



Environmental Assessment for the Designation of Critical Habitat for the Spikedace and Loach Minnow



December 20, 2006

Prepared By:



LOGAN SIMPSON
DESIGN INC.

ENVIRONMENTAL ASSESSMENT

for the

DESIGNATION OF CRITICAL HABITAT

for the

SPIKEDACE and LOACH MINNOW

Prepared by
Logan Simpson Design Inc.

for the

Department of the Interior
United States Fish and Wildlife Service
Arizona Ecological Services Office
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021

December 20, 2006

THIS PAGE LEFT INTENTIONALLY BLANK

ENVIRONMENTAL ASSESSMENT FOR THE DESIGNATION OF CRITICAL HABITAT FOR THE SPIKEDACE AND LOACH MINNOW

December 20, 2006

Lead Agency:

Department of the Interior–United States Fish and Wildlife Service (USFWS)

Cooperating Agencies:

Arizona Game and Fish Department
New Mexico Department of Game and Fish

Contact Person:

Steve Spangle, Field Supervisor
United States Fish and Wildlife Service
Arizona Ecological Services Office
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021
602-242-2513 (fax)

Summary

The purpose of this environmental assessment (EA) is to identify and disclose the environmental consequences resulting from the Proposed Action of re-designating critical habitat for the spikedace (*Meda fulgida*) and loach minnow (*Tiaroga cobitis*), each species listed as threatened under the Endangered Species Act (ESA). The need for the Proposed Action is to comply with Section 4(b)(2) of the ESA to designate critical habitat for listed species. Three alternatives were considered: Alternative A, Proposed Rule with Exclusions; Alternative B, Proposed Rule without Exclusions; and the No Action Alternative. Alternative A would designate 522 miles of selected stream segments as critical habitat within Arizona and New Mexico. Under Alternative A, approximately 30 miles of stream segments on Tribal lands and potentially 18 miles of stream segments on private lands identified as critical habitat would be excluded from designation. The designation includes 10 stream segments for the spikedace and 23 stream segments for the loach minnow. Critical habitat includes the riverine ecosystem formed by the wetted channel and the adjacent floodplains within 300 lateral feet on either side of bankfull stage. This 300-foot width defines the lateral extent of each area of critical habitat that contains sufficient primary constituent elements to provide for one or more of the life history functions of the spikedace and loach minnow and was set to accommodate stream meandering and high flows. Streams are not isolated but are connected with other streams to form “complexes.” Five complexes have been identified for critical habitat designation. Under Alternative B, approximately 569 miles of stream segments are proposed for critical habitat designation, including those stream segments occurring on the White Mountain Apache, San Carlos Apache, and Yavapai Apache Tribal lands. The No Action Alternative is required by the National Environmental Policy Act (NEPA) for comparison to the other alternative analyzed in the EA.

The environmental issues identified by federal agencies and the public during the initial public comment period and during resource analysis included concerns regarding the impacts of

critical habitat on water resources, wildland fire management, livestock grazing, vegetation, wildlife, recreation, land management and use, Tribal Trust resources, and environmental justice.

The designation for critical habitat for the spinedace and loach minnow would not have any direct impacts on the environment; designation is not expected to impose land use restrictions or prohibit land use activities. The exception may be those rare instances of adverse modification that could occur but that are not foreseeable. However, the action alternatives would (1) increase the number of additional Section 7 consultations for proposed projects within designated critical habitat, (2) maintain spinedace and loach minnow critical habitat primary constituent elements, (3) indirectly increase the likelihood of greater expenditures of time and federal funds of government agencies to develop measures to prevent both adverse effects and adverse modification to maintain critical habitat, and (4) indirectly increase the likelihood of greater expenditure of nonfederal funds by project proponents to complete Section 7 consultations and to develop reasonable and prudent alternatives (as a result of adverse modifications) to maintain or avoid the destruction or adverse modification of designated critical habitat.

TABLE OF CONTENTS

CHAPTER 1.0—PURPOSE OF AND NEED FOR ACTION.....	1
1.1 Introduction.....	1
1.2 Purpose of the Action	2
1.3 Need for Action.....	2
1.4 Background	2
1.4.1 Critical Habitat.....	2
1.4.2 Spikedace	6
1.4.3 Loach minnow.....	8
1.4.4 Current Status and Reasons for the Decline of the Spikedace and Loach Minnow	10
1.5 Permits Required for Implementation.....	10
1.6 Related Laws, Authorizations, and Plans.....	10
1.7 Issues and Concerns from Public Comments	11
1.7.1 Tribal Concerns.....	11
1.7.2 Need for Critical Habitat Designation.....	11
1.7.3 Structure of Critical Habitat Designation.....	12
1.7.4 Socioeconomics.....	12
1.8 Topics Analyzed in Detail in this Environmental Assessment.....	12
1.8.1 Mandatory Topics Dismissed from Detailed Analysis	12
1.9 Decision to be Made	13
CHAPTER 2.0—ALTERNATIVES, INCLUDING THE NO ACTION ALTERNATIVE	15
2.1 Development of Alternatives	15
2.1.1 No Action Alternative.....	15
2.1.2 Alternative A, Proposed Rule with Exclusions	15
2.1.3 Alternative B, Proposed Rule without Exclusions	16
2.2 Alternatives Considered But Not Advanced for Further Analysis.....	18
2.2.1 Development of Conservation Agreements	18
2.2.2 Land Acquisition or Conservation Easements	18
2.3 Comparison of Alternatives.....	18
2.4 Proposed Primary Constituent Elements	26
2.4.1 Proposed Critical Habitat Complexes and Stream Segments.....	28
CHAPTER 3.0—AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES... 44	
3.1 Introduction.....	44
3.1.1 Methodology	44
3.2 Water Resources.....	46
3.2.1 Existing Conditions.....	46
3.2.2 Environmental Consequences.....	49
3.3 Wetlands and Floodplains.....	51
3.3.1 Existing Conditions.....	51
3.3.2 Environmental Consequences.....	53

3.4	Natural Resources—Fish, Wildlife, Plants, and Biological Communities	54
3.4.1	Existing Conditions.....	54
3.4.2	Environmental Consequences.....	56
3.5	Land Use and Management.....	57
3.5.1	Existing Conditions.....	57
3.5.2	Environmental Consequences.....	58
3.6	Wildland Fire Management	59
3.6.1	Existing Conditions.....	59
3.6.2	Environmental Consequences.....	61
3.7	Recreation	63
3.7.1	Existing Conditions.....	63
3.7.2	Environmental Consequences.....	64
3.8	Socioeconomics	65
3.8.1	Existing Conditions.....	66
3.8.2	Environmental Consequences.....	71
3.9	Tribal Trust Resources	73
3.9.1	Existing Conditions.....	73
3.9.2	Environmental Consequences.....	76
3.10	Environmental Justice.....	80
3.10.1	Minority Populations.....	80
3.10.2	Low-income Populations	80
3.11	Cumulative Impacts	81
CHAPTER 4.0—ANALYSIS OF SIGNIFICANCE.....		83
CHAPTER 5.0—PREPARERS		85
CHAPTER 6.0—REFERENCES.....		86
Appendix A—Legal descriptions of proposed critical habitat for the spikedace and loach minnow.....		93

LIST OF FIGURES

Figure 1.	Simplified diagram of the ESA Section 7 process	4
Figure 2.	Spikedace.....	7
Figure 3.	Loach minnow	9
Figure 4.	Overview of proposed critical habitat complexes and stream segments.....	29
Figure 5.	Proposed critical habitat; Complex 1, Verde River Complex	30
Figure 6.	Proposed critical habitat; Complex 2, Black River Complex	31
Figure 7.	Proposed critical habitat; Complex 3, Middle Gila / Lower San Pedro / Aravaipa Creek Complex.....	32
Figure 8.	Proposed critical habitat; Complex 4, San Francisco and Blue Rivers Complex ...	33
Figure 9.	Proposed critical habitat; Complex 5, Upper Gila River Complex.....	34

LIST OF TABLES

Table 1.	Approximate proposed critical habitat stream miles (mi) and kilometers (km) by state and landowner for Alternative A.....	17
Table 2.	Areas determined to meet the definition of critical habitat for the spikedace and loach minnow and the areas excluded from the final critical habitat designation ...	17
Table 3.	Comparison of potential effect of spikedace and loach minnow proposed critical habitat designation alternatives	19
Table 4.	Proposed critical habitat complex information	42
Table 5.	Approximate proposed critical habitat in stream miles (mi) and kilometers (km) by state and land owner.....	57
Table 6.	Socioeconomic profile of counties containing critical habitat for the spikedace and loach minnow	66
Table 7	Number of establishments and employees by industry within counties containing spikedace and loach minnow proposed critical habitat (2006)	68
Table 8.	Annual payroll for selected industries within counties containing proposed critical habitat (\$ thousands [2003]).....	70
Table 9.	2000 population in the proposed action area and percent of total state population	80
Table 10.	Racial minority (nonwhite), American Indian, and Hispanic populations within the analysis area.....	81
Table 11.	2000 poverty levels with the analysis area.....	81

THIS PAGE LEFT INTENTIONALLY BLANK

CHAPTER 1.0—PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

The United States Department of the Interior (USDI), Fish and Wildlife Service (Service) has prepared this Environmental Assessment (EA) to analyze the potential effects on physical and biological resources and social and economic conditions that may result from the designation of critical habitat for the spokedace (*Meda fulgida*) and loach minnow (*Tiaroga cobitis*), each listed as threatened under the Endangered Species Act of 1973 (ESA), as amended. The proposed rule to designate critical habitat for the spokedace and loach minnow was published in the Federal Register December 20, 2005 (70 FR 75546).

This EA would be used by the Service to decide whether critical habitat would be designated as proposed, if the proposed action requires refinement, or if further analyses are needed through preparation of an Environmental Impact Statement. If the proposed action is selected as described or with minimal changes and no further environmental analyses are needed, a Finding of No Significant Impact (FONSI) would be prepared. This EA has been prepared pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA) as implemented by the Council on Environmental Quality (CEQ) regulations 40 Code of Federal Regulations (CFR) Part 1500 et seq. and USDI NEPA procedures.

The spokedace and loach minnow were listed as threatened under the ESA on July 1, 1986 (51 Federal Register [FR] 23769), and October 28, 1986 (51 FR 39458), respectively. Critical habitat designations for both the spokedace and loach minnow were finalized on March 8, 1994 (59 FR 10898 and 10906, respectively). That critical habitat designation was set aside by a court order on October 13, 1994. The court cited the

Service's failure to analyze the effects of critical habitat designation under NEPA. Therefore, the Service removed critical habitat designation for the spokedace and loach minnow on March 25, 1998 (63 FR 14378). On September 20, 1999, a court ordered the Service to complete critical habitat designation for the spokedace and loach minnow by February 17, 2000. On October 6, 1999, the court amended the September 20 decision requiring the Service to make a critical habitat determination rather than a designation. The Service published a proposed rule to designate critical habitat on December 10, 1999 (64 FR 69324). The court extended the deadline for completing critical habitat designation to April 21, 2000. The final rule on critical habitat designation for the spokedace and loach minnow was published on April 25, 2000 (65 FR 24327–24372). This designation was challenged because the economic analysis for critical habitat designation was held to be invalid by the Tenth Circuit Court. The Service agreed to voluntarily halt critical habitat designation, except for the Tonto Creek Complex. On August 31, 2004, the United States District Court for the District of New Mexico set aside the April 25, 2000, critical habitat designation in its entirety and remanded it to the Service for preparation of a new proposed and final designation.

Critical habitat was not designated when the spokedace and loach minnow were first listed because the Service needed additional time to collect and analyze information to determine impacts (65 FR 24329). Additionally, time was needed to collect and analyze economic data as required under Section 4(b)(2) of the ESA (65 FR 24329).

It is estimated that the spokedace has been eliminated from 85 to 90 percent of its historical range (65 FR 24328) and that the

loach minnow has been eliminated from 80 to 85 percent of its historical range (65 FR 24329). The primary threats for both species are habitat destruction and competition and predation from nonnative species, which have severely reduced the spikedeace's and loach minnow's range and abundance (65 FR 24328–24329). Recovery plans for the spikedeace and loach minnow were finalized in 1991 (Service 1991a, 1991b).

Designating critical habitat provides regulatory benefits to the spikedeace and loach minnow by identifying areas that contain the physical and biological features that are essential for the conservation of these species. This knowledge helps to focus conservation activities, helps to provide protection to areas where significant threats to the spikedeace and loach minnow have been identified, and helps to avoid accidental damage to such areas.

1.2 Purpose of the Action

Preservation of critical habitat for an endangered or threatened species is a crucial component of conservation. A primary purpose of the ESA is to “provide a means whereby the ecosystems upon which endangered species and threatened species may be conserved” (section 2[b]). The critical habitat provisions of the ESA are intended to provide protection of habitat that is essential to the conservation of the listed species. The purpose of this action is to designate critical habitat for the spikedeace and loach minnow, of which both are listed as threatened under the ESA. Critical habitat designation identifies geographic areas that have features essential for the conservation of these fish. It also describes those physical and biological features that constitute critical habitat (i.e., primary constituent elements).

1.3 Need for Action

Critical habitat designation for listed species is required by the ESA, except in very limited circumstances. Areas designated as critical habitat are subject to Section 7(a)(2) of the ESA, thereby requiring consultation of federal actions that may affect these areas in order to avoid destruction or adverse modification of this habitat. Most of the spikedeace's and loach minnow's habitat has been degraded or destroyed. Additional loss of habitat and further restriction of the spikedeace and loach minnow range would increase these species' vulnerability to catastrophic events, such as the introduction of nonnative predators or a prolonged period of low or no flow. It is important to note that only actions conducted by federal agencies or that require a federal permit or receive federal funding are subject to the requirement to consult as a result of a critical habitat designation. Private or state actions are not otherwise affected by the designation.

1.4 Background

1.4.1 Critical Habitat

1.4.1.1 Provisions of the ESA. Section 4(a)(3) of the ESA states that critical habitat shall be designated to the maximum extent prudent and determinable and that such designation may be revised periodically as appropriate. Section 4(b)(2) of the ESA requires that critical habitat designation be based on the best scientific information available and that economic and other impacts must be considered. Areas may be excluded from critical habitat designation if it is determined that the benefits of exclusion outweigh the benefits of inclusion, unless failure to include the areas in critical habitat would result in the extinction of the species.

In section 3(5)(A) of the ESA, critical habitat is defined as (i) the specific areas within the geographical area occupied by a

species, at the time it is listed in accordance with the provisions of Section 4 of the ESA, on which are found those physical or biological features (1) essential to the conservation of the species and (2) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by a species at the time it is listed in accordance with the provisions of Section 4 of the Act, upon the determination by the Secretary of the Interior that such areas are essential for the conservation of the species.

Section 3(5)(C) also states that critical habitat “shall not include the entire geographic area which can be occupied by the threatened or endangered species,” except when the Secretary of the Interior determines that the areas are essential for the conservation of the species.

1.4.1.2 Section 4(b)(2) Exclusion Process. Section 4(b)(2) of the ESA allows the Secretary of the Interior to exclude any area from the critical habitat designation after considering the economic, national security, or other relevant impacts of designating the area or if the Secretary determines that the benefit of excluding the area exceeds the benefit of designating it as critical habitat, unless the exclusion would result in the extinction of the species. After reviewing public comment on the critical habitat proposal on this EA and on the draft economic analysis, and after reviewing the final versions of this EA and the economic analysis, the Secretary could determine to exclude areas other than those addressed in this EA. This is as provided for in ESA section 4(b)(2) and in implementing regulations at 50 CFR Part 424.19.

1.4.1.3 Section 7 Consultation Process. Section 7(a)(2) of the ESA requires federal agencies to consult with the Service to “insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of

any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined to be critical.” Each agency is required to use the best scientific and commercial data available. This consultation process is typically referred to as *Section 7 consultation*. Section 7 of the ESA does not apply to state, local, or private land unless there is a federal nexus (i.e., federal funding, authorization, or permitting).

Designation of critical habitat can help focus conservation efforts by identifying areas that are essential for the conservation of the species. Designation of critical habitat also serves to alert the public and land-managing agencies to the importance of an area for conservation of a listed species. As described above, critical habitat receives protection from destruction or adverse modification through required consultation under Section 7 of the ESA. Aside from outcomes of consultation with the Service under Section 7, the ESA does not automatically impose any restrictions on lands designated as critical habitat.

The Section 7 consultation process begins with a determination of the effects on a listed species and designated critical habitat by a federal action agency (Figure 1). If the federal action agency determines that there would be no effect on listed species or designated critical habitat, then the Section 7 process concludes at that point. If the federal action agency determines that listed species or designated critical habitat may be affected, then consultation with the Service is initiated. Once it is determined that the proposed federal action may affect a listed species or critical habitat, the federal action agency and the Service typically enter into informal Section 7 consultation. Informal consultation is an optional process for identifying affected species and critical habitat, determining potential effects, and exploring ways to modify the action to remove or reduce

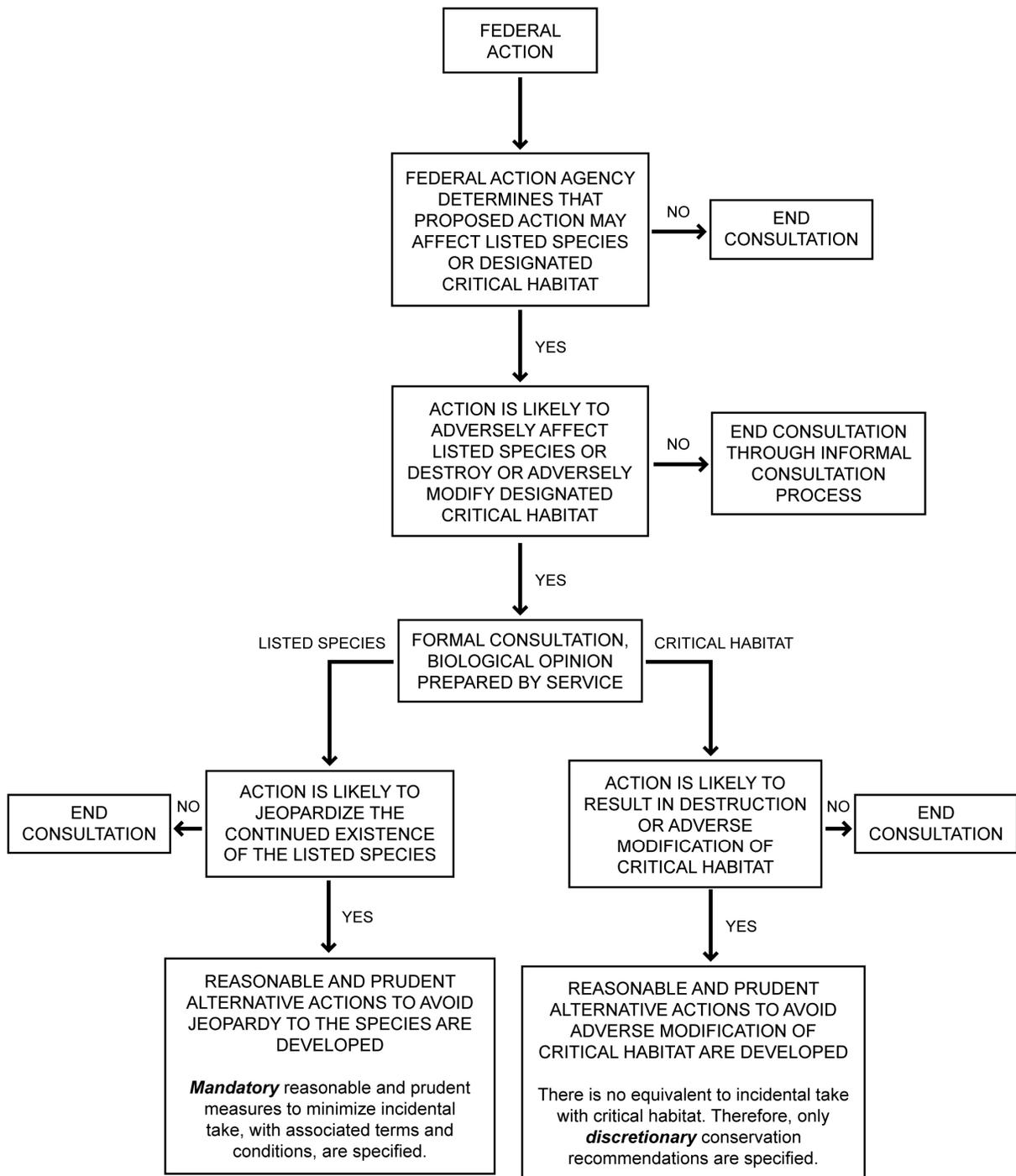


Figure 1. Simplified diagram of the ESA Section 7 process

adverse effects on listed species or critical habitat (50 CFR Part 402.13). During this process the Service may make suggestions concerning project modifications, which then can be adopted by the action agency. If the action agency decides to further modify the project as suggested by the Service, the Service would then concur in writing or recommend formal consultation. The informal Section 7 consultation process concludes in one of two ways: (1) the Service concurs in writing that the proposed action is not likely to adversely affect listed species or critical habitat or (2) the Service determines that adverse impacts are likely to occur. Formal consultation is initiated when it is determined that the proposed federal action is likely to adversely affect listed species or critical habitat (50 CFR Part 402.14). Formal consultation concludes with a biological opinion issued by the Service on whether the proposed federal action is likely to jeopardize the continued existence of a listed species or to destroy or adversely modify critical habitat (50 CFR Part 402.14[h]).

Independent analyses are made under both the jeopardy and the adverse modification standards. The jeopardy analysis evaluates potential impacts on the species, while the adverse modifications analysis specifically evaluates potential impacts on designated critical habitat. The Ninth Circuit Court recently determined that there is an additional difference between the two standards. In *Gifford Pinchot Task Force v. United States Fish and Wildlife Service*, 378 F.3d 1059 (9th Cir. 2004), the court held that while the jeopardy standard concerns the survival of a species or its risk of extinction, the adverse modification standard concerns the value of critical habitat for the recovery, or eventual delisting, of a species. As pointed out in the Ninth Circuit decision, survival of a species and recovery (or conservation) of a species are distinct concepts in the ESA. Implementation of the two standards,

therefore, involves separate and distinct analyses based on these concepts.

In light of the *Gifford Pinchot* decision, the Service no longer relies on the regulatory definition of “destruction or adverse modification” of critical habitat at 50 CFR 402.02. Instead, the Service relies on the statutory provisions of the Act to complete the analysis with respect to critical habitat. The potential for destruction or adverse modification of critical habitat by a federal action is assessed by determining the effects of the proposed federal action on primary constituent elements (PCEs) of habitat qualities that are essential to the conservation of the species. These anticipated effects are then analyzed to determine how they will influence the function and conservation role of the affected critical habitat. This analysis provides the basis for determining the significance of anticipated effects of the proposed federal action on critical habitat. The threshold for destruction or adverse modification is evaluated in the context of whether the critical habitat would remain functional to serve the intended conservation role for the species.

Critical habitat is defined in section 3(5)(A) of the ESA as those areas that are essential for conservation of the species, and the definition of conservation includes species recovery. In general, conservation and recovery of the spikedace and loach minnow will likely require sustaining existing populations, augmenting remnant or marginal aggregations of these species, and restoring these species to areas they formerly occupied. Thus, because the proposed critical habitat units are all occupied, the conservation value of proposed critical habitat for the spikedace and loach minnow would be to sustain or allow augmentation of existing populations. The threshold for destruction or adverse modification in proposed critical habitat units would likely be a reduction in the capability of the habitat to sustain existing populations or to allow augmentation of the

population. In other words, in determining adverse modification, the Service would analyze the current condition of the critical habitat unit, factors responsible for that condition, and the conservation role of the unit to maintain the quality of the PCEs and the existing spikedace and loach minnow populations.

A “nonjeopardy” or “no adverse modification” opinion concludes consultation, and the proposed action may proceed under the ESA. The Service may prepare an incidental take statement with reasonable and prudent measures alternatives to minimize take and associated, mandatory terms and conditions that describe the methods for accomplishing the reasonable and prudent measures alternatives. Discretionary conservation recommendations may be included in a biological opinion based on the effects on the species. Conservation recommendations, whether they relate to the jeopardy or adverse modification standard, are discretionary actions recommended by the Service. These recommendations may address minimizing adverse effects on listed species or critical habitat, identifying studies or monitoring, or suggesting how action agencies can assist species under their own authorities and Section 7(a)(1) of the ESA. There are no ESA Section 9 prohibitions for critical habitat. Therefore, a biological opinion that concludes no destruction or adverse modification of critical habitat may contain conservation recommendations but would not include an incidental take statement, reasonable and prudent alternatives, or other terms and conditions.

In a biological opinion that results in a jeopardy or adverse modification conclusion, the Service develops mandatory reasonable and prudent alternatives to the proposed action. Reasonable and prudent alternatives are actions that the federal agency can take to avoid jeopardizing the continued existence of the species or adversely modifying the

critical habitat. Reasonable and prudent alternatives may vary from minimal project changes to extensive redesign or relocation of the project, depending on the situations involved. Reasonable and prudent alternatives must be consistent with the intended purpose of the proposed action, and they also must be consistent with the scope of the federal agency’s legal authority. Furthermore, the reasonable and prudent alternatives must be economically and technically feasible. A biological opinion that results in a jeopardy finding, based on effects on the species, may also include an incidental take statement, reasonable and prudent measures alternatives, terms and conditions, and conservation recommendations. A biological opinion that results in an adverse modification finding (but no jeopardy to the species) may include reasonable and prudent alternatives and conservation recommendations but no incidental take statement or associated reasonable and prudent measures alternatives and terms and conditions.

1.4.2 Spikedace

The spikedace was first collected in 1851 from the San Pedro River in Arizona and was described from those specimens in 1856 by Girard. It is the only species in the genus *Meda*.

1.4.2.1 Description The spikedace is a small, slim stream-dwelling fish of the minnow family (Cyprinidae) (Figure 2). The body is slender and slightly compressed laterally. Scales are prominent only as small plates deeply imbedded in the skin. There are two spines at the leading edge of the dorsal fin—the first being obviously the strongest, sharp-pointed, and nearly as long as the second. The eyes and mouth are large. Coloration is bright silvery on the sides of the body, with vertically elongated, black specks. The back is olive-gray to brownish and usually mottled with darker pigment, and the underside is white. Males in breeding condition become brightly

golden or brassy, especially on the head and the base of the fins (Girard 1857; Miller and Hubbs 1960; and Minckley 1973).

several weeks between spawnings. Fecundity of individual females based on gonad examination ranges from 90 to

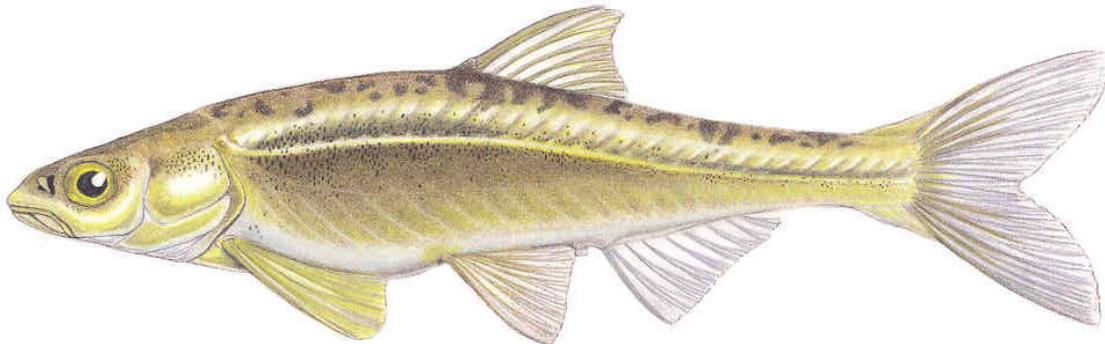


Figure 2. Spikedace

1.4.2.2 Habitat. Spikedace occupy flowing waters, usually less than a meter deep, and as adults often aggregate in shear zones along gravel-sand bars, quiet eddies on the downstream edge of riffles, and broad, shallow areas above gravel-sand bars (Rinne and Kroeger 1988). Smaller, younger fish are found in quiet water along pool margins over soft, fine-grained bottoms. In larger rivers (e.g., Salt River Canyon), spikedace often are in the vicinity of tributary mouths. The fish use shallower, strongly flowing areas in springtime, often over sandy-gravelly substrates. Specific habitat associations vary seasonally, geographically, and ontogenetically (Andersen 1978; Rinne 1986; Propst et al. 1986; Rinne and Kroeger 1988; Rinne 1991).

1.4.2.3 Life History. The spikedace spawn in spring (April–June) and breeding is apparently initiated in response to a combination of stream discharge and water temperature; timing varies annually and geographically (Andersen 1978; Barber et al. 1970; Propst et al. 1986). Males patrol in shallow, sandy-gravelly riffles where the current is moderate. There is no indication of territoriality, although males generally remain evenly spaced within an occupied area. Females may be fractional spawners, releasing only a few eggs at each spawn, with elapsed periods of a few days to

250 ova and is significantly correlated with both length and age. No specific information on incubation times or size at hatching is available (Service 1991a).

Spikedace are carnivores that feed mostly on aquatic and terrestrial insects within the stream drift (Anderson 1978; Barber and Minckley 1983; Propst et al. 1986). Kinds and quantities consumed vary with spatial and temporal availability of foods. Prey body size is small, typically ranging from 2 to 5 millimeters long. At times of emergence, all stages of benthic insects are consumed in large quantities. Other foods, including larval fishes, are occasionally eaten, but these constitute a minor component of the diet (Service 1991a; Schreiber 1978).

1.4.2.4 Distribution. The spikedace are small, stream dwelling fish endemic to the Gila River drainage of Arizona and New Mexico (Miller and Hubbs 1960; Minckley 1973). Historically, the spikedace were abundant in the San Pedro River in Arizona and probably occurred in that stream in Sonora, Mexico, as well, although they were never collected there (Miller and Winn 1951). Distribution in Arizona was widespread in large- and moderate-sized rivers and streams, including the Gila, Salt, and Verde rivers and their major tributaries upstream of the present Phoenix

metropolitan area, and the Agua Fria, San Pedro, and San Francisco river system (Minckley 1973; Rhode 1980). Populations transplanted from Aravaipa Creek into Sonoita Creek, Santa Cruz County, in 1968 and Seven-Springs Wash, Maricopa County, in 1970 have since been extirpated (Minckley and Brooks 1985). Distribution in New Mexico was in the San Francisco and the East, Middle, and West Forks Gila Rivers (Koster 1957; Propst et al. 1986; Sublette et al. 1990). There are no records for spikedace transplants in New Mexico.

Current distribution of the spikedace in Arizona occurs in Aravaipa Creek, tributary to the San Pedro River in Graham and Pinal counties; Eagle Creek, tributary to the Gila River in Graham and Greenlee counties; and upper Verde River in Yavapai County. Aravaipa Creek supports a moderate-sized, sustaining population in relatively undisturbed reaches. In New Mexico, the spikedace are now restricted to the mainstem of the Gila River and its East, Middle, and West forks; a few individuals may occur in the lowermost reaches of perennial tributaries (e.g., Duck and Mangas creeks in New Mexico).

Both distribution and abundance of spikedace have become dramatically reduced in the past century, with major changes occurring in recent decades (Minckley 1973, Propst et al. 1986). Major rivers and streams, such as lower reaches of the Gila, Salt, and Verde rivers that once supported substantial populations in several places have been recently depleted. Past changes in range and density likely occurred in response to natural spatial and temporal variations in the environment, but the current threatened status of spikedace appears a direct or indirect result of human activity.

1.4.3 Loach minnow

The loach minnow is an endemic species to the Gila River drainage of Arizona and New Mexico and Sonora, Mexico (Miller

and Winn 1951). The loach minnow was first collected in 1851 from the San Pedro River in Arizona and was described from those specimens in 1856 by Girard. It is the only species in the genus *Tiaroga*.

1.4.3.1 Description. The loach minnow is a small, stream-dwelling member of the minnow family (Cyprinidae) (Figure 3). It has an elongated, compressed body that is flattened ventrally. There are eight rays in the dorsal fin and seven in the anal fin. The lateral line has about 65 scales. The mouth is small, terminal, and highly oblique; there are no barbels. The upper lip is nonprotractile, attached to the snout by a broad fold of tissue (the frenum). Openings to the gills are restricted. Coloration of the body is an olivaceous background, highly blotched with darker pigment. Whitish spots are present at the base of the dorsal fin and ventral portions of the caudal fin base. Breeding males have bright red-orange coloration at the bases of the paired fins, on the adjacent body, on the base of the caudal lobe, about the mouth, near the upper portions of the gill openings, and often on the abdomen. Females in breeding become yellowish on the fins and lower body (Girard 1857; Miller and Hubbs 1960; Minckley 1973).

1.4.3.2 Habitat. The loach minnow is a bottom dweller of small to large perennial creeks and rivers, typically in shallow turbulent riffles with cobble substrate, swift currents, and, in some places, filamentous algae. It is generally found below 8,000 feet (2,438 meters) elevation. Recurrent flooding is instrumental in maintenance of quality habitat (Minckley 1973; Propst et al. 1988; Rinne 1989; Propst and Bestgen 1991).

1.4.3.3 Life History. Loach minnow first spawn at age 1 in late winter–early spring in Aravaipa Creek (Minckley 1973) and from late March into early June in New Mexico (Propst et al. 1988). Spawning is in the same riffles occupied by adults during

the nonreproductive season, where sex ratios appear approximately equal.

Adhesive eggs are deposited on the underside of flattened rocks and cavities usually open on the downstream side, while the upstream portion of the rock is embedded in the substrate. Fecundity of individual females ranges from about 150 to 250 ova and generally increases with increasing size (Minckley 1973).

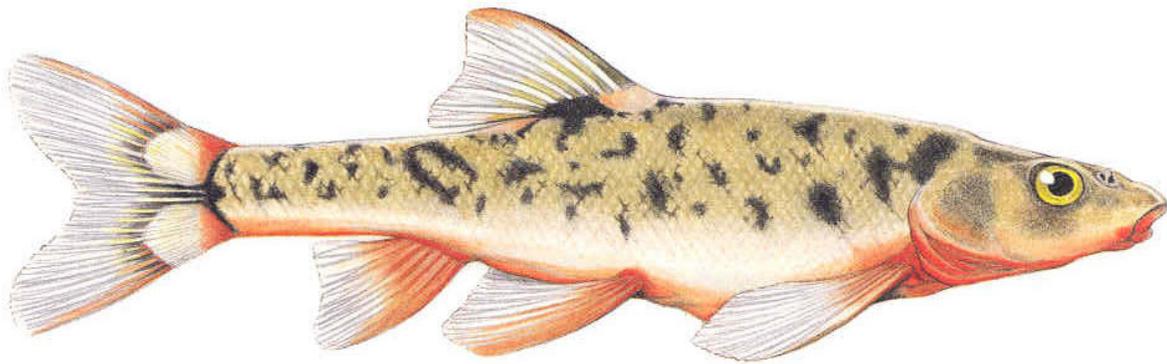


Figure 3. Loach minnow

Loach minnows are opportunistic, benthic insectivores, largely deriving their food supply from among riffle-dwelling larval insects. The array of food eaten is usually small compared with other stream fishes (Schreiber and Minckley 1981). Loach minnow support themselves on their pectoral fins on the stream bottom, swimming in short bursts from place to place (Minckley 1973). Feeding habits parallel seasonal changes in relative abundance and thus availability of riffle-inhabiting invertebrates (Schreiber 1978).

1.4.3.4 Distribution. Historically, the loach minnow was endemic to the Gila River basin of Arizona and New Mexico and Sonora, Mexico. Distribution in Arizona included the Salt River mainstream (limited to those areas at and upstream of Phoenix, Arizona), White River, East Fork White River, Verde River, Gila River, San Pedro River, Aravaipa Creek, San Francisco River, Blue River and Eagle Creek, plus major tributaries of larger streams

(Minckley 1973, 1981). Populations transplanted from Aravaipa Creek into Sonoita Creek, Santa Cruz County, Arizona, in 1968 and Seven-Springs Wash, Maricopa County, Arizona, in 1970 have since been extirpated (Minckley and Brooks 1985). Distribution in New Mexico included the Gila River, including the East, Middle, and West forks, San Francisco River, Tularosa River, Dry Blue Creek, Pace Creek, and Frieborn Creek; there

have been no recorded transplants of loach minnow in New Mexico (Desert Fishes Team 2003).

Currently, the loach minnow persists in Arizona in the East Fork Black River, North Fork East Fork Black River, and Boneyard Creek (Apache and Greenlee counties); East Fork White River (Navajo County); Aravaipa Creek (Graham and Pinal counties); San Francisco and Blue rivers; Eagle Creek; and Campbell Blue Creek (Greenlee County). Loach minnow are rare to uncommon in Arizona, except in Aravaipa Creek and the Blue River drainage (Minckley 1981; Montgomery 1985; Propst et al. 1985; Propst and Bestgen 1991).

In New Mexico, the species still may be found in the Upper Gila River and the East, Middle, and West forks of the Gila River (Grant and Catron counties); San Francisco and Tularosa rivers (Catron County); lowermost Whitewater Creek

(Catron County) and lowermost reach of Dry Blue Creek, Frieborn Creek, and Pace Creek (Catron County); and the upper Blue River and Negrito and Little Blue creeks (Catron County). From 1982–1985 the species was locally abundant in scattered reaches of these streams; populations were small in Whitewater and Dry Blue creeks (Propst et al. 1988; Sublette et al. 1990; Propst and Bestgen 1991). Existing populations of loach minnow are presumably producing and recruiting, but their potential for long-term stability is unknown.

1.4.4 Current Status and Reasons for the Decline of the Spikedace and Loach Minnow

Habitat destruction and competition from nonnative aquatic species have severely reduced the range and abundance of both fish species. The spikedace is now limited to approximately 289 mi (466 km) of stream in the upper part of the Gila River (Grant, Catron, and Hidalgo counties, New Mexico); middle Gila River (Pinal County, Arizona); Aravaipa Creek (Graham and Pinal counties, Arizona); Eagle Creek (Graham and Greenlee counties, Arizona); and the Verde River (Yavapai County, Arizona). The loach minnow is now restricted to approximately 419 mi (676 km) of stream in portions of the upper Gila River (Grant, Catron, and Hidalgo counties, New Mexico); the San Francisco and Tularosa River and their tributaries Negrito and Whitewater creeks (Catron County, New Mexico); the Blue River and its tributaries Dry Blue, Campbell Blue, Little Blue, Pace, and Frieborn creeks (Greenlee County, Arizona, and Catron County, New Mexico); Aravaipa Creek and its tributaries Turkey and Deer creeks (Graham and Pinal counties, Arizona); Eagle Creek (Graham and Greenlee counties, Arizona); the White River (Apache, Gila, and Navajo counties, Arizona); and the Black River (Apache and Greenlee counties, Arizona) (Bagley et al. 1998; Bagley et al. 1996; 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 for the spikedace is approximately 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. The present range for the loach minnow 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.

1.5 Permits Required for Implementation

No permits are required for critical habitat designation. Designation of critical habitat occurs through a rule-making process under the Administrative Procedures Act (5 United States Code 551–59, 701–06, 1305, 3105, 3344, 5372, 7521) and the ESA.

1.6 Related Laws, Authorizations, and Plans

Related provisions of the ESA require federal agencies to consult with the Service when there are potential effects to endangered or threatened species, independent of critical habitat. The ESA also prohibits any person from “taking” the species without a permit from the Service. Other federal laws address various aspects of conservations of fish and wildlife and their habitat, which apply to the spikedace and loach minnow. The Lacey Act (16 USC 3371 et seq.), as amended in 1982, prohibits the import, export, sale, receipt, acquisition, purchase, and engagement in

interstate or foreign commerce of any species taken, possessed, or sold in violation of any law, treaty, or regulation of the United States, and Tribal law, or any law or regulation of any state. The Federal Land Policy Management Act of 1976 (43 USC 1701 et seq.) and the National Forest Management Act of 1976 (16 USC 1600 et seq.) direct federal agencies to prepare programmatic-level management plans to guide long-term resource management decisions. In addition, the Forest Service (USFS) is required to manage habitat to maintain viable populations of existing native and desired nonnative vertebrate species in planning areas (36 CFR 219.19). These regulations have resulted in the preparation of a variety of land management plans by the USFS and the Bureau of Land Management (BLM) that address management and resource protection of areas that support, or in the past supported, populations of spikedace and loach minnow.

In addition, the Arizona Game and Fish Department (AGFD) considers these fish species as Wildlife of Special Concern in Arizona, and state regulations prohibit collection of or fishing for these fish in Arizona except under special permit. In New Mexico, the spikedace and loach minnow are listed as threatened, and collecting is prohibited by New Mexico law except by special permit (19 New Mexico Administrative Code 33.6.2).

1.7 Issues and Concerns from Public Comments

The following issues and concerns associated with designation of critical habitat were identified through comments received during the public comment period (December 20, 2005, to 21 February 21, 2006) for the proposed rule (70 FR 75546-75590).

1.7.1 Tribal Concerns

- The Tribes have stated that the Service is without authority to designate critical habitat on Tribal lands, and designation of critical habitat on Tribal lands is directly contrary to government-to-government relations.

1.7.2 Need for Critical Habitat Designation

- Many areas that have been disturbed over time, where industrial activity occurs, should be excluded from designated critical habitat due to the lack of PCEs.
- The Gila River, below the confluence with the San Pedro River, is not different than the river above the confluence and should be excluded as designated critical habitat.
- Critical habitat should not include the upper portion of the San Pedro River and the Verde River from Tapco Diversion Dam downstream because of nonnative fish presence and absence of both spikedace and loach minnow.
- The Gila River, from the San Pedro confluence down to the Ashurst-Hayden Dam, should be excluded from critical habitat designation because it has not been occupied by either fish species for the past 10 years.
- Critical habitat provides significant conservation benefits to listed species because it is an essential tool for species recovery.
- The Service's proposal to exclude Tribal lands from critical habitat violates the ESA and is not supported by the best available science.
- Critical habitat should include all areas designated as critical habitat in the 2000 final rule, plus a recently discovered population in New Mexico.
- The North Fork White River and the White River downstream to the confluence of the North and East Forks should be included in critical habitat designation.

1.7.3 Structure of Critical Habitat Designation

- Instead of designating a 300-foot zone, the Service should map specific areas with PCEs.
- The restriction of proposed critical habitat to currently occupied areas has no biological validity.
- Critical habitat should be amended to include the 100-year floodplain. The proposed 300-foot width is inadequate.
- All PCEs must be present in a stream reach in order for the habitat to be functional and designated as critical habitat.
- The 300-foot-width buffer on either side of the stream is an arbitrary delineation of essential habitat.

1.7.4 Socioeconomics

- Designation of critical habitat and species potential reintroductions would lead to undue restrictions on private landowners.
- Critical habitat designation would negatively affect residents of nearby local communities.
- The designation of critical habitat would reduce private property values.
- The designation of critical habitat would limit livestock grazing, logging, and mining activities.
- Including Riparian National Conservation Areas in proposed designated critical habitat could affect the economic viability of these lands.
- Designating critical habitat on Tribal lands would impose additional administrative costs resulting from Section 7 consultation.
- Designation of critical habitat has the potential to affect power generation, transmission, or distribution.

1.8 Topics Analyzed in Detail in this Environmental Assessment

Based on issues raised during the comment period for the proposed rule to designate critical habitat for the spikedace and loach minnow, as well as during internal scoping within the Service, several resources were identified as potentially affected by the proposed designation. These resources, which are analyzed in Chapter 3.0 of this EA, are as follows:

- Water Resources (including water management projects and groundwater pumping)
- Wetlands and Floodplains
- Fish, Wildlife, and Plants (including other special-status species)
- Land Management
- Wildland Fire Management
- Recreation (including sport fishing)
- Socioeconomics
- Livestock Grazing
- Tribal Trust Resources
- Environmental Justice

1.8.1 Mandatory Topics Dismissed from Detailed Analysis

Federal regulations (40 CFR 1500 et seq.) require that certain topics be addressed as part of a NEPA analysis. The Service reviewed the mandatory topics listed below and determined that the proposed action has no potential to affect them. These topics have been dismissed from detailed analysis in this document because designation of critical habitat for the spikedace and loach minnow is likely to have no or, at most, negligible effect on them.

- Energy requirements and conservation potential (1502.16). Additional Section 7 consultations resulting from critical habitat designation of the spikedace and loach minnow may require a very

small increase in energy consumption in the form of fuel for vehicles used for fence construction and other conservation actions. Relative to energy requirements for the overall management of the affected federal, state, and county lands, this increase is anticipated to be negligible.

- Natural or depletable resource requirements and conservation potential (1502.16). No natural or depletable resources (e.g., oil, gas, coal, or other minerals) would be lost as a result of designating critical habitat for the spikedace and loach minnow.
- Urban quality, and design of the built environment (1502.16). The proposed critical habitat segments are not located in urban or other built environments and would not affect the quality of such environments.
- Prime and unique agricultural lands (1508.27). Prime agricultural land is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. Unique agricultural land is defined as land other than prime farmland that is used for the production of specific high-value food and fiber crops (e.g., citrus, tree nuts, olive, cranberries, fruits, and vegetables). Proposed designated critical habitat areas include areas that are irrigated for croplands; however, these areas do not qualify as prime or unique agricultural lands. Therefore, no prime or unique agricultural lands are included within the proposed critical habitat segments.
- Important scientific, archeological, and other cultural resources, including historic properties listed in or eligible for the National Register of Historic Places (1508.27). The proposed designation would not

result in any ground-disturbing activities that have the potential to affect archeological or other cultural resources. Potential conservation measures to protect critical habitat PCEs also would not modify any historic properties listed in or eligible for the National Register of Historic Places.

- Ecologically critical areas, Wild and Scenic Rivers, or other unique natural resources (1508.27). Approximately 40.5 miles (65.2 km) of the Verde River were designated as Wild and Scenic in 1984. There are 22.2 miles (35.7 km) designated as Wild that are within proposed critical habitat; however, designation of critical habitat for the spikedace and loach minnow would not affect the outstanding and remarkable values of the Verde River. Additionally, the designation of critical habitat for the spikedace and loach minnow would not affect the eligibility of other streams for Wild and Scenic River status.
- Public health and safety (1508.27). These topics are not analyzed in detail in this EA because the potential for effects from designation of critical habitat are very small. Nonetheless a slight possibility exists that public safety issues may arise with effects on fire management and transportation. (see Section 3.6 Wildland Fire Management, and Section 3.8 Socioeconomics, in this document).

1.9 Decision to be Made

Critical habitat is designated in a federal rule-making process that includes publication of notices for the draft and final rule in the *Federal Register*. The draft rule notice solicits public comment. The final rule notice include responses to comments received. The decision to be made by the Assistant Secretary of the Department of

the Interior, is whether to designate critical habitat for the spikedace and loach minnow as described under Alternative A.

CHAPTER 2.0—ALTERNATIVES, INCLUDING THE NO ACTION ALTERNATIVE

2.1 Development of Alternatives

In developing the action alternatives, the Service based their decisions on the best scientific and commercial information available. The Service solicited information from knowledgeable biologists; considered recommendations contained in wildlife resource reports; and reviewed available literature pertaining to habitat requirements, historical distribution, and current localities of species (Minckley 1973; Rinne 1989; Minckley and Somerfeld 1979; Sublette et al. 1990; Rinne and Minckley 1991). The Service also took into account all comments received from agencies and the public on the proposed rule for designating critical habitat for the spikedace and loach minnow.

The Service developed three alternatives for impact analysis:

- No Action Alternative
- Alternative A, Proposed Rule with Exclusions
- Alternative B, Proposed Rule without Exclusions

The Service also considered additional alternatives that were not carried forward for further analysis. These are described later in Section 2.3 of this EA.

The Service has excluded areas from designation of critical habitat in other rules based on land use designation or land use plans. Areas excluded may include but are not limited to:

- approved Habitat Conservation Plans (HCP) that cover the species and provide assurances that the

- conservation measure for the species would be implemented and effective;
- draft HCPs that cover the species, have undergone public review and comment, and provide assurances that the conservation measures for the species would be implemented and effective;
- Tribal conservation plans that cover the species and provide assurances that the conservation measures for the species would be implemented and effective;
- state conservation plans that provide assurances that the conservation measures for the species would be implemented and effective;
- National Wildlife Refuge System Comprehensive Conservation Plans that provide assurances that the conservation measures for the species would be implemented and effective.

2.1.1 No Action Alternative

The No Action Alternative is defined as a decision to forego the designation of critical habitat for spikedace and loach minnow. This alternative describes the existing environment and consequences that are anticipated as a result of the current listing status of both species, without designation of critical habitat.

This alternative would have no substantial impacts beyond those impacts already existing as a result of 1986 listing of spikedace and loach minnow as threatened (51 FR 23769 and 51 FR 39468, respectively) and associated requirements of Section 7 of the ESA.

2.1.2 Alternative A, Proposed Rule with Exclusions

Under Alternative A the Service is proposing five complexes as critical habitat

for the spinedace and loach minnow (70 FR 75546). Approximately 522.2 miles (840.4 kilometers) of stream segments are proposed for critical habitat (Table 1). Approximately 30 miles of stream segments located on Tribal lands on the White Mountain Apache and San Carlos Apache reservations. The Service has addressed the possibility of excluding the lower portion of the Verde River downstream from the Prescott and Coconino forest boundary with private lands for economic reasons. The Service also received two management plans from Phelps Dodge (PDC) for an additional 18 miles of potential exclusions. Factors considered in identifying proposed critical habitat included features specific to each river system, such as size, and habitat diversity, as well as factors pertinent to rangewide recovery, such as genetic diversity and representation of the species' historical range. Individual complexes must be of sufficient size to provide habitat large enough for the spinedace and loach minnow to be self-sustaining over time, despite fluctuations in local conditions. Areas considered eligible for critical habitat designation must be within the historical range of the species and contain one or more of the PCEs identified in Section 2.2 of this document.

The proposed critical habitat includes the stream channel at bankfull width, plus 300 feet on either side of the banks. The bankfull width is the width of the stream or river at bankfull discharge, that is, the flow at which water begins to leave the channel and move into the floodplain.

Existing paved roads; bridges; railroad tracks and trestles; water control and diversion structures; water diversion canals outside of natural stream channels; active gravel pits; cultivated agricultural land; and residential, commercial, and industrial developments within the boundaries of delineated critical habitat are excluded from critical habitat. Such human-made features do not provide habitat or biological features essential to the conservation of the spinedace and loach minnow and generally would not contribute to the species' recovery.

2.1.3 Alternative B, Proposed Rule without Exclusions

Under this alternative the Service is proposing five complexes as critical habitat for the spinedace and loach minnow including those stream segments located on the White Mountain Apache, San Carlos Apache, and Yavapai Apache Tribal lands. Approximately 569 miles of stream segments would be included as critical habitat (Table 2). Factors considered in identifying proposed critical habitat are the same as those listed under Alternative A.

Table 1. Approximate proposed critical habitat stream miles (mi) and kilometers (km) by state and landowner for Alternative A

Land Owner	Arizona mi (km)	New Mexico mi (km)	TOTALS mi (km)
Federal	170.4 (274.2)	167.7 (269.9)	338.1 (544.1)
Private	90.2 (145.1)	82.5 (132.8)	172.7 (277.9)
State	8.0 (12.9)	1.3 (2.1)	9.3 (15)
County	0 (0)	0 (0)	0 (0)
Tribal	2.1 (3.4)	0 (0)	2.1 (3.4)
TOTALS	270.7 (435.6)	251.5 (404.8)	522.2 (840.4)

Table 2. Areas determined to meet the definition of critical habitat for the spikedace and loach minnow and the areas excluded from the final critical habitat designation

State	Meets Definition of Critical Habitat mi (km)	Proposed for Exclusion from Critical Habitat mi (km)
Arizona	373.7 (601.5)	103.1 (165.9)
New Mexico	258.8 (416.4)	7.3 (11.7)
TOTALS	632.5 (1017.9)	110.4 (177.6)

2.2 Alternatives Considered But Not Advanced for Further Analysis

2.2.1 Development of Conservation Agreements

Developing conservation agreements with agencies and private landowners to gain similar protection to that afforded by designation of critical habitat would preclude the need to designate critical habitat. Such conservation agreements, as noted in Section 2.4 of this EA, would have to be negotiated with numerous federal and state agencies, local governments, Native American Tribes, and private landowners in two states, and conservation efforts would have to be implemented or in progress. The development of a multistate, multiagency, multiwatershed conservation agreement(s) involving a large number of private landowners would be difficult to develop, costly to implement, and subject to litigation. No such efforts were underway during the proposed rule development nor are any proposed in the foreseeable future. It is unlikely that such a conservation agreement could be developed or implemented before the statutory time frame for completing the designation process or completing the NEPA process. Therefore, this alternative was rejected as impractical.

2.2.2 Land Acquisition or Conservation Easements

The time required and the cost of acquiring lands in fee title or obtaining conservation easements for approximately 569 mi (916 km) of streams would exceed the time and current funding available for this action. Therefore, this alternative was rejected as impractical.

2.3 Comparison of Alternatives

Table 3 summarizes the potential effects of the critical habitat designation alternatives. The existing environmental conditions and potential environmental consequences for designation of critical habitat for the spikedace and loach minnow is addressed in Chapter 3.0.

Table 3. Comparison of potential effect of spikedace and loach minnow proposed critical habitat designation alternatives

Resource	No Action Alternative	Alternative A	Alternative B
Water Resources	No impact beyond those conservation measures resulting from the listing of the spikedace and loach minnow and associated requirements of Section 7 ESA.	<ul style="list-style-type: none"> • Compared with No Action Alternative, a small, unknown increase in the number of new and reinitiated Section 7 consultations inclusive of associated outcomes and costs based on the presence of critical habitat. • Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species. • Minor adverse impacts, e.g., delays, increased project costs, for proposed or ongoing water management projects due to additional Section 7 consultations for critical habitat and resulting conservation measures (i.e., surveying, monitoring, implementation of Best Management Practices [BMPs]). • Minor beneficial impacts on water resources due to increased conservation measures to help conserve PCEs and natural stream hydrology and geomorphology. • Compared to Alternative B—Critical habitat considerations would not be incorporated into White Mountain Apache and San Carlos Apache tribal land Section 7 consultations conducted for water management projects. Potential effects would be analyzed under the jeopardy standard but not the adverse modification standard. • Tribal fish management plans cover spikedace and loach minnow habitat and provides assurances that the conservation measures will be implemented and effective. 	<ul style="list-style-type: none"> • Effects similar to Alternative A. Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species.
Wetlands and Floodplains	No impact beyond those conservation measures resulting from the listing of the	<ul style="list-style-type: none"> • Compared with No Action Alternative, a small, unknown increase in the number of new and reinitiated Section 7 consultations inclusive of associated outcomes and costs based on the presence of critical habitat. 	<ul style="list-style-type: none"> • Effects similar to Alternative A. Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedace and loach minnow in designated areas. The jeopardy standard may include

Table 3. Comparison of potential effect of spikedeace and loach minnow proposed critical habitat designation alternatives

Resource	No Action Alternative	Alternative A	Alternative B
Wetlands and Floodplains (continued)	spikedeace and loach minnow and associated requirements of Section 7, ESA.	<ul style="list-style-type: none"> • Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedeace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species. • Minor beneficial impacts on water resources due to increased conservation measures to help conserve PCEs and integrity of riparian ecosystems, including wetland and floodplain resources. • Compared with Alternative B—Critical habitat considerations would not be incorporated into White Mountain Apache and San Carlos Apache tribal land Section 7 consultations conducted for water management projects. Potential effects would be analyzed under the jeopardy standard but not the adverse modification standard. • Tribal fish management plans cover spikedeace and loach minnow habitat and provides assurances that the conservation measures will be implemented and effective. 	an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species.
Natural Resources - Fish, Wildlife, Plants, and Biological Communities	No impact beyond those conservation measures resulting from the listing of the spikedeace and loach minnow and associated requirements of Section 7, ESA.	<ul style="list-style-type: none"> • Compared with No Action Alternative, a small, unknown increase in the number of new and reinitiated Section 7 consultations inclusive of associated outcomes and costs based on the presence of critical habitat. • Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedeace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the 	• Effects similar to Alternative A. Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedeace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species.

Table 3. Comparison of potential effect of spikedace and loach minnow proposed critical habitat designation alternatives

Resource	No Action Alternative	Alternative A	Alternative B
<p>Natural Resources - Fish, Wildlife, Plants, and Biological Communities (continued)</p>		<p>ability of those designated areas to remain functional and serve the conservation role for the species.</p> <ul style="list-style-type: none"> • Minor beneficial impacts on native fish, wildlife and plants, including listed, proposed/candidate, and sensitive species due to increased conservation measures to help conserve PCEs and natural riparian and aquatic ecosystems. • Compared with Alternative B—Critical habitat considerations would not be incorporated into White Mountain Apache and San Carlos Apache tribal land Section 7 consultations conducted for water management projects. Potential effects would be analyzed under the jeopardy standard but not the adverse modification standard. • Tribal fish management plans cover spikedace and loach minnow habitat and provides assurances that the conservation measures will be implemented and effective. 	
<p>Land Use and Management</p>	<p>No impact beyond those conservation measures resulting from the listing of the spikedace and loach minnow and associated requirements of Section 7, ESA.</p>	<ul style="list-style-type: none"> • Compared with No Action Alternative, a small, unknown increase in the number of new and reinitiated Section 7 consultations inclusive of associated outcomes and costs based on the presence of critical habitat. • Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species. • Minor adverse impacts (e.g., delays, increased costs, project alterations to incorporate conservation features or actions) on proposed and ongoing land management projects due to additional Section 7 consultations for critical habitat (revising resource management plans, mapping, surveying, and monitoring of spikedace and loach minnow habitat). 	<ul style="list-style-type: none"> • Effects similar to Alternative A. Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether designated as critical habitat or not; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species.

Table 3. Comparison of potential effect of spikedace and loach minnow proposed critical habitat designation alternatives

Resource	No Action Alternative	Alternative A	Alternative B
Land Use and Management (continued)		<ul style="list-style-type: none"> • Compared with Alternative B—Critical habitat considerations would not be incorporated into White Mountain Apache and San Carlos Apache tribal land Section 7 consultations conducted for water management projects. Potential effects would be analyzed under the jeopardy standard but not the adverse modification standard. • Tribal fish management plans cover spikedace and loach minnow habitat and provides assurances that the conservation measures will be implemented and effective. 	
Wildland Fire Management	<p>No impact beyond those conservation measures resulting from the listing of the spikedace and loach minnow and associated requirements of Section 7, ESA.</p>	<ul style="list-style-type: none"> • Compared with No Action Alternative, a small, unknown increase in the number of new and reinitiated Section 7 consultations inclusive of associated outcomes and costs based on the presence of critical habitat. • Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species. • Negligible adverse impacts (e.g., delays, increased costs, project alterations) on proposed and ongoing fire management projects due to additional Section 7 consultations for critical habitat and resulting conservation measures (e.g., low- or minimum-impact practices, preclusion of herbicide applications). Potential delays would be mitigated by emergency Section 7 regulations for fire management that limit the delays allowed for completing consultations. • Compared with Alternative B—Critical habitat considerations would not be incorporated into White Mountain Apache and San Carlos Apache tribal land Section 7 consultations conducted for water management projects. Potential effects would be analyzed under the 	<ul style="list-style-type: none"> • Effects similar to Alternative A. Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species.

Table 3. Comparison of potential effect of spikedace and loach minnow proposed critical habitat designation alternatives

Resource	No Action Alternative	Alternative A	Alternative B
Wildland Fire Management (continued)		<p>jeopardy standard but not the adverse modification standard.</p> <ul style="list-style-type: none"> • Tribal fish management plans cover spikedace and loach minnow habitat and provides assurances that the conservation measures will be implemented and effective. 	
Recreation	<p>No impact beyond those conservation measures resulting from the listing of the spikedace and loach minnow and associated requirements of Section 7, ESA.</p>	<ul style="list-style-type: none"> • Compared with No Action Alternative, a small, unknown increase in the number of new and reinitiated Section 7 consultations inclusive of associated outcomes and costs based on the presence of critical habitat. • Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species. • Minor adverse impacts (e.g., delays, increased costs, project alterations to incorporate conservation features or actions) on recreation-related activities due to additional Section 7 consultations for critical habitat (e.g., limiting higher-impact activities such as OHV [off-highway vehicle] use and camping restrictions on constructing recreational facilities in or near critical habitat.) • Negligible beneficial impacts on recreational activities such as birding, wildlife viewing, photography, and day hiking due to increased conservation measures that help conserve PCEs and integrity of riparian ecosystems. • Compared with Alternative B—Critical habitat considerations would not be incorporated into White Mountain Apache and San Carlos Apache tribal land Section 7 consultations conducted for water management projects. Potential effects would be analyzed under the jeopardy standard but not the adverse modification standard. 	<ul style="list-style-type: none"> • Effects similar to Alternative A. Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether designated as critical habitat or not; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species.

Table 3. Comparison of potential effect of spikedace and loach minnow proposed critical habitat designation alternatives

Resource	No Action Alternative	Alternative A	Alternative B
Recreation (continued)		<ul style="list-style-type: none"> • Tribal fish management plans cover spikedace and loach minnow habitat and provide assurances that the conservation measures will be implemented and effective. 	
Socioeconomics	<p>No impact beyond those conservation measures resulting from the listing of the spikedace and loach minnow and associated requirements of Section 7, ESA.</p>	<ul style="list-style-type: none"> • Compared with No Action Alternative, a small, unknown increase in the number of new and reinitiated Section 7 consultations inclusive of associated outcomes and costs based on the presence of critical habitat. • Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species. • Minor adverse impacts (e.g., project delays, increased costs, project modifications to incorporate conservation features or actions) due to additional Section 7 consultations for critical habitat and resulting conservation measures. • Compared with Alternative B—Critical habitat considerations would not be incorporated into White Mountain Apache and San Carlos Apache tribal land Section 7 consultations conducted for water management projects. Potential effects would be analyzed under the jeopardy standard but not the adverse modification standard. • Tribal fish management plans covers spikedace and loach minnow habitat and provides assurances that the conservation measures will be implemented and effective. 	<ul style="list-style-type: none"> • Effects similar to Alternative A. Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spikedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species.

Table 3. Comparison of potential effect of spokedace and loach minnow proposed critical habitat designation alternatives

Resource	No Action Alternative	Alternative A	Alternative B
<p>Tribal Trust Resources</p>	<p>No impact beyond those conservation measures resulting from the listing of the spokedace and loach minnow and associated requirements of Section 7, ESA.</p>	<ul style="list-style-type: none"> • Compared with No Action Alternative, a small, unknown increase in the number of new and reinitiated Section 7 consultations inclusive of associated outcomes and costs based on the presence of critical habitat. • Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spokedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species. • Minor adverse impacts (e.g., increased costs) on Tribal trust resources due to additional Section 7 consultation for critical habitat and resulting conservation measures (e.g., fencing of critical habitat areas). • Minor beneficial impacts on Tribal trust resources due to increased conservation measures that help conserve PCEs and riparian ecosystem integrity. • Compared with Alternative B—Critical habitat considerations would not be incorporated into White Mountain Apache and San Carlos Apache tribal land Section 7 consultations conducted for water management projects. Potential effects would be analyzed under the jeopardy standard but not the adverse modification standard. • Tribal fish management plans cover spokedace and loach minnow habitat and provides assurances that the conservation measures will be implemented and effective. 	<ul style="list-style-type: none"> • Effects similar to Alternative A. Critical habitat designation will result in the addition of adverse modification analyses to the Section 7 consultation process for spokedace and loach minnow in designated areas. The jeopardy standard may include an evaluation of all habitats including migratory or temporary habitat, whether or not designated as critical habitat; however, the focus is on the relation to the actual species itself. The adverse modification determination is limited to the areas designated as critical habitat and instead must evaluate the ability of those designated areas to remain functional and serve the conservation role for the species.

Table 3. Comparison of potential effect of spikedace and loach minnow proposed critical habitat designation alternatives

Resource	No Action Alternative	Alternative A	Alternative B
Environmental Justice	No impact beyond those conservation measures resulting from the listing of the spikedace and loach minnow and associated requirements of Section 7, ESA.	<ul style="list-style-type: none"> Impacts to minority or low-income populations cannot be predicted due to lack of site-specific outcomes and impacts of Section 7 consultations for critical habitat. Further investigations would provide no useful information for evaluating the potential for disproportionate impacts on minority or low-income populations. 	<ul style="list-style-type: none"> Effect similar to Alternative A.

2.4 Proposed Primary Constituent Elements

The habitat features (PCEs) that provide for the physiological, behavioral, and ecological requirements essential for the conservation of a species are described in 50 CFR 424.14 and include 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 offspring;
- habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species

In considering the biological basis for determining critical habitat for the spikedace and loach minnow, the Service focused on the PCEs essential to the conservation of the species. These PCEs are interrelated in the life history of the spikedace and loach minnow and are identified in the proposed rule for critical habitat designation.

PCEs for the spikedace include the following:

1. Permanent flowing water with low levels of pollutants that includes
 - a. living areas for adult spikedace with slow to swift flow velocities between 8 and 24 inches (in)/second (20 and 60 centimeters (cm) per second) in shallow water between approximately 4 in (10 cm) to 40 in deep (1 meter [m]) with shear zones where rapid flow borders slower flow, areas of sheet flow (or smoother, less turbulent flow) at the upper ends of mid-channel sand-gravel bars, and eddies at downstream riffle edges;
 - b. living areas for juvenile spikedace with slow to moderate water velocities of approximately 8 in/second (18 cm/second) or higher in shallow water between approximately 1.2 in (3 cm) and 40 in deep (1 m);
 - c. living areas for larval spikedace with slow to moderate flow velocities of approximately 4 in/second (10 cm/second) or higher in shallow water approximately 1.2 in (3 cm) to 40 in deep (1 m);
 - d. water with low levels of pollutants such as copper, arsenic, mercury and cadmium; human and animal waste products; pesticides; suspended sediments; and gasoline

- or diesel fuels and with dissolved oxygen levels greater than 3 parts per million (ppm).
2. Sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness. Suitable levels of embeddedness are generally maintained by a natural, unregulated hydrograph that allows for periodic flooding or, if flows are modified or regulated, that allows for adequate river functions, such as flows capable of transporting sediments.
 3. Streams that have
 - a. low gradients of less than approximately 1 percent;
 - b. water temperatures in the approximate range of 35–85° Fahrenheit (F) (1.7–29.4° Celsius [C]) (with natural diurnal and seasonal variation);
 - c. riffle, run, and backwater components;
 - d. an abundant aquatic insect food base consisting of mayflies, true flies, caddisflies, stoneflies, and dragonflies.
 4. Habitat devoid of nonnative fish species detrimental to spikedace, or habitat in which detrimental nonnative fish are at levels that allow persistence of spikedace.
 5. Areas within perennial, interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.

PCEs for the loach minnow include the following:

1. Permanent flowing water with low levels of pollutants that includes;
 - a. living areas for adult loach minnow with moderate to swift flow velocity between 9–32 in/second (24–80 cm/second) in shallow water between 1–30 in deep (3–75 cm) with gravel, cobble, and rubble substrates;
 - b. living areas for juvenile loach minnow with moderate to swift flow velocities between 1–34 in/second (3–85 cm/second) in shallow water between approximately 1 and 30 in deep (3–75 cm) with sand, gravel, cobble, and rubble substrates;
 - c. living areas for larval loach minnow with slow to moderate velocities between 3 and 20 in/second (9–50 cm/second) in shallow water with sand, gravel, and cobble substrates;
 - d. spawning areas with slow to swift flow velocities in shallow water where cobble and rubble and the spaces between them are not filled in by fine dirt or sand;
 - e. water with low levels of pollutants such as copper, arsenic, mercury and cadmium; human and animal waste products; pesticides; suspended sediments; and gasoline or diesel fuels and with dissolved oxygen levels greater than 3 ppm.
2. Sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness. Suitable levels of embeddedness are generally maintained by a natural, unregulated hydrograph that allows for periodic flooding or, if flows are modified or regulated, that allows for adequate river functions, such as flows capable of transporting sediments.
3. Streams that have
 - a. low gradients of less than approximately 2.5 percent;
 - b. water temperatures in the approximate range of 35–85°F (1.7–29.4°C) (with natural diurnal and seasonal variation);
 - c. riffle and run components;
 - d. an abundant aquatic insect food base consisting of mayflies, true flies, caddisflies, stoneflies, and dragonflies.
4. Habitat devoid of nonnative fish species detrimental to loach minnow, or habitat

in which detrimental nonnative fish are at levels that allow persistence of loach minnow.

5. Areas within perennial, interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.

The areas proposed for critical habitat for the spikedace and loach minnow provide at least one of the above PCEs. All the proposed areas require special management considerations or protection to ensure their contribution to the species' recovery.

2.4.1 Proposed Critical Habitat Complexes and Stream Segments

The Service is proposing five complexes as critical habitat for the spikedace and loach minnow. Historically, the range of the spikedace included most of the Gila River Basin. The spikedace now occupies approximately 10–15 percent of its historical range. Current populations of spikedace are found in Graham, Pinal, and Yavapai counties in Arizona and Grant, Catron, and Hidalgo counties in New Mexico. Critical habitat vital to the conservation of loach minnow includes small to large perennial streams with shallow, turbulent riffles, primarily cobble substrate, and swift currents (Minckley 1973; Propst and Bestgen 1991; Rinne 1989; Propst et al. 1988). As with spikedace, the historical range of the loach minnow encompassed most of the Gila

River Basin. The loach minnow now occupies approximately 15–20 percent of its historical range, and is found in Graham, Greenlee, and Pinal counties in Arizona and Catron, Grant, and Hidalgo counties in New Mexico.

Within the five complexes, 33 stream segments were proposed for designation as critical habitat for the spikedace (10) and the loach minnow (23). Figures 4–9 depict all five complexes and the critical habitat segments within them. Land ownership of the proposed critical habitat includes federal (USFS and BLM), state (Arizona), county (Pima County), Tribal (Yavapai Apache, San Carlos Apache and White Mountain Apache reservations), and private. The approximate length of the critical habitat by ownership is provided in Table 1.

The proposed critical habitat includes the stream channel at bankfull width, plus 300 feet on either side of the banks. The bankfull width is the width of the stream or river at bankfull discharge, that is, the flow at which water begins to leave the channel and move into the floodplain.

All the proposed stream segments are considered essential for reestablishing populations to achieve recovery of the species. Every stream segment contains one or more of the PCEs listed in Section 2.4 of this document. For each stream segment, the upstream and downstream boundaries and landownership are described in Appendix A of this document.

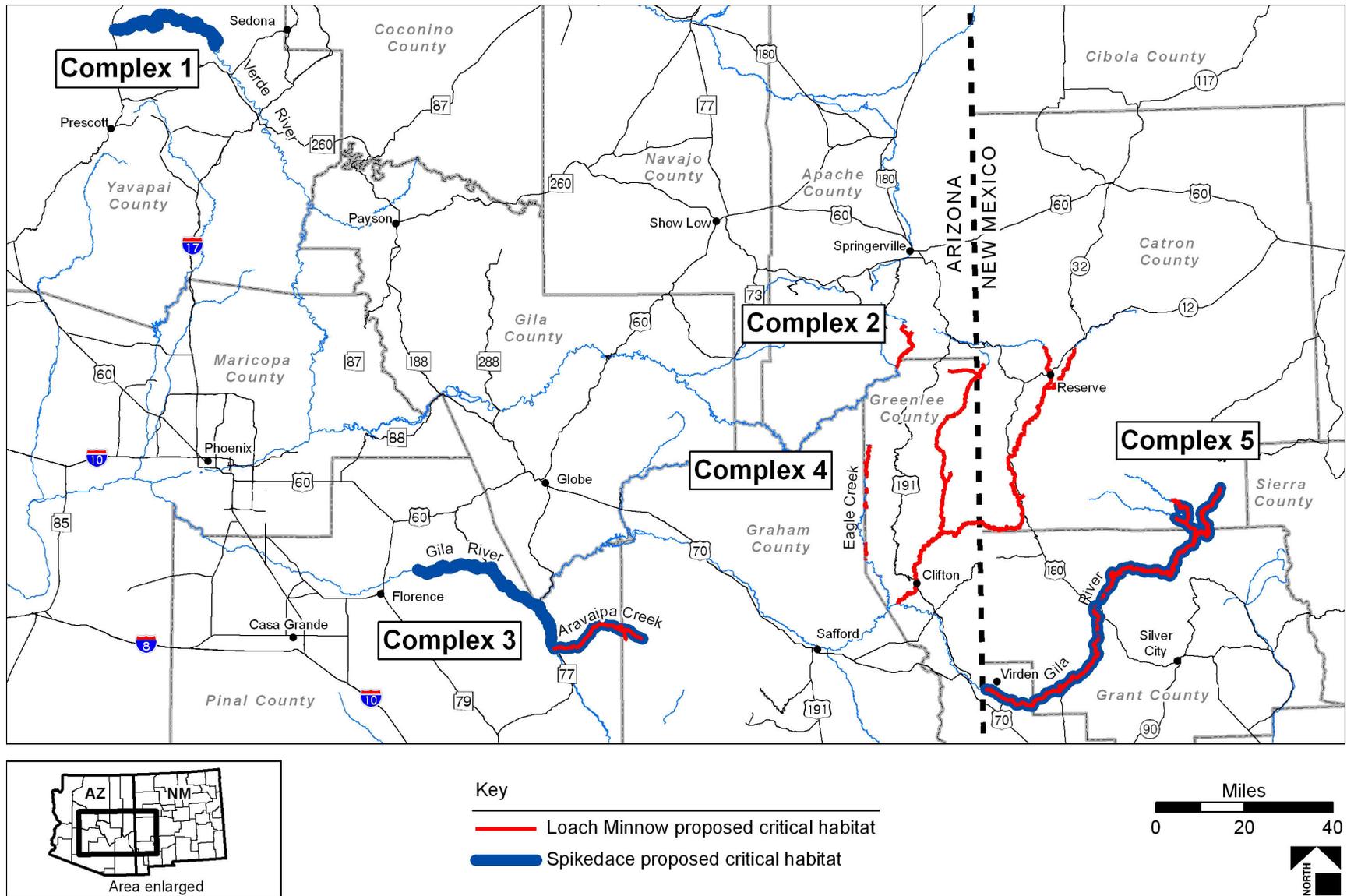


Figure 4. Overview of proposed critical habitat complexes and stream segments

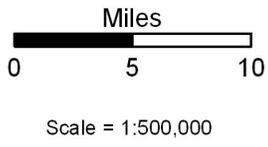
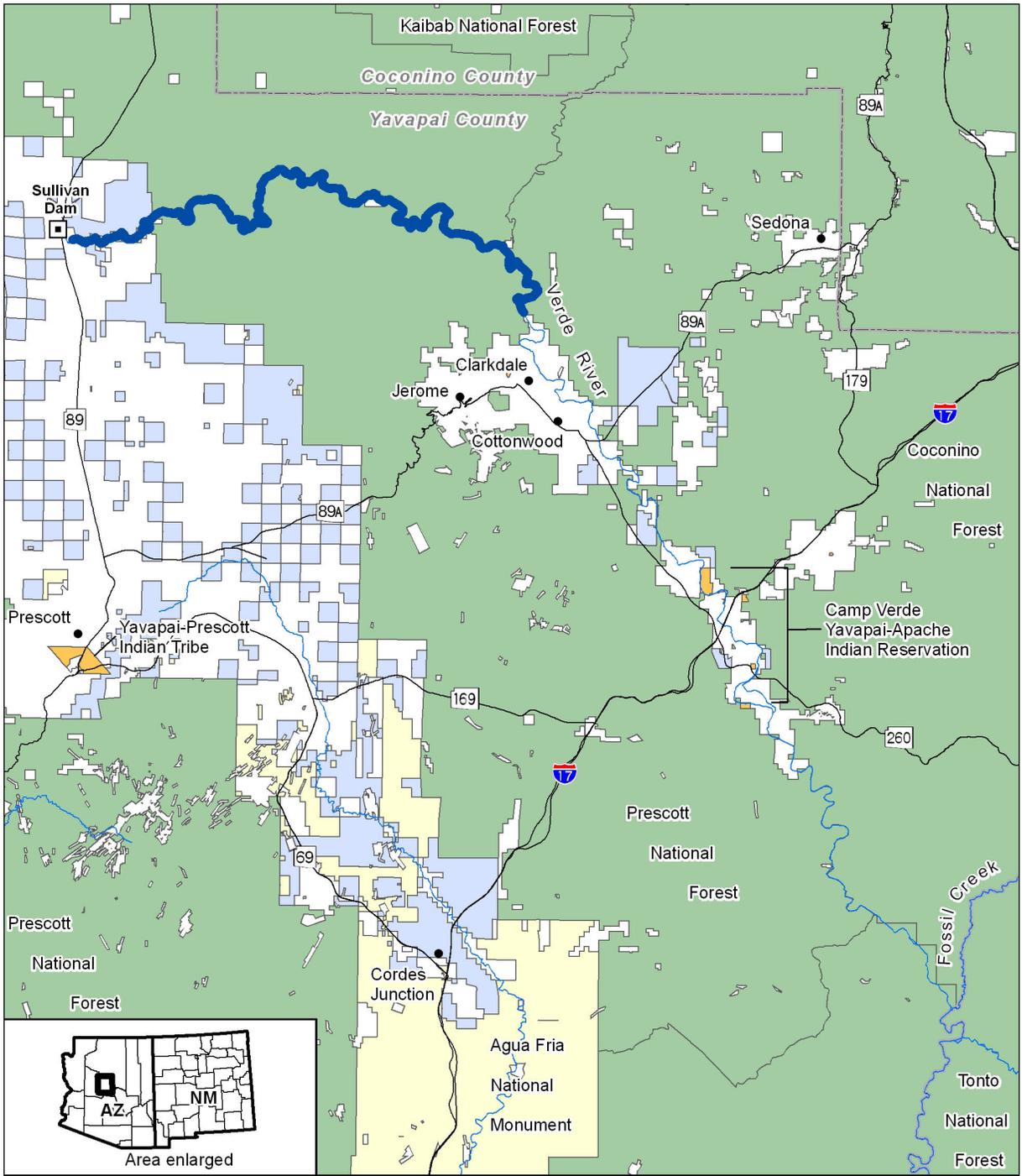
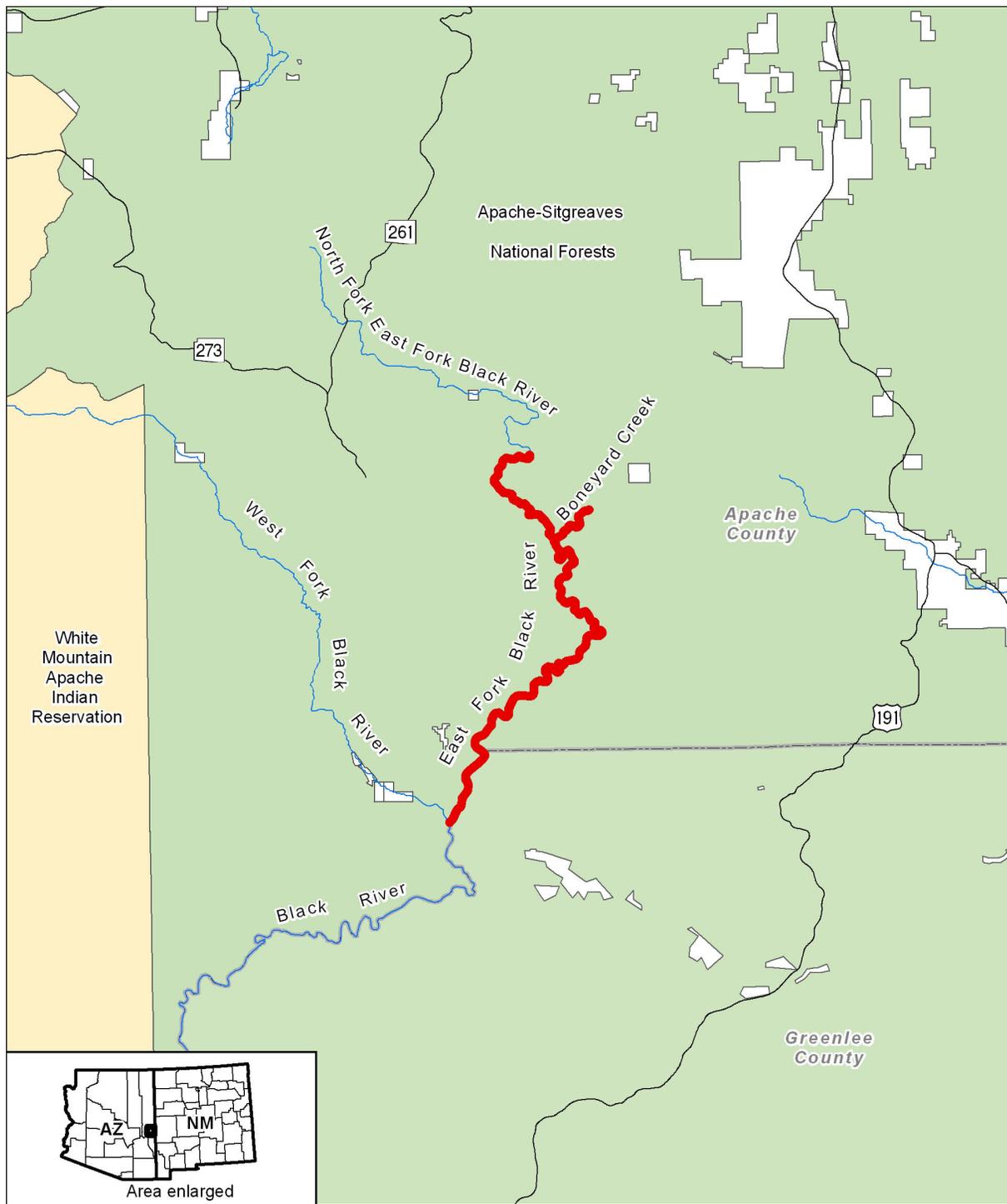


Figure 5. Proposed critical habitat; Complex 1, Verde River Complex



Key

- Loach Minnow proposed critical habitat
- Private
- Indian Reservation
- USDA National Forest

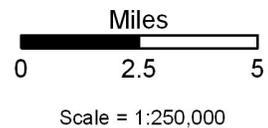
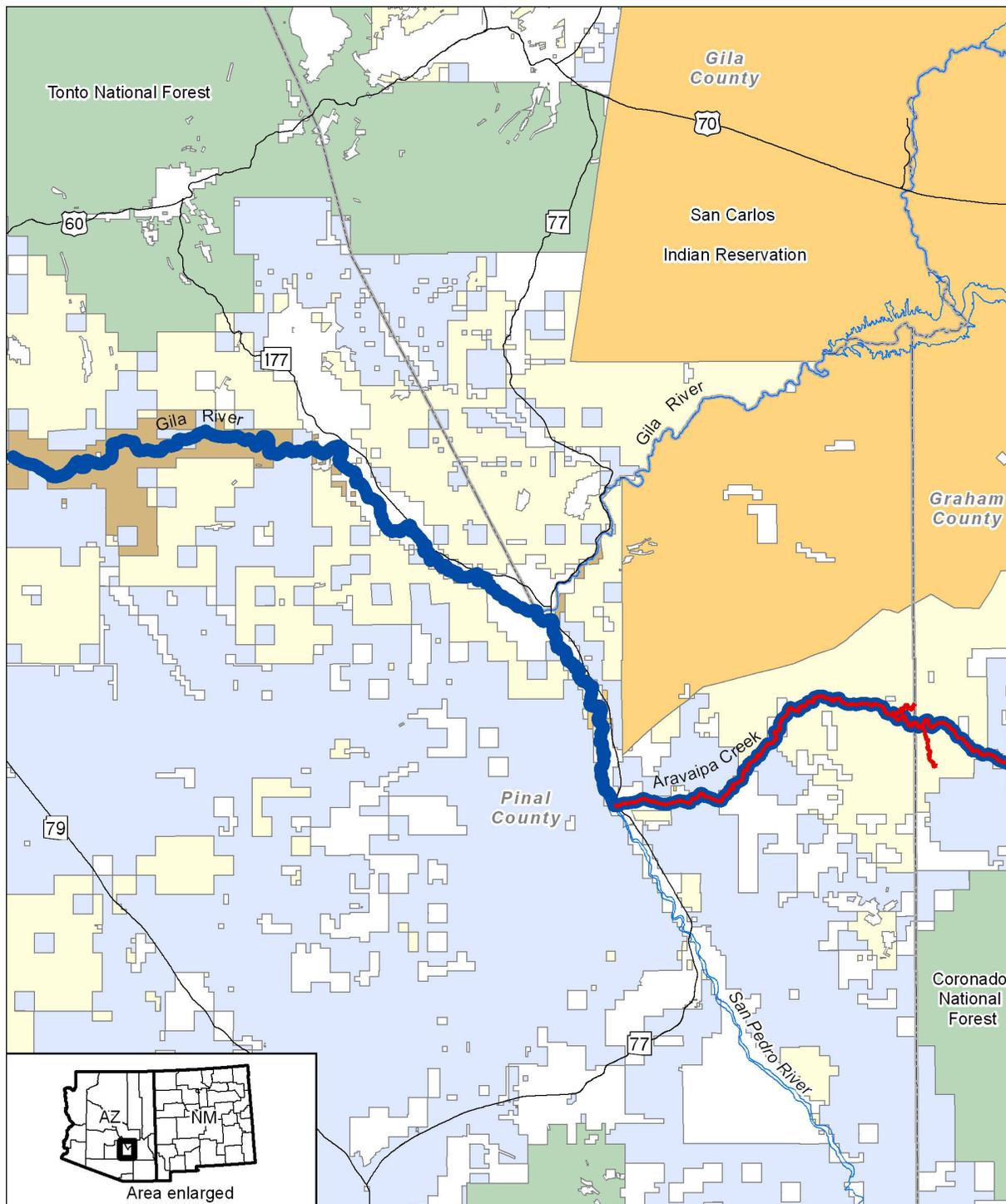


Figure 6. Proposed critical habitat; Complex 2, Black River Complex



Key

- | | | | |
|---|--|---|---------------------------|
|  | Spikedace proposed critical habitat |  | Bureau of Land Management |
|  | Loach Minnow proposed critical habitat |  | Bureau of Reclamation |
|  | Private |  | Indian Reservation |
|  | State Trust |  | USDA National Forest |

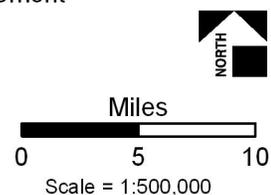
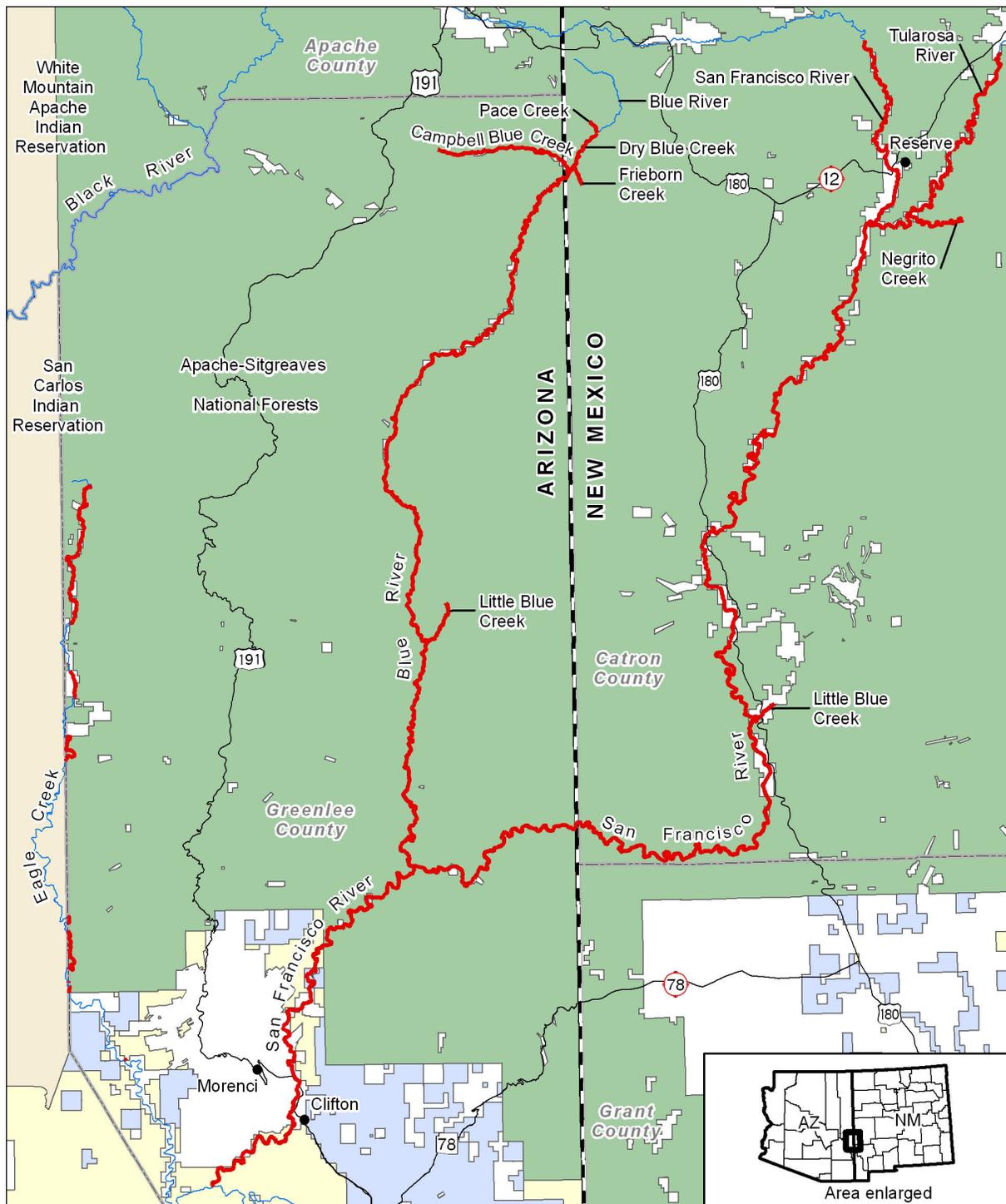


Figure 7. Proposed critical habitat; Complex 3, Middle Gila / Lower San Pedro / Aravaipa Creek Complex



Key

- | | | | |
|---|--|---|---------------------------|
|  | Loach Minnow proposed critical habitat |  | Bureau of Land Management |
|  | Private |  | USDA National Forest |
|  | State Trust |  | Indian Reservation |

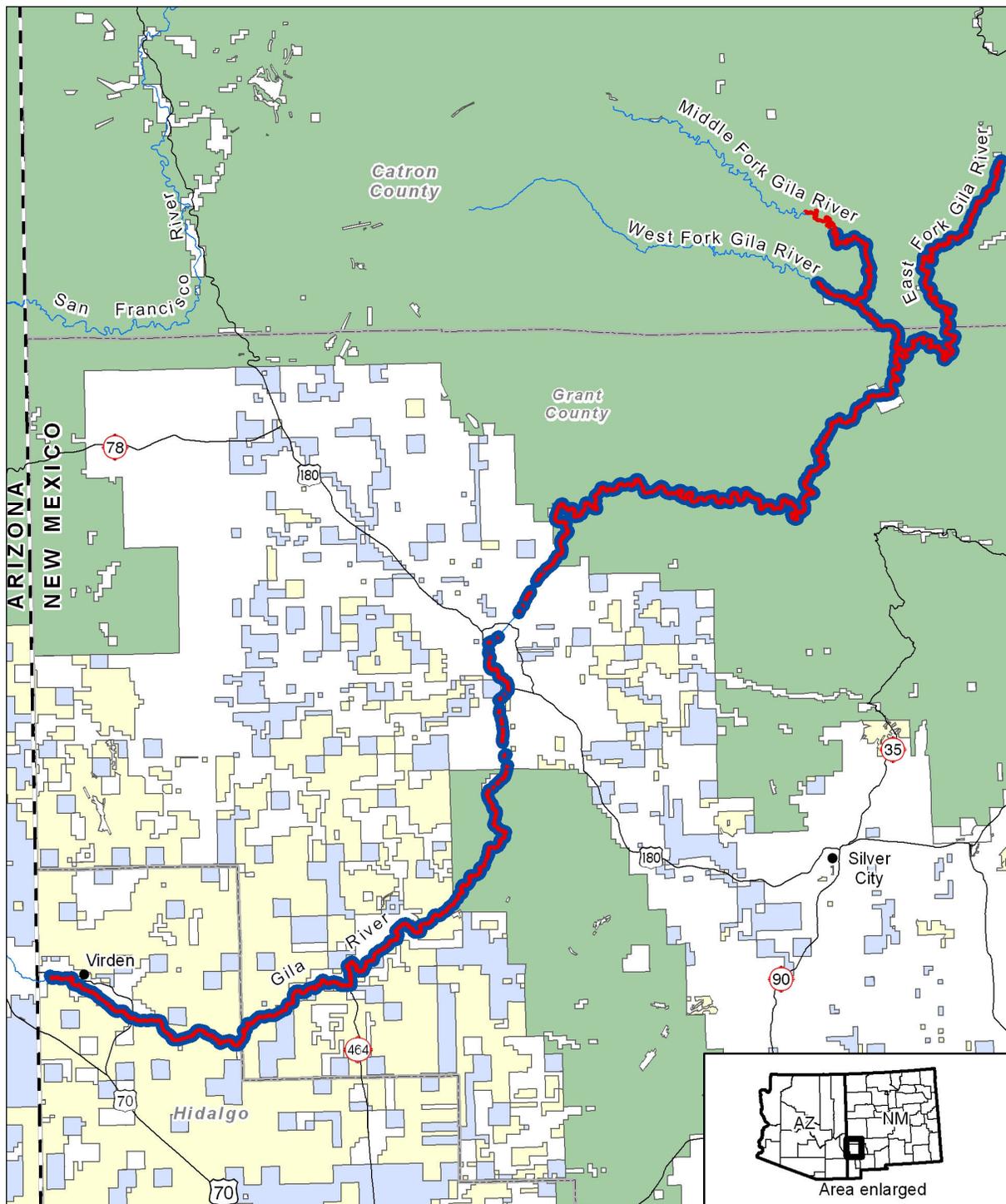


Scale = 1:500,000

Miles



Figure 8. Proposed critical habitat; Complex 4, San Francisco and Blue Rivers Complex



Key

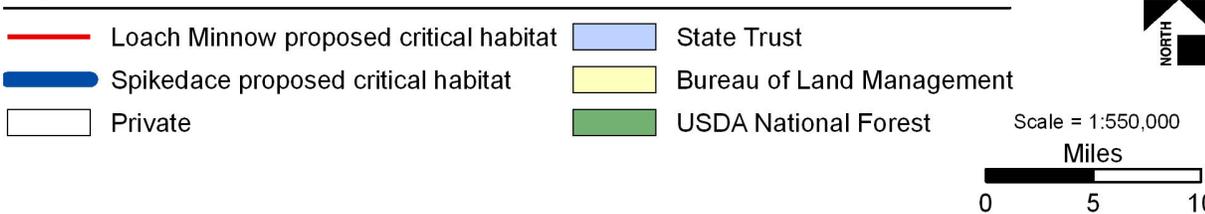


Figure 9. Proposed critical habitat; Complex 5, Upper Gila River Complex

2.4.1.1 Complex 1: Verde River Complex, Yavapai County, Arizona. The Service proposes streams within this complex as critical habitat for spikedace only. The Verde River Complex was occupied by spikedace at the time of listing and is still considered occupied based on surveys documenting spikedace presence as recently as 1999. Currently, the tributary streams of the Verde River are believed to be unoccupied by spikedace or loach minnow and are not being proposed as critical habitat. 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, one of the tributaries to the Verde River. Also, spikedace in the Verde River are genetically and morphologically distinct from all other spikedace populations. The Verde River contains one or more of the PCEs, including shear zones, sheet flow, and eddies, and an appropriate prey base. The continuing presence of spikedace and the existence of features that are essential to the conservation of the species create a high potential for restoration of spikedace to the Verde River system. Threats to this critical habitat area requiring special management and protections include water diversions, grazing, and nonnative fish species (Table 4).

The landownership of this complex consists of large blocks of USFS lands. There are also lands belonging to Arizona State Parks and the Arizona State Land Department (ASLD). The Verde River occurs in parts of the Prescott, Coconino, and Tonto national forests, and passes by or through the towns of Camp Verde, Middle Verde, Bridgeport, Cottonwood, and Clarkdale.

Proposed Critical Habitat Verde River Complex–Spikedace only: 43.0 mi (69.2 km) of the Verde River extending from the Prescott and Coconino forest boundary with private lands upstream to Sullivan Dam. Sullivan Dam is at the upstream limit of perennial flow in the

mainstem of the Verde River. Perennial flow results from a series of river-channel springs and from Granite Creek. The Verde River contains features essential to the conservation of the spikedace between its headwaters and Fossil Creek. These portions of the Verde River provide a relatively stable thermal and hydrologic regime suitable for spikedace.

Yavapai Apache Tribal lands fall within this area, and are excluded as part of the overall exclusion. However, the Service also finds pursuant to their analysis that Yavapai Apache Tribal lands should be excluded on the basis of the Service's relationship with the Yavapai Apache Tribe, and the Tribe's management of the Verde River that the Service believes provides a conservation benefit to the spikedace.

2.4.1.2 Complex 2: Black River Complex, Apache and Greenlee Counties, Arizona. The Salt River sub-basin represents a significant portion of loach minnow historical range; however, loach minnow have been extirpated from all but a small portion of the Black and White rivers. Since the only remaining population of loach minnow on public lands is in the Salt River sub-basin, the Black River Complex is considered vital to the species.

The Service proposes streams within this complex as critical habitat for loach minnow only. At this time, 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 in a future revision. Portions of the sub-basin are unsuitable, either because of topography or because of the presence of reservoirs, stream channel alteration by humans, or overwhelming nonnative fish populations. However, other areas within the sub-basin remain suitable. Threats in this complex requiring special management

include grazing, nonnative fish, recreation, and sedimentation resulting from a recent fire that destroyed vegetation (Table 4). The ownership of this complex is predominantly USFS, with a few small areas of private land. All streams within the complex are within the boundaries of the Apache-Sitgreaves National Forest and include lands of the White Mountain Apache Tribe.

1. Proposed Critical Habitat East Fork Black River–Loach minnow only: 12.2 miles (19.7 km) of the East Fork Black River extending from the confluence with the West Fork Black River upstream to the confluence with an unnamed tributary approximately 0.51 mile below the Boneyard Creek confluence. This area is considered occupied based on records from 1996; it is connected to the North Fork East Fork Black River with documented loach minnow records from 2004, and it contains one or more of the PCEs including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles).

2. Proposed Critical Habitat North Fork East Fork Black River–Loach minnow only: 4.4 mi (7.1 km) of the North Fork East Fork Black River extending from the confluence with East Fork Black River upstream to the confluence with an unnamed tributary. The loach minnow occupies this area based on surveys documenting presence as recently as 2004. Above the unnamed tributary, the river has finer substrate and lacks riffle habitat, making it unsuitable for loach minnow.

3. Proposed Critical Habitat Boneyard Creek–Loach minnow only: 1.4 mi (2.3 km) of Boneyard Creek extending from the confluence with the East Fork Black River upstream to the confluence with an unnamed tributary. Boneyard Creek contains one or more of the PCEs, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). This

area is considered occupied based on records from 1996; it is also connected to the North Fork East Fork Black River. This area represents the only part occupied in the Salt River basin.

2.4.1.3 Complex 3: Middle Gila/Lower San Pedro/Aravaipa Creek Complex, Pinal and Graham Counties, Arizona.

The portions of this complex being proposed for critical habitat are within the geographical range occupied by both spikedace and loach minnow and contain the features essential to the conservation of these species. This complex supports the largest remaining spikedace and loach minnow populations in Arizona. Threats in this complex requiring special management include water diversions, grazing, nonnative fish, recreation, and mining (Table 4). This area includes extensive BLM land as well as extensive private land, some State of Arizona lands, and a small area of allotted land used by the San Carlos Apache Tribe. The lower portions of the Gila River are United States Bureau of Reclamation (Reclamation) lands.

1. Proposed Critical Habitat Gila River–Spikedace only: 39.0 mi (62.8 km) of the Gila River extending from the Ashurst-Hayden Dam upstream to the confluence with the San Pedro River. Spikedace were located in the Gila River in 1991 (Jakle 1992), and the Gila River is connected with Araviapa Creek, which supports the largest remaining spikedace population. Those portions of the Gila River proposed for designation contain one or more of the PCEs, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Above the confluence with the San Pedro River, flow in the Gila River is highly regulated by the San Carlos Dam and does not contain the features essential to the conservation of either species. Below the confluence, the input of the San Pedro provides a sufficiently unregulated hydrograph, which is a feature essential to the conservation of the spikedace. Threats in this area requiring special management

include water diversions, grazing, and nonnative fish species.

2. Proposed Critical Habitat Lower San Pedro River–Spikedace only: 13.4 mi (21.5 km) of the San Pedro River extending from the confluence with the Gila River upstream to the confluence with Aravaipa Creek. This area was occupied at the time of listing and is connected with Aravaipa Creek, which supports a large spikedace population. This portion of the San Pedro River contains one or more of the PCEs, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Existing flow in the river comes from surface and subsurface contributions from Aravaipa Creek. Threats in this area requiring special management include water diversions, nonnative fish, grazing, and mining.

3. Proposed Critical Habitat Aravaipa Creek: 28.1 mi (45.3 km) of Aravaipa Creek extending from the confluence with the San Pedro River upstream to the confluence with Stowe Gulch, which is where the upstream limit of sufficient perennial flow ends for either species. Aravaipa Creek was occupied by both spikedace and loach minnow at the time of listing and continues to support a substantial population of both species. Aravaipa Creek contains one or more of the PCEs, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats in this area requiring special management include water diversions, nonnative fish, and recreational pressures (Table 4).

4. Proposed Critical Habitat Turkey Creek–Loach minnow only: 2.7 mi (4.3 km) of Turkey Creek extending from the confluence with Aravaipa Creek upstream to the confluence with Oak Grove Canyon. Turkey Creek was occupied at the time of listing and is currently occupied by loach minnow (Service 2005a). Turkey Creek contains one or more of the PCEs,

including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area requiring special management are generally the same for Aravaipa Creek and include water diversions, nonnative fish, and recreational pressure (Table 4).

5. Proposed Critical Habitat Deer Creek–Loach minnow only: 2.3 mi (3.6 km) of Deer Creek extending from the confluence with Aravaipa Creek upstream to the boundary of the Aravaipa Wilderness. Deer Creek was occupied at the time of listing and is currently occupied by loach minnow (Service 2005a). This stream contains one or more of the PCEs important to loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). The threats to loach minnow in this area are similar to those for Aravaipa Creek, including water diversions, nonnative fish, and recreation.

2.4.1.4 Complex 4: San Francisco and Blue Rivers Complex, Graham and Greenlee Counties, Arizona and Catron County, New Mexico. The streams in this complex are within the geographical range occupied by the loach minnow and the spikedace. The Blue River system and adjacent portions of the San Francisco River constitute the longest stretch of occupied loach minnow habitat unbroken by large areas of unsuitable habitat. Threats in this complex are described in the individual stream reaches below. This complex contains extensive USFS land; some BLM land; and scattered private, State of Arizona, and New Mexico Department of Game and Fish (NMDGF) lands.

1. Proposed Critical Habitat Eagle Creek: 17.7 mi (28.5 km) of Eagle Creek extending from the Phelps-Dodge Diversion Dam upstream to the confluence of Dry Prong and East Eagle creeks, including lands of the San Carlos Apache Reservation. Eagle

Creek was occupied by spikedace and loach minnow at the time of listing. The most current records of occupancy in Eagle Creek are 1987 for spikedace and 1997 for loach minnow. Eagle Creek contains one or more of the PCEs important to spikedace and loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats within this area that require special management include water diversions, grazing, nonnative fish, and mining (Table 4).

A section of Eagle Creek approximately 17.2 mi (27.7 km) long occurs on the San Carlos Apache Reservation. The Service has received a management plan from the San Carlos Apache Tribe addressing native fishes. On the basis of this plan and the partnership with the San Carlos Apache Tribe, the Service is proposing to exclude this area from final critical habitat pursuant to section 4(b)(2) of the Act.

Portions of Eagle Creek totaling approximately 11.0 mi (17.8 km) long occur on Phelps-Dodge lands. The Service has received a management plan from Phelps-Dodge addressing management for spikedace and loach minnow. On the basis of this plan the Service is proposing to exclude these lands for the final critical habitat pursuant to section 4(b)(2) of the Act.

2. Proposed Critical Habitat San Francisco River–Loach minnow only: 126.5 mi (203.5 km) of the San Francisco River extending from the confluence with the Gila River upstream to the mouth of The Box, a canyon above the town of Reserve, New Mexico. Loach minnow occupied the San Francisco River at the time of listing and still occupy it presently (Propst 2002). The San Francisco River contains one or more of the PCEs important to loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area requiring special

management include water diversions, grazing, and nonnative fish species (Table 4).

3. Proposed Critical Habitat Tularosa River–Loach minnow only: 18.6 mi (30.0 km) of Tularosa River extending from the confluence with the San Francisco River upstream to the town of Cruzville, New Mexico. Above Cruzville, the river does not contain the features essential to the conservation of the species because of the small size of the stream and a predominance of fine substrates. This area includes one or more of the PCEs important to loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). The Tularosa River was occupied at the time of listing and is known to be currently occupied based on records as recent as 2001. Threats to the species and its habitat in this area that require special management include grazing and nonnative fish (Table 4).

4. Proposed Critical Habitat Negrito Creek–Loach minnow only: 4.2 mi (6.8 km) of Negrito Creek extending from the confluence with the Tularosa River upstream to the confluence with Cerco Canyon. Above this area, the creek does not contain the features essential to the conservation of the species because of gradient and channel morphology. Negrito Creek has been occupied since listing, with the most recent record from 1998. This area contains one or more of the PCEs important to loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area requiring special management include grazing and nonnative fish (Table 4). This stream contains the features essential to the conservation of the species and one of the few remaining populations of the species. The stream is currently occupied, and it is directly connected to the Tularosa

River, which is also occupied with records dating from 2001.

5. Proposed Critical Habitat Whitewater Creek–Loach minnow only: 1.1 mi (1.8 km) of Whitewater Creek extending from the confluence with the San Francisco River upstream to the confluence with the Little Whitewater Creek. Upstream of this area, the river does not contain the features essential to the conservation of the species because of gradient and channel changes that make the portion above Little Whitewater Creek unsuitable for loach minnow. Whitewater Creek was occupied at the time of listing, and is currently occupied, as it is within an area connected with the San Francisco River where loach minnow records exist from 2001. This area does support one or more PCEs for loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area include grazing and nonnative fish (Table 4).

6. Proposed Critical Habitat Blue River–Loach minnow only: 51.1 mi (82.2 km) of the Blue River extending from the confluence with the San Francisco River upstream to the confluence of Campbell Blue and Dry Blue creeks. The Blue River was occupied at the time of listing and continues to be occupied by loach minnow (Carter 2005). The Blue River contains one or more of the PCEs required by loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Planning is underway among several state and federal agencies for reintroduction of native fishes, including spinedace, in the Blue River; thus, the Blue River may be considered for spinedace critical habitat in future revisions of the designation. Threats in this area include water diversions, grazing, nonnative fish, and roads (Table 4).

7. Proposed Critical Habitat Campbell Blue Creek–Loach minnow only: 8.1 mi

(13.1 km) of Campbell Blue Creek extending from the confluence of Dry Blue and Campbell Blue creeks upstream to the confluence with Coleman Canyon. Areas above Coleman Canyon do not contain the features essential to the conservation of the species because Campbell Blue Creek changes and becomes steeper and rockier, making it unsuitable for loach minnow. Campbell Blue Creek is currently occupied and supports one or more of the PCEs required by loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area include grazing and nonnative fish species (Table 4).

8. Proposed Critical Habitat Dry Blue Creek–Loach minnow only: 3.0 mi (4.8 km) of Dry Blue Creek extending from the confluence with Campbell Blue Creek upstream to the confluence with Pace Creek. Dry Blue Creek has been occupied by loach minnow since listing and is connected with Campbell Blue Creek, which has documented loach minnow records as recent as 2004. This area also contains one or more of the PCEs required by loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area requiring special management include grazing and nonnative fish species (Table 4).

9. Proposed Critical Habitat Pace Creek–Loach minnow only: 0.8 mi (1.2 km) of Pace Creek extending from the confluence with Dry Blue Creek upstream to a barrier falls. Pace Creek has been occupied by loach minnow since listing with the most recent record from 1998. This area also contains one or more of the PCEs required by loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area requiring special management include grazing and nonnative fish species (Table 4).

10. Proposed Critical Habitat Frieborn Creek–Loach minnow only: 1.1 mi (1.8 km) of Frieborn Creek extending from the confluence with Dry Blue Creek upstream to an unnamed tributary. The Loach minnow has occupied Frieborn Creek since listing with the most recent record from 1998. This area also contains one or more of the PCEs required by loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area requiring special management include grazing and nonnative fish species (Table 4).

11. Proposed Critical Habitat Little Blue Creek–Loach minnow only: 2.8 mi (4.5 km) of Little Blue Creek extending from the confluence with the Blue River upstream to the mouth of a canyon. Little Blue Creek was occupied at the time of listing and is connected with the Blue River. This area also contains one or more of the PCEs required by loach minnow. Threats requiring special management in this area include grazing and nonnative fish (Table 4).

2.4.1.5 Complex 5: Upper Gila River Complex, Catron, Grant, and Hidalgo Counties, New Mexico. This complex is occupied by spinedace and loach minnow and contains the largest remaining populations of both species in New Mexico. It is considered to represent the “core” of what remains of these species. Threats requiring special management in this area are addressed in each of the individual stream segment descriptions below. This complex contains extensive USFS land, large areas of private land in the Cliff-Gila Valley, and some BLM lands. There are also small areas of NMDGF, National Park Service, and State of New Mexico lands.

1. Proposed Critical Habitat Upper Gila River: 94.9 mi (152.7 km) of the Upper Gila River extending from the confluence with Moore Canyon (near Arizona/New Mexico border) upstream to the confluence of the

East and West forks of the Gila River. The Gila River was occupied by spinedace and loach minnow at the time of listing and continues to be occupied by both species (Propst 2002; Propst et al. 1988; Rinne 1999). The Gila River from its confluence with the West Fork Gila and East Fork Gila contains one or more PCEs for spinedace and loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area requiring special management include water diversions, grazing, recreation, road construction, and nonnative fish species (Table 4). Approximately 7.3 mi (11.7 km) along the Gila River are owned by the PDC. The Service received a management plan from PDC addressing management for spinedace and loach minnow for these areas. Within the management plans, PDC developed goals for both the loach minnow and spinedace within the PDC reaches. These goals regarding the two species include the following: (1) monitoring distribution and abundance; (2) obtaining an understanding of the population dynamics as they relate to existing habitat conditions and land use practices; (3) continuing historic land use practices and water supply practices which enhance water flows; and (4) consideration of habitat when deviating from such historic management practices. The Service is considering excluding stream reaches adjacent to PDC land from designating critical habitat because of these management commitments, as well as other actions committed to by PDC (See Section 3.2.2.2 of this document).

2. Proposed Critical Habitat East Fork Gila River: 26.1 mi (42.0 km) of the East Fork Gila River extending from the confluence with the West Fork Gila River upstream to the confluence of Beaver and Taylor creeks. This area was occupied by both species at the time of listing and both species have been found there as recently as 2001 (Propst 2002). In addition, this area is connected to habitat currently

occupied by spinedace and loach minnow on the West Fork of the Gila River. Portions of the East Fork Gila River contain one or more of the PCEs required by spinedace and loach minnow including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area requiring special management include grazing and nonnative fish species (Table 4).

3. Proposed Critical Habitat Middle Fork Gila River–Spinedace only: 7.7 mi (12.3 km) of the Middle Fork Gila River extending from the confluence with the West Fork Gila River upstream to the confluence with Big Bear Canyon. This area is currently occupied and is connected to currently occupied habitat on the West Fork of the Gila River (Propst 2002). The Middle Fork Gila River contains one or more of the PCEs required by spinedace, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area requiring special management include grazing and nonnative fish species (Table 4). The Service proposes this portion of the Middle Fork Gila River as critical habitat for spinedace only.

4. Proposed Critical Habitat Middle Fork Gila River–Loach minnow only: 11.9 mi (19.1 km) of the Middle Fork Gila River extending from the confluence with the West Fork Gila River upstream to the confluence with Brothers West Canyon. This area is currently occupied and is connected to currently occupied habitat on the West Fork of the Gila River. Portions of the Middle Fork Gila River contain one or more PCEs required by loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Threats to this area requiring special management include grazing and nonnative fish species (Table 4). The Service proposes this portion of the Middle

Fork Gila River as critical habitat for loach minnow only.

5. Proposed Critical Habitat West Fork Gila River: 7.7 mi (12.4 km) of the West Fork Gila 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 was occupied by spinedace and loach minnow at the time of listing and continues to be occupied by both species. This area contains one or more PCEs required by spinedace and loach minnow, including sufficient flow velocities and appropriate gradients, substrates, depths, and habitat types (e.g., pools, riffles). Above EE Canyon, the river does not contain the features essential to the conservation of the species due to gradient and channel morphology. Threats to this area requiring special management include grazing and nonnative fish species (Table 4).

Table 4. Proposed critical habitat complex information

Spikedace and/or Loach Minnow Critical Habitat Areas	Threats	Last Year Occupancy Confirmed	Critical Habitat Distance in mi (km)	Source
Complex 1—Verde River				
spikedace only	Nonnative species, grazing, water diversions	1999 (the lower portion of the Verde River is proposed for exclusion)	43 mi (69.2 km)	AGFD 2004; ASU 2002; Brouder 2002 p. 1
Complex 2—Black River Complex				
East Fork Black: loach minnow	recreation, nonnative species, recent fire & related retardant application, ash, & sediment	2004	12.2 mi (19.7 km)	AGFD 2004; ASU 2002
North Fork East Fork Black: loach minnow	recreation, nonnative species, recent fire & related retardant application, ash, & sediment	2004	4.4 mi (7.1 km)	AGFD 2004; ASU 2002; Bagley et al. 1995, multiple surveys; Lopez 2000, p. 1
Boneyard Creek: loach minnow	recreation, nonnative species, recent fire & related retardant application, ash, & sediment	1996	1.4 mi (2.3 km)	AGFD 2004; ASU 2002
Complex 3—Middle Gila / Lower San Pedro / Aravaipa Creek				
Gila River; Ashurst-Hayden Dam to San Pedro: spikedace	water diversions, grazing, nonnative species	1991	39.0 mi (62.8 km)	AGFD 2004; ASU 2002; Jakle 1992, p. 6
Lower San Pedro River: spikedace	water diversions, grazing, nonnative species, mining	1996	13.4 mi (21.5 km)	AGFD 2004; ASU 2002
Aravaipa Creek: spikedace loach minnow	fire, some recreation; low nonnative pressures, water diversion	2005	28.1 mi (45.3 km)	ADEQ 2006; AGFD 2004; ASU 2002; Rienthal 2006, pp. 2-3
Turkey Creek: loach minnow	recreation; low nonnative pressures	2005	2.7 mi (4.3 km)	AGFD 2004; ASU 2002; Rienthal 2006, p. 2
Deer Creek: loach minnow	recreation; low nonnative pressures	2005	2.3 mi (3.6 km)	AGFD 2004; ASU 2002; Rienthal 2006, p. 2
Complex 4—San Francisco and Blue Rivers				
Eagle Creek: loach minnow	water diversions, grazing, nonnative species, mining	1997	17.7 mi (28.5 km)	AGFD 2004; ASU 2002; Bagley and Marsh 1997, pp. 1-2; Knowles 1994, pp. 1-2, 5;
San Francisco River: loach minnow	grazing, water diversions, nonnative species, road construction	2001	126.5 mi (203.5 km)	AGFD 2004; ASU 2002; Paroz et al. 2006, p. 67; Propst 2002, p. 13; Propst 2005, p. 10; Propst 2006, p. 2

Table 4. Proposed critical habitat complex information (continued)

Spikedace and/or Loach Minnow Critical Habitat Areas	Threats	Last Year Occupancy Confirmed	Critical Habitat Distance in mi (km)	Source
Tularosa River: loach minnow	grazing, watershed disturbances	2001	18.6 mi (30.0 km)	ASU 2002; Propst 2002, p. 9; Propst 2005, p. 6
Negrito Creek: loach minnow	grazing, watershed disturbances	1998	4.2 mi (6.8 km)	Miller 1998, pp. 4-5
Whitewater Creek: loach minnow	grazing, watershed disturbances	1984	1.1 mi (1.8 km)	ASU 2002; Propst et al. 1988, p. 15
Blue River: loach minnow	water diversions, nonnative species, grazing, road construction	2004	51.1 mi (82.2 km)	AGFD 2004; ASU 2002; Carter 2005; Propst 2002, p. 4
Campbell Blue Creek: loach minnow	grazing, nonnative species	2004	8.1 mi (13.1 km)	AGFD 2004; ASU 2002; Carter 2005
Dry Blue Creek: loach minnow	grazing	1948	3.0 mi (4.8 km)	ASU 2002; Propst 2006, p. 2
Pace Creek: loach minnow	grazing, nonnative species	1998	0.8 mi (1.2 km)	ASU 2002
Frieborn Creek: loach minnow	Unknown	1998	1.1 mi (1.8 km)	ASU 2002
Little Blue Creek: loach minnow	Grazing, nonnative fish species	1981	2.8 mi (4.5 km)	AGFD 2004; ASU 2002
Complex 5—Upper Gila River				
Upper Gila River: spikedace loach minnow	grazing, recreation, road construction, nonnative species, water diversions	2005	94.9 mi (152.7 km)	ASU 2002; Propst 2002, pp. 4, 31
East Fork Gila River: spikedace loach minnow	grazing, nonnative species	2001	26.1 mi (42.0 km)	ASU 2002; Propst 2002, p. 27; Propst et al. 1998, p. 14-15; Propst 2006, pp. 2
Middle Fork Gila River: spikedace	grazing, nonnative species	1995	7.7 mi (12.3 km)	ASU 2002; Paroz et al. 2006, p. 63; Propst 2002, p. 22; Propst, 2006, p. 2
loach minnow		1998	11.9 mi (19.1 km)	
West Fork Gila River: spikedace	grazing, nonnative species, road construction	2005	7.7 mi (12.4 km)	ASU 2002; Paroz et al. 2006, p. 64; Propst 2002, p. 18; Propst 2006, p. 2
loach minnow		2002		

CHAPTER 3.0—AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

This chapter is organized by resource categories that may potentially be affected by designating critical habitat for the spinedace and loach minnow. These resource categories were selected based on issues and concerns identified by the Service. Within each resource category, a description of the existing condition is followed by an evaluation of potential environmental consequences resulting from the designation of critical habitat. Potential effects are evaluated for each alternative described in Chapter 2.0. Under the No Action Alternative, no critical habitat would be designated for the spinedace and loach minnow. Under the Alternative A, a total of approximately 633 mi (1,018 km) of stream reaches in five complexes (10 streams for spinedace and 23 streams for loach minnow) would be designated as critical habitat (Table 3, Figures 4–9). Under Alternative B, a total of approximately 662 miles (1,067 km) of stream reaches in five complexes would be designated as critical habitat.

3.1.1 Methodology

Descriptions of the affected environment presented in Sections 3.2 through 3.11 of this document are based on published literature, available state and federal agency reports and management plans, previous critical habitat designations for the spinedace and loach minnow (1994 to 1998 and 2000 to 2004 [64 FR 69324 and 65 FR 24329, respectively]), the 2005 proposed rule for designating critical habitat for the spinedace and loach minnow (70 FR 75546-75590), formal conference opinions issued by the Service relative to potential impacts on the spinedace and loach minnow, formal Section 7 consultations conducted since these

species were listed, biological opinions for other fish species in small southwestern streams, and the draft economic analysis for the proposed designation of critical habitat.

The evaluation of potential impacts of spinedace and loach minnow critical habitat designation to identified resource categories is based on the premise that designation of critical habitat has no effect on the natural and human environment other than through the ESA Section 7 consultation process (see Section 1.4.1.3). Designating critical habitat imposes no universal rules or restrictions on land use, nor does it automatically prohibit or alter any land use activity. With respect to critical habitat, the purpose of Section 7 consultation is to ensure that federal actions of federal agencies do not adversely modify critical habitat. Individuals, organizations, local governments, states, and other nonfederal entities are potentially affected by the designation of critical habitat only if their actions have a connection to federal actions—a nexus—that is, only if those actions occur on federal lands, require a federal permit or license, or involve federal funding.

Critical habitat designation generally increases the potential for more Section 7 consultations, both reinitiated and new, with their associated costs and outcomes. Designating critical habitat is likely to result in formal consultations over and above those required for a listed species with no designated critical habitat. Federal action agencies may consult on project activities they otherwise would not have consulted on because the affected habitat was thought to be unoccupied by or unsuitable for the listed species. Also, additional consultations may result from new

information, guidance, or clarification provided in the critical habitat proposal. However, those areas proposed for designation of critical habitat for the spikedace and loach minnow are currently occupied or have been occupied by these fish species for the past 10 years. Therefore, there should be little additional Section 7 consultation required for critical habitat designation alone.

It is not possible to predict with certainty or detail what the effects of additional Section 7 consultations would be. However, the record of past conservation measures and consultations provides some basis for predicting what kinds of actions would be subject to consultation and the outcome of those consultations. Because the spikedace and loach minnow were listed in 1986 the number of consultations is large (76 formal, 182 informal, 228 technical assistance) (Industrial Economics [IEc] 2006). Therefore, it is assumed that future consultations would be near the same magnitude as past consultations.

The evaluation of impacts in this chapter focuses on costs and outcomes of the potential increase in Section 7 consultations resulting from the designation of critical habitat for the spikedace and loach minnow. Impacts of increased consultations may include the following:

- Additional expenditures of time and money by federal agencies, including the Service, and nonfederal proponents to complete the consultations.
- Additional time and costs to implement the reasonable and prudent alternatives and (possibly) discretionary conservation recommendations specified in biological opinions in which adverse modification was concluded.
- A greater probability that the PCEs identified in Section 2.4 would be maintained. The requirement to consult on activities that may adversely modify

designated critical habitat may cause action agencies and project proponents to alter their proposals to reduce, minimize, or avoid impacts on PCEs. Such alterations may obviate the need for consultation. If a consultation is initiated, then the outcome of critical habitat designation could be the modification of the proposal to limit the impacts on PCEs or the imposition of reasonable and prudent alternatives that would reduce impacts on PCEs.

For the purposes of this evaluation, it is assumed that designation of critical habitat protects PCEs for the spikedace and loach minnow (e.g., natural stream flows, adequate water quality, cover, prey base) as a result of Section 7 consultation or project modification in anticipation of or to avoid Section 7 consultation. Benefits of these protections extend indirectly to other components of interconnected ecosystems. Critical habitat exclusion areas (e.g., San Carlos Apache Tribal lands) may also be protective of PCEs.

3.1.1.1 Economic Analysis. A separate analysis was conducted by Industrial Economics Incorporated (IEc 2006) to assess the potential economic effects of measures to protect the spikedace and loach minnow and their habitat in the proposed critical habitat areas. Dollar estimates of future economic impacts take into account all the conservation activities related to the spikedace and loach minnow predicted to occur in the proposed critical habitat areas over the next 20 years, not just those attributable to designation of critical habitat. This EA addresses only those impacts that are directly or indirectly attributable to the designation of critical habitat and does not predict impacts associated with future economic impacts. Where appropriate, information from the economic analysis was incorporated into this EA.

3.2 Water Resources

3.2.1 Existing Conditions

All stream segments proposed for spikedace and loach minnow critical habitat designation fall within the Gila River Basin, which encompasses about 60,000 mi² (160,000 km²) (Service 2000). Originating in the Mogollon Mountains of western New Mexico, the Gila River flows in a southwesterly direction across Arizona to join the Colorado River near Yuma, Arizona on the Arizona-California border. Major tributaries include the San Francisco, Salt, Verde, San Simon, San Pedro, Santa Cruz, Agua Fria, and Hassayampa rivers. Precipitation varies greatly from the upper portions of the basin to the lower portions, but the area is generally hot and arid with a bi-seasonal (winter–summer) rain pattern (Sheppard et al. 1999). Hydrograph patterns in the upper reaches reflect snowmelt, but overall the basin depends on precipitation events. Stream flow is flashy, and the 2-year flood event is usually over an order of magnitude greater than the base flow (Shreve and Wiggins 1964).

Surface water resources in the Gila River are fully appropriated and subject to ongoing adjudication. Consumptive uses in the Gila River basin total over 3 million acre-feet per year, with about 72 percent for irrigation and livestock uses, 25 percent for municipal and industrial uses, and 3 percent for mining operations (Reclamation 2004). To facilitate consumptive use, numerous water storage and diversion structures have been constructed in the mainstem Gila River and its major tributaries. A recent federal statute, the Arizona Water Settlements Act of 2004, in addition to settling several outstanding Indian water claims, authorizes water exchanges between the Gila River Indian Community and various parties in the State of Arizona, including mining companies and several municipalities in the upper Gila River watershed. This Act also authorizes construction of the New Mexico

Unit of the Central Arizona Project (CAP), which could include a new reservoir on the upper Gila River basin in New Mexico. Implementation of this Act could alter water use patterns in the vicinity of proposed spikedace and loach minnow critical habitat.

Past modifications to water supply and diversion projects in proposed critical habitat designation area have generally not involved water quantity issues. Instead, they involved minimal changes to a few projects, primarily involving water diversion repair.

While no Salt River Project (SRP) facilities fall within proposed critical habitat areas, SRP has water rights to a large portion of the flow of the Verde River and is currently engaged in developing an HCP in the Verde River Watershed for Horseshoe and Bartlett reservoirs, which are located downstream of proposed critical habitat for the spikedace and the loach minnow. The HCP covers many species, including: razorback sucker, Colorado pikeminnow, Gila topminnow, spikedace, loach minnow, roundtail chub, desert sucker, Sonoran sucker, longfin dace, and speckled dace.

In affected counties, surface water is only used for public water supplies in Pinal County, Arizona, and Grant County, New Mexico. Surface water withdrawals in Pinal County dominate withdrawals among affected counties. However, much of the surface water supply in Pinal County is derived from Lower Colorado River water that is provided by the CAP and which lies outside of proposed critical habitat for the spikedace and loach minnow (IEc 2006).

Total groundwater withdrawals in affected counties exceed surface water withdrawals. Groundwater use is also dominated by irrigation, which represents approximately 81 percent of groundwater withdrawals in affected counties. Pinal County, which has the largest agricultural production in

Arizona, also dominates groundwater use in affected counties (IEc 2006).

Within the affected counties, there are approximately 501 groundwater wells that appear to fall within proposed critical habitat. The majority of these wells are used for domestic purposes (83 percent) (IEc 2006). The majority of wells in proposed critical habitat are exempt wells in Arizona (pumping less than 35 gallons per minute [gpm]). There are 67 nonexempt wells in Arizona—39 are irrigation wells (58 percent), 19 are domestic wells (28 percent), 7 are industrial wells (10 percent), and 2 (3 percent) are used for other purposes (IEc 2006).

The Verde River segment has the largest number of domestic wells (322), the largest population within 10 miles (16 km) (58,000), and the largest projected population growth of all proposed critical habitat areas (49 percent between 2005 to 2025) (IEc 2006). The segment of the Verde River proposed as critical habitat has perennial average flow of approximately 25 to 30 cubic feet per second (cfs). Most of the surface water rights to the water in the Verde River are held by SRP, which impounds water downstream of the proposed stream segment for water delivery purposes. The only substantial upstream impoundment is Sullivan Dam, a heavily silted dam that serves little current use (IEc 2006). Other surface water rights are primarily held by irrigators, who divert water for agricultural purposes. Some surface water rights are held by mining interests (e.g., Phelps Dodge), though they are not currently used for mining activities. Residential and commercial users in this area rely on groundwater suppliers, either through private or municipal supplies.

The relatively large number of groundwater wells (322) that appear to fall within proposed critical habitat on the Verde River represents 63 percent of all ground water wells that fall within proposed critical

habitat. Of these wells, most are small, exempt wells that are used for domestic purposes. Thirty-three nonexempt wells fall within proposed critical habitat on the Verde River, of which 14 are designated for domestic use and 17 are designated for irrigation use (IEc 2006).

Economies in these communities have traditionally been agricultural, but residential populations have grown quickly in recent years, and continued growth is expected in the near future. A large number of small, residential groundwater wells exist within proposed critical habitat as well as 17 nonexempt wells used for domestic water use.

Approximately 4,800 acres (1,942 hectares [ha]) of land are irrigated in the Verde Valley area for alfalfa or other agricultural crops (IEc 2006). At least nine ditch companies utilize Verde surface water. The estimated value of agricultural lands within the Verde Valley area, which relies heavily on water diverted from the Verde Valley, is \$30.3 million (IEc 2006).

SRP operates six reservoirs and dams on the Salt and Verde rivers. Together, these reservoirs provide 40 percent of the water supply to the Phoenix Active Management Area, an area of approximately 5,600 square miles (14,503 sqkm) (IEc 2006). SRP diverts about 900,000 acre-feet of surface water annually for use by the City of Phoenix, Salt River Pima-Maricopa Indian Community, Fort McDowell Yavapai Nation, Phelps Dodge, irrigation users, and other communities in the Phoenix area, including Chandler, Glendale, Mesa, Scottsdale, and Tempe. The system serves 240,000 acres (97,125 ha) over an area of 375 square miles (971 sqkm) (IEc 2006).

The City of Prescott is located in the Prescott Active Management Area, where water is scarce. For this reason, the City of Prescott recently purchased a ranch (JWK Ranch) that lies 40 to 50 miles north of the City in the vicinity of the Verde River

headwaters, which are located upstream of proposed critical habitat. The City plans to utilize the groundwater water rights it obtained by purchasing this ranch to supply the city with approximately 10,000 to 12,000 acre-feet of water annually for domestic use. The City plans to develop a pipeline system in the next several years in order to deliver the water to its residents.

Complex 3 of proposed critical habitat is principally composed of three river segments: Aravaipa Creek (28.1 miles), Lower San Pedro (13.4 miles), and the Gila River (39 miles). The downstream terminus of proposed critical habitat is at Ashurst-Hayden Dam on the Gila River. Approximately 30 miles upstream of proposed critical habitat on the Gila River is Coolidge Dam. The Proposed Rule lists water diversions as threats to all of these river segments.

Construction of the Ashurst-Hayden Diversion Dam was completed in 1922. This dam is operated and maintained by the San Carlos Irrigation Project (SCIP), for the purposes of providing irrigation water for the Gila River Indian Community and the San Carlos Irrigation and Drainage District (SCIDD). All of the flows between the Coolidge Dam and the Ashurst-Hayden Diversion Dam are appropriated. Diversions to these entities are regulated under the 1935 Globe Equity 59 Decree and overseen by the Gila River Water Commissioner. The Gila River Water Commissioner is appointed by the United States District Court to administer the Globe Equity 59 Decree, which controls use of the waters of the Gila River in the reach from above Virden, New Mexico, to its confluence with the Salt River west of Phoenix, Arizona. Under the Decree, approximately 60 percent of the water goes to the Gila River Indian Community, while the other 40 percent goes to SCIDD (IEc 2006). SCIDD provides water to a variety of private landowners and municipalities for irrigation purposes on approximately 50,000 acres, including the communities of

Casa Grande and Florence, Arizona. There is ongoing litigation regarding Gila River water rights that could affect future water rights distribution on the Gila River. There is no history of consultation with the Service for the effects of Ashurst-Hayden Diversion Dam operations on the spikedace and loach minnow.

Reclamation consulted with the Service on a proposed water exchange by the San Carlos Apache. The Tribe states that it is likely to propose an exchange of up to 20,000 acre-feet of CAP water to be supplied downstream of Coolidge Dam in the future. The Tribe has a legal right to conduct this project, which would serve multiple functions, including maintaining an adequate water supply to maintain fish in the reservoir. However, the Tribe acknowledges that many administrative and political hurdles could get in the way of future project approval.

The Blue River runs through forestlands and rural in-holdings of the Apache-Sitgreaves and Gila national forests. Surface waters of the San Francisco and Blue rivers in New Mexico are primarily used for agriculture. Agriculture along the San Francisco consists of irrigated pasture and ranching activities.

The proposed rule lists water diversions as a threat to the upper Gila River. Surface waters of the Gila River in New Mexico are primarily used for agriculture and mining uses. Major cities in southwestern New Mexico do not rely on surface water for domestic supply purposes.

In addition to smaller water diversions, discussions have been ongoing since the 1980s about constructing a dam on the Gila River to allow New Mexico to utilize 18,000 acre-feet of Gila River water as part of the CAP. However, the New Mexico Interstate Stream Commission states that building a dam on the Gila River is not foreseeable.

3.2.2 Environmental Consequences

3.2.2.1 No Action Alternative. Under the No Action Alternative, spikedace and loach minnow critical habitat would not be designated under the ESA. The Section 7 consultation process would continue as presently conducted without consideration of PCEs. Section 7 would be initiated only for *may affect* determinations of impacts on the spikedace and loach minnow. Consequently, this alternative would have no impact on water resources or water management projects, including groundwater pumping, beyond those conservation measures resulting from the listing of the spikedace and loach minnow (65 FR 24328-24372) and associated requirements of Section 7 of the ESA.

3.2.2.2 Alternative A. Compared to the No Action Alternative, Alternative A would result in (1) a small but unknown increase in the number of additional new and reinitiated Section 7 consultations for water management activities based solely on the presence of designated critical habitat and (2) the addition of an adverse modification of critical habitat analyses to Section 7 consultations for the spikedace and loach minnow critical habitat. Most proposed critical habitat areas are occupied by the spikedace and loach minnow; therefore, water management projects in those areas would be subject to Section 7 consultations regardless of the area's status as critical habitat. The analyses are distinct, however, in that the standard for determining jeopardy concerns only the survival of the species, while the standard for determining adverse modification must take into account habitat values essential for the recovery of the species.¹

The outcome of future consultations would depend on the details of project proposals and the analysis of effects, which are

unknowable at this time. Conservation of the spikedace and loach minnow would likely require maintenance of existing populations. Therefore, the conservation value of proposed critical habitat must sustain existing populations found within those segments. Activities that appreciably diminish the conservation value of critical habitat would include any action that reduces the ability of that habitat to support existing populations.

The additional consultations (those based solely on the presence of designated habitat) would moderately increase administrative costs to the Service, the action agencies, and any project proponent involved in the consultation process. Outcomes of consultations for critical habitat may also include reasonable and prudent alternatives and other conservation measures designed to maintain spikedace and loach minnow PCEs. These conservation measures may adversely affect water management projects and beneficial water uses by requiring adjustment to project plans, schedules, and operations; by limiting water withdrawals; and by increasing costs to action agencies and project proponents.

The specific modifications to water management activities that may result from critical habitat designation, the effects of those modifications on beneficial water uses, and the costs attributable solely to designating critical habitat as opposed to listing the species cannot be predicted with precision, but most of the past water management consultations involving critical habitat of listed fish in small southwestern streams provide some indication of what can be expected (Service 2005b, p39). The proposed actions prompting these consultations have tended to be infrequent and minor in scope. Past consultations involving critical habitat areas have resulted in relatively minor changes to proposed projects. Typical project modifications have included minimizing activities within the wetted channel,

¹ See Section 1.4.1.3 Section 7 Consultation Process for a discussion of the implications of the Ninth Circuit Court in *Gifford Pinchot Task Force v. United States Fish and Wildlife Service*, 378 F.3d 1059 (9th Cir. 2004)

ensuring no pollutants enter surface waters, replanting riparian vegetation, monitoring for up to 10 years, and conducting research studies. These modifications have been recommended for approximately ten diversion repair and bank stabilization-type projects.

Conservation measures related to habitat protection have required the use of BMPs, which are mandated by the Clean Water Act permitting requirements. It is likely that the outcomes and impacts of future Section 7 consultations for the spikedace and loach minnow critical habitat would be similarly minor in scope. It is not expected, based on past consultations in the Southwest that designation of critical habitat would result in the infringement of any existing water rights.

Potential impacts on municipal, agricultural, Tribal, and industrial water use that could result from spikedace and loach minnow conservation are mostly uncertain. Few impacts on water use have occurred in the past. In fact, the only known example is related to use of water by a federal entity on federal lands (Fort Huachuca). However due to the intense competition for water resources in the Southwest, there is concern that spikedace and loach minnow would be considered additional "water users" in a water system for which water is already fully allocated.

It is possible that the City of Prescott's ability to make use of its existing groundwater resource at JWK Ranch could be limited as a result of spikedace and loach minnow conservation measures, should the ranch be shown to draw water from the Verde River headwaters. However, the City believes that a hydrologic connection from the ranch to the proposed critical habitat areas does not exist. In a worst-case scenario, the Service could recommend, or the City could decide, that in order to prevent take of spikedace, the City must abandon the ranch project, resulting in a loss of the City's ability to use

water from the ranch. Under this scenario, the City would lose some of its investment in the ranch and be forced to seek another, likely more remote and costly, water source for its residents.

The proposed rule lists water diversions as a threat to the East Fork White River. This river segment is within the boundaries of lands owned by the White Mountain Apache Tribe and has been proposed for exclusion. A detailed discussion of potential impacts on Tribal interests is presented in Section 3.9 of this document.

The San Carlos Apache Tribe is concerned that the designation of critical habitat for the spikedace and loach minnow would further complicate the procedure for getting the CAP project approved. Reclamation states that this project would be reevaluated before an exchange could occur and a new consultation is likely.

Designation of spikedace and loach minnow critical habitat may affect water use and management in New Mexico relative to the proposed New Mexico Unit of the CAP. However, as stated above, the New Mexico Interstate Stream Commission states that building a dam on the Gila River is not foreseeable. Because the future of this project is uncertain, potential impacts of spikedace and loach minnow critical habitat are not estimated.

While no SRP facilities fall within proposed critical habitat areas, SRP has water rights to a large portion of the flow of the Verde River and is currently engaged in developing an HCP in the Verde River Watershed for Horseshoe and Bartlett reservoirs, which are located downstream of proposed critical habitat for the spikedace and loach minnow. As stated above, the HCP covers many species, including several native fish species.

PDC is concerned that the designation of critical habitat for spikedace and loach minnow would limit the availability and

quantity of water for their operations. They state that if the availability of water is curtailed or precluded, PDC operations would be severely impacted and their viability placed at risk. PDC is also concerned that some potential ore reserves may not be exploitable if critical habitat for spinedace and loach minnow leads to unavailability of water supplies, large mitigation costs and/or project delays. The Service notes that this has not happened before under previous designations of critical habitat for these species.

Under their management plans, PDC is committed to regular coordination with the Service, which would include an annual summary to the Service regarding implementation of the management plan. Any deviations from the plan would be addressed, as would intended implementation of actions under the plan for the following year. PDC would make all reasonable efforts to provide the Service with notice of any significant changes to the management of its water supply system that are outside the range of historic operating parameters discussed in the management plan. If any changes are required, PDC would consider loach minnow and spinedace habitat and any comments received from the Service, and would make reasonable efforts to minimize adverse impacts to these fish and the PCEs.

In addition to the site-specific reasons discussed above, effects on future water management activities and water resources from critical habitat designation are expected to be minor and not constrain any intended water management activities because (1) most of the previously completed Section 7 consultations involving critical habitat for these fish species in small southwestern streams have resulted only in minor project alterations to proposed projects; (2) the number of consultations is not expected to change; few projects and operations would be subject to consultation based solely on

the presence of designated critical habitat because most all of the proposed segments are occupied by the spinedace and loach minnow; (3) if the outcome of those few consultations were based solely on critical habitat that do not reach the threshold of adverse modification they could only result in discretionary conservation recommendations to reduce impacts on PCEs because there is no incidental take statement or reasonable prudent alternatives for adverse affects to critical habitat; and (4) the small likelihood that reasonable and prudent alternatives developed under the jeopardy standard would be changed substantially with the addition of critical habitat designation and application of the adverse modification standard.

3.2.2.3 Alternative B. Compared to the No Action Alternative, impacts associated with the designation of critical habitat would be similar to those identified for Alternative A. However compared to Alternative A, Alternative B would result in a small but unknown increase in the number of additional new and reinitiated Section 7 consultations based solely on the presence of designated critical habitat on Tribal lands and on the addition of an adverse modification of critical habitat analysis to Section 7 consultations for the spinedace and loach minnow in critical habitat on Tribal lands.

3.3 Wetlands and Floodplains

3.3.1 Existing Conditions

Within the 300-ft (91-m) buffer along streams segments, the proposed spinedace and loach minnow critical habitat includes riparian areas containing floodplains and wetland habitats. Quality fish habitat is intrinsically linked to the quality of the existing adjacent upland habitat that provides key habitat components (e.g., large woody debris) crucial for fish species. Streams regularly

submerge portions of the riparian zone via floods and channel migration, and portions of the riparian zone may contain off-channel rearing habitats used by juvenile fishes. Healthy riparian zones help ensure water quality essential to native fishes as well as the forage some species depend on (Reiser and Bjornn, 1979; Meehan 1991; Forest Ecosystem Management Assessment Team [FEMAT] 1993; Spence et. al. 1996).

Both wetlands and floodplains are valuable components of healthy riparian ecosystems. Wetlands, in addition to providing habitat for native fish, are valued for their ability to purify water, to help regulate natural flooding cycles, and to prevent erosion. Floodplains, during flood events, can interact with streams to supply nutrients, debris, and organic material back into the main channel; allow fish passage during high flow; and provide spawning sites and food supply for native fish species.

Currently, there is no definite quantification of the amount of wetlands and floodplains within proposed critical habitat areas. However, it can be assumed that all of the 522 stream miles of proposed critical habitat, where not confined by canyon walls, are within floodplains.

Flood control programs occur throughout the counties where critical habitat is proposed. These programs involve plans and structures designed to reduce floods and property damage as a result of floods. It is unknown how many structures or plans occur within the areas proposed for critical habitat designation. In general, where flooding is a risk, development is discouraged. Additionally, the Federal Emergency Management Agency (FEMA) does not prohibit all construction in floodways, but does require developers to obtain a "No Rise Certificate" by demonstrating that there would be no increase in water level as a result of construction. This development regulation

may require special engineering, often making development in floodways impractical and prohibitively expensive.

Federal guidelines govern real estate development in floodplains for jurisdictions in flood-prone areas that choose to participate in the National Flood Insurance Program (NFIP), managed by the Mitigation Division of FEMA. Communities in this program adopt FEMA's floodplain management ordinances in exchange for Federally-backed flood insurance. FEMA defines the floodplain lands as Special Flood Hazard Areas and places special requirements on development within these areas. The lowest floor of all new residential buildings in the floodplain must be at or above the level of the 100-year flood, in order to qualify for FEMA-backed insurance. Non-residential buildings must be at or above the level of the 100-year flood, or be flood-proofed to that level. Using these guidelines, construction in a floodplain is possible in lower-risk locations, such as areas where the floodplain is wide.

Many flood control projects are developed within city limits to reduce the risk of flooding residences and businesses. These projects may consist of constructing bank protection and channelization, additional drains, catchment basins, and placing pipes to convey stormwater from flood-prone areas to the catchment basins.

Most consultations related to flooding and flood control methods are a result of emergency situations. During a flooding event the responsible agency contacts the Service and emergency consultation is conducted to shore up banks, put in erosion control structures, or allow for emergency repair work. When conducting emergency consultations, the Service may recommend efforts that can be taken, but are not required, by the action agency to minimize impacts on listed species. Emphasis is placed upon protecting human life and property. For emergency

consultations, the Service does not develop reasonable and prudent measures or alternatives.

Other consultations relative to flooding include road repairs. This is usually covered under emergency consultations conducted by the affected County and results from access to private property being cut off.

Flood control issues were raised by the public in response to a previous critical habitat proposal (59 FR 10906 and 10898). Critical habitat was set aside following a ruling in *Catron County Board of Commissioners, New Mexico v. U.S. Fish and Wildlife Service*, 75 F. 3rd 1429 (10th Cir. 1996). However no public comments raising flood control issues were received under this current proposed rule.

3.3.2 Environmental Consequences

3.3.2.1 No Action Alternative. Under the No Action Alternative, the spikedace and loach minnow critical habitat would not be designated under the ESA. The Section 7 consultation process would continue as presently conducted without consideration of PCEs. Section 7 would be initiated only for *may affect* determinations of impacts on the spikedace and loach minnow. Consequently, this alternative would have no impact on wetlands or floodplains, beyond those conservation measures resulting from the listing of the spikedace and loach minnow (65 FR 24328-24372) and associated requirements of Section 7 of the ESA.

3.3.2.2 Alternative A. Compared to the No Action Alternative, Alternative A would result in (1) a small but unknown increase in the number of additional new and reinitiated Section 7 consultations based solely on the presence of designated critical habitat and (2) the addition of an adverse modification of critical habitat analysis to Section 7 consultations for the

spikedace and loach minnow in critical habitat. A potential outcome of Section 7 consultations for critical habitat would be increased maintenance of the spikedace and loach minnow PCEs through conservation measures within designated critical habitat. This would serve to maintain wetland and floodplain values and functions. These beneficial effects are expected to be minor because the outcomes of consultations for critical habitat are not likely to substantially change management practices, proposed and existing projects, or various uses of proposed critical habitat segments.

Flood control projects are basically designed to protect residences and business from stormwater runoff. Most of the stream segments proposed for critical habitat designation are located in areas removed from higher density human populations, and are in areas that naturally provide flood control through expanded floodplains and braided channels or restricted canyons. Therefore, future flood control methods and plans are not expected to be impacted by the designation of critical habitat.

Most flood control consultations are conducted under the emergency consultation process and do not include reasonable and prudent measures or alternatives. Therefore, consultations conducted for flood control methods would experience little modification from the designation of critical habitat.

3.3.2.3 Alternative B. Compared to the No Action Alternative, impact associated with the designation of critical habitat would be similar to those identified for Alternative A. However compared to Alternative A, Alternative B would result in a small but unknown increase in the number of additional new and reinitiated Section 7 consultations based solely on the presence of designated critical habitat on Tribal lands and the addition of an adverse modification

of critical habitat analysis to Section 7 consultations for the spikedace and loach minnow in critical habitat on Tribal lands.

3.4 Natural Resources—Fish, Wildlife, Plants, and Biological Communities

3.4.1 Existing Conditions

Several hundred species of fish, wildlife, and plants, including threatened, endangered, and sensitive (TES) species occupy the aquatic and terrestrial biological communities within the proposed critical habitat area (Rea 1983; McNamee 1994). This value is evidenced by the disproportionately large number of species that utilize riparian habitat for all or part of their life history requirements compared to the area of other habitats (Hubbard 1977; Ohmart and Anderson 1982).

Proposed critical habitat areas include one or more of the PCEs for spikedace and loach minnow described in Section 2.4 or can be restored to provide those elements. The presence of these elements and the potential to restore them indicate the proposed areas contain a relatively intact riparian habitat that is of great importance to wildlife species. The occurrence of any given species, whether fish, wildlife, or plant within the proposed critical habitat varies widely and depends on local and regional environmental conditions such as elevation, climate, stream type, water management activities, proximity to land development or other human disturbances, and grazing practices (Ffolliott et al. 2004).

3.4.1.1 Fish. 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 proposed designation 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*). See Section 3.4.1.4 in this document for a description of TES fish species that occur in the proposed critical habitat areas.

Numerous nonnative aquatic species also occur within the proposed critical habitat areas, notably fish in the family Centrarchidae, which includes bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), and a species of bass (*Micropterus* spp.). Other nonnative fish include the red shiner (*Cyprinella lutrensis*), flathead catfish (*Pylodictis olivaris*), channel catfish (*Ictalurus punctatus*), rainbow trout (*Oncorhynchus mykiss*), yellow bullhead (*Ameiurus natalis*), and black bullhead (*Ictalurus melas*) (Service 2005b). Most nonnative fish species were introduced into Arizona streams as sport fish, but one particularly invasive species, mosquitofish (*Gambusia affinis*), was widely introduced to control mosquitoes (Courtenay and Meffe 1989). Several of these species have demonstrated an ability to displace native fish populations within a short period of time (Courtney and Meffe 1989). Introduced crayfish (*Orconectes* spp.) and bullfrogs (*Rana catesbeiana*) may also be found in proposed critical habitat areas and have a profound adverse impact on native fish communities and aquatic habitat structure (Bury and Whelan 1984; Hayes and Jennings 1986; Lodge et al. 2000).

3.4.1.2 Wildlife. Hundreds of species of mammals, birds, amphibians, reptiles, and invertebrates depend on riparian and aquatic habitats that are likely to occur in the proposed critical habitat areas (Ohmart and Anderson 1982). Wildlife species commonly found in southwestern riparian habitats are listed in Brown's *Biotic Communities* (1994). These species

include small rodents; furbearers such as beaver (*Castor canadensis*) and muskrats (*Ondatra zibethicus*); small carnivores such as raccoon (*Procyon lotor*), otter (*Lontra canadensis*), and bobcat (*Lynx rufus*), and larger carnivores such as mountain lion (*Felis concolor*), black bear (*Ursus americanus*), and coyote (*Canis latrans*); and wide-ranging mammals such as deer (*Odocoileus* spp.) and javelina (*Pecari tajacu*). Migratory and resident birds such as gray hawk (*Asturina nitida*), common black-hawk (*Buteogallus anthracinus*), marsh wren (*Cistothorus palustris*), summer tanager (*Piranga rubra*), and turkey (*Meleagris* spp.) also depend on riparian habitats. Amphibians such as treefrogs (*Pternohyla* spp.) and salamanders (*Ambystoma* spp.) and reptiles such as garter snakes (*Thamnophis* spp.), Sonoran mud turtle (*Kinosternon sonoriense sonoriense*), and leopard frogs (*Rana* spp.) depend on riparian and aquatic habitats for all or most of their life cycles. Hundreds of species of invertebrates also utilize southwestern riparian and aquatic habitats or depend on these habitats for all or most of their life cycles (Merritt and Cummins 1984). See Section 3.4.1.4 of this document for a description of threatened and endangered wildlife species that are likely to occur in the critical habitat areas.

3.4.1.3 Plants. Riparian vegetation along the proposed critical habitat streams is primarily cottonwood (*Populus fremontii*, *P. 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 (Brown 1994).

3.4.1.4 Threatened, Endangered, and Sensitive Species. There are a number of

other endangered and threatened species in the proposed critical habitat for spikedace and loach minnow. The endangered razorback sucker has been stocked into the Gila Box Riparian National Conservation Area (RNCA), which includes the Gila River, Bonita Creek, Eagle Creek and the San Francisco River. Additionally, the razorback sucker has been stocked in the Blue and Verde rivers. 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 RNCA, which is part of this designation. It also includes the Verde River and its 100-year floodplain from Perkinsville, Arizona, to Horseshoe Reservoir. The endangered Colorado pikeminnow, formerly 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 spikedace and loach minnow. Critical habitat for the flycatcher includes the San Pedro River from the Hereford Bridge, near Hereford, Arizona, to Benson, Arizona, and from Aguaja Canyon to the Gila River, a substantial overlap with the proposed designation for spikedace and loach minnow.

Southwestern willow flycatcher critical habitat also includes other areas of the spikedace 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, Arizona, and the Tularosa River.

Within proposed critical habitat areas the threatened bald eagle (*Haliaeetus leucocephalus*) nests along the Verde River, 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 spikedace and loach minnow.

3.4.2 Environmental Consequences

3.4.2.1 No Action Alternative. Under the No Action Alternative, the spikedace and loach minnow critical habitat would not be designated under the ESA. The Section 7 consultation process would continue as presently conducted without consideration of PCEs. Section 7 would be initiated only for *may affect* determinations of impacts on the spikedace and loach minnow. Consequently, this alternative would have no impact on fish, wildlife, and plants, including candidate, proposed, or listed species, beyond those conservation measures resulting from the listing of the spikedace and loach minnow (65 FR 24328-24372) and associated requirements of Section 7 of the ESA.

3.4.2.2 Alternative A. Compared to No Action Alternative, the Alternative A would result in (1) a small but unknown increase in the number of additional new and reinitiated Section 7 consultations based solely on the presence of designated critical habitat and (2) the addition of an adverse modification of critical habitat analysis to Section 7 consultations for the spikedace and loach minnow in critical habitat. A potential outcome of Section 7 consultations for critical habitat would be increased maintenance of the spikedace and loach minnow PCEs through conservation measures within designated critical habitat. This would serve to maintain water quality, natural stream flow characteristics, and stream morphology, as well as other PCEs that sustain aquatic and riparian ecosystem integrity. As a result, all native fish, wildlife, and plants, including

candidate, proposed, or listed species, that are components of those ecosystems would benefit.

The species most likely to benefit, in addition to the spikedace and loach minnow, are aquatic species such as roundtail chub, headwater chub, desert sucker, Sonora sucker, speckled dace, longfin dace, leopard frogs and other amphibians, snails and other aquatic invertebrates, and aquatic mammals and plants. Riparian vegetation would benefit through measures to ensure natural streamflow patterns, as well as measures to anchor soils and reduce erosion and excessive sedimentation into critical habitat stream segments. Maintenance of riparian vegetation would benefit all wildlife dependent on riparian habitats.

The beneficial effects of the Alternative A on fish, wildlife, and plants are expected to be minor because the outcomes of consultations for critical habitat are not likely to substantially change management practices, proposed and existing projects, or various uses of proposed critical habitat segments.

Nonnative fish, such as the red shiner, that are considered harmful to the spikedace and loach minnow may be adversely affected if managers implement a program to remove them from critical habitat. Such a program may be instituted prior to reintroducing the spikedace and loach minnow into critical habitat areas. The adverse impacts on nonnative fish populations throughout the Gila River basin would be negligible because of their large numbers and invasive nature.

3.4.2.3 Alternative B. Compared to the No Action Alternative, impact associated with the designation of critical habitat would be similar to those identified for Alternative A. However compared to Alternative A, Alternative B would result in a small but unknown increase in the number of additional new and reinitiated Section 7

Table 5. Approximate proposed critical habitat in stream miles (mi) and kilometers (km) by state and land owner

Land Owner	Arizona mi (km)	New Mexico mi (km)	Total mi (km)
Federal	170.4(274.2)	167.7 (269.9)	338.1 (544.1)
Tribal	2.1 (3.4)	0 (0)	2.1 (3.4)
State	8.0 (12.9)	1.3 (2.1)	9.3 (15)
County	0 (0)	0 (0)	0 (0)
Private	90.2 (145.1)	82.5 (132.8)	172.7 (277.9)
Total	270.7 (435.6)	251.5 (404.8)	522.2 (840.4)

consultations based solely on the presence of designated critical habitat on Tribal lands and the addition of an adverse modification of critical habitat analysis to Section 7 consultations for the spikedace and loach minnow in critical habitat on Tribal lands.

3.5 Land Use and Management

3.5.1 Existing Conditions

Federal, state, county, and Tribal governments that have management authority for the proposed spikedace and loach minnow critical habitat stream segments are shown in Table 5. In some cases different governments may have management responsibility for different portions of a given proposed critical habitat segment. Just over half of the proposed critical habitat is on federal land. These public lands are managed according to the pertinent management plan for each Forest Service district office and BLM field office.

There is a wide diversity of human activities and land uses throughout the proposed 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 Forest Service. 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 creeks, the BLM is a primary manager. Livestock grazing, recreation, roads, and mining are major uses of those lands. On both Forest Service and BLM 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 Mazatzal, Gila, Aravaipa, and Hellsgate Wildernesses, Blue Range Primitive Area, and Gila Box and San Pedro RNCA.

Private lands are scattered throughout the proposed designation with large areas of private land in the Cliff/Gila Valley on the upper Gila 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 developments exist in many other areas. Substantial areas of land are owned by large mining companies, such as PDC and ASARCO (formerly American Smelting and Refining Company), with concentrations in the Cliff/Gila Valley, the lower San Francisco River and Eagle Creek, and in the Winkelman 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 areas on the upper Gila River, Aravaipa Creek, the San Pedro 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 being considered for exclusion from 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 proposed designated portions of Eagle Creek lie upstream, downstream, and across the stream from Reservation lands. These reservation areas are primarily used for livestock grazing, fuelwood cutting, roads, and recreation. 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 was built by the Reclamation under the terms of a 1994 biological opinion on the potential for the CAP to introduce and spread nonnative aquatic species. The Yavapai-Prescott Tribe Reservation is also located in the general area. However, none of these are proposed or would be affected by critical habitat designation.

National Park Service lands include 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.

3.5.2 Environmental Consequences

3.5.2.1 No Action Alternative. Under the No Action Alternative, the spikedace and loach minnow critical habitat would not be designated under the ESA. The Section 7 consultation process would continue as presently conducted without consideration of PCEs. Section 7 would be initiated only for *may affect* determinations of impacts on the spikedace and loach minnow. Consequently, this alternative would have no impact on land use and management

beyond those conservation measures resulting from the listing of the spikedace and loach minnow (65 FR 24328-24372) and associated requirements of Section 7 of the ESA.

3.5.2.2 Alternative A. Compared to the No Action Alternative, the Alternative A would result in (1) a small but unknown increase in the number of additional new and reinitiated Section 7 consultations for land management actions based solely on the presence of designated critical habitat and (2) the addition of an adverse modification of critical habitat analysis to Section 7 consultations for the spikedace and loach minnow in critical habitat. Few projects and operations would be subject to consultation based solely on the presence of designated critical habitat. Most proposed critical habitat areas are occupied by the spikedace and loach minnow; therefore, land management actions in those areas would be subject to Section 7 consultations irrespective of the area's status as critical habitat. The consultation analyses for effects on a listed species and effects on critical habitat are similar in many respects and are parallel processes because the health of a species cannot be disassociated from the health of its habitat. The analyses are distinct, however, in that the standard for determining jeopardy concerns only survival of the species, while the standard for determining adverse modification must also take into account habitat values essential for the recovery of the species. The outcomes of future consultations would depend on the details of project proposals and the analysis of effects, which are unknowable at this time.

The additional consultations would increase administrative costs to the Service and action agencies. Implementing conservation measures resulting from those consultations would also increase costs for action agencies. Outcomes of consultations for critical habitat may also include reasonable and prudent alternatives and other conservation

measures designed to maintain the spikedace and loach minnow PCEs. These outcomes cannot be predicted with precision; however, based on past consultations, types of additional management actions that may be required include but are not limited to revising resource management plans; mapping, surveying, and monitoring the spikedace and loach minnow habitat and preparing survey and monitoring reports; restoring stream habitats; removing nonnative fish and other nonnative aquatic species; removing invasive, nonnative plants; implementing and monitoring grazing restrictions; implementing and monitoring recreation restrictions; and realigning roads and trails. Implementing conservation measures for the spikedace and loach minnow critical habitat may affect how action agencies meet other management objectives. For example, use of pesticides and herbicides may be precluded in critical habitat.

In summary, the effects of critical habitat designation on land use and management are expected to be minor because (1) most of the previously completed Section 7 consultations involving critical habitat for these fish species in small southwestern streams have resulted only in minor project alterations to proposed projects; (2) the number of consultations is not expected to change; few projects and operations would be subject to consultation based solely on the presence of designated critical habitat because most all of the proposed segments are occupied by the spikedace and loach minnow; (3) if the outcome of those few consultations were based solely on critical habitat that do not reach the threshold of adverse modification they could only result in discretionary conservation recommendations to reduce impacts on PCEs because there is no incidental take statement or reasonable prudent alternatives for adverse affects to critical habitat; and (4) the small likelihood that reasonable and prudent alternatives developed under the jeopardy standard

would be changed substantially with the addition of critical habitat designation and application of the adverse modification standard.

3.5.2.3 Alternative B. Compared to the No Action Alternative, impact associated with the designation of critical habitat would be similar to those identified for Alternative A. However compared to Alternative A, Alternative B would result in a small but unknown increase in the number of additional new and reinitiated Section 7 consultations based solely on the presence of designated critical habitat on Tribal lands and the addition of an adverse modification of critical habitat analysis to Section 7 consultations for the spikedace and loach minnow in critical habitat on Tribal lands.

3.6 Wildland Fire Management

3.6.1 Existing Conditions

Wildland fires and fire management activities increasingly affect southwest riparian areas in general, and the spikedace and loach minnow habitat in particular. Native riparian vegetation is not generally fire adapted, and evidence suggests that, historically, fire has not been a major disturbance in the vegetation communities that border southwestern streams. Wildland fire, however, is becoming a more common form of disturbance in riparian habitats throughout the Southwest. The increased prevalence of fire disturbance is attributed to increased fuel loading resulting from control of floods that historically swept away dead vegetation, litter, and woody debris; replacement of native vegetation by exotic species, many of which are highly flammable (e.g., tamarisk); river dewatering; and increased ignitions associated with increased human activity (Service 2002).

Current federal fire management practices conform to the National Fire Plan, which was developed by federal agencies in 2001 to address the causes of changing fire regimes and to guide wildland fire management (*FY 2001 Interior and Related Agencies Appropriations Act* [Public Law 106–291]). The implementation plan for this collaborative effort, called the *10-year Comprehensive Strategy*, outlines a comprehensive approach to the management of wildland fire, hazardous fuels, and ecosystem restoration and rehabilitation on federal and adjacent state, Tribal, and private forest and range lands in the United States. The four primary goals of this strategy are to (1) improve prevention and suppression, (2) reduce hazardous fuels, (3) restore fire-adapted ecosystems, and (4) promote community assistance. Possible fire management actions depend on specific circumstances and may include

- reduction of hazardous fuel loads by mechanical, chemical, or biological means;
- reduction of hazardous fuel loads or habitat restoration with prescribed fire, which is any fire ignited by management actions to meet specific objectives;
- wildland fire use, which is the management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in predefined geographic areas;
- wildland fire suppression.

Consistent with national policy, the focus of fire management has increasingly been on the wildland-urban interface (WUI), which comprises areas where flammable wildland fuels meet or intermingle with structures and other human development. Very little (approximately 2 percent) of the proposed critical habitat for the spikedace and loach minnow overlaps WUI areas (IEc 2006).

WUI areas are closer to developed areas and may be more vulnerable to human-

caused fires and consequent fire suppression efforts. In general, however, riparian habitats, areas occupied by federally protected species, and designated or proposed critical habitat are primarily managed to protect their resource values. Section 7 consultations regarding fire management are often programmatic in nature, covering broad-based fire management plans and programs, but consultations may be required for individual burn and rehabilitation plans. Emergency Section 7 consultations for wildland fire suppression are typically conducted after the fact. Since listing the spikedace and loach minnow on the endangered species list in 1986, two consultations have been completed for actions involving fire management planning and potential effects on the spikedace and loach minnow. The first consultation was for a BLM Arizona *Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management* (Service 2004a). The second was completed for prescribed burning efforts on the Robinson Mesa Fire project (Service 2004b).

Conservation measures listed in the *Biological and Conference Opinion for the BLM Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management* (Service 2004a) and the *Formal Conference on the Robinson Mesa Prescribed Fire Project on the Clifton Ranger District of the Apache-Sitgreaves National Forests* (Service 2004b), exemplify the kinds of conservation measures that might be expected for future Section 7 consultations for the spikedace and loach minnow. These measures are designed to minimize adverse effects of all fire management activities on federally protected species and their habitat. Several measures are specifically designed to protect and enhance the ecological values and functions of riparian areas and a few target species like the spikedace and loach minnow. Conservation efforts for protecting sensitive species and habitat generally include using Minimum Impact Suppression

Tactics in sensitive habitats; excluding fire retardant and wildland fire use fires from riparian and wetland areas; and incorporating consideration of sensitive species and habitat into all fire management and rehabilitation plans, programs, and implementation efforts.

In spikedace and loach minnow proposed critical habitat areas, and in many areas across the United States, the Department of Agriculture and the Department of the Interior are jointly implementing the National Fire Plan, which grew out of a report to the President called *Managing the Impacts of Wildfire on Communities and the Environment: A Report to the President in Response to the Wildfires of 2000*. The National Fire Plan calls for a substantial increase in the number of forested acres treated annually to reduce hazardous fuels. Under the plan, WUI areas are defined by each agency “where human life, property, and natural resources are in imminent danger from catastrophic wildfire” (USFS 2001). This makes the WUI a focal area for human environment conflicts such as wildland fires (University of Wisconsin 2004).

3.6.2 Environmental Consequences

3.6.2.1 No Action Alternative. Under the No Action Alternative, spikedace and loach minnow critical habitat would not be designated under the ESA. The Section 7 consultation process would continue as presently conducted without consideration of PCEs. Section 7 would be initiated only for *may affect* determinations of impacts on the spikedace and loach minnow. Consequently, this alternative would have no impact on wildfire management beyond those conservation measures resulting from the listing of the spikedace and loach minnow (65 FR 24328-24372) and associated requirements of Section 7 of the ESA.

3.6.2.2 Alternative A. Compared to No Action Alternative, Alternative A would

result in (1) a small but unknown increase in the number of additional new and reinitiated Section 7 consultations for fire management actions based solely on the presence of designated critical habitat and (2) the addition of an adverse modification of critical habitat analysis to Section 7 consultations for the spikedace and loach minnow in critical habitat. The additional Section 7 consultations would most likely be for specific hazardous fuels reduction treatments or for after-the-fact (emergency) consultations for wildland fire suppression and rehabilitation activities in those areas. The primary impact of the additional consultations would be increased administrative costs to the Service and action agencies.

Consultations for critical habitat may also result in the establishment of reasonable and prudent alternatives and other conservation measures designed to maintain the spikedace and loach minnow PCEs. These conservation measures, however, are unlikely to appreciably constrain wildfire management activities in the field. Land management agencies generally preclude wildland fires from riparian areas whether or not designated critical habitat is present. This is common practice because native riparian vegetation is not fire adapted, and fires of all but the lowest intensity tend to be destructive to those habitats. Prescribed fire is used only judiciously in riparian habitat for the same reason. Designation of critical habitat may discourage the use of herbicides to reduce fuels (e.g., tamarisk) and would encourage low-impact methods to mechanically reduce fuels. Agencies generally employ low- or minimum-impact practices in riparian areas; therefore, designation of critical habitat would have a negligible adverse impact on fire management activities.

Some fuels reduction projects, however, do occur in riparian habitats, particularly in WUI areas, and it is possible that Section 7 consultations resulting from designation of

the spokedace and loach minnow critical habitat could cause delays in implementing these projects. If delays did occur and hazardous fuel loads contributed to destructive wildland fire, public safety could be compromised, particularly in WUI areas. This potential impact is mitigated by alternative Section 7 regulations for fire management that limit the delays allowed for completing consultations on fire management actions. Consequently, the effects of critical habitat designation on public safety would be negligible.

The effects of the spokedace and loach minnow critical habitat designation on fire management are also expected to be negligible because (1) most of the previously completed Section 7 consultations involving critical habitat for these fish species in small southwestern streams have resulted only in minor project alterations to proposed projects; (2) the number of consultations is not expected to change; few projects and operations would be subject to consultation based solely on the presence of designated critical habitat because most all of the proposed segments are occupied by the spokedace and loach minnow; (3) if the outcome of those few consultations were based solely on critical habitat that do not reach the threshold of adverse modification they could only result in discretionary conservation recommendations to reduce impacts on PCEs because there is no incidental take statement or reasonable prudent alternatives for adverse affects to critical habitat; and (4) the small likelihood that reasonable and prudent alternatives developed under the jeopardy standard would be changed substantially with the addition of critical habitat designation and application of the adverse modification standard.

Wildland fire within the natural range of variability may have beneficial effects on fish habitat through restoration and maintenance of watershed functions. For example, a multiyear prescribed burn

program enacted in the Muleshoe Ranch Cooperative Management Area by The Nature Conservancy has improved watershed condition, aquatic habitat, and native fish populations. In contrast, high-intensity wildfire in and near riparian habitat can result in severe adverse impacts on fish. These impacts include increased water temperatures, fire-induced changes in pH, and increased ammonium and phosphate levels leached from smoke and ash. Post-fire effects include increased runoff and heavy sediment loads due to loss of groundcover and subsequent erosion in the watershed; loss of streamside vegetation that provides nutrients, shade, bank stabilization, and habitat among roots; altered channel morphology; degraded water quality; and altered food web. These adverse effects of high-intensity wildfire are well documented (Brown 1989; Gresswell 1999; Minshall et al. 1990; Newcombe and MacDonald 1991; Norris et al. 1991; Rieman and Clayton 1997; Rinne 1996; Spencer and Hauer 1991). Fire suppression activities can adversely affect aquatic habitats. Impacts include the construction of fire lines, foot traffic, and vehicle use that can destroy riparian vegetation, destabilize soils, and increase sedimentation in streams. Fire retardants can contaminate streams with chemicals toxic to fish and other aquatic ecosystem components (Service 2004a).

Designating critical habitat is expected to have minimal impacts on fire risk reduction projects and wildfire suppression. This is because of the benefits to spokedace and loach minnow from reducing the risk of wildfire and the expectation that few fire management projects would be subject to consultation solely because of the presence of critical habitat.

3.6.2.3 Alternative B. Compared to the No Action Alternative, impact associated with the designation of critical habitat would be similar to those identified for Alternative A. However compared to Alternative A, Alternative B would result in a small but

unknown increase in the number of additional new and reinitiated Section 7 consultations based solely on the presence of designated critical habitat on Tribal lands and the addition of an adverse modification of critical habitat analysis to Section 7 consultations for the spokedace and loach minnow in critical habitat on Tribal lands.

3.7 Recreation

3.7.1 Existing Conditions

Several types of dispersed recreational activities take place in or near proposed critical habitat for the spokedace and loach minnow. Recreational opportunities include hiking, wading, swimming, birding, wildlife viewing, photography, angling, hunting, camping, horseback riding, and OHV use (Service 2002). Level of use and type of activity vary by site characteristics, landownership, management policy, and accessibility.

Most of the proposed habitat segments receive only low-level recreational use because of their remoteness, difficult terrain, or landownership status (IEc 2006). Numerous road crossings were cited in the proposed rule to list the spokedace and loach minnow as a threat to the species and its habitat (Service 2002). Public access to the streams has not been restricted; however, recreational use in the proposed habitat segments appears to be low.

3.7.1.1 OHVs. As a general policy, the BLM does not allow OHV use up and down any of the stream reaches within proposed critical habitat on BLM-administered lands and stream crossings are limited to established roads (IEc 2006). Use of OHVs is prohibited in the Gila Box RNCA and in the Aravaipa Canyon Wilderness (both managed by the BLM).

The proposed critical habitat areas where OHV use is most prevalent are within

Apache-Sitgreaves National Forest, which contains several reaches in proposed critical habitat in Complex 2 and 4. Representatives of two OHV groups have expressed concern that OHV use could be curtailed as a result of proposed critical habitat for the spokedace and loach minnow (Public Hearing, Thatcher, Arizona, December 15, 1999).

OHV use on USFS lands in Arizona is being reexamined as part of an Environmental Impact Statement (EIS) that examines all cross-country travel by OHVs in Arizona national forests. The creation of the EIS was prompted by numerous factors including concerns that continuing unrestricted OHV use could increase the spread of noxious weeds, cause erosion, create user conflicts, disrupt wildlife, and damage wildlife habitat (USFS 2004). The EIS does not change lands currently designated for intensive OHV use or lands currently closed to OHV use. However, areas currently designated as open or seasonal would be restricted pending site-specific planning.

The USFS plans to implement internal direction to limit OHV use in riparian areas to benefit seven endangered species including the spokedace and loach minnow as part of the EIS program (USFS 2004). However, any future changes to OHV use would be subject to public review. Because any future changes to OHV use allowed in proposed critical habitat areas is unknown, potential impacts that may be caused by spokedace and loach minnow conservation are not quantified.

3.7.1.2 Fishing. The AGFD ceased to stock sportfish in Eagle Creek and the Blue River in Apache-Sitgreaves National Forest due to native fish considerations in the late 1990s. Spokedace and loach minnow were among numerous species considered when these stocking cessations were put in place. Under Arizona Game and Fish Commission requirements, AGFD must identify alternate stocking sites when

stocking is discontinued at a particular location. As a result, AGFD estimates that changes in stocking on Eagle Creek and the Blue River have not affected the overall amount fish stocking taking place in Arizona, nor the overall level of fishing taking place (IEc 2006). However, localized impacts may have occurred. Several citizens at a public hearing held in Thatcher, Arizona, in 1999 voiced disappointment that the sites are no longer stocked.

According to the AGFD there are an estimated 198,300 angler use days within or near areas that are designated critical habitat. The most popular area is Big Lake in the White Mountains, generating approximately 124,576 angler days a year (AGFD pers. comm. 2006). Big Lake drains into the North Fork East Fork Black River, which is proposed for critical habitat designation downstream of Big Lake. According to AGFD, the upper Verde River provided approximately 191 angler days, while the Cottonwood area provided approximately 22,971 angler days during 2006. AGFD has made efforts to address the issue of stocking nonnative fish in streams that are proposed for critical habitat designation, taking into account native fish species.

3.7.2 Environmental Consequences

3.7.2.1 No Action Alternative. Under the No Action Alternative, the spokedace and loach minnow critical habitat would not be designated under the ESA. The Section 7 consultation process would continue as presently conducted without consideration of PCEs. Section 7 would be initiated only for *may affect* determinations of impacts on the spokedace and loach minnow. Consequently, this alternative would have no impact on recreation beyond those conservation measures resulting from the listing of the spokedace and loach minnow (65 FR 24328-24372) and associated requirements of Section 7 of the ESA.

3.7.2.2 Alternative A. Compared to No Action, the Alternative A would result in (1) a small but unknown increase in the number of additional new and reinitiated Section 7 consultations for recreation-related activities based solely on the presence of designated critical habitat and (2) the addition of an adverse modification of critical habitat analysis to Section 7 consultations for spokedace and loach minnow in critical habitat. The areas most likely to be affected are those not occupied by the spokedace and loach minnow but designated as critical habitat. The additional consultations would increase administrative costs to the Service, the action agencies, and any project proponent involved in the consultation process. Consultations for critical habitat may also result in the establishment of reasonable and prudent alternatives and other conservation measures designed to maintain the spokedace and loach minnow PCEs. Conservation measures may adversely affect recreational opportunities, primarily by limiting the higher-impact activities such as OHV use and camping in critical habitat. Conservation measures may also include restrictions on constructing recreational facilities in or near critical habitat to reduce impacts from construction, maintenance, and use by recreationists.

A potential beneficial outcome of increasing Section 7 consultations for recreation-related activities would be maintenance of spokedace and loach minnow PCEs through conservation measures within designated critical habitat. The conservation of riparian habitat values that would result may benefit such recreational activities as birding, wildlife viewing, photography, and day hiking.

The adverse and beneficial effects of critical habitat designation on recreation-related activities are expected to be negligible to minor because recreational use of most critical habitat areas is light and (1) most of the previously completed

Section 7 consultations involving critical habitat for these fish species in small southwestern streams have resulted only in minor project alterations to proposed projects; (2) the number of consultations is not expected to change; few projects and operations would be subject to consultation based solely on the presence of designated critical habitat because most all of the proposed segments are occupied by the spinedace and loach minnow; (3) if the outcome of those few consultations were based solely on critical habitat that do not reach the threshold of adverse modification they could only result in discretionary conservation recommendations to reduce impacts on PCEs because there is no incidental take statement or reasonable prudent alternatives for adverse effects to critical habitat; and (4) the small likelihood that reasonable and prudent alternatives developed under the jeopardy standard would be changed substantially with the addition of critical habitat designation and application of the adverse modification standard.

Proposed activities analyzed through the Section 7 process could require mitigation to conserve designated critical habitat PCEs. However, the additional incremental benefit to spinedace and loach minnow and impacts on recreational opportunities from critical habitat designation beyond that resulting from listing is expected to be small—in terms of potential modification to or restrictions on recreational activities. This is because impacts to habitat from recreational activities are currently being assessed in Section 7 consultations on effects to these species. Based on past impacts to recreational opportunities within the areas of proposed designated critical habitat, there would potentially be minor, indirect, adverse impacts from critical habitat designation on some recreational opportunities and activities within designated critical habitat (e.g., fishing, overnight camping) from the limitations and restrictions imposed on recreational activities to preserve PCEs. However, other

recreational activities and opportunities would be enhanced, and could benefit from critical habitat designation (e.g., bird-watching, wildlife viewing, day hiking), because of increased riparian habitat conservation or maintenance. The indirect adverse impacts on recreation would be similar to those past impacts described above: some recreational restrictions in designated critical habitat or potential closure of designated critical habitat to some forms of recreation.

Because of the measures that AGFD is taking to ensure native fish are not detrimentally impacted from the stocking of streams with nonnative fish, impacts on the spinedace and loach minnow from fish stocking activities are expected to be minimal. Additionally there are no expected impacts on recreational fishing and the amount of angler use days from the designation of critical habitat because fish stocking activities are expected to continue.

3.7.2.3 Alternative B. Compared to the No Action Alternative, impact associated with the designation of critical habitat would be similar to those identified for Alternative A. However compared to Alternative A, Alternative B would result in a small but unknown increase in the number of additional new and reinitiated Section 7 consultations based solely on the presence of designated critical habitat on Tribal lands and the addition of an adverse modification of critical habitat analysis to Section 7 consultations for the spinedace and loach minnow in critical habitat on Tribal lands.

3.8 Socioeconomics

A separate economic analysis of critical habitat designation for the spinedace and loach minnow has been conducted (IEc 2006). The analysis assessed the economic costs incurred since the spinedace and loach minnow were listed, as well as costs that would be incurred with designation, including all costs resulting

from conservation activities associated with the spokedace and loach minnow. As previously discussed in Section 3.1.1.1, Economic Analysis, the broad scope of the separate economic analysis included costs of actions since these species were listed in 1986 and 20-year forecasts of potential future impacts after issuance of the decision record. That analysis considered: (1) the economic efficiency (i.e., the opportunity costs) associated with the commitment of resources to comply with critical habitat conservation measures and (2) the distribution of economic impacts, including an assessment of local or regional impacts, of spokedace and loach minnow conservation on designated critical habitat. The scope of this EA is limited to the potential impacts that would result from the designation of critical habitat; therefore, not all of the conclusions of the economic analysis are germane. Following is a description the economic setting in the proposed designated critical habitat area.

3.8.1 Existing Conditions

3.8.1.1 Population Characteristics.

Table 6 presents the population size, population density, population growth, and per capita income for the States of Arizona and New Mexico as a whole, as well as for

the nine counties that have proposed critical habitat within their boundaries. The proposed action area is largely rural and sparsely populated. Approximately one-third of the total population residing within the proposed critical habitat boundaries is in Pinal County, Arizona (United States Census Bureau, Census 2000).

In Arizona, the counties containing proposed critical habitat account for about 14 percent of the state population. Pinal and Yavapai counties are the fastest growing counties with 54.5 percent and 55.5 percent increase in population between 1990 and 2000, respectively (IEc 2006). For New Mexico, the three counties that contain critical habitat designation represent approximately 2.2 percent of the state's population. Catron County is the fastest growing county with a 38.2 percent increase in population between 1990 and 2000, while Hidalgo County experienced a decrease in population over the same time period. In summary, all nine counties containing proposed critical habitat have a lower per capita income and fewer persons per square mile than their respective statewide averages.

Table 6. Socioeconomic profile of counties containing critical habitat for the spokedace and loach minnow

	County	Population 2000	% of Statewide Population	Population Density (persons/sq mi)	% Change in Population (1990–2000)	Per Capita Income (1999)
Arizona	State Total	5,130,632	100.0%	45.2	40%	\$20,275
	Apache	69,423	1.4%	6.2	12.7%	\$8,986
	Graham	33,489	0.7%	7.2	26.1%	\$12,139
	Greenlee	8,547	0.2%	4.6	6.7%	\$15,814
	Navajo	97,470	1.9%	9.8	25.5%	\$11,609
	Pinal	179,727	6.5%	33.4	54.5%	\$16,025
	Yavapai	167,517	3.3%	20.6	55.5%	\$19,727
New Mexico	State Total	1,819,046	100.0%	15.0	20.1%	\$17,261
	Catron	3,543	0.2%	0.5	38.2%	\$13,951
	Grant	31,002	1.7%	7.8	12.0%	\$14,597
	Hidalgo	5,932	0.3%	1.7	-0.4%	\$12,431

Source: Industrial Economics (2006), Exhibit 2-4.

3.8.1.2 Economic Activity. The proposed action area contains over 11,700 business establishments, which employ approximately 121,000 individuals (IEc 2006). As shown in Table 7, the largest employment sectors are services, retail trade, and construction. The services sector represents approximately 48.8 percent of the job base; retail trade represents 18.9 percent, and construction represents nearly 8.6 percent. These three employment sectors combined compose approximately 76.3 percent of all jobs in the nine counties. In the fast-growing counties of Pinal and Yavapai, manufacturing and construction are large industries (IEc 2006).

Table 8 depicts economic activity within the nine counties that contain proposed critical habitat, as measured by annual payroll in 2003.

The significance of specific industries within the counties follows a similar pattern to the state-level figures. The “services and other” industry has the largest number of employees, establishments, and highest amount of payroll in all counties. In most of these counties, retail trade is the second most prevalent industry. Activities that have the potential to be economically affected by designation of critical habitat for the spikedace and loach minnow are described below. If the activity is described elsewhere in this document, a cross-reference is provided.

The Service states that adverse effects of livestock grazing on native fishes of the Southwest are well documented, and that ongoing livestock grazing continues to exert adverse effects on native fish by inhibiting recovery from past overgrazing (Desert Fishes Team 2003). Effects to spikedace and loach minnow from grazing include streambank chiseling, sloughing, compaction, and collapse that can lead to wider and shallower stream channels and increased water temperatures. Other effects of grazing on riparian habitat

include increased sedimentation, higher peak flows and channel incisement, lower base flow, changes in riparian vegetation and channel morphology, and loss of nutrients within the stream channel.

Exclusion of riparian areas from grazing can result in a reduction in the number of permitted AUMs (animal unit months: forage for one cow and calf for one month) on the allotment.

The system of federal grazing permits in the American West was established on USFS lands in the early twentieth century and on BLM lands by the Taylor Grazing Act of 1934 (Cody 1996). In most areas, qualifying ranches (“base properties”) were assigned an exclusive amount of AUM based on the carrying capacity of the grazing allotment (Kerr 1998). These allotments were connected to private holdings through the establishment of renewable leases that were both inheritable and transferable with the sale of the land or, in the case of USFS permits, the transfer of the livestock (pending the approval of the USFS or the BLM).

The greatest past economic impact of spikedace and loach minnow conservation on livestock grazing activities has occurred when restrictions on the use of riparian areas for livestock grazing were implemented and reductions in the level of grazing activity have occurred. On federal lands, AUM reductions take the form of reductions in the number of authorized or permitted AUMs by USFS or BLM range members. On many allotments that contain spikedace and loach minnow habitat, riparian areas have already been excluded from grazing either year-round or seasonally.

Table 7. Number of establishments and employees by industry within counties containing spikedace and loach minnow proposed critical habitat (2006)

Industry		Arizona								New Mexico				
		Apache	Graham	Greenlee	Navajo	Pinal	Yavapai	Six County Total	% of State Total	Catron	Grant	Hidalgo	Three County Total	% of State Total
Agriculture, Forestry, Hunting, Fishing	Employees	19	99	0	66	139	12	335	18.5%	284	19	19	322	74.2%
	Establishments	9	5	0	14	13	11	52	22.1%	73	1	1	75	75.0%
Mining	Employees	19	19	2499	833	159	913	4,442	58.2%	19	999	0	1,018	7.5%
	Establishments	3	2	2	8	13	17	45	25.0%	4	8	0	12	2.0%
Utilities	Employees	19	249	99	422	218	249	1,256	12.4%	19	99	19	137	2.7%
	Establishments	7	4	4	17	16	23	71	27.2%	3	6	3	12	5.4%
Construction	Employees	215	260	42	1,561	1,511	5,928	9,517	5.8%	99	775	24	898	2.0%
	Establishments	62	47	10	325	258	1,022	1,724	12.7%	9	84	11	104	2.1%
Manufacturing	Employees	249	271	19	1,089	2,773	3,383	7,784	4.7%	19	137	99	255	0.8%
	Establishments	11	14	1	44	88	202	360	7.5%	2	13	3	18	1.2%
Wholesale Trade	Employees	99	173	99	353	637	1,653	3,014	3.4%	0	156	99	255	1.2%
	Establishments	10	15	5	59	88	169	346	5.3%	0	18	2	20	1.0%
Retail Trade	Employees	1,290	1,245	121	3,868	5,935	8,875	21,334	7.6%	52	1,240	247	1,539	1.7%
	Establishments	117	101	16	302	434	797	1,767	10.1%	12	129	35	176	2.4%
Transportation/Warehousing	Employees	89	78	99	431	458	816	1,971	2.3%	19	126	15	160	1.0%
	Establishments	22	26	4	45	80	114	291	10.3%	3	22	8	33	2.7%

Table 7. Number of establishments and employees by industry within counties containing spikedace and loach minnow proposed critical habitat (2006) (continued)

Industry		Arizona								New Mexico				
		Apache	Graham	Greenlee	Navajo	Pinal	Yavapai	Six County Total	% of State Total	Catron	Grant	Hidalgo	Three County Total	% of State Total
Information	Employees	149	90	19	357	312	797	1,724	3.1%	19	255	10	284	1.9%
	Establishments	16	11	6	28	40	76	177	8.0%	1	21	4	26	3.1%
Finance and Insurance	Employees	99	103	19	454	743	1,488	2,906	2.6%	19	230	99	348	1.4%
	Establishments	19	22	4	80	99	295	519	6.2%	1	42	5	48	1.8%
Real Estate	Employees	99	127	19	261	709	1,046	2,261	5.3%	19	108	19	146	1.5%
	Establishments	23	25	3	94	139	342	626	8.8%	3	38	1	42	1.9%
Unclassified	Employees	19	19	19	19	6	40	122	17.7%	1	4	0	5	2.1%
	Establishments	6	6	1	9	8	18	48	9.4%	3	4	0	7	4.1%
Services and Other	Employees	3,715	2860	542	8,960	14,662	23,972	54,711	5.6%	227	3,581	527	4,335	1.5%
	Establishments	220	224	33	784	1,022	2,406	4,689	8.2%	30	320	36	386	2.0%

Source: Industrial Economics, Incorporated (2006), Exhibit 2-7.

Table 8. Annual payroll for selected industries within counties containing proposed critical habitat (\$ thousands [2003])

Industry	Arizona								New Mexico				
	Apache	Graham	Greenlee	Navajo	Pinal	Yavapai	Six County Total	% of State Total	Catron	Grant	Hidalgo	Three County Total	% of State Total
Agriculture, Forestry, Hunting, Fishing	0	0	0	1,662	3,742	173	5,577	13.2%	0	0	0	0	0%
Mining	0	0	0	45,717	7,019	35,304	88,040	25.2%	0	0	0	0	0%
Utilities	0	0	0	23,451	11,358	12,151	46,960	7.5%	0	0	0	0	0%
Construction	4,910	5,953	611	37,231	41,768	159,329	249,802	4.4%	0	19,742	450	20,192	7.2%
Manufacturing	0	6,281	0	42,228	92,697	112,770	253,976	3.6%	0	4,051	0	4,051	0.3%
Wholesale Trade	0	4,405	0	11,312	22,806	48,896	87,419	2.3%	846	2,161	0	3,007	0.4%
Retail Trade	19,436	24,348	1,812	79,454	114,289	187,874	427,213	6.8%	0	21,216	4,255	25,471	1.4%
Transportation/Warehousing	2,249	2,986	0	12,781	15,159	20,245	53,420	1.8%	0	2,240	324	2,564	0.5%
Information	6,165	2,200	0	14,054	10,308	23,998	56,725	2.1%	0	6,234	274	6,508	1.3%
Finance and Insurance	0	3,177	0	11,394	7,793	54,130	76,494	1.4%	0	6,063	0	6,063	0.7%
Real Estate	0	2,339	0	5,998	3,429	28,711	40,477	3.1%	0	1,632	0	1,632	0.7%
Unclassified	0	0	0	0	107	368	475	3.3%	12	88	0	100	3.0%
Services and Other Industries	80,528	32,950	0	196,296	337,500	533,610	1,100,356	3.9%	449	66,899	5,260	72,608	1.0%

Source: Industrial Economics, Incorporated (2006), Exhibit 2-6.

In 1998, USFS Region 3 (New Mexico and Arizona) conducted a regionwide consultation on all of their grazing actions, resulting in the allotment-by-allotment review of 962 allotments. This review was the result of two lawsuits filed against the USFS by the Forest Guardians and the Center for Biological Diversity in 1997 (United State District Court, Phoenix, Arizona, Case No. CIV 97-2562 PHX SMM).

The Forest Guardians' initial lawsuit focused on four endangered and threatened species: the southwestern willow flycatcher, the loach minnow, the spikedace, and the Mexican spotted owl (MSO). Their lawsuit challenged the issuance of grazing permits on allotments located in the Apache-Sitgreaves, Carson, Cibola, Gila, Prescott, and Santa Fe national forests.

The Center for Biological Diversity's initial lawsuit did not focus on any specific endangered or threatened species but challenged the issuance of grazing permits on allotments in six national forests: Apache-Sitgreaves, Coconino, Coronado, Gila, Prescott, and Tonto.

Because the complaints shared common issues and challenged many of the same allotments, the cases were consolidated. In response to the lawsuit, USFS initiated informal consultation with the Service in February 1998 on the 158 allotments named in the complaints, as well as hundreds of other allotments (962 in total) in the national forests of Arizona and New Mexico (USFS Region 3). The purpose of the consultation was to determine the potential effects of livestock grazing on endangered and threatened species on the allotments and therefore whether formal consultation between USFS and the Service was necessary.

As part of the informal consultation process, the Forest Service also developed *Grazing Guidance Criteria for Preliminary*

Effects Determinations for Species Listed as Threatened, Endangered or Proposed for Listing, (Guidance Criteria) dated February 13, 1998.

Of the 962 allotments under consultation, 619 "No Effect," 321 "NLAA" (not likely to adversely affect) findings, and 22 "LAA" (likely to adversely affect) determinations were made. "No Effect" findings concluded the Forest Service's obligations under the ESA and did not require Service concurrence. The USFS received concurrence from the Service for the 321 "NLAA" determinations thus no further action was necessary on those allotments.

This left 22 allotments where the USFS made LAA determinations with regards to the loach minnow. In February 1999, the Service released a biological opinion in which it concluded that the impacts of grazing on 21 of the 22 allotments would not jeopardize the continued existence of the loach minnow.

The 962-allotment review prompted both Plaintiffs to amend their complaints in September 1999. The Forest Guardians narrowed their complaint to the loach minnow, the spikedace, and the MSO on allotments in the Apache-Sitgreaves, Gila and Cibola national forests while the Center for Biological Diversity refocused their complaint to the loach minnow and spikedace on allotments in the Apache-Sitgreaves and Gila national forests (United States District Court of Arizona 1999). The result of this process was the exclusion of the majority of the riparian corridor on grazing allotments in USFS Region 3.

3.8.2 Environmental Consequences

3.8.2.1 No Action Alternative. Under the No Action Alternative, the spikedace and loach minnow critical habitat would not be designated under the ESA. The Section 7 consultation process would continue as presently conducted without consideration of PCEs. Section 7 would be initiated only

for *may affect* determinations of impacts on the spokedace and loach minnow. Consequently, this alternative would have no impact on livestock grazing beyond those conservation measures resulting from the listing of the spokedace and loach minnow (65 FR 24328-24372) and associated requirements of Section 7 of the ESA.

3.8.2.2 Alternative A. Compared to No Action, the Alternative A would result in (1) a small but unknown increase in the number of additional new and reinitiated Section 7 consultations for livestock grazing based solely on the presence of designated critical habitat and (2) the addition of an adverse modification of critical habitat analysis to Section 7 consultations for the spokedace and loach minnow in critical habitat. The areas most likely to be affected are those not occupied by the spokedace and loach minnow but designated as the spokedace and loach minnow critical habitat. The additional consultations would increase administrative costs to the Service, the action agencies, and any project proponent involved in the consultation process. Additional consultations may also result in the establishment of reasonable and prudent alternatives and other conservation measures designed to maintain the spokedace and loach minnow PCEs. These conservation measures may adversely affect livestock grazing, primarily by requiring critical habitat to be fenced to prevent livestock use and by modifying AUMs or grazing seasons.

The specific effects on livestock grazing that may result from critical habitat designation and the costs attributable solely to designating critical habitat as opposed to listing the species cannot be predicted with precision. The adverse impacts of critical habitat designation on livestock grazing, however, are expected to be minor in part because livestock grazing operations typically occur on a large scale, and designated critical habitat within any

one allotment is likely to be small; therefore, few grazing allotments are likely to be subject to consultation requirements based solely on the presence of the spokedace and loach minnow designated critical habitat. The impacts of designation on livestock grazing are also expected to be minor because (1) most of the previously completed Section 7 consultations involving critical habitat for these fish species in small southwestern streams have resulted only in minor project alterations to proposed projects; (2) the number of consultations is not expected to change; few projects and operations would be subject to consultation based solely on the presence of designated critical habitat because most all of the proposed segments are occupied by the spokedace and loach minnow; (3) if the outcome of those few consultations were based solely on critical habitat that do not reach the threshold of adverse modification they could only result in discretionary conservation recommendations to reduce impacts on PCEs because there is no incidental take statement or reasonable prudent alternatives for adverse affects to critical habitat; and (4) the small likelihood that reasonable and prudent alternatives developed under the jeopardy standard would be changed substantially with the addition of critical habitat designation and application of the adverse modification standard.

As stated earlier, previous lawsuits have resulted in the exclusion of cattle from much of the riparian corridor in proposed critical habitat. Thus, it is not anticipated that spokedace and loach minnow conservation activities would result in further reductions in permitted or authorized AUMs on federal lands.

Impacts on grazing activities from critical habitat designation would be similar to current conditions. It should also be noted that there are impacts on grazing that cannot be separated from the impacts caused by critical habitat designation.

Impacts such as drought, current and future market trends and fluctuations, and supplemental forage availability contribute to the cumulative impacts on livestock grazing. While the impacts from critical habitat designation are expected to have minor effects on current livestock grazing conditions, an acknowledgment must be given to other factors that contribute to the cumulative impacts on grazing.

3.8.2.3 Alternative B. Compared to the No Action Alternative, impact associated with the designation of critical habitat would be similar to those identified for Alternative A. However compared to Alternative A, Alternative B would result in a small but unknown increase in the number of additional new and reinitiated Section 7 consultations based solely on the presence of designated critical habitat on Tribal lands and the addition of an adverse modification of critical habitat analysis to Section 7 consultations for the spikedace and loach minnow in critical habitat on Tribal lands.

3.9 Tribal Trust Resources

3.9.1 Existing Conditions

The USDI, Office of the Special Trustee for American Indians defines Indian trust resources as “*lands and interests in lands, minerals, natural resources, or other physical assets held in trust by the federal government for beneficial owners, and natural resources in which Indian tribes have federally protected or reserved interests (e.g., water, fish, wildlife, vegetation).*” American Indian lands are not federal public lands or part of the public domain and thus are not subject to general federal land laws. American Indian tribes are sovereign entities that manage their land and resources in accordance with Tribal goals and objectives, within the framework of applicable laws; however, the United States is entrusted with Tribal trust resources for the benefit of American Indian tribes.

The Tribes with lands in proposed critical habitat are sovereign nations. Secretarial Order 3206 recognizes that Tribes have governmental authority and the desire to protect and manage their resources in the manner that is most beneficial to them. The Tribes have their own natural resource programs and staff and have enacted or are in the process of developing resource management plans. In addition, as trustee for land held by the United States for Indian Tribes, the Bureau of Indian Affairs (BIA) provides technical assistance to the Tribes on forest management planning and oversees a variety of programs on Tribal lands. The Yavapai Apache Tribe states that “it is the position of the Nation that the Service is without legal authority under the ESA to designate critical habitat on the lands of the Nation” (IEc 2006). The San Carlos Apache have made similar remarks in regard to other proposed critical habitat designations.

The Service determined that the Yavapai Apache, San Carlos Apache, and White Mountain Apache tribes have lands containing features essential to the conservation of the spikedace and loach minnow. However, in designating critical habitat with regard to Tribal lands, the Service considered several factors including its relationship with the Tribe or Nation and whether a management plan has been developed for the conservation of the spikedace and loach minnow on their lands.

3.9.1.1 Yavapai Apache Tribe. The Yavapai Apache Tribe has long worked to protect the Verde River and its surrounding habitat as it flows on the lands of the Nation. The Yavapai Apache Tribe is implementing strong conservation measures designed to preserve the Verde River and its riparian corridor for the benefit of all species, and in order to protect the traditional and cultural practices of the Tribe. The Yavapai Apache Tribe’s continued efforts to work cooperatively with

the Service to protect federally listed species have previously been demonstrated through adoption of a recent Southwestern Willow Flycatcher Management Plan, dated May 25, 2005. This document provides realistic and practicable objectives for protection of the riparian community on tribal lands. This habitat is coextensive with the habitat currently being proposed for the spikedace. Because the existing Management Plan requires that the habitat of the Verde River be protected and preserved for the flycatcher, its protections similarly extend to the spikedace. In addition, the Tribe passed a resolution on June 15, 2006, confirming and declaring a riparian conservation corridor along the Verde River including 300 ft (91.4 m) on either side of the river. Within the conservation corridor stocking of non-native fishes is prohibited; livestock grazing, construction and other activities would be minimized to assure that no net loss of habitat for federally listed species such as the spikedace and loach minnow would occur; and no permanent modification of habitat essential to listed species would be allowed. The Tribe would also take all reasonable steps to coordinate with the Service regarding recreational activities, habitat restoration activities, or other activities that may impact the habitat essential to the spikedace and loach minnow. The Tribe would monitor habitat, including surveys for these fish and conduct research or other activities to provide a conservation benefit.

3.9.1.2 White Mountain Apache Tribe.

The White Mountain Apache Tribe has one stream within its tribal lands, East Fork White River, that is known to be currently occupied by loach minnow and its tribal lands contain features that are essential to the conservation of the loach minnow. The White Mountain Apache Tribe currently has a management plan in place for loach minnow. The plan was completed in 2000 and provides for, among other conservation measures, inventory and monitoring, water quality protection ordinance, captive

propagation, and relocation to minimize loss from catastrophic events such as fire and drought. Prior to and since the plan was developed, the Tribe has actively managed for loach minnow. In this exclusion, we considered several factors, including our relationship with the White Mountain Apache Tribe, and the degree to which the Tribe's management plan provides specific management for the loach minnow. Tribal governments protect and manage their resources in the manner that is most beneficial to them. The White Mountain Apache Tribe exercises legislative, administrative, and judicial control over activities within the boundaries of its lands. Additionally, the Tribe has natural resource programs and staff and has been managing for the conservation of the loach minnow. In addition, as trustee for land held in trust by the United States for Indian Tribes, the BIA provides technical assistance to the White Mountain Apache Tribe on management planning and oversees a variety of programs on their lands. The development and implementation of the efforts formalized in the management plan will continue with or without critical habitat designation.

The White Mountain Apache Tribe highly values its wildlife and natural resources, and is charged to preserve and protect these resources under the Tribal Constitution. Consequently, the Tribe has long worked to manage the habitat of wildlife on its tribal lands, including the habitat of endangered and threatened species. The Service understands that it is the Tribe's position that a designation of critical habitat on its lands improperly infringes upon its tribal sovereignty and the right to self-government.

The United States Census estimates that Fort Apache Reservation had a population of 13,652 enrolled members residing on the reservation in 2005. The unemployment rate was reported by the Arizona Department of Economic Security to be 24 percent in 2004, but the Tribe states that it

believes that this estimate is low (IEc 2006). Per capita income was \$3,805 in 2000, less than half the average for Arizona. In addition, approximately 48.8 percent of the Tribe's population lives below the poverty line (IEc 2006).

3.9.1.3 San Carlos Apache Tribe. The San Carlos Apache Tribe has one stream within its tribal lands, Eagle Creek, that is known to be currently occupied by the spikedace and loach minnow and its tribal lands contain features that are essential to the conservation of the spikedace and loach minnow. The Tribe has completed and is implementing a Fisheries Management Plan (FMP) that includes specific management actions for the spikedace and loach minnow. In this exclusion, the Service considered several factors, including our relationship with San Carlos Apache Tribe, and the degree to which the Tribe's FMP provides specific management for the spikedace and loach minnow. Tribal governments protect and manage their resources in the manner that is most beneficial to them. The San Carlos Apache Tribe exercises legislative, administrative, and judicial control over activities within the boundaries of its lands. Additionally, the Tribe has natural resource programs and staff and has enacted the FMP. In addition, as trustee for land held in trust by the United States for Indian Tribes, the Bureau of Indian Affairs (BIA) provides technical assistance to the San Carlos Apache Tribe on management planning and oversees a variety of programs on their lands. Spikedace and loach minnow conservation activities have been ongoing on San Carlos Apache tribal lands, and, prior to the completion of their FMP, their natural resource management was consistent with management of habitat for this species. The development and implementation of the efforts formalized in the San Carlos Apache Tribes FMP will continue with or without critical habitat designation.

The San Carlos Apache Tribe highly values its wildlife and natural resources, and is charged to preserve and protect these resources under the Tribal Constitution. Consequently, the Tribe has long worked to manage the habitat of wildlife on its tribal lands, including the habitat of endangered and threatened species. The Service understands that it is the Tribe's position that a designation of critical habitat on its lands improperly infringes upon its tribal sovereignty and the right to self-government.

The San Carlos Apache Tribes FMP provides assurances and a conservation benefit to the spikedace and loach minnow. Implementation of the FMP would result in protecting all known spikedace and loach minnow habitat on San Carlos Tribal Land and assures no net habitat loss or permanent modification would occur in the future. The purpose of the FMP includes the long-term conservation of native fishes, including the spikedace and loach minnow, on tribal lands. The FMP outlines actions to conserve, enhance, and restore spikedace and loach minnow habitat, including efforts to eliminate nonnative fishes from spikedace and loach minnow habitat. All habitat restoration activities (whether it is to rehabilitate or restore native plants) would be conducted under reasonable coordination with the Service. All reasonable measures would be taken to ensure that recreational activities do not result in a net habitat loss or permanent modification of the habitat. All reasonable measures would be taken to conduct livestock grazing activities in a manner that will ensure the conservation of spikedace and loach minnow habitat. Within funding limitations and under confidentiality guidelines established by the Tribe, the Tribe will cooperate with the Service to monitor and survey spikedace and loach minnow habitat, conduct research, perform habitat restoration, remove nonnative fish species, or conduct other beneficial spikedace and loach minnow management activities.

The San Carlos Apache Reservation encompasses over 1.8 million acres in southeast Arizona. The Service has proposed for designation a 45.3-mile stretch of Eagle Creek, of which approximately 17.2 miles occurs on the San Carlos Apache Reservation (see Figure 8). In considering the Service's 300-foot buffer on either side of proposed critical habitat, approximately 1,100 acres of San Carlos Apache land along Eagle Creek are potentially included in the proposed spikedace and loach minnow critical habitat designation. Because the San Carlos Apache Tribe has developed a native fish management plan, these lands have been proposed for exclusion from critical habitat designation.

Based on United States Census data, the San Carlos Apache Tribe's population was 9,385 in 2000; current population is estimated at more than 12,000. Based on the 2000 Census, the unemployment rate was 35.4 percent. However, a recent study by the Tribe found that the unemployment rate is much higher, at 76 percent, indicating that at least seven out of ten people in the Tribe's labor force were unemployed (IEc 2006). San Carlos Apache per capita income was \$5,200 in 2000, or about one-fifth of the Arizona average. In addition, the poverty rate on the San Carlos Apache Reservation is 48 percent (IEc 2006). These data illustrate the vulnerability of the San Carlos Apache Tribe to economic impact or regulatory burden.

The San Carlos Apache Tribe's economy includes cattle operations, forestry operations, a small service sector, and tourism and recreation. The Tribe has five cattle associations and operates two Tribal ranches, although livestock numbers have decreased in recent years. The San Carlos Apache operated the Cutter sawmill outside of Globe, Arizona, but in 2000 the mill was leased to a private company, Precision Pine.

3.9.2 Environmental Consequences

3.9.2.1 No Action Alternative. Under the No Action Alternative, the spikedace and loach minnow critical habitat would not be designated under the ESA. The Section 7 consultation process would continue as presently conducted without consideration of PCEs. Section 7 would be initiated only for *may affect* determinations of impacts on the spikedace and loach minnow. Consequently, this alternative would have no impact on livestock grazing beyond those conservation measures resulting from the listing of the spikedace and loach minnow (65 FR 24328-24372) and associated requirements of Section 7 of the ESA.

3.9.2.2 Alternative A

Yavapai Apache Tribe. The Yavapai Apache Tribe opposes critical habitat designation on its lands, and states that "any designation of critical habitat on the lands of the Nation would have a disproportionate impact on the ability of the Nation to use its resources on its sovereign lands and to successfully achieve economic self-sufficiency in its Permanent Tribal Homeland" (IEc 2006). The Tribe states that with such a small reservation, they need to be able to manage its lands in such a way as to achieve economic self-sufficiency in the long term. The Tribe has indicated that it is concerned that proposed critical habitat designation could hinder its management ability. The Tribe has also indicated that it may wish to use proposed critical habitat area lands for uses such as farming, light industrial, or economic development purposes. The Tribe uses the Verde River for traditional purposes, such as willow harvesting, and also holds water rights to the River.

While the Tribe wants to maintain the options to use their lands as they see fit, the Tribe also states that it has historically worked to protect wildlife and the unique riparian habitat of the Verde River. Perhaps

most relevant is the recent development of a master planning document that provides specific protections for the Verde River on the Reservation, including designating “for protection of a conservation corridor on either side on the Verde River beginning at the center of the river and extending outward for approximately 500 feet” (IEc 2006). The Tribe also points out that it has adopted a southwestern willow flycatcher management plan, which also provides protections to the riparian area on the Verde River (IEc 2006).

Under Alternative A, Yavapai Apache Tribal lands are downstream of the proposed critical habitat designation along the Verde River and any impacts associated with the designation of critical habitat would not be expected.

White Mountain Apache Tribe. In their public comment on proposed critical habitat designation (Brauchli 2006), the White Mountain Apache argue that the designation of critical habitat on their lands would

- adversely impact the Tribe’s working relationship with the Service and would be contrary to the government-to-government relationship that it has established with the Service for over a decade;
- not comply with the Service’s affirmative trust obligation to consider Tribal reserved water rights in the context of implementation of the ESA;
- undermine the Tribe’s own watershed-based ecosystem management approach and result in needless diversion of resources away from the Tribe’s own on-the-ground conservation efforts;
- create a considerable social and economic hardship for the Tribe, limiting its ability to conduct activities necessary to sustain an economy and its growing population;
- impact potential expansion and restoration projects;

- impair the Tribe’s ability to conduct prescribed burns thereby increasing the likelihood of a large fire;
- affect Tribal practices that take place adjacent to the river;
- affect “tribal rights and trust resources, including exercise of our water rights, timber, and fisheries. It could affect economic activity, our recreation program, our cultural practices, and our municipal water supply.”

The White Mountain Apache also question the legality of, and the Service’s authority to make, such designations and argue that their Tribal lands do not meet the definition of critical habitat because they are already being adequately protected. The Tribe also states that pursuant to Executive Order 13084, the Service cannot make designations without providing funds necessary to pay the direct costs incurred by the Tribal government in complying with the regulation.

The Tribe has conducted loach minnow studies and surveys from the 1960s to the 1980s and continues to conduct loach minnow and native fish inventory and monitoring studies, including stream assessment for loach minnow habitat. Since 2000, the Tribe and the Service have worked cooperatively to implement the Tribe’s loach minnow management plan.

Under Alternative A, the White Mountain Apache Tribal lands would be excluded from critical habitat designation and any impacts associated with such designation would not be expected.

San Carlos Apache Tribe. As stated in the San Carlos Apache Tribe’s public comments on another native fish, the Gila chub, “due to the unique Trust relationship between the United States and the Tribe, a significant number of Tribal programs, activities, and development projects require Federal government involvement, funding, or oversight. Thus, there would frequently be a Federal nexus requiring costly Section

7 consultation with the [Service] for any Tribal project, activity, or development endeavor” (Montgomery 2005). Past and potential ongoing impacts on San Carlos Apache activities related to spikedace and loach minnow conservation efforts could include the following:

- Administrative costs of complying with the Act and preparing a Fisheries Management Plan
- Impacts on water use by the Tribe, as well as potential water exchanges
- Limitations on livestock use of potentially proposed critical habitat designation for grazing and water
- Limitations on fire management activities.

Each of these impacts are discussed in more detail below.

Administrative Costs: Past costs of spikedace and loach minnow conservation activities have been limited to the development of a draft fisheries management plan in 2003 (revised September 2005) and related surveying and monitoring of the Tribe’s water resources. The cost of the fish surveys and development of the draft fisheries management plan comprise past impacts related to spikedace and loach minnow conservation activities, although specific cost estimates are unavailable. The estimated cost of developing a management plan for the southwestern willow flycatcher is estimated at \$5,000, which may serve as a rough estimate of costs of developing the native fish plan.

Any future consultations with the Service would involve a commitment of the Tribe’s limited resources. As stated in their public comments on the Gila chub proposed critical habitat designation, “Tribal governments frequently utilize special counsel as well as skilled and technical personnel within Tribal departments, like the San Carlos Recreation and Wildlife Department, when Section 7 consultation is

called for by the [Service] under the ESA. These ‘administrative costs’ are very real costs which must be borne by the Tribe, regardless of whether the acting agency (such as the Bureau of Indian Affairs or the Bureau of Reclamation), is also participating in the Section 7 consultation process.” The Tribe is also unsure of the costs of implementing the final fisheries management plan (IEc 2006). If the fisheries management plan adequately addresses conservation of the spikedace and loach minnow, the critical habitat designation should result in little extra administrative effort.

Water Resources: The Tribe is concerned that proposed critical habitat designation for spikedace and loach minnow may threaten the ability of the Tribe to utilize its water resources on the Reservation. Water use on the Reservation is generally constrained by the arid climate of the Reservation, competing water claims, as well as by the 1935 Globe Equity 59 Decree (on the mainstem Gila River). Thus any restrictions in management of Eagle Creek for spikedace and loach minnow purposes could threaten Tribal uses of this water.

As discussed in Section 3.2 of this document, Reclamation has consulted with the Service on the proposed exchange of up to 20,000 acre-feet of CAP water by the San Carlos Apache Tribe to be supplied downstream of San Carlos Reservoir on the Gila River, including the designated portion in Complex 3 of proposed critical habitat designation. This biological opinion recommended that Reclamation undertake a variety of activities, including additional research and monitoring, installation of meters, and reporting (Service 2004c). However, the project did not take place in 2004 as a Court denied the Tribe the necessary permit, for reasons unrelated to spikedace and loach minnow (IEc 2006).

Livestock Grazing: Livestock grazing is an important source of income for the San

Carlos Apache Tribe, as large portions of San Carlos Apache lands are grazed by five livestock associations and two Tribal ranches. Tribal representatives have expressed concerns that grazing could be impacted by other proposed critical habitat designations on San Carlos Apache Tribe lands (IEc 2006).

It is unknown what modifications or mitigation measures may be recommended to grazing activities as a result of spikedace and loach minnow concerns. If the Service recommended, or the Tribe chose to implement, mitigation measures, one option could be the installation of fencing along Eagle Creek to exclude livestock from the streams and adjacent riparian areas.

Despite the potential impacts on livestock activities, it appears unlikely that there would be much change in grazing effort on the San Carlos Apache Reservation as a result of potentially designating proposed critical habitat for spikedace and loach minnow, primarily because: (1) the area of potentially proposed critical habitat is a small percentage of the total area available for grazing to each livestock association; (2) each of the livestock associations has access to multiple water sources; and (3) the herds are of relatively small size.

Fire Management Activities Under Public Law 93-638, activities related to fire management and forest health on Tribal lands are conducted by BIA and the Tribe. The Tribe has not experienced impacts to these activities in the past. However, the Tribe's goal is to have prescribed burns on the majority of reservation land every ten years. The Tribe could experience impacts in the form of restrictions on burning. If the Tribe were not able to perform fire management activities as planned, the risk of catastrophic fire on Tribal lands could increase.

Under Alternative A, the San Carlos Apache Tribal lands would be excluded

from designation of critical habitat and any impacts associated with such designation would not be expected.

3.9.2.3 Alternative B. Under Alternative B, if Tribal lands were to be included in critical habitat designation for spikedace and loach minnow, impacts of designation are expected to be minor because (1) most of the previously completed Section 7 consultations involving critical habitat for these fish species in small southwestern streams have resulted only in minor project alterations to proposed projects; (2) the number of consultations is not expected to change; few projects and operations would be subject to consultation based solely on the presence of designated critical habitat because most all of the proposed segments are occupied by the spikedace and loach minnow; (3) if the outcome of those few consultations were based solely on critical habitat that do not reach the threshold of adverse modification they could only result in discretionary conservation recommendations to reduce impacts on PCEs because there is no incidental take statement or reasonable prudent alternatives for adverse affects to critical habitat; and (4) the small likelihood that reasonable and prudent alternatives developed under the jeopardy standard would be changed substantially with the addition of critical habitat designation and application of the adverse modification standard.

Additionally, as stated in the Economic Analysis, the economies of tribes within the areas proposed as critical habitat are poorer than their respective regional economies, making these communities particularly vulnerable to economic impacts associated with increased regulatory burden. Future impacts resulting from spikedace and loach minnow conservation efforts on tribal lands include administrative costs of Section 7 consultations, surveys and monitoring of habitat, development of fish management plans, modifications to development activities, and potential

project modifications to restoration activities and water projects. As site-specific plans are unavailable for many of these activities, the costs cannot be accurately estimated (IEc 2006).

3.10 Environmental Justice

Executive Order 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*) requires that federal programs and actions be evaluated to identify and address disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. Designating critical habitat for the spikedace and loach minnow is a federal action; therefore, the alternatives identified in Chapter 2 of this EA must be analyzed for their potential effects on such populations.

The geographic area for this analysis comprises the nine counties in two states that include the proposed critical habitat stream segments. These counties are Apache, Graham, Greenlee, Navajo, Pinal, and Yavapai counties in Arizona and Catron, Grant, and Hidalgo counties in New Mexico. Designation would affect portions of all nine counties. In 2000, the population of the analysis area totaled approximately 595,650 (Table 9). Almost one-third that total resides in one county—Pinal County, Arizona (United States Census Bureau, Census 2000) The majority of the analysis area is rural and sparsely populated.

3.10.1 Minority Populations

Table 10 provides 2000 census data for racial minority (nonwhite) and Hispanic populations within the analysis area compared to statewide percentages. As shown by these data, in Arizona, the

percentage of racial minorities in the analysis area is greater than that within the state (33.3% vs. 24.5%), while a somewhat higher percentage of Hispanic persons reside in the state than in the analysis area as whole (25.3% vs. 18.9%). In New Mexico the trend for the percentage of racial minorities is reversed compared to Arizona, with more racial minorities residing in the state than in the analysis area as a whole (33.2 % vs. 22.0%), while a higher percentage of Hispanic persons reside in the analysis area than in the state as a whole (47.3% vs. 42.1%). For both categories (racial and Hispanic), the deviation from state figures is less than 11 percent.

The largest single racial minority in both Arizona and New Mexico is American Indian (Table 10). The percentage of the general population represented by American Indian groups within the analysis area is 21.9 percent in Arizona and 1.4 percent in New Mexico. The percentages in the analysis area is much greater than the state percentage for Arizona (21.9% vs. 5.0%) and is lower than the state percentage for New Mexico (1.4% vs. 9.5%). Because Alternative A proposes the exclusion of Tribal lands from critical habitat designation, these numbers may reflect higher impacts than would be realized.

3.10.2 Low-income Populations

The estimated percentage of the population below the poverty level in the analysis area by state is depicted in Table 11 below. In both states, the percentage of individuals below the poverty level in the analysis area is slightly larger than in the state as a whole (20.5% vs. 13.9% in Arizona; 20.4% vs. 18.4% in New Mexico).

The potential for disproportionate impacts on minority and low-income populations from designating critical habitat is unknown. This is because

- site specific riparian-associated human demographics in the majority of affected areas are unknown;
- critical habitat designation does not directly restrict land management or land use activities;
- the outcomes of Section 7 consultations and the subsequent impacts upon these populations cannot be predicted.

Table 9. 2000 population in the proposed action area and percent of total state population

State	Proposed Action Area Population	Total State Population	Percent State Population
Arizona	555,173	5,130,632	10.8%
New Mexico	40,477	1,819,046	2.2%
TOTAL	595,650	6,949,678	8.6%

Source: United States Census Bureau, Census 2000 and State County QuickFacts, accessed at <http://quickfacts.census.gov/qfd>.

Table 11. 2000 poverty levels with the analysis area

State	Analysis Area Poverty Levels		Statewide Poverty Levels	
	Below Poverty Level	% of Analysis Area Population	Below Poverty Level	% of State Population
Arizona	113,853	20.5	713,158	13.9%
New Mexico	8,285	20.4	334,704	18.4%

Source: United States Census Bureau, Census 2000.

Table 10. Racial minority (nonwhite), American Indian, and Hispanic populations within the analysis area

State	Racial Minority		American Indian		Hispanic	
	Analysis Area (%)	Statewide (%)	Analysis Area (%)	Statewide (%)	Analysis Area (%)	Statewide (%)
Arizona	33.3	24.5	21.9	5.0	16.9	25.3
New Mexico	22.0	33.2	1.4	9.5	47.3	42.1

Source: United States Census Bureau, Census 2000.

- Section 7 consultation outcomes and the subsequent impacts on these populations could not be predicted even if a detailed, site-specific demographic study or characterization were conducted. Therefore, further investigations would provide no useful information for evaluating the potential for disproportionate impacts of critical habitat designation on minority and low-income populations.

3.11 Cumulative Impacts

A cumulative impact is the effect on the environment that results from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or individual undertakes such actions. Cumulative impacts can result from individually minor but collectively noteworthy actions taking place over a period of time. The past, present, and reasonably foreseeable future actions in the proposed critical habitat analysis area that, when combined with the proposed

action, could contribute to cumulative effects include (1) Section 7 consultations conducted for other species and other designated critical habitat and (2) existing land management policies and plans.

recreation, socioeconomics, livestock grazing, Tribal trust resources, and environmental justice.

The number of consultations is not expected to change because all of the segments proposed for critical habitat designation are currently occupied by the spikedace and loach minnow.

Designating critical habitat for the spikedace and loach minnow is expected to have negligible to minor adverse impacts on proposed and ongoing projects, socioeconomic conditions, land uses, and resource management. Minor beneficial impacts are expected on the spikedace and loach minnow PCEs and, by extension, on the riparian/aquatic ecosystem integrity in the proposed critical habitat analysis area. Impacts from other past, present, and reasonably foreseeable future actions in the analysis area are similar in type and intensity.

The total size of proposed critical habitat for the spikedace and loach minnow is small and widespread—much of it is relatively isolated, in public rather than private ownership, in special management areas already managed primarily to preserve resource values, and overlaps proposed or designated critical habitat for other species. With few exceptions, human use of the analysis area is relatively low. These factors collectively tend to conserve high-value natural resources like riparian habitats and constrain consumptive and destructive uses of such resources.

Therefore, the incremental impact of designating critical habitat for the spikedace and loach minnow when added to other past, present, and reasonably foreseeable future actions in the analysis area would be negligible to minor on water resources, wetlands and floodplains, natural resources, land use and management, wildland fire management,

CHAPTER 4.0—ANALYSIS OF SIGNIFICANCE

The primary purpose of preparing an environmental assessment under NEPA is to determine whether a proposed action would have significant impacts on the human environment. If significant impacts may result from a proposed action, then an environmental impact statement is required (40 CFR 1502.3). Whether a proposed action exceeds a threshold of significance is determined by analyzing the context and the intensity of the proposed action (40 CFR 1508.27). *Context* refers to the setting of the proposed action and potential impacts of that action. The context of a significance determination may be society as a whole (human, national), the affected region, the affected interests, or the locality. *Intensity* refers to the severity of the impacts.

Under Council of Environmental Quality (CEQ) regulations, which is responsible for ensuring compliance with NEPA, intensity is determined by considering 10 criteria (CFR 40 1508.27[b]):(1) beneficial and adverse impacts; (2) the degree of impacts on health and safety; (3) impacts on the unique characteristics of the area; (4) the degree to which the impacts would likely be highly controversial; (5) the degree to which the proposed action would impose unique, unknown, or uncertain risks; (6) the degree to which the proposed action might establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration; (7) whether the proposed action is related to other actions, which cumulatively could produce significant impacts; (8) the degree to which the proposed action might adversely affect locales, objects, or structures eligible for listing in the National Register of Historic Places; (9) the degree to which the proposed action might adversely affect an endangered or threatened species or its habitat, as determined to be critical under the ESA of

1973; and (10) whether the proposed action threatens a violation of federal, state, or local law.

The context of short- and long-term impacts of the proposed designation of critical habitat for spikedace and loach minnow includes the 5 critical habitat complexes—a 9-county area in 2 states and 33 stream segments totaling 633 miles that encompass critical habitat. Impacts of critical habitat designation would not be significant.

Potential impacts on environmental resources, both beneficial and adverse, would be minor. Analyses of impacts of critical habitat designation on sensitive resources within stream segments proposed as spikedace and loach minnow critical habitat were conducted and discussed in Chapter 3 of this EA, and it was determined that designation of critical habitat would have both adverse and beneficial impacts on those resources. These analyses concluded that the adverse impacts of critical habitat designation would not be significant.

There would be minor impacts on public health or safety from the proposed designation of critical habitat and no impacts on unique characteristics of the geographic area. The increased risk of wildland fire was analyzed within the context of critical habitat designation. Impacts of wildland fire on public health and safety were determined to be minor, because wildland fire suppression and wildland fire management within WUI areas would not be significantly impeded by the designation of critical habitat. The increased risk to flood control was analyzed within the context of critical habitat designation. Impacts on flood control on public health and safety were determined to be minor, since flood control

methods and plans would not be significantly impeded by the designation of critical habitat.

Potential impacts on the quality of the environment are not likely to be highly controversial, and the impacts do not pose any uncertain, unique, or unknown risks. Impacts are not likely to be highly controversial because, as the analyses of impacts of critical habitat designation has concluded, the quality of the environment would not be significantly modified from current conditions. This analysis was based on past consultations, past impacts of spikedace and loach minnow conservation on activities within spikedace and loach minnow recovery areas, and the likely future impacts from spikedace and loach minnow conservation. Past Section 7 consultations within proposed designated critical habitat would likely be reinitiated. New activities would result in Section 7 consultations. A number of activities, including livestock grazing, wildland fire, recreation, and vegetation management (i.e., timber management) would likely have some spikedace and loach minnow conservation-related constraints or limitations imposed on them.

Impacts on water management and resource activities are not expected to be controversial because, as discussed in the analysis of impacts on water resources, the constraints on current water management activities are expected to be limited. Because the spikedace and loach minnow have been listed as threatened for the past 20 years, federal activities impacting water resources and water management activities have been through the consultation process, and mitigating measures and conservation activities have been developed for these activities to protect the spikedace and loach minnow. Conservation constraints or limitations related to

proposed designated critical habitat would be similar to those imposed from species-related constraints.

The designation of critical habitat by the Service for the conservation of threatened species is not a precedent-setting action with significant effects. The agency has designated critical habitat for numerous other species. Therefore, designating critical habitat for the spikedace and loach minnow is not a precedent-setting action. There would not be any significant cumulative impacts because, as described in Section 3.12 of this EA, the cumulative impacts would be limited to Section 7 consultation outcomes and subsequent effects on other species, the effects of designated critical habitat for other species, and the effects of land management plans.

Critical habitat designation is not likely to affect sites, objects, or structures of historical, scientific, or cultural significance because federal and state laws enacted to protect and preserve these resources would address any such potential impacts.

The Proposed Action to designate critical habitat for the spikedace and loach minnow would have long-term, beneficial effects for these fish species. The purpose of the Proposed Action is to redesignate critical habitat for the spikedace and loach minnow, both listed as threatened under the ESA. Critical habitat designation would have long-term, beneficial, conservation-related impacts on the spikedace and loach minnow survival and recovery through maintenance of PCEs.

Proposed critical habitat designation would not violate any federal, state, or local laws. The designation of critical habitat is required by law in order to comply with the ESA.

CHAPTER 5.0—PREPARERS

This environmental assessment was prepared by Logan Simpson Design Inc. of Tempe, Arizona, under contract to the Service's, Arizona Ecological Services Office. The socioeconomic analysis was prepared by Industrial Economics Inc. of Cambridge Massachusetts.

CHAPTER 6.0—REFERENCES

- Andersen, R.M. 1978. The distribution and aspects of the life history of *Meda fulgida* in New Mexico. Unpubl. M.S. Thesis. New Mexico State University, Las Cruces, NM.
- Arizona Department of Environmental Quality. 2006. Fact sheet – Klondyke tailings water quality assurance revolving fund site, January 2006. Phoenix, AZ. 4 pp.
- Arizona Game and Fish Department. 2004. Heritage Database Management System. Phoenix, AZ.
- Arizona State University. 2002. Lower Colorado Basin fish database. Produced for the US Bureau of Reclamation and US Fish and Wildlife Service by Arizona State University, Tempe, AZ.
- Bagley, B., B. Kesner, and C. Secor. 1998. Upper Blue River and Tributaries Fisheries Survey. Arizona State University, Tempe, AZ.
- Bagley, B. and P. Marsh 1997. Eagle Creek, Greenlee County, Arizona fisheries survey June 23–25, 1997. Arizona State University, Tempe, AZ. 4 pp.
- Bagley, B., G.H. Schiffmiller, P.A. Sowka, and P.C. Marsh. 1996. A New Locality for Loach Minnow, *Tiaroga cobitis*. Proceedings of the Desert Fishes Council 28:8.
- Bagley, B., G.W. Knowles, and T.C. Inman. 1995. Fisheries survey of the Apache-Sitgreaves National Forests, trip reports 1-9. May 1994 to September 1995. Arizona State University, Tempe, AZ.
- Barber W.E. and W.L. Minckley. 1983. Feeding ecology of southwestern Cyprinid fish, the spokedace *Meda fulgida* Girard. The Southwestern Naturalist 28(1):33-40.
- Barber, W.E. D.C. Williams, and W.L. Minckley. 1970. Biology of the Gila spokedace, *Meda fulgida* in Arizona Copeia 1970(1):9-18.
- Bettaso, R.H., D.B. Dorum, and K.L. Young. 1995. Results of the 1992–1994 Aravaipa Creek Fish Monitoring Project. Arizona Game and Fish Department, Technical Report 73, Phoenix, AZ.
- Brauchli, R. Brauchli & Brauchli, P.C., on behalf of the White Mountain Apache Tribe, Public Comment Letter "Re: White Mountain Apache Tribe's Comments on Proposed Rule to Designate Critical Habitat for Spikedace and Loach Minnow, RIN No. 1018-AU33, 70 Fed. Reg. 75546 (December 20, 2005)," Feb. 21, 2006
- Britt, K.D., Jr. 1982. The Reproductive Biology and Aspects of Life History of *Tiaroga cobitis* in Southwestern New Mexico. M.S. thesis. New Mexico State University, Las Cruces, NM.
- Brouder, M. e-mail dated July 25, 2002, to Marianne Meding from Mark Brouder re: Verde River survey info.

Brown, D.E. 1994. Biotic Communities: Southwestern United States and Northwestern Mexico. University of Utah Press, Salt Lake City, UT.

Brown, J.K. 1989. Effects of fire on streams. Pages 106–110 in F. Richardson, F., and R.H. Hamre (eds). Wild Trout IV: proceedings of the symposium. United States Government Printing Office, Washington, D.C.

Bury, R.B., and J.A. Whelan. 1984. Ecology and Management of the Bullfrog. United States Dept. Interior, Fish and Wildlife Service Resource Publication 155, Washington, D.C.

Carter, C.D. 2005. Unpublished notes from the upper Blue and Campbell Blue River survey, 2004 and 2005. United States Forest Service, Rocky Mountain Research Station, Flagstaff, AZ.

Cody, B.A. 1996. Grazing Fees: An Overview. Congressional Research Service. Washington, D.C.

Courtenary, W.R., Jr., and G.K. Meffe. 1989. Small fishes in strange places: A review of introduced poeciliids. Pages 319–331 in Meffe, G.K., and F.F. Snelson, Jr. (eds.). Ecology and evolution of livebearing fishes (Poeciliidae).

Desert Fishes Team. 2003. Status of federal and state listed warm water fish of the Gila River Basin, with recommendations for management. Report #1.

Forest Ecosystem Management Assessment Team (FEMAT). 1993. Forest ecosystem management: an ecological, economic, and social assessment. Report of the Forest Ecosystem Management Assessment Team. 1993-793-071.

Ffolliott, P.F., L.F. DBano, M.B. Baker, Jr., D.G. Neary, and K.N. Brooks. 2004. Hydrology and Impacts of Disturbance on Hydrologic Function. Pages 51–76 in Baker, M.B., P.F. Ffolliott, L.F. DBano, and M.B. Baker, Jr., D.G. Neary, and K.N. Brooks (eds.) Riparian areas of the Southwestern United States, hydrology, ecology, and management. CRC Press, Boca Raton, FL.

Gresswell, R.E. 1999. Fire and aquatic ecosystems in forested biomes of North America. Transactions of the American Fisheries Society 128:193–221.

Girard, C. 1857. Researches upon the cyprinod fishes inhabiting the fresh waters of the United States of America, west of the Mississippi Valley, from specimens in the Museum of the Smithsonian Institution. Proceeding of the Academy of Natural Sciences 8:165-213.

Hayes, M.P., and M.R. Jennings. 1986. Decline of Ranid Frog Species in Western North America: Are Bullfrogs (*Rana catesbeiana*) Responsible? Journal of Herpetology 20:490-509.

Hubbard, J.P. 1977. Importance of Riparian Ecosystems: Biotic Considerations. Pp. 14-18. In Importance, Preservation, and Management of Riparian Habitat: a Symposium, R.R. Johnson and D.A. Jones (eds.). United States Dept. Agriculture, Forest Service General Technical Report RM-43, Rocky Mountain Forest and Range Experimental Station, Fort Collins, CO.

Industrial Economics Incorporated. 2006. Economic Analysis of Critical Habitat Designation for the Spikedace and Loach Minnow. Industrial Economics Incorporated. Cambridge, MA.

Jakle, M. 1992. Memo dated 26 February 1992 entitled Summary of Fish and Water Quality Sampling along the San Pedro River from Dudleyville to Hughes Ranch near Cascabel, Oct. 24 and 25, 1992, and the Gila River from Coolidge Dam to Ashurst/Hayden Diversion Dam, Oct. 28–31, 1991. United States Dept. Interior, Bureau of Reclamation, Phoenix, AZ.

Kerr, Andy. 1998. The Voluntary Retirement Option for Federal Public Land Grazing Permittees. *Rangelands*. Vol. 20, No. 5. October. 26-30.

Knowles, G.W. 1994. Fisheries survey of the Apache-Sitgreaves National Forests. Third trip report: Eagle Creek, July 05-07 and August 02, 1994. Arizona State University, Tempe, AZ.

Koster, W.J. 1957. Guide to the Fishes of New Mexico. University of New Mexico Press, Albuquerque, NM.

Leon, S.C. 1989. Trip Report: East Fork White River, 26 May 1989. United States Dept. Interior, Fish and Wildlife Service, Pinetop, AZ.

Lodge, D.M., C.A. Taylor, D.M. Holdich, and J. Skurdal. 2000. Nonindigenous Crayfishes Threaten North American Freshwater Biodiversity: Lessons from Europe. *Fisheries* 25(8):7-19.

Lopez, M. 2000. e-mail dated August 30, 2000, to Paul Marsh from Mike Lopez re: TICO surveys.

Marsh, P.C., B.E. Bagley, G.W. Knowles, G. Schiffmiller, and P.A. Sowka. 2003. New and rediscovered populations of loach minnow, *Tiogara cobitis* (Cyprinidae) in Arizona. *The Southwestern Naturalist* 48(4):666-669.

Marsh, P.C., J.E. Brooks, D.A. Hendrickson, and W.L. Minckley. 1990. Fishes of Eagle Creek, Arizona, with Records for Threatened Spikedace and Loach Minnow (Cyprinidae). *Journal of the Arizona-Nevada Academy of Science* 23(2):107–116.

McNamee, G. 1994. Gila: the Life and Death of an American River. University of New Mexico Press, Albuquerque, NM.

Meehan, W.R., ed. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats: Bethesda, Maryland, Amer. Fish. Soc. Spec. Publ. 19. 751 pp.

Merritt, R.W., and K.W. Cummins (eds). 1984. An introduction to the aquatic insects of North America. Kendall/Hunt Publishing Co., Dubuque, IA. 721 pp.

Miller D. 1998. Fishery survey report, Negrito Creek within the Gila National Forest, New Mexico, 29 and 30 June 1998. Western New Mexico State University, Biology Department, for the Gila National Forest. Silver City, NM. 6 pp.

Miller, R.R., and C.L. Hubbs. 1960. The spiny-rayed cyprinid fishes (Plagopterini) of the Colorado River system. *Miscellaneous Publications, Museum of Zoology, University of Michigan* 115:1-39.

Miller, R.R. and H.E. Winn. 1951. Additions to the Known Fish Fauna of Mexico: Three Species and One Subspecies from Sonora. *Journal of the Washington Academy of Sciences* 1(2):83–84.

Minckley, W.L. 1973. *Fishes of Arizona*. Arizona Department of Game and Fish, Phoenix.
———. 1981. *Ecological Studies of Aravaipa Creek, Central Arizona, Relative to Past, Present, and Future Uses*. United States Dept. Interior, Bureau of Land Management, Safford, AZ.

———. 1991. Native Fishes of the Grand Canyon Region: an Obituary? Pp. 124–177. *In* Committee to Review the Glen Canyon Environmental Studies (eds.), *Colorado River Ecology and Dam Management: Proceedings of a Symposium May 24–25, 1990, Santa Fe, New Mexico*. National Academy Press, Washington, D.C.

Minckley, W.L., and J.E. Brooks. 1985. Transplantations of Native Arizona fishes: Records Through 1980. *Journal of the Arizona-Nevada Academy of Science* 20(2):73–89.

Minckley, W.L., and M.R. Somerfeld. 1979. Resource inventory for the Gila River complex, eastern Arizona. United States Bureau of Land Management, Safford, AZ. 570 pp.

Minshall, G.W., D.A. Andrews, J.T. Brock, C.T. Robinson, and D.E. Lawrence. 1990. Changes in wild trout habitat following forest fire. Pages 174–177 *in* F. Richardson, F., and R.H. Hamre (eds). *Wild Trout IV: proceedings of the symposium*. Trout Unlimited, Arlington, VA.

Montgomery, Susan B. 2005. Comments to Proposed Rule to Draft Environmental Assessment and Final Draft Economic Analysis of Critical Habitat for the Gila Chub. Montgomery, Sparks, Tehan, and Ryley P. C. Special Counsel to the San Carlos Apache Tribe.

Montgomery (J.M.) Consulting Engineers. 1985. *Wildlife and Fishery Studies, Upper Gila Water Supply Project*. J.M. Montgomery Consulting Engineers for Dept. Interior, Bureau of Reclamation, Boulder City, NV.

Newcombe, C.P., and D.D. MacDonald. 1991. Effects of suspended sediments on aquatic ecosystems. *North American Journal of Fisheries Management* 11:72–82.

Norris, L.A., H.W. Lorz, and S.V. Gregory. 1991. Forest chemicals. *American Fisheries Society Special Publication* 19:207–296.

Ohmart, R.D., and B.W. Anderson. 1982. North American Desert Riparian Ecosystems. Pp. 433-479. *In* Reference Handbook on the Deserts of North America, G.L. Bender (ed.). Greenwood Press, Westport, CT.

Paroz, Y.M., D.L. Propst, and J.A. Stefferud. 2006. Long-term monitoring of fish assemblages in the Gila River drainage, New Mexico. New Mexico Department of Game and Fish, Santa Fe, NM. 74 pp.

Propst, D.L. 1996. Sampling data from West Fork Gila River, March 1995 to June 1996. New Mexico Department of Game and Fish, Santa Fe, NM.

Propst, D.L. 2002. Systematic investigations of warmwater fish communities. FW-17-RD Completion Report, 1 July 1997—30 June 2002. New Mexico Department of Game and Fish, Santa Fe, NM.

Propst, D.L. 2005. Systematic investigations of warmwater fish communities. FW-17-R-32 Performance Report, 1 July 2004 – 30 June 2005. New Mexico Department of Game and Fish, Santa Fe, NM. 43 pp.

Propst, D.L. 2006. Letter dated February 7, 2006 to Steven L. Spangle from David L. Propst re: Peer Review Comments on the proposed rule to designate critical habitat for spikedace and loach minnow (FR 70:75546-75590).

Propst, D.L., and K.R. Bestgen. 1991. Habitat and biology of the loach minnow, *Tiaroga cobitis*, in New Mexico. *Copeia* 1991(1):29-38.

Propst, D.L., K.R. Bestgen, and C.W. Painter. 1986. Distribution, status, and biology of the spikedace (*Meda fulgida*) in New Mexico. Endangered Species Report No. 15, United States Department of the Interior, Fish and Wildlife Service, Albuquerque, NM.

Propst, D.L., K.R. Bestgen, and C.W. Painter. 1988. Distribution, status, biology, and conservation of the loach minnow (*Tiaroga cobitis*) in New Mexico. Endangered Species Report No. 17, United States Department of the Interior, Fish and Wildlife Service, Albuquerque, NM.

Rea, A.M. 1983. Once a River. University of Arizona Press, Tuscon.

Reiser, D.W. and T.C. Bjornn. 1979. Habitat requirement of anadromous salmonids. General Technical Report PNW-96. University of Idaho Cooperative Fishery Research Unit and Pacific Northwest Forest and Range Experiment Station. Portland, OR. 54 pp.

Rhode, F.C. 1980. *Meda fulgida* Girard, Spikedace. Pp. 206. In D.S. Lee, C.R. Gilbert, C.H. Hocutt, R.E. Jenkins, D.E. McAllister, and J.R. Stauffer, Jr. (eds), Atlas of North American Freshwater Fishes. North Carolina State Museum of Natural History, Raleigh, NC.

Rieman, B.E., and J.L. Clayton. 1997. Fire and fish: issues of forest health and conservation of native fishes. *Fisheries* 22(11):6–15.

Rinne, J.N. 1986. Physical habitat evaluation of small stream fishes: point vs. transect, observation vs. capture methodologies. *Journal of Freshwater Ecology* 3(1):121-131.

———. 1989. Physical Habitat Use by Loach Minnow, *Tiaroga cobitis* (Pisces: Cyprinidae), in Southwestern Desert Streams. *Southwestern Naturalist* 34(1):109–117.

———. 1996. Short-term effects of wildfire on fishes and aquatic macroinvertebrates in the southwestern United States. *North American Journal of Fisheries Management* 16:653– 658.

———. 1999. The Status of the Spikedace (*Meda fulgida*) in the Verde River, 1999: Implications for Management and Research. *Hydrology and Water Resources of Arizona and the Southwest*.

———. 2001. Relationship of sediment and two native southwestern fish species. *Hydrology and Water Resources in Arizona and the Southwest*: 31:67-70 pp.

Rinne, J.N. and E. Kroeger. 1988. Physical habitat used by spikedace, *Meda fulgida*, in Aravaipa Creek, Arizona. *Proceedings of the Western Association of Fish and Wildlife Agencies Agenda* 68:1-10.

Rinne, J.N., and W.L. Minckley. 1991. Native fishes of arid lands: A dwindling resource of the desert Southwest. Pages 24–25 *in* United States Department of Agriculture, Forest Service, General Technical Report RM-206. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Schreiber, D.C. 1978. Feeding Interrelationships of Fishes of Aravaipa Creek, Arizona. M.S. thesis, Arizona State University, Tempe, AZ.

Schreiber, D.C., and W.L. Minckley. 1981. Feeding Interrelationships of Native Fishes in a Sonoran Desert Stream. *Great Basin Naturalist* 41(4):409–426.

Sheppard, P.R., A.C. Comrie, G.D. Packin, K. Angersbach, and M.K. Hughes. 1999. The Climate of the Southwest, CLIMAS Report Series CL 1-99, Institute for the Study of Planet Earth, University of Arizona, Tucson, AZ.

Shreve, F., and I.L. Wiggins. 1964. *Vegetation and Flora of the Sonoran Desert*. 2 Vols. Stanford University Press, Stanford, CA.

Spence, B.C., G.A. Lomnicky, R.M. Huges, and R.P. Novitzki. 1996. An Ecosystem Approach to Salmonid Conservation. TR-4501-96-6057. Mantech Environmental Research Services Corp., Corvallis, OR.

Spencer, C.N., and F.R. Hauer. 1991. Phosphorus and nitrogen dynamics in streams during a wildfire. *Journal of the North American Benthological Society* 10(1):24–30.

Springer, C.L. 1995. Fishery Survey of the Gila River Within the Gila Wilderness Area, Gila National Forest, New Mexico, June and August 1994. United States Dept. Interior, Fish and Wildlife Service, Albuquerque, NM.

Sublette, J.E., M. D. Hatch, and M. Sublette. 1990. *The Fishes of New Mexico*. University of New Mexico Press, Albuquerque, NM.

United States Bureau of Reclamation. 2004. Colorado River system consumptive uses and losses report, 1996-2000. February 2004, revised December 2004.

United States Census Bureau, Census 2000. Online at <http://www.census.gov/>.

United States Fish and Wildlife Service. 1991a. Spikedace Recovery Plan. Albuquerque, NM. 38 pages.

———. 1991b. Loach Minnow Recovery Plan. Albuquerque, NM. 38 pages.

———. 2000. Environmental Assessment–Designation of Critical Habitat for the Spikedace (*Meda fulgida*) and Loach Minnow (*Tiaroga [=Rhinichthys] cobitis*). Phoenix, AZ. 36 pages.

———. 2002. Listing the Gila chub as endangered with critical habitat, Proposed Rule. Federal Register 67(154):51948–51985.

———. 2004a. Biological and Conference Opinion for the BLM Arizona Statewide land use Plan Amendment for Fire, Fuels, and Air Quality Management. September 3, 2004.

———. 2004b. Formal Conference on the Robinson Mesa Prescribed Fire Project on the Clifton Ranger District of the Apache-Sitgreaves National Forests. October 5, 1999.

———. 2004c. Biological Opinion on the Bureau of Reclamation's Approval of Water Exchange by the San Carlos Apache Tribe for Retention in San Carlos Reservoir. March 8, 2004.

———. 2005a. Endangered and Threatened Wildlife and Plants: Proposed Rule to Designate Critical Habitat for the Spikedace (*Meda fulgida*) and Loach Minnow (*Tiaroga cobitis*); Proposed Rule. Federal Register 70 (243): 75546–75590.

———. 2005b. Designation of Critical Habitat for the Gila Chub Environmental Assessment. United States Dept. Interior, Fish and Wildlife Service, Phoenix, AZ.

University of Wisconsin. 2004. The Wildland-Urban Interface. Department of Forest Ecology & Management. Online at: http://silvis.forest.wisc.edu/projects/WUI_Main.asp, accessed on March 15, 2006.

United States Forest Service. 2001. Biological Opinion on the USFS Proposed Wildland/Urban Interface (WUI) Fuel Treatments in New Mexico and Arizona and their effects on listed and proposed species in accordance with Section 7 of the Endangered Species Act. USDA.

———. 2004. Biological Assessment for the Continued Implementation of the Land and Resource Management Plans for the Eleven National Forests and National Grasslands of the Southwestern Region, Appendix E: Regional Management Direction for Species and Forest Accomplishments. USDA.

Appendix A—Legal descriptions of proposed critical habitat for the spikedace and loach minnow

Designated Critical Habitat Maps (Figures 4–9). Legal descriptions for New Mexico and Arizona are based on the Public Lands Survey System. Within this system, all coordinates reported for New Mexico are in the New Mexico Principal Meridian, while those in Arizona are in the Gila and Salt River Meridian. Where possible, the ending or starting points have been described to the nearest quarter section, abbreviated as “1/4.” All mileage calculations were performed using GIS. Each stream segment includes a lateral component that consists of 91 m (300 ft) on either side of the stream channel measured from the stream edge at bankfull discharge. This lateral component of critical habitat is intended as a surrogate for the 100-year floodplain.

Spikedace

Complex 1—Verde River, Yavapai County, Arizona (Figure 5).

Verde River—43.0 mi (69.2 km) of river extending from the Prescott and Coconino forest boundary with private lands upstream to Sullivan Dam at Township 17 North, Range 2 West, Section 15. Land ownership: USFS (Coconino, Prescott, and Tonto national forests), Yavapai Apache Nation, state, and private.

Complex 3—Middle Gila / Lower San Pedro / Aravaipa Creek, Pinal and Graham Counties, Arizona (Figure 7).

Gila River—39.0 mi (62.8 km) of river extending from the Ashurst-Hayden Dam at Township 4 South, Range 11 East, Section 8 upstream to the confluence with the San Pedro River at Township 5 South, Range 15 East, Section 23. Land ownership: Reclamation, BLM, state, and private.

Lower San Pedro River—13.4 mi (21.5 km) of river extending from the confluence with the Gila River at Township 5 South, Range 15 East, section 23 upstream to the confluence with Aravaipa Creek at Township 7 South, Range 16 East, Section 9. Land ownership: BLM, Tribal, state, and private.

Aravaipa Creek—28.1 mi (45.3 km) of creek extending from the confluence with the San Pedro River at Township 7 South, Range 16 East, Section 9 upstream to the confluence with Stowe Gulch at Township 6 South, Range 19 East, Section 35. Land ownership: BLM, Tribal, State, and private lands.

Complex 5—Upper Gila River Complex, Catron, Grant, and Hidalgo Counties, New Mexico (Figure 9).

Upper Gila River—94.9 mi (152.7 km) of river extending from the confluence with Moore Canyon (near the Arizona/New Mexico border) at Township 18 South, Range 21 West, Section 32 upstream to the confluence of the East and West Forks of the Gila River at Township 13 South, Range 13 West, Section 8. Land ownership: BLM, USFS (Gila National Forest), state, and private lands.

East Fork Gila River—26.1 mi (42.0 km) of river extending from the confluence with the West Fork Gila River at Township 13 South, Range 13 West, Section 8 upstream to the confluence of Beaver and Taylor creeks at Township 11 South, Range 12 West, Section 17. Land ownership: USFS (Gila National Forest) and private lands.

Middle Fork Gila River—7.7 mi (12.3 km) of river extending from the confluence with the West Fork Gila River at Township 12 South, Range 14 West, Section 25 upstream to the confluence with Big Bear Canyon at Township 12 South, Range 14 West, Section 2. Land ownership: USFS (Gila National Forest) and private lands.

West Fork Gila River—7.7 mi (12.4 km) of river extending from the confluence with the East Fork Gila River at Township 13 South, Range 13 West, Section 8 upstream to the confluence with EE Canyon at Township 12 South, Range 14 West, Section 22. Land ownership: USFS (Gila National Forest), NPS, and private lands.

Loach Minnow

Complex 2—Black River, Apache and Greenlee Counties, Arizona (Figure 6).

East Fork Black River—12.2 mi (19.7 km) of river extending from the confluence with the West Fork Black River at Township 4 North, Range 28 East, Section 11 upstream to the confluence with an unnamed tributary creek 0.51 mile (0.82 km) downstream of the Boneyard Creek confluence at Township 5 North, Range 29 East, Section 5. Land ownership: USFS (Apache-Sitgreaves National Forest).

North Fork East Fork Black River—4.4 mi (7.1 km) of river extending from the confluence with East Fork Black River and an unnamed drainage at Township 5 North, Range 29 East, Section 5 upstream to the confluence with an unnamed tributary at Township 6 North, Range 29 East, Section 30. Land ownership: USFS (Apache-Sitgreaves National Forest).

Boneyard Creek—1.4 mi (2.3 km) of creek extending from the confluence with the East Fork Black River at Township 5 North, Range 29 East, Section 5 upstream to the confluence with an unnamed tributary at Township 6 North, Range 29 East, Section 32. Land ownership: USFS (Apache-Sitgreaves National Forest).

Complex 3: Middle Gila / Lower San Pedro / Aravaipa Creek, Pinal and Graham Counties, Arizona (Figure 7).

Aravaipa Creek—28.1 mi (45.3 km) of creek extending from the confluence with the San Pedro River at Township 7 South, Range 16 East, Section 9 upstream to the confluence with Stowe Gulch at Township 6 South, Range 19 East, Section 35. Land ownership: BLM, Tribal, and state lands.

Turkey Creek—2.7 mi (4.3 km) of creek extending from the confluence with Aravaipa Creek at Township 6 South, Range 19 East, Section 19 upstream to the confluence with Oak Grove Canyon at Township 6 South, Range 19 East, Section 32. Land ownership: BLM.

Deer Creek—2.3 mi (3.6 km) of creek extending from the confluence with Aravaipa Creek at Township 6 South, Range 18 East, Section 14 upstream to the boundary of the

Aravaipa Wilderness at Township 6 South, Range 19 East, Section 18. Land ownership: Bureau of Land Management.

Complex 4--San Francisco and Blue Rivers, Pinal and Graham Counties, Arizona and Catron County, New Mexico (Figure 8).

Eagle Creek—17.7 mi (28.5 km) of creek extending from the Phelps-Dodge Diversion Dam at Township 4 South, Range 28 East, Section 23 upstream to the confluence of Dry Prong and East Eagle Creeks at Township 2 North, Range 28 East, Section 29. Land ownership: USFS (Apache-Sitgreaves National Forest), Tribal lands, and private.

San Francisco River—126.5 mi (203.5 km) of river extending from the confluence with the Gila River at Township 5 South, Range 29 East, Section 21 upstream to the mouth of The Box, a canyon above the town of Reserve, at Township 6 South, Range 19 West, Section 2. Land ownership: BLM, USFS (Apache-Sitgreaves National Forest), state, and private in Arizona, and USFS (Gila National Forest) and private in New Mexico.

Tularosa River— 18.6 mi (30.0 km) of river extending from the confluence with the San Francisco River at Township 7 South, Range 19 West, Section 23 upstream to the town of Cruzville at Township 6 South, Range 18 West, Section 12. Land ownership: USFS (Gila National Forest) and private.

Negrito Creek—4.2 mi (6.8 km) of creek extending from the confluence with the Tularosa River at Township 7 South, Range 18 West, Section 19 upstream to the confluence with Cerco Canyon at Township 7 South, Range 18 West, Section 21. Land ownership: USFS (Gila National Forest), and private lands.

Whitewater Creek—1.1 mi (1.8 km) of creek extending from the confluence with the San Francisco River at Township 11 South, Range 20 West, Section 27 upstream to the confluence with the Little Whitewater Creek at Township 11 South, Range 20 West, Section 23. Land ownership: private lands.

Blue River—51.1 mi (82.2 km) of river extending from the confluence with the San Francisco River at Township 2 South, Range 31 East, Section 31 upstream to the confluence of Campbell Blue and Dry Blue Creeks at Township 7 South, Range 21 West, Section 6. Land ownership: USFS (Apache-Sitgreaves National Forest) and private lands in Arizona; USFS (Gila National Forest) in New Mexico.

Campbell Blue Creek—8.1 mi (13.1 km) of creek extending from the confluence of Dry Blue and Campbell Blue Creeks at Township 6 South, Range 20 West, Section 6 in New Mexico upstream to the confluence with Coleman Canyon at Township 4 North, Range 31 East, Section 32 in Arizona. Land ownership: USFS (Apache-Sitgreaves National Forest) and private lands in Arizona; USFS (Gila National Forest) in New Mexico.

Dry Blue Creek—3.0 mi (4.8 km) of creek extending from the confluence with Campbell Blue Creek at Township 7 South, Range 21 West, Section 6 upstream to the confluence with Pace Creek at Township 6 South, Range 21 West, Section 28. Land ownership: USFS (Gila National Forest).

Pace Creek—0.8 mi (1.2 km) of creek extending from the confluence with Dry Blue Creek at Township 6 South, Range 21 West, Section 28 upstream to a barrier falls at Township 6 South, Range 21 West, Section 29. Land ownership: USFS (Gila National Forest).

Frieborn Creek—1.1 mi (1.8 km) of creek extending from the confluence with Dry Blue Creek at Township 7 South, Range 21 West, Section 6 upstream to an unnamed tributary at Township 7 South, Range 21 West, Section 8. Land ownership: USFS (Gila National Forest).

Little Blue Creek—2.8 mi (4.5 km) of creek extending from the confluence with the Blue River at Township 1 South, Range 31 East, Section 5 upstream to the mouth of a canyon at Township 1 North, Range 31 East, Section 29. Land ownership: USFS (Apache-Sitgreaves National Forest).

Complex 5—Upper Gila River Complex, Catron, Grant, and Hidalgo Counties, New Mexico (Figure 9).

Upper Gila River—94.9 mi (152.7 km) of river extending from the confluence with Moore Canyon (near the Arizona/New Mexico border) at Township 18 South, Range 21 West, Section 32 upstream to the confluence of the East and West Forks of the Gila River at Township 13 South, Range 13 West, Section 8. Land ownership: BLM, USFS (Gila National Forest), state, and private lands.

East Fork Gila River—26.1 mi (42.0 km) of river extending from the confluence with the West Fork Gila River at Township 13 South, Range 13 West, Section 8 upstream to the confluence of Beaver and Taylor Creeks at Township 11 South, Range 12 West, Section 17. Land ownership: USFS (Gila National Forest) and private lands.

Middle Fork Gila River—11.9 mi (19.1 km) of river extending from the confluence with the West Fork Gila River at Township 12 South, Range 14 West, Section 25 upstream to the confluence with Brothers West Canyon at Township 11 South, Range 14 West, Section 33. Land ownership: USFS (Gila National Forest) and private lands.

West Fork Gila River—7.7 miles (12.4 km) of river extending from the confluence with the East Fork Gila River at Township 13 South, Range 13 West, Section 8 upstream to the confluence with EE Canyon at Township 12 South, Range 14 West, Section 22. Land ownership: USFS (Gila National Forest), NPS, and private lands.