upstream portion of the population is not well known. Above the unnamed tributary, the river character makes it unsuitable for loach minnow.

c. Boneyard Creek– Loach minnow only: 2.3 km (1.4 mi) of creek extending from the confluence with the East Fork Black River upstream to the confluence with an unnamed tributary. Although no loach minnow have been found in Boneyard Creek, they are probably present based on the pattern of occupation of lower portions of small tributaries in other parts of the loach minnow range.

d. Coyote Creek– Loach minnow only: 3 km (2 mi) of creek extending from the confluence with the East Fork Black River upstream to the confluence with an unnamed tributary. Loach minnow are thought to use the lower portion of this creek as part of the population in the East Fork Black River.

e. West Fork Black River– Loach minnow only: 10 km (6 mi) of river extending from the confluence with the East Fork Black River upstream to the confluence with Hay Creek. Above Hay Creek, the gradient and channel morphology are unsuitable for loach minnow. The West Fork Black River is not known to be occupied by loach minnow at present. However, it is considered important for conservation of the Black River remnant of the Salt River subbasin population.

3. Tonto Creek complex, Gila County, Arizona. Spikedace are known to have occupied Tonto Creek, and loach minnow are presumed to have done so although no records exist. Suitable habitat still exists, although degradation has occurred due to watershed uses, water diversion, agriculture, roads, and nonnative species introduction. The presence of substantial areas of USFS lands make this one of the most promising areas for reestablishment of spikedace and loach minnow in the Salt River subbasin.

a. Tonto Creek– Spikedace: 47 km (29 mi) of creek extending from the confluence with Greenback Creek upstream to the confluence with Houston Creek. The influence of Roosevelt Lake below Greenback Creek, and gradient and substrate changes above Houston Creek, make the stream unsuitable for spikedace.

Loach minnow: 70 km (44 mi) of creek extending from the confluence with Greenback Creek upstream to the confluence with Haigler Creek. The influence of Roosevelt Lake above Greenback Creek and changes in channel morphology above Haigler Creek make those portions of the stream unsuitable for loach minnow.

b. Greenback Creek–14 km (8 mi) of creek extending from the confluence with Tonto Creek upstream to Lime Springs.

c. Rye Creek–2.1 km (1.3 mi) of creek extending from the confluence with Tonto Creek upstream to the confluence with Brady Canyon. This area of Rye Creek still supports a native fish community indicating high potential for spikedace and loach minnow reestablishment.

4. Middle Gila/Lower San Pedro/Aravaipa Creek complex, Pinal and Graham counties, Arizona. This complex is occupied by spikedace with its population status ranging from rare to common. Aravaipa Creek supports some of the best and most protected spikedace and loach minnow populations due to special use designations on Bureau of Land Management (BLM) land and to substantial ownership by The Nature Conservancy as well as planned construction of fish barriers to prevent invasion of nonnative fish species. Enhancement of downstream habitats in the San Pedro and Gila rivers would contribute substantially to recovery of these species.

a. Gila River—63 km (39 mi) of river extending from Ashurst-Hayden Dam upstream to the confluence with the San Pedro River. A small population of spikedace currently occupies this area. At Ashurst-Hayden Dam, all water is diverted into a canal. Above the confluence with the San Pedro River, flow in the Gila River is highly regulated by San Carlos Dam and becomes marginally suitable for either species. Below the confluence, the input of the San Pedro provides a sufficiently unregulated hydrograph which is a primary constituent element of loach minnow and spikedace critical habitat.

b. San Pedro River—21 km (13 mi) of river extending from the confluence with the Gila River upstream to the confluence with Aravaipa Creek. This area is currently occupied by spikedace. It provides an important connection between the existing population of loach minnow in Aravaipa Creek and the recovery habitat in the Gila River. Existing flow in the river comes primarily from surface and subsurface contributions from Aravaipa Creek.

c. Aravaipa Creek—45 km (28 mi) of creek extending from the confluence with the San Pedro River upstream to the confluence with Stowe Gulch. Aravaipa Creek supports a substantial population of spikedace and loach minnow. Stowe Gulch is the upstream limit of sufficient perennial flow for either species.

d. Turkey Creek—Loach minnow only: 4 km (3 mi) of creek extending from the confluence with Aravaipa Creek upstream to the confluence with Oak Grove Canyon. This creek is occupied by loach minnow. A substantial portion of the flow in Turkey Creek comes from the Oak Grove Canyon tributary.

e. Deer Creek—Loach minnow only: 4 km (3 mi) of creek extending from the confluence with Aravaipa Creek upstream to the boundary of the Aravaipa Wilderness. This stream is occupied by loach minnow. Suitable habitat extends to the Wilderness boundary.

5. Middle-Upper San Pedro River complex, Cochise, Graham, and Pima counties, Arizona. None of the habitat in this complex is currently occupied by spikedace or loach minnow. However, the San Pedro River is the type locality of spikedace, and this complex contains important restoration areas.

a. San Pedro River—74 km (46 mi) of river extending from the confluence with Alder Wash (near Redfield) upstream to the confluence with Ash Creek (near the Narrows). This middle portion of the river is expected to have increasing surface flow due to

restoration activities, including riparian and channel restoration, watershed improvements, and groundwater pumping reductions.

- b. Redfield Canyon—22 km (14 mi) of creek extending from the confluence with the San Pedro River upstream to the confluence with Sycamore Canyon. Above Sycamore Canyon, permanent water becomes too scarce, and the habitat becomes unsuitable.
- c. Hot Springs Canyon—19 km (12 mi) of creek extending from the confluence with the San Pedro River upstream to the confluence with Bass Canyon. Hot Springs Canyon is currently unoccupied but contains suitable habitat for restoration of spinedace and loach minnow.
- d. Bass Canyon—5 km (3 mi) of creek extending from the confluence with Hot Springs Canyon upstream to the confluence with Pine Canyon. Bass Canyon is an extension of the Hot Springs Canyon habitat.
- e. San Pedro River—60 km (37 mi) of river extending from the confluence with the Babocomari River upstream to the U.S./Mexico border. Although currently unoccupied, this area is identified in BLM (1993) planning documents as a restoration area for spinedace and loach minnow.

6. Gila Box/San Francisco River complex, Graham and Greenlee counties, Arizona and Catron County, New Mexico. The only spinedace population remaining in the complex is in Eagle Creek. Substantial restoration potential for spinedace exists in the remainder of the complex. This complex has the largest area of habitat suitable for spinedace restoration.

Most of this complex is occupied by loach minnow, although the status varies substantially from one portion to another. Only Bonita Creek, Little Blue Creek, and the Gila River are currently unoccupied. The Blue River system and adjacent portions of the San Francisco River is the longest stretch of occupied loach minnow habitat unbroken by large areas of unsuitable habitat. Management of Federal lands and resources in the Gila Box, Bonita Creek, and the Blue River are highly compatible with recovery goals, giving restoration of spinedace and loach minnow in this complex a high likelihood of success.

- a. Gila River—36 km (23 mi) of river extending from the Brown Canal diversion, at the head of the Safford Valley, upstream to the confluence with Owl Canyon, at the upper end of the Gila Box. The Gila Box is not known to currently support spinedace, but is considered to have a high potential for restoration of both species. Both above and below the Gila Box, the Gila River is highly modified by agriculture, diversions, and urban development.
- b. Bonita Creek—24 km (15 mi) of creek extending from the confluence with the Gila River upstream to the confluence with Martinez Wash. Bonita Creek has suitable habitat

for spikedace and loach minnow. Bonita Creek above Martinez Wash lies on the San Carlos Apache Reservation, which is excluded from this designation.

c. Eagle Creek—73 km (45 mi) of creek extending from the Phelps-Dodge Diversion Dam upstream to the confluence of Dry Prong and East Eagle creeks, but excluding lands of the San Carlos Apache Reservation. Because the creek repeatedly flows from private or USFS lands into the San Carlos Apache Reservation and back, it is difficult to separately calculate stream mileages on tribal lands. Therefore, the above mileage covers the entire stream segment and is not corrected for tribal exclusions. Eagle Creek supports a small population of spikedace. Below the Phelps-Dodge Diversion Dam the creek is often dry; however comments received on the proposed rule suggest the stretch of Eagle Creek below the dam may offer sufficient connective value and habitat value to justify its inclusion in critical habitat. This area may be considered for critical habitat in future revisions of this designation.

d. San Francisco River—Spikedace: 182 km (113 mi) of river extending from the confluence with the Gila River upstream to the confluence with the Tularosa River. Habitat above the Tularosa River does not appear suitable for spikedace. The San Francisco River was historically occupied by spikedace and is important habitat for restoration of the species.

Loach minnow: 203 km (126 mi) of river extending from the confluence with the Gila River upstream to the mouth of The Box, a canyon above the town of Reserve. Loach minnow in the San Francisco River vary from common to rare throughout the length of the river.

e. Tularosa River—Loach minnow only: 30 km (19 mi) of river extending from the confluence with the San Francisco River upstream to the town of Cruzville. Above Cruzville, the habitat becomes unsuitable.

f. Negrito Creek—Loach minnow only: 7 km (4 mi) of creek extending from the confluence with the San Francisco River upstream to the confluence with Cerco Canyon. Above this area, gradient and channel morphology make the creek unsuitable for loach minnow.

g. Whitewater Creek—Loach minnow only: 2 km (1 mi) of creek extending from the confluence with the San Francisco River upstream to the confluence with Little Whitewater Creek. Upstream gradient and channel changes make the portion above Little Whitewater Creek unsuitable for loach minnow.

h. Blue River—82 km (51 mi) of river extending from the confluence with the San Francisco River upstream to the confluence of Campbell Blue and Dry Blue creeks. The Blue River is not currently occupied by spikedace, but planning among several State and Federal agencies for restoration of native fishes in the Blue River is under way.

i. Campbell Blue Creek—13 km (8 mi) of creek extending from the confluence of Dry Blue and Campbell Blue creeks upstream to the confluence with Coleman Canyon. Above Coleman Canyon, the creek changes and becomes steeper and rockier, making it unsuitable for spikedace or loach minnow.

j. Dry Blue Creek—Loach minnow only: 5 km (3 mi) of creek extending from the confluence with Campbell Blue Creek upstream to the confluence with Pace Creek.

k. Pace Creek—Loach minnow only: 1.2 km (0.8 mi) of creek extending from the confluence with Dry Blue Creek upstream to a barrier falls.

l. Frieborn Creek—Loach minnow only: 1.8 km (1.1 mi) of creek extending from the confluence with Dry Blue Creek upstream to an unnamed tributary.

m. Little Blue Creek—5 km (3 mi) of creek extending from the confluence with the Blue River upstream to the mouth of a box canyon. Little Blue Creek is not currently occupied by spikedace or loach minnow, but contains suitable habitat and is considered an important restoration area for both species.

7. Upper Gila River complex, Grant, Catron, and Hidalgo counties, New Mexico. This complex is occupied throughout by loach minnow and contains the largest remaining population of spikedace. It is considered to represent the "core" of what remains of the species. Because of the remoteness of the area, there is a relatively low degree of habitat threats.

a. Gila River—164 km (102 mi) of river extending from the confluence with Moore Canyon (near the Arizona/New Mexico border) upstream to the confluence of the East and West Forks. Spikedace and loach minnow are known to occupy the river into the Duncan-Virden Valley (Rinne 1999b).

b. East Fork Gila River—42 km (26 mi) of river extending from the confluence with the West Fork Gila River upstream to the confluence of Beaver and Taylor creeks.

c. Middle Fork Gila River—

Spikedace: 12 km (8 mi) of river extending from the confluence with the West Fork Gila River upstream to the confluence with Big Bear Canyon.

Loach minnow: 19 km (12 mi) of river extending from the confluence with the West Fork Gila River upstream to the confluence with Brothers West Canyon

d. West Fork Gila River—12 km (8 mi) of river extending from the confluence with the East Fork Gila River upstream to the confluence with EE Canyon. This lower portion of the West Fork is occupied by spikedace and loach minnow, but the river becomes unsuitable above EE Canyon due to gradient and channel morphology.

Primary Constituent Elements

The habitat features (primary constituent elements) that provide for the physiological, behavioral, and ecological requirements essential for the conservation of a species are described at 50 CFR 424.12 and include, but are not limited to, the following:

- Space for individual and population growth, and for normal behavior;
- Food, water, or other nutritional or physiological requirements;
- Cover or shelter;
- Sites for breeding, reproduction, or rearing of offspring; and
- Habitats that are protected from disturbance or are representative of the historical geographical and ecological distributions of a species.

Spikedace:

We determined the primary constituent elements for spikedace from studies on their habitat requirements and population biology including, but not limited to, Barber et al. 1970; Minckley 1973; Anderson 1978; Barber and Minckley 1983; Turner and Taffanelli 1983; Barrett et al. 1985; Propst et al. 1986; Service 1989; Hardy et al. 1990; Douglas et al. 1994; Stefferud and Rinne 1996; Velasco 1997. These primary constituent elements include:

- Permanent, flowing, unpolluted water;
- Living areas for adult spikedace with slow to swift flow velocities in shallow water with 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 downstream riffle edges;
- Living areas for juvenile spikedace with slow to moderate flow velocities in shallow water with moderate amounts of instream cover;
- Living areas for larval spikedace with slow to moderate flow velocities in shallow water with abundant instream cover;
- Sand, gravel, and cobble substrates with low to moderate amounts of fine sediment and substrate embeddedness;
- Pool, riffle, run, and backwater components present in the aquatic habitat;
- Low stream gradient;
- Water temperatures in the approximate range of 1-30°C (35-85°F), with natural diurnal and seasonal variation;
- Abundant aquatic insect food base;
- Periodic natural flooding;
- A natural, unregulated hydrograph or, if the flows are modified or regulated, then a hydrograph that demonstrates an ability to support a native fish community; and
- Habitat devoid of nonnative aquatic species detrimental to spikedace, or habitat in which detrimental nonnative species are at levels which allow persistence of spikedace.

The areas we are designating as critical habitat for spikedace provide the above primary constituent elements or will be capable, with restoration or removal of detrimental nonnative species, of providing them. All of the designated areas require special management considerations or protection to ensure their contribution to the species' recovery.

Loach minnow:

We determined the primary constituent elements for loach minnow from studies on their habitat requirements and population biology including, but not limited to, Barber and Minckley 1966; Minckley 1973; Schreiber 1978; Britt 1982; Turner and Taffanelli 1983; Service 1988; Rinne 1989; Hardy et al. 1990; Vives and Minckley 1990; Propst and Bestgen 1991; Douglas et al. 1994; Velasco 1997. These primary constituent elements include:

- Permanent, flowing, unpolluted water;
- Living areas for adult loach minnow with moderate to swift flow velocities in shallow water with gravel, cobble, and rubble substrates;
- Living areas for juvenile loach minnow with moderate to swift flow velocities in shallow water with sand, gravel, cobble, and rubble substrates;
- Living areas for larval loach minnow with slow to moderate velocities in shallow water with sand, gravel, and cobble substrates and abundant instream cover;
- Spawning areas for loach minnow with slow to swift flow velocities in shallow water with uncemented cobble and rubble substrate;
- Low amounts of fine sediment and substrate embeddedness;
- Riffle, run, and backwater components present in the aquatic habitat;
- Low to moderate stream gradient;
- Water temperatures in the approximate range of 1-30°C (35-85°F), with natural diurnal and seasonal variation;
- Abundant aquatic insect food base;
- Periodic natural flooding;
- A natural unregulated hydrograph or, if flows are modified or regulated, then a hydrograph that demonstrates an ability to support a native fish community; and
- Habitat devoid of nonnative aquatic species detrimental to loach minnow, or habitat in which detrimental nonnative species are at levels which allow persistence of loach minnow.

The areas we are designating as critical habitat for loach minnow provide the above primary constituent elements or will be capable, with restoration or removal of detrimental nonnative species, of providing them. All of the designated areas require special management considerations or protection to ensure their contribution to the species' recovery.

3.0 Description of the Affected Environment

3.1 Physical Environment

The Gila River basin encompasses approximately 160,000 square kilometers (60,000 square miles) in the southwestern portion of New Mexico and the southern half of Arizona. The Gila River begins along the continental divide and flows in a southwesterly direction to enter the Colorado River near the U.S. border with Mexico. There are a number of major tributaries (subbasins) including the San Francisco, Salt, Verde, San Simon, San Pedro, Santa Cruz, Agua Fria and Hassayampa. Along its length the Gila River and its tributaries flow from subalpine coniferous forests to Sonoran desert scrub (Brown 1994). Rainfall varies greatly from the upper portion of the basin to the lower, but the area is in general hot and arid with a biseasonal (winter-summer) precipitation pattern. Hydrograph patterns in the upper reaches reflect snowmelt, but the overall pattern for the basin is based on precipitation events. Stream flow is flashy and the two-year flood event is usually over an order of magnitude greater than the base flow.

Geology and topography varies greatly along the stream reaches in critical habitat designated for spikedace and loach minnow. All of the reaches proposed include canyon areas as well as valleys with broad floodplains. Primary unifying factors are low gradient and moderate sized substrate. Stream flows (discharge) vary from very small in tributaries such as Pace Creek in the upper Blue River subbasin, to moderate in the middle Gila River with a mean discharge of 15 cubic meters per second (538 cubic feet per second).

3.2 Biological Environment

Riparian vegetation along the designated streams is primarily cottonwood (*Populus fremontii* and *angustifolia*) and willow (*Salix* sp.). At higher elevations there is also extensive alder (*Alnus oblongifolia*) and boxelder (*Acer negundo*), at middle elevations sycamore (*Platanus wrightii*), velvet ash (*Fraxinus pennsylvanica*), and walnut (*Juglans major*) are major components, and at lower elevations mesquite (*Prosopis juliflora*), seepwillow (*Baccharis* sp.), and hackberry (*Celtis reticulata*) are prominent.

The native fish community is an important component of the biological environment of the critical habitat areas. While the native fish fauna of the Gila River basin originally included 17 species, one of those is extinct and several have become extirpated from the basin. Remaining or reestablished native species in the areas designated range from two to eight and include spikedace, loach minnow, desert sucker (*Pantosteus [Catostomus] clarki*), Sonora sucker (*Catostomus insignis*), razorback sucker (*Xyrauchen texanus*), roundtail chub (*Gila robusta*), speckled dace (*Rhinichthys osculus*), and longfin dace (*Agosia chrysogaster*).

There are a number of other endangered and threatened species in critical habitat for spikedace and loach minnow. The endangered razorback sucker has been stocked into the Gila Box, lower San Francisco River, Blue and Verde rivers, and Eagle and Bonita creeks. Critical habitat for razorback sucker includes the Gila River and its 100-year floodplain from the Arizona/New Mexico border downstream to San Carlos Lake, including the Gila Box, which is part of this designation. It also includes the Verde River and its 100-year floodplain from Perkinsville to

Horseshoe Reservoir. The endangered Colorado squawfish (*Ptychocheilus lucius*) has also been stocked into the Verde River, but as an experimental nonessential population.

The endangered southwestern willow flycatcher (*Empidonax traillii extimus*) is found in many areas of the critical habitat for spinedace and loach minnow. Critical habitat for the flycatcher includes the San Pedro River from the Hereford Bridge to Benson and from Aguaja Canyon to the Gila River, a substantial overlap with the proposed designation for spinedace and loach minnow. Southwestern willow flycatcher critical habitat also includes other areas of the spinedace and loach minnow critical habitat, including the Verde River from the upper end of the Verde Valley to Horseshoe Reservoir, the lower portions of Beaver and West Clear creeks, the upper Gila River in the Cliff/Gila Valley, the East and West Forks of the Gila River, the upper Gila mainstem just below the Forks, and the San Francisco River from Frisco Hot Springs upstream to near the town of Luna, and the Tularosa River.

The endangered Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*) is found along the upper San Pedro River and has designated critical habitat from the Hereford Bridge to Benson, overlapping substantially with the critical habitat for spinedace and loach minnow. The endangered cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) inhabits the riparian areas along the San Pedro and middle Gila rivers. Critical habitat for the pygmy-owl is designated on the San Pedro River from Roble Canyon to the confluence with the Gila River and on the Gila River from the confluence with the San Pedro River to Florence.

The threatened bald eagle (*Haliaeetus leucocephalus*) nests along the Verde River and Tonto Creek, on the middle Gila River, and on the San Francisco River. Wintering bald eagles use most of the streams included in the proposed critical habitat designation for spinedace and loach minnow.

3.3 Human Environment

There is a wide diversity of human activities and land and water uses throughout the critical habitat areas. On the upper Gila, Verde, Blue, San Francisco, Tularosa, and Black rivers and their tributaries and Eagle and Tonto creeks, the predominant land ownership is National Forest. Uses of National Forest lands include timber harvest, grazing, recreation, roads, mining, and other activities. On the San Pedro and middle Gila rivers, and Aravaipa and Bonita Creek, the Bureau of Land Management is a primary manager. Livestock grazing, recreation, roads, and mining are major uses of those lands. On both National Forest and Bureau of Land Management managed lands there are also a number of special use areas designated that offer some level of protection to the streams from adverse impacts of human use. These include the Gila, Aravaipa, and Hellsgate Wildernesses, Blue Range Primitive Area, and Gila Box and San Pedro Riparian National Conservation Areas.

Private lands are scattered throughout the proposed designation with large areas of private land in the Cliff/Gila Valley on the upper Gila River, the Verde Valley on the Verde River, and the

middle and lower San Pedro River. Uses on the private lands are primarily agricultural, including livestock grazing, pasture, and irrigated cropland. Significant numbers of irrigation diversions exist in these areas. In the Verde Valley and upper San Pedro there is extensive urban and suburban development along the river. Small towns and small-lot residential and summer-home development exist in many other areas. Significant areas of land are owned by large mining companies, such as Phelps-Dodge Corporation and ASARCO, with concentrations in the Cliff-Gila Valley, the lower San Francisco River and Eagle Creek, and in the Winkleman area on the lower San Pedro and middle Gila rivers. Some of these lands are presently used for agriculture and water rights and others are used for large open-pit mining, milling, and tailings disposal. The Nature Conservancy also owns significant areas of land within the proposed designation, including on the upper Gila River, Aravaipa Creek, the San Pedro River, and the middle Verde River. The Nature Conservancy lands are managed for natural value with recreational use as a secondary activity.

Tribal lands exist in the vicinity of the critical habitat, but are not being proposed as critical habitat. The White Mountain Apache Reservation lies downstream from the Black River areas included in the proposal, as does the San Carlos Apache Reservation. Because of its sinuous course along the Reservation boundary, the portion of Eagle Creek designated lies upstream, downstream, and across the stream from Reservation lands. These reservation areas are primarily used for livestock grazing, fuelwood cutting, roads, and recreation. The Yavapai-Apache Indian Community have lands along the Verde River where critical habitat is proposed both upstream and downstream. Some of these lands are used for commercial purposes. The Gila River Indian Community is downstream from the area proposed on the middle Gila River and receives irrigation water via diversion from the river. About 200 allottees hold a small area of land on lower Aravaipa Creek, where critical habitat is assigned. Those lands are presently used only by dispersed public recreation, with the exception of a fish barrier that is being built by the Bureau of Reclamation under the terms of a 1994 biological opinion on the potential for the Central Arizona Project to introduce and spread nonnative aquatic species. Other Reservations that are located in the general area include the Yavapai-Prescott Tribe, Mohave-Apache Indian Tribe (Fort McDowell), and the Salt River Pima-Maricopa Indian Community. None of these have lands that will be affected by the designation.

Archaeological and historical resources are located throughout the area designated as critical habitat for spikedace and loach minnow. Notable areas are the Gila Cliff Dwellings National Monument on the West Fork Gila River, Tuzigoot National Monument on the Verde River, and Montezuma's Castle National Monument on Beaver Creek. However, there are numerous small sites scattered along most of the streams.

Water development and diversion occurs on lands of all ownership. Large water development is unusual in any of the designated areas because such development often precludes habitat for spikedace and loach minnow. The one exception is the middle Gila River below Coolidge Dam (San Carlos Lake). Although flow in this portion of the river is regulated by Coolidge Dam releases, the river still retains spikedace, presumably due to the ameliorating influence of the

unregulated hydrograph of the San Pedro River, which is a major contributor to flows in this reach. There are other major impoundments downstream from the critical habitat, but their adverse impacts are less than from upstream impoundments. Numerous small impoundments exist, such as Sullivan Lake on the upper Verde, which is a small mainstem stock tank located above the beginning of perennial flow in the Verde River and Wall Lake, a small recreational fishing reservoir on the upper East Fork Gila River. Irrigation diversions are located throughout the proposed critical habitat designation. Many, such as the diversions in the Verde Valley, the Phelps-Dodge diversion of Eagle Creek, the City of Safford diversion in Bonita Creek, the private hatchery diversion on the upper Blue River, and the diversions in the Pleasanton-Glenwood area on the San Francisco River, divert all stream flow completely during some seasons. Groundwater pumping is also a major threat to the surface flow of several of the rivers. In the San Pedro River, groundwater pumping in the Sierra Vista area is expected to completely remove surface flow in the river unless significant reduction in the existing cone of depression can be achieved (Rojo 1998) and groundwater pumping is a serious threat to surface flows in the upper and middle Verde rivers (Arizona Department of Water Resources 1994, Ewing *et al.* 1994).

4.0 Environmental Consequences

This section reviews the environmental consequences of designating critical habitat for spikedace and loach minnow under the action alternative and the environmental consequences of the no action alternative. The United States District Court for the District of New Mexico has ordered the Secretary of the Interior to issue a final determination for the designation of critical habitat for spikedace and loach minnow by April 21, 2000.

Regardless of which alternative is chosen, Federal agencies are required to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of the listed species, or destroy or adversely modify designated critical habitat in accordance with section 7(a)(2) of the Act. Activities that adversely modify critical habitat are defined as those actions that "appreciably diminish the value of critical habitat for both the survival and recovery" of the species (50 CFR 401.02). Activities that jeopardize a species are defined as those actions that "reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery" of the listed species (50 CFR 402.02). According to these definitions, activities that destroy or adversely modify critical habitat would ordinarily jeopardize the species. Therefore, designation of critical habitat has very rarely resulted in greater protection than that afforded under section 7 by the listing of a species. Section 7 consultations apply only to actions with Federal involvement (i.e., activities authorized, funded or conducted by Federal agencies), and do not affect activities strictly under State or private authority.

As required by NEPA, this document is in part intended to disclose the programmatic goals and objectives of the Act. These objectives include the protection of natural communities and ecosystems, the minimization of fragmentation and the promotion of the natural patterns and connectivity of wildlife habitats, the promotion of native species and the avoidance of the introduction of non-native species, the protection of rare and ecologically important species and

unique or sensitive environments, the maintenance of naturally occurring ecosystem processes and genetic and structural diversity, and the restoration of ecosystems, communities and the recovery of species.

A designation of critical habitat may in some cases provide some benefits to a species in that the designation may be helpful in alerting Federal agencies to situations when section 7 consultation is required. This may be particularly true in cases where the action would not result in direct mortality, injury or harm to individuals of a listed species (e.g., an action occurring within a critical habitat area when a species is not present). Another potential benefit is that critical habitat may help to focus Federal, State, and private conservation and management efforts. In practice, however, the designation of critical habitat for spinedace and loach minnow will effectively provide no additional benefits to the species because there are functioning program activities already alerting Federal agencies and the public of endangered species concerns. Since the two species were listed in 1986, there have been a number of consultations with the Forest Service, Army Corps of Engineers, and Reclamation. No additional restrictions are expected to result from the proposed critical habitat in presently occupied areas. In areas which do not currently contain spinedace or loach minnow, critical habitat designation may have some effect in that it will require Federal agencies to consult with us pursuant to section 7 of the Act, and thus will require them to insure their actions do not destroy or adversely modify critical habitat.

4.1 No Critical Habitat Designation (No Action Alternative)

In addition to examining the environmental consequences that would result from not designating critical habitat, this alternative may be used as a baseline for comparison to the action alternative (the proposed alternative).

4.1.1 Effects on Spinedace and Loach Minnow

The No Action alternative would have no significant impacts to spinedace or loach minnow in areas presently occupied by the species because the protections resulting from their listing in 1986 and the associated requirements of section 7 of the Act are already in place and are duplicative of protections associated with critical habitat designation. There may be some negative effect in unoccupied areas because the opportunity to avoid harm to the species' habitat and assist in its recovery via the section 7 consultation process may not occur, if agencies are unaware of the need to consult on unoccupied areas.

4.1.2 Effect on Fish, Wildlife and Plants

The No Action alternative would have no significant impacts to fish, wildlife or plants beyond those protections already in place as a result of listing of spinedace and loach minnow in 1986 and associated requirements of section 7 of the Act. There may be some negative effect in unoccupied areas because the opportunity to avoid harm to the species' habitat and assist in its recovery via

the section 7 consultation process may not occur, if agencies are unaware of the need to consult on unoccupied areas.

4.1.3 Recreational Impacts

The No Action alternative would have no impacts upon the continued use of the Gila River basin for camping, fishing, and swimming beyond those impacts upon recreational use already resulting from the 1986 listing of spikedace and loach minnow.

4.1.4 Water Management Impacts

The No Action alternative would have no impacts upon activities such as irrigation, water diversions and impoundments, flood control, waste water management or hydroelectric activities beyond those impacts upon water management already resulting from the 1986 listing of spikedace and loach minnow and associated requirements of section 7 of the Act.

4.1.5 Agricultural, Including Timber, Fuelwood, and Grazing Impacts

The No Action alternative would have no impacts upon agricultural activities beyond those already resulting from the listing of the 1986 listing of spikedace and loach minnow and the associated requirements of section 7 of the Act.

4.1.6 Socioeconomic Impacts

The No Action alternative would have no impacts to the economic vitality of existing businesses within the area, business districts, the local economy, tax revenues, public expenditures, or municipalities beyond those impacts already resulting from the 1986 listing of spikedace and loach minnow and the associated requirements of section 7 of the Act. This alternative would likewise have no social impacts in neighborhoods or on community cohesion.

4.2 Action Alternative (Proposed Action)

The proposed action is to finalize the designation of critical habitat as described in the final rule published in the Federal Register (XX FR XXXX, April ?, 2000). Critical habitat would include the 1,448 kilometers (898 miles) of stream channels within the identified stream reaches indicated below and areas within these reaches potentially inundated by high flow events. Critical habitat designation will require section 7 (ESA) consultation in both occupied and unoccupied areas.

4.2.1 Effects on Spikedace and Loach Minnow

Designation of critical habitat is not anticipated to result in discernible effects to spikedace and loach minnow in areas presently occupied by the species beyond protections afforded by the species' listing. The species' listing ensures that Federal agencies cannot manipulate the habitat of

the species to the point that the continued existence of spikedace and loach minnow is jeopardized. This prohibition also applies to their habitats and constituent elements that are included within the critical habitat designation. There may be some beneficial effect in unoccupied areas because of the opportunity to avoid harm to the species' habitat and assist in its recovery via the section 7 consultation process.

4.2.2 Effect on Fish, Wildlife and Plants

Designation of critical habitat in occupied areas is not anticipated to result in discernible effects on fish, wildlife, and plants beyond those protections resulting from the 1986 listing of spikedace and loach minnow and associated requirements of section 7 of the Act. The effects of listing and critical habitat together are, at a minimum, anticipated to be a lessening of threats to spikedace and loach minnow, at the maximum, the effects of listing and critical habitat together are anticipated to be restored health to the river ecosystem with concomitant recovery of the fish. There may be some beneficial effect in unoccupied areas because of the opportunity to avoid harm to the habitat of co-occurring species via protection of spikedace and loach minnow habitat through the section 7 consultation process.

4.2.3 Recreational Impacts

This alternative may have some level of impact on the continued use of the Gila River basin for camping, fishing, and swimming beyond those impacts upon recreational use already resulting from the 1986 listing of spikedace and loach minnow and associated requirements of section 7 of the Act. At this time, the best available information leads us to conclude that there will be some recreational impacts beyond those already associated with the species listing, primarily in presently unoccupied areas proposed as critical habitat. Some of these impacts may be positive, e.g., the protection and enhancement of recreational opportunities such as sport fishing; while others may be negative, e.g., restrictions on some recreational activities which increase siltation in streams. Although we are unable to reliably estimate the impacts to recreation, we do not expect them to be significant.

4.2.4 Water Management Impacts

Effects to water management within the project area were analyzed by comparing the conditions arising from the designation to those resulting from the No Action alternative. In our canvas of Federal agencies, we received no information to change our conclusion that there will be water management impacts beyond those already associated with the species listing, primarily in presently unoccupied areas proposed as critical habitat, but these impacts are not expected to be significant.

4.2.5 Agricultural, Including Timber, Fuelwood, and Grazing Impacts

From a geographic perspective, the landscape surrounding the critical habitat for spikedace and loach minnow is predominantly non-metropolitan. The possibility exists that private entities could be affected if Federal actions are curtailed by the designation of critical habitat. The best available information leads us to conclude that there will be agricultural impacts beyond those already associated with the species listing, primarily in presently unoccupied areas proposed as critical habitat. However, based upon our response from the Forest Service, because of management actions already taken for other purposes, the impact of critical habitat for spikedace and loach minnow, although unquantified, is expected to be small.

4.2.6 Socioeconomic Impacts

Effects to the social infrastructures and economy of the project area were analyzed by comparing the conditions arising from the designation to those resulting from the No Action alternative. The best available information leads us to conclude that there will be impacts beyond those already associated with the species listing, primarily in presently unoccupied areas proposed as critical habitat. However, while we are unable to reliably estimate those impacts, we expect that they will be small..

4.2.7 Direct and Indirect Effects

Designation of critical habitat in occupied areas is not anticipated to result in direct effects on the components, structures, and functioning of the Gila River ecosystem, or the aesthetic, historic, economic, social, and health resources of the area, beyond those effects resulting from the 1986 listing of spikedace and loach minnow and associated requirements of section 7 of the Act. However, at this time, the best available information leads us to conclude that there will be direct impacts beyond those already associated with the species listing, in presently unoccupied areas proposed as critical habitat.

Indirect effects of the designation that are reasonably foreseeable include focusing Federal, State, and private, conservation and management efforts, and alerting Federal agencies to situations requiring section 7 consultation. The possibility exists that private entities could be impacted if Federal actions are modified by the designation of critical habitat. While we are unable to reliably estimate those impacts, they are not expected to be significant.

4.2.8 Cumulative Impact

Designation of critical habitat for spikedace and loach minnow in presently occupied areas will have no incremental impact when added to other past, present, and reasonably foreseeable future actions within the watersheds comprising the Gila River basin. Development of the basin over the past century has changed and continues to modify the historic character of the rivers. Most rivers

in the basin are now controlled by dams and diverted and often depleted for irrigation and urban water supply.

In unoccupied areas there may be some impact on Federal or non-Federal actions. However, we expect this impact to be relatively small because in addition to spikedace and loach minnow, the subject of the proposed action, several listed and candidate species may occur in the action area. These include the endangered razorback sucker, southwestern willow flycatcher, cactus ferruginous pygmy-owl, Huachuca water umbel, and the threatened bald eagle. Federal agencies are required to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of the listed species, or destroy or adversely modify designated critical habitat in accordance with section 7(a)(2) of the Act. Activities that adversely modify critical habitat are defined as those actions that “appreciably diminish the value of critical habitat for both the survival and recovery” of the species (50 CFR 401.02). Activities that jeopardize a species are defined as those actions that “reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery” of the listed species (50 CFR 402.02). According to these definitions, activities that destroy or adversely modify critical habitat would ordinarily jeopardize the species. Therefore, designation of critical habitat has very rarely resulted in greater protection than that afforded under section 7 by the listing of a species. Section 7 consultations apply only to actions with Federal involvement (i.e., activities authorized, funded, or conducted by Federal agencies), and do not impact activities strictly under State or private authority.

In practice, the designation of critical habitat for spikedace and loach minnow will effectively provide no additional benefits to the species in presently occupied areas because there are functioning program activities already alerting Federal agencies and the public of endangered species concerns. However, there may be some benefits in unoccupied habitat.

5.0 Council on Environmental Quality Analysis of Significance

Under CEQ 40 CFR Part 1508.27, the determination of “significantly” requires consideration of both context and intensity.

5.1 Context: Based upon our responses from agencies and the public, although long-term, any effects will not be national, only regional and mostly local in context; and any that occur are expected to be small.

5.2 Intensity: Intensity is define by CEQ as referring to the severity of impact. The following ten points identified by CEQ were considered in evaluating intensity.

1. Both beneficial and adverse impacts may occur as a result of this designation; most are expected to be beneficial to the environment and any adverse societal impacts are expected to be small.

2. This designation will not have a discernable impact on human safety. For example, the BLM raised a question about whether or not this designation would cause delays in the City of Safford's ability to repair flood control damage to the city water supply in a timely manner. The ESA provides for emergency consultation in such cases, which allows repairs to proceed without delay.
3. Although several areas designated as critical habitat are in proximity to historic and cultural sites, parklands, farmland, wetlands, scenic rivers and ecologically critical areas, no major adverse impacts will occur to these areas; in fact, the wetlands, rivers and ecologically critical areas are expected to only benefit from this designation.
4. There is a private perception by some segments of the public that critical habitat designation will severely limit property rights; however, all projects in Arizona, that have undergone section 7 consultation under the ESA have gone forward, and critical habitat designation has no effect on private actions on private land that do not involve Federal approval or action. Therefore, we conclude that this correction of a mis-perception in the Final Rule and the results of future section consultations related to this action will result in this designation not being highly controversial.
5. The Service has designated critical habitat along many miles of streams in Arizona for other species in the recent past and we are familiar with the associated effects. Therefore, we do not anticipate that any effects to the human environment are highly uncertain nor do they involve any unique or unknown risks.
6. This designation of critical habitat is not expected to set any precedents for future actions with significant effects or represent a decision in principle about a future consideration because critical habitat has been designated in Arizona before for other species, as required by law, often along many of the same stream reaches involved in this designation.
7. This designation of critical habitat will be additive (cumulative) to critical habitat that has been, and will be, designated for other species. However, it is the Service's conclusion that the beneficial and adverse impacts of any and all critical habitat designations are small, and therefore insignificant, due to the existing impacts, both beneficial and adverse, already resulting from the listing of the species involved.
8. This designation will have no adverse effects to National Register of Historic Places or other cultural sites and it could possibly benefit historic sites near streams due to improvement of bankline stability resulting in erosion control.
9. All impacts from this designation of critical habitat are certain to be totally beneficial to endangered and threatened species, particularly the spinedace and the loach minnow.
10. This designation of critical habitat will not violate any Federal, state, or local laws or requirements imposed for the protection of the environment.

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