DESIGNATION OF CRITICAL HABITAT FOR THE GILA CHUB ENVIRONMENTAL ASSESSMENT

LEAD AGENCY:

Department of the Interior - U.S. Fish and Wildlife Service

USFWS PROJECT NUMBER:

CONTACT PERSON:

Steve Spangle, Field Supervisor
U.S. Fish and Wildlife Service
Arizona Ecological Services Office
2321 West Royal Palm Road, Suite 103
Phoenix, AZ, 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 designating critical habitat for the Gila chub, a fish species proposed for listing as endangered under the Endangered Species Act (ESA). The need for the proposed action is to comply with the ESA. Two alternatives were considered: the No Action Alternative and the Proposed Rule Alternative, with an option for exclusions. The No Action Alternative is required by the National Environmental Policy Act (NEPA) for comparison to the other alternatives analyzed in this EA. The Proposed Rule Alternative would designate approximately 341 km (212 mi) along 27 selected stream segments as critical habitat within Arizona and New Mexico. The Proposed Rule Alternative includes an option to exclude San Carlos Apache lands in Arizona (47.3 km [29.4 mi]) from consideration as critical habitat. The exclusion would be based upon final approval by tribal authorities of a fish management plan now in draft form, or upon other applicable factors, under the authority of section 4(b)(2) of the ESA. The Proposed Rule Alternative with the option to exclude San Carlos Apache land would designate approximately 293.8 km (182.6 mi) as critical habitat.

Environmental issues related to this proposed action were identified by the U.S. Fish and Wildlife Service (Service) during resource analysis, and by other government agencies, tribal representatives, and the public during the public comment period for the proposed rule to list Gila chub as endangered with critical habitat. Concerns include the impacts of critical habitat designation on water resources; wetlands and floodplains; fish, wildlife, and plants; land management; wildland fire management; recreation; socioeconomics, livestock grazing; tribal

trust resources; and environmental justice. This EA evaluates the potential effects of critical habitat designation for each of these categories.

The designation of critical habitat for Gila chub would have no direct impacts on the natural or human environment; designation would impose no land use restrictions nor would it prohibit land use activities. However, the Proposed Rule Alternative (with or without the Exclusion Option) could:

1. increase the number of new and reinitiated ESA section 7 consultations for proposed and ongoing projects within designated critical habitat;
2. increase the likelihood of greater expenditures of time and funds by the Service, action agencies, and project proponents to complete the additional section 7 consultations;
3. increase the likelihood of greater expenditure of time and funds by action agencies and project proponents to implement any reasonable and prudent alternatives and other conservation measures resulting from the consultations;
4. increase the likelihood of changes to proposed and ongoing activities that could adversely modify critical habitat; and
5. assist in maintaining Gila chub critical habitat primary constituent elements, and, by doing so, help conserve the aquatic and riparian ecosystems of which the primary constituent elements are an integral part.

TABLE OF CONTENTS

1.0 CHAPTER 1 - PURPOSE OF AND NEED FOR ACTION 5
1.1 Introduction 5
1.2 Purpose of the Action 6
1.3 Need for the Action 6
1.4 Background 6
1.4.1 Critical Habitat 6
1.4.1.1 Provisions of the Endangered Species Act 6
1.4.1.2 Section 7 Consultation Process 7
1.4.1.3 Proposed Primary Constituent Elements 8
1.4.1.4. Section 4(b)(2) Exclusion Process 9
1.4.2 Gila Chub 10
1.4.2.1 Description 10
1.4.2.2 Habitat 10
1.4.2.3 Life History 10
1.4.2.4 Distribution 11
1.4.2.5 Current Status and Reasons for the Decline of Gila chub 11
1.5 Permits Required for Implementation 12
1.6 Related Laws, Authorizations, and Plans 12
1.7 Issues 12
1.7.1 Issues and Concerns Raised in Public Comments 13
1.7.1.1 Authority and Regulatory Issues 13
1.7.1.2 Need for Critical Habitat Designation 13
1.7.1.3 Structure of Critical Habitat Designation 14
1.7.1.4 Water Resources 14
1.7.1.5 Socioeconomics 15
1.7.1.6 Transportation 15
1.7.1.7 Recreation 15
1.8 Topics Analyzed in Detail in This Environmental Assessment 16
1.8.1 Mandatory Topics Dismissed from Detailed Analysis 16
1.9 Decision to Be Made 17

2.0 CHAPTER 2 - ALTERNATIVES 18
2.1 Development of Alternatives 18
2.2 No Action Alternative 18
2.3 Proposed Rule Alternative 18
2.3.1 Proposed Critical Habitat Units and Stream Segments 19
2.3.1.1 Area 1: Upper Gila River 20
2.3.1.2 Area 2: Middle Gila River 20
2.3.1.3 Area 3: The Babocomari River 21
2.3.1.4 Area 4: Lower San Pedro River 21
2.3.1.5 Area 5: Lower Santa Cruz River 22
2.3.1.6 Area 6: Upper Verde River 22
2.3.1.7 Area 7: Agua Fria River 23
2.4 Exclusion option 23

2.5 Alternatives Considered but Not Carried Forward for Further Analysis 24
2.5.1 Development of Conservation Agreements 24
2.5.2 Land Acquisition/Conservation Easements.....24
2.6 Comparison of Alternatives.....25

3.0 CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES.....35
3.1 Introduction 35
3.1.1 Methodology 35
3.1.1.1 Economic Analysis.....36
3.1.1.2 Gila Chub Section 7 Consultation History 37
3.2 Water Resources.....38
3.2.1 Existing Conditions 38
3.2.2 Environmental Consequences 40
3.2.2.1 No Action Alternative 40
3.2.2.2 Proposed Rule Alternative.....40
3.2.2.3 Exclusion Option 42
3.3 Wetlands and Floodplains 43
3.3.1 Existing Conditions 43
3.3.2 Environmental Consequences 43
3.3.2.1 No Action Alternative 43
3.3.2.2 Proposed Rule Alternative.....43
3.3.2.3 Exclusion Option 44
3.4 Fish, Wildlife, and Plants 44
3.4.1 Existing Conditions 44
3.4.1.1 General Fish, Wildlife, and Plants.....45
3.4.1.1.1 Fish 45
3.4.1.1.2 Wildlife 45
3.4.1.1.3 Plants.....46
3.4.1.2 Threatened, Endangered, Proposed, and Candidate Species 46
3.4.1.2.1 Gila Chub.....46
3.4.1.2.2 Listed and Candidate Species 48
3.4.2 Environmental Consequences 49
3.4.2.1 No Action Alternative 49
3.4.2.2 Proposed Rule Alternative.....50
3.4.2.3 Exclusion Option 50
3.5 Land Management.....51
3.5.1 Affected Environment 51
3.5.2 Environmental Consequences 53
3.5.2.1 No Action Alternative 53
3.5.2.2 Proposed Rule Alternative.....53
3.5.2.3 Exclusion Option 54
3.6 Wildland Fire Management.....55
3.6.1 Affected Environment 55

3.6.2 Environmental Consequences 57
3.6.2.1 No Action Alternative 57
3.6.2.2 Proposed Rule Alternative 57
3.6.2.3 Exclusion Option 58
3.7 Recreation 58
3.7.1 Existing Conditions 58
3.7.2 Environmental Consequences 59
3.7.2.1 No Action Alternative 59
3.7.2.2 Proposed Rule Alternative 59
3.7.2.3 Exclusion Option 60
3.8 Socioeconomics 61
3.8.1 Existing Conditions 61
3.8.1.1 Population Characteristics 61
3.8.1.2 Economic Activity 62
3.8.2 Environmental Consequences 67
3.8.2.1 No Action Alternative 67
3.8.2.2 Proposed Rule Alternative 68
3.8.2.3 Exclusion Option 69
3.9 Livestock Grazing 70
3.9.1 Affected Environment 70
3.9.2 Environmental Consequences 70
3.9.2.1 No Action Alternative 70
3.9.2.2 Proposed Rule Alternative 71
3.9.2.3 Exclusion Option 71
3.10 Tribal Trust Resources 72
3.10.1 Existing Conditions 72
3.10.2 Environmental Consequences 72
3.10.2.1 No Action Alternative 72
3.10.2.2 Proposed Rule Alternative 73
3.10.2.3 Exclusion Option 73
3.11 Environmental Justice 73
3.11.1 Minority Populations 74
3.11.2 Low-Income Populations 75
3.12 Cumulative Impacts 76

4.0 CHAPTER 4 – ANALYSIS OF SIGNIFICANCE 77
4.1 Considerations in Determining Significance 77
4.2 Significance Determination 77

5.0 CHAPTER 5 – LIST OF PREPARERS 79

REFERENCES CITED 80

LIST OF FIGURES

Figure 2.1 Overview of proposed critical habitat river units in Arizona and New Mexico. 30
Figure 2.2 Proposed critical habitat in Area 1: Upper Gila River. 31
Figure 2.3 Proposed critical habitat in Area 2: Middle Gila River. 32
Figure 2.4 Proposed critical habitat in Area 3: Babocomari River, Area 4: Lower San Pedro River, and Area 5: Lower Santa Cruz River. 33
Figure 2.5 Proposed critical habitat in Area 6: Upper Verde River and Area 7: Agua Fria River. 34

LIST OF TABLES

Table 2.1 Approximate Proposed Critical Habitat for Gila Chub in Stream Kilometers and Miles 19
Table 2.2 Comparison of Potential Effects of Gila Chub Critical Habitat Designation Alternatives 25
Table 3.1 Agency Actions That Have Undergone Formal Section 7 Conferences for Effects on Gila Chub 37
Table 3.2 Threatened, Endangered, Proposed, and Candidate Species That Have the Potential to Occur in Proposed Gila Chub Critical Habitat 47
Table 3.3 Status of Gila Chub within the Proposed Critical Habitat Areas 48
Table 3.4 Land Manager and Special Management Designations for Proposed Gila Chub Critical Habitat Segments (Excluding Private Lands) 52
Table 3.5 Socioeconomic Profile of Counties Containing Critical Habitat for the Gila Chub. 62
Table 3.6 Employees by Industry within Counties Containing Gila Chub Proposed Critical Habitat (2002) 63
Table 3.7 Annual Payroll for Selected Industries within Counties Containing Designated Critical Habitat ($ Thousands [2002]) 64
Table 3.8 Summary of Future Costs Related to Designation of Critical Habitat for the Gila Chub (2005–2024) 68
Table 3.9 2000 Population in the Proposed Action Area and Percent of Total State Population 74
Table 3.10 Racial Minority (Non-white), American Indian, and Hispanic Populations within the Analysis Area 75
Table 3.11 2000 Poverty Levels within the Analysis Area 75
Table 5.2 SWCA List of Preparers 79

1.0 CHAPTER 1 - PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has prepared this Environmental Assessment (EA) to analyze potential effects on physical and biological resources and economic conditions that may result from designation of critical habitat for the Gila chub (*Gila intermedia*), a species proposed for listing as endangered under the Endangered Species Act of 1973 (ESA), as amended (16 USC 1531 et seq.). This EA will be used by the Service to decide whether or not critical habitat will 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 will be prepared. This EA has been prepared pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA), as amended (42 USC 4321 et seq.) as implemented by the Council on Environmental Quality regulations (40 CFR 1500, et seq.) and Department of the Interior NEPA procedures.

The Gila chub was approved as a candidate for listing under the ESA on August 17, 1997, and was included in the candidate Notice of Review published on September 19, 1997 (62 FR 49402). On August 9, 2002, the Service published a proposed rule in the *Federal Register* to list the Gila chub as an endangered species with critical habitat (67 FR 51948). According to the proposed rule:

> *Without protections, the Gila chub will become extinct in the foreseeable future…85 to 90 percent of its habitat has been degraded or destroyed, and further degradation and destruction is ongoing…Gila chub have been extirpated or reduced in numbers and distribution in the majority of its historical range (Minckley 1973, Weedman et al. 1996). Where it is still present, populations are often small, scattered, and at risk from known and potential threats and from random events. Threats include predation by and competition with nonnative organisms, including fish in the family Centrarchidae (Micropterus spp., Lepomis spp.), other fish species, bullfrogs (Rana catesbeiana), and crayfish (Orconectes virilis); disease; and habitat alteration, destruction, and fragmentation resulting from water diversions, dredging, recreation, roads, livestock grazing, changes in the natural flow pattern, mining, degraded water quality (including contaminants from mining activities and excessive sedimentation), and groundwater pumping* (Service 2002a).

Designating critical habitat provides nonregulatory benefits to the Gila chub by identifying areas that contain the physical and biological features that are essential for the conservation of this species. Designation of critical habitat also identifies areas that may require special management considerations or protection. This knowledge helps to focus conservation activities, helps to provide protection to areas where significant threats to the Gila chub have been identified, and helps to avoid accidental damage to such areas.

1.2 PURPOSE OF THE ACTION

Preservation of the habitat required by 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 physical or biological features essential to the conservation of listed species. The purpose of this action is to designate critical habitat for Gila chub, a species proposed for listing as endangered under the ESA. Critical habitat designation identifies geographic areas that are essential for conservation of Gila chub and that may also require special management. It also describes the physical and biological features that constitute critical habitat (i.e., primary constituent elements).

1.3 NEED FOR THE ACTION

Critical habitat designation is required under 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 for federal actions that may affect these areas in order to avoid destruction or adverse modification of this habitat. Approximately 85 to 90 percent of the Gila chub's historical habitat has been degraded or destroyed, and much of that is unrecoverable. Additional loss of habitat and further restriction of the Gila chub's range would increase this 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. Purely private or state actions are not affected by the designation.

1.4 BACKGROUND

1.4.1 CRITICAL HABITAT

1.4.1.1 Provisions of the Endangered Species Act

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 excluding them outweigh the benefits of their inclusion, unless failure to include the areas in critical habitat would result in extinction of the species.

Critical habitat is defined in section 3(5)(A) of the ESA as: "*(I) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical and biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection;* and *(ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon*

a determination by the Secretary 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 geographical 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.

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, permitting).

Designation of critical habitat can help focus conservation activities by identifying physical or biological features that are essential to the conservation of the species, and possibly unoccupied areas that are themselves essential to the conservation of the species. Designation of critical habitat also serves to alert the public and land management 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 the requirement to consult with the Service under section 7, the ESA does not impose any restrictions on lands designated as critical habitat.

1.4.1.2 Section 7 Consultation Process

The section 7 consultation process begins with a determination of effects on listed species and designated critical habitat by the federal action agency. If the federal action agency determines that there will be no effect on listed species or designated critical habitat, the proposed action is not altered or impacted by ESA considerations. 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 adverse effects to listed species or critical habitat (40 CFR 402.13). 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) adverse impacts are likely to occur and formal consultation is initiated. Formal consultation is initiated when it is determined that the proposed federal action is likely to adversely affect a listed species or critical habitat (40 CFR §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 result in destruction or adverse modification of critical habitat 40 CFR 402.14[h]).

Independent analyses are made under the jeopardy and the adverse modification standards. The jeopardy analysis evaluates potential impacts on the species, while the adverse modification analysis specifically evaluates potential impacts on designated critical habitat. The Ninth Circuit recently determined that there is an additional difference between the two standards. In Gifford Pinchot Task Force v. U.S. 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.

A *non-jeopardy* 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* to minimize take, and associated, mandatory *terms and conditions* that describe the methods for accomplishing the reasonable and prudent measures. Discretionary *conservation recommendations* may also be included in a biological opinion based on effects to 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, identify studies or monitoring, or suggest 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 finds no destruction or adverse modification of critical habitat may contain conservation recommendations but would not include an incidental take statement, reasonable and prudent measures, or 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 critical habitat. Reasonable and prudent alternatives may vary from slight 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 to the species, may also include an incidental take statement, reasonable and prudent measures, terms and conditions, and conservation recommendations. A biological opinion that results in an adverse modification finding may include reasonable and prudent alternatives and conservation recommendations, but no incidental take statement or associated reasonable and prudent measures and terms and conditions.

1.4.1.3 Proposed Primary Constituent Elements

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

- space for individual and population growth, and for normal behavior;
- food, water, or other nutritional or physiological requirements;
- cover or shelter;
- sites for breeding, reproduction, or rearing of offspring; and
- habitats that are protected from disturbance or are representative of the historical geographical and ecological distributions of a species.

In considering the biological basis for determining critical habitat for the Gila chub, the Service focused on the primary physical and biological elements essential to the conservation of the species. These primary constituent elements are interrelated in the life history of the Gila chub and are identified in the proposed rule for critical habitat designation as follows:

1. Perennial pools, areas of higher velocity between pool areas, and areas of shallow water among plants or eddies all found in small segments of headwaters, springs, or cienegas of smaller tributaries.
2. Water temperatures for spawning ranging from 20 to 26.5°C (68 to 79.7°F) with sufficient dissolved oxygen, nutrients, and any other water-related characteristics needed.
3. Water quality with reduced levels of contaminants or any other water quality characteristics, including excessive levels of sediments, adverse to Gila chub health.
4. Food base consisting of aquatic invertebrates, filamentous (threadlike) algae, and terrestrial insects.
5. Sufficient cover consisting of downed logs in the water channel, submerged aquatic vegetation, submerged large tree root wads, undercut banks with sufficient overhanging vegetation, large rocks and boulders with overhangs.
6. Habitat devoid of nonnative aquatic species detrimental to Gila chub or habitat in which detrimental nonnatives are kept at a level that allows Gila chub to continue to survive and reproduce.
7. Streams that maintain a natural unregulated flow pattern, including periodic natural flooding. If flows are modified, then the stream should retain a natural flow pattern that demonstrates an ability to support Gila chub.

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

1.4.1.4. 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, if she 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 environmental analysis. This is as provided for in ESA section 4(b)(2) and in implementing regulations at 50 CFR 424.19.

1.4.2 GILA CHUB

The Gila chub (*Gila intermedia*), a member of the minnow family Cyprinidae, has been recognized as a distinct species since the 1850s, with the exception of a short period in the mid-1900s when it was placed as a subspecies of *G. robusta* (Miller 1945). For the past 30 years, Gila chub has been recognized as a full monotypic species, separate from the polytypic species *G. robusta* (Robbins et al. 1991, Mayden et al. 1992, Service 2002a).

1.4.2.1 Description

The Gila chub is a small-finned, deep bodied, chubby fish. It is dark colored (sometimes lighter on the belly), with diffuse lateral band(s) rarely present. Adult males average about 150 mm (6 in) in total length; females can exceed 200 mm (8 in). Scales are coarse, large, thick and broadly overlapped, and radiating out from the base. Lateral-line scales usually number greater than 61 and less than 80. There are usually eight (rarely seven or nine) dorsal and anal fin-rays; pelvic fin-rays typically number eight, but sometimes nine (Service 2002a).

1.4.2.2 Habitat

Gila chub commonly inhabit pools in smaller streams, springs, cienegas (marshes), and can survive in small artificial impoundments. Gila chub are highly secretive, preferring quiet, deeper waters, especially pools, or remaining near cover such as cutbanks, boulders, fallen logs, and thick overhanging or aquatic vegetation. Recurrent flooding and a natural hydrograph (physical conditions, boundaries, flow, and related characteristics of waters) are very important in maintaining the habitat of Gila chub and in helping the species maintain a competitive edge over invading nonnative aquatic species (Propst et al. 1986, Minckley and Meffe 1987).

1.4.2.3 Life History

While most reproductive activity by Gila chub occurs during late spring and summer, in some habitats it may extend from late winter through early autumn. Spawning may occur over beds of aquatic plants (Minckley 1973). Some individuals may be mature by the end of their first year; however, evidence suggests that others do not mature until their second or third year (Griffith and Tiersch 1989). Optimal water temperature for spawning is apparently 20 to 24°C (68 to 75.2°F) (Weedman et al. 1996). No data on Gila chub fecundity have been reported (Propst 1999).

Adult Gila chub have been reported to be crepuscular feeders, consuming primarily terrestrial and aquatic invertebrates and small fishes (Griffith and Tiersch 1989, Rinne and Minckley 1991). Young Gila chub are active throughout the day and feed on small invertebrates and

aquatic vegetation (filamentous algae and diatoms) and organic debris (Griffith and Tiersch 1989, Rinne and Minckley 1991). Gila chub may also be benthic feeders (Weedman et al. 1996).

1.4.2.4 Distribution

Historically, Gila chub have been recorded in approximately 30 rivers, streams, and spring-fed tributaries throughout the Gila River basin in southwestern New Mexico; central and southeastern Arizona; and northern Sonora, Mexico (Miller and Lowe 1967, Minckley 1973, Rinne 1976, Bestgen and Propst 1989). Several populations may originally have had basin-wide distributions (e.g., Babocomari and Santa Cruz Rivers) (Service 2002a).

This species is now restricted to small portions of tributary streams in portions of the upper Gila River (Greenlee County, Arizona, and Grant County, New Mexico); middle Gila River (Graham, Greenlee, Gila, and Pinal Counties, Arizona); San Pedro River (Pinal, Graham, Santa Cruz, and Cochise Counties, Arizona); and the Agua Fria and Verde Rivers (Yavapai County, Arizona) (Service 2002a).

1.4.2.5 Current Status and Reasons for the Decline of Gila chub

The Gila chub has been extirpated or reduced in numbers and distribution in the majority of its historical range (Minckley 1973, Weedman et al. 1996). Known Gila chub populations are fragmented and isolated to small stream segments. Past changes in range and density must have occurred in response to natural spatial and temporal variations in the environment, but the current status of Gila chub appears to be a direct or indirect result of human activities.

Habitat destruction or alteration and interactions with nonnative aquatic species have acted both independently and in concert to extirpate or deplete Gila chub populations. Habitat destruction and alteration has occurred due to numerous human uses of the stream, floodplain, and watershed, including livestock grazing, agriculture, timber harvest, mining, roads, urban and suburban development, irrigation, water diversion, impoundment, flood control and repair, channelization, vegetation manipulation, groundwater pumping, gravel mining, fuelwood harvest, recreation, and others (Miller 1961; Rinne 1976; Minckley and Deacon 1991; Service 1991a, 1991b; Cain et al. 1997). Erosion, sedimentation, channel downcutting, changes in channel morphology, channel instability, and loss of surface water commonly resulted from human activities causing further loss and alteration of Gila chub habitat (Leopold 1946, Dobyns 1981, Williams et al. 1985). In the San Pedro and Aqua Fria Rivers, plus major reaches of the Salt and Gila Rivers, dewatering and other such drastic habitat modifications resulted in demise of most native fishes. Downstream reaches of the Verde, Salt, and mainstem Gila Rivers have been affected by impoundments and highly altered flow regimes. Gila chub do not persist in reservoirs or other nonflowing waters. Impacts downstream from dams range from dewatering to altered chemical and thermal conditions.

Introduction of nonnative aquatic species has adversely affected Gila chub through predation, competition, habitat alteration, community disruption, and disease (Miller 1961, Propst et al. 1986, Propst and Bestgen 1991, Minckley 1991, Douglas et al. 1994). Nonnative organisms that adversely affect Gila chub include parasites and diseases, invertebrates, plants, amphibians, and

reptiles. However, nonnative fish, including smallmouth bass (*Micropterus dolomieui*), green sunfish (*Lepomis cyanellus*), red shiner (*Cyprinella lutrensis*), channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictus olivaris*), black and yellow bullhead (*Ameiurus melas* and *natalis*), western mosquitofish (*Gambusia affinis*), brown trout *(Salmo trutta)*, and rainbow trout (*Oncorhynchus mykiss*) have had the most detrimental effects on Gila chub.

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 USC 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"[1] the species without a permit from the Service. Other federal laws address various aspects of conservation of fish and wildlife and their habitat, which apply to Gila chub. 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, any 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 U.S. 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 Gila chub.

In addition, the Arizona Game and Fish Department (AGFD) considers the Gila chub a Wildlife of Special Concern in Arizona, and state regulations prohibit collection of or fishing for Gila chub in Arizona except under special permit (AGFD 1988). In New Mexico, Gila chub is listed as endangered (Propst 1999), and collecting is prohibited by New Mexico law except by special permit (19 NMAC 33.6.2). In Mexico, the Gila chub is endangered, and the collection of threatened and endangered species is prohibited (Diario Oficial de la Federación 1994).

1.7 ISSUES

The following issues associated with designation of critical habitat were identified in comments received during the public comment period (August 9–October 8, 2002) for the proposed rule to list the Gila chub as endangered with critical habitat (67 FR 51948).

[1] Killing, harming, catching, trapping, harassing, or collecting, or attempting to do so, are the definitions of "take" most applicable to the Gila chub.

1.7.1 ISSUES AND CONCERNS RAISED IN PUBLIC COMMENTS

1.7.1.1 Authority and Regulatory Issues

- The Service is without authority to designate critical habitat on tribal lands, and has not consulted with the San Carlos Apache Tribe on the proposed critical habitat.

- The proposed rule incorrectly treats San Carlos Apache tribal lands as federal land in several instances, most notably with regard to the Regulatory Flexibility Act.

1.7.1.2 Need for Critical Habitat Designation

- Listing the Gila chub (and by extension, designating critical habitat) is not warranted because:
  - The Gila chub's confusing taxonomic history has caused the service to overstate the species' historical range and the degree to which the species has declined.
  - The threats to Gila chub (including groundwater pumping, surface water diversions, channelization, livestock grazing, agriculture, mining, road building, nonnative species introductions, urbanization, and recreation) are largely unsubstantiated.
  - Birds or other natural predators may be a threat, as opposed to humans.
  - Gila chub provide no sport fish opportunity and should not be protected.

- Many areas proposed as critical habitat do not warrant designation as critical habitat because they already have adequate management and protection by federal, state, and county agencies and private entities. The San Carlos Apache Tribe's fisheries management planning provides adequate management and protection, thus critical habitat is not necessary on San Carlos Apache tribal lands.

- Critical habitat for the Gila chub is currently undeterminable because of insufficient information about the species' habitat use and requirements.

- Listing the Gila chub will alienate stakeholders that otherwise would have been amenable to conserving the species. Conservation agreements between the various stakeholders would be a more effective method to conserve the Gila chub.

- Listing the Gila chub (and by extension, designating critical habitat) is warranted because the species is reduced to a small fraction of its historical range; is restricted to a decreasing number of small, isolated populations; and is exposed to increasing anthropogenic threats. Without additional protection, the species is not likely to survive.

1.7.1.3 Structure of Critical Habitat Designation

- Critical habitat should be expanded to include unoccupied areas that provide connectivity between populations to allow gene flow and repopulation of formerly occupied suitable habitat. Limiting critical habitat to only those areas that are occupied will not achieve the purposes of the ESA, particularly when the proposed rule states that stabilization of the Gila chub at its present population level and distribution will not achieve conservation.

- Critical habitat should be expanded to include additional occupied habitat in Indian Creek, Little Sycamore Creek, Sycamore Creek, and Bonita Creek.

- The lateral extent of critical habitat should be expanded to include the 100-year floodplain or entire watersheds. The 300-foot buffer on either side of "banks" is indefinable in practice, would shift with shifting stream morphology, and would provide inadequate and inconsistent protection from adverse impacts in some areas.

- Using a 300-foot distance from bankfull width as a lateral extent of critical habitat captures areas in some segments that are outside the floodplain, and thus should not be considered essential to Gila chub.

- The primary constituent elements need to be expanded to include a moderate to high degree of streambank stability and a healthy, intact riparian vegetation community. The element for "habitats protected from disturbance" needs to be expanded to include other exotic animals and other forms of habitat alteration.

- The critical habitat designation is overbroad because it includes areas that are unoccupied and have not been shown to be essential to the conservation of the species. Eagle, Turkey, Post, and Little Sycamore Creeks are not occupied and so should not be included in critical habitat unless they are shown to be essential to the conservation of the species.

- Disconnected reaches such as Mineral Creek do not support the purported goal of the critical habitat designation of providing connected habitats between disjunct populations of Gila chub.

- Critical habitat in Spring Creek should be contracted to exclude unsuitable habitat at both ends.

1.7.1.4 Water Resources

- Residential development and associated groundwater withdrawal threaten the Gila chub, especially in Yavapai County.

- Adding Gila chub to the endangered species list will deprive citizens of their right of vital water supplies.

- The designation of critical habitat in Spring Creek would adversely affect the nearby community by interfering with groundwater withdrawal for municipal use, a compliant waste water disposal system, and flood damage repair.

- The City of Safford's water diversion of Bonita Creek acts as a barrier to protect native fish from nonnative fishes that would invade upstream. The Service fails to recognize that road use around Bonita Creek is essential to maintain the diversion.

- The Gila chub is threatened by habitat degradation related to water diversions, dams, and groundwater pumping.

1.7.1.5 Socioeconomics

- Designation of critical habitat and species reintroductions will lead to undue restrictions on private landowners.

- Critical habitat designation will negatively impact residents of nearby local communities.

- The designation will ruin the property value of Spring Creek Ranch.

- To avoid economic impacts to the San Carlos Apache Tribe, critical habitat should not be designated on tribal land. The proposed rule has not evaluated the economic effect of critical habitat on the San Carlos Apache Tribe as required in Section 4(b)(2).

- The Gila chub is threatened by habitat degradation related to livestock grazing, logging, and mining.

1.7.1.6 Transportation

- The designation of critical habitat in Spring Creek would adversely affect the nearby community by interfering with road and bridge maintenance and low-water crossings for residential access.

1.7.1.7 Recreation

- The designation of critical habitat in Spring Creek would adversely affect the nearby community by interfering with the recreational opportunities of nearby residents.

- The Gila chub is threatened by habitat degradation related to recreation.

1.8 TOPICS ANALYZED IN DETAIL IN THIS ENVIRONMENTAL ASSESSMENT

Based on the issues raised during the comment period for the proposed rule to designate critical habitat for Gila chub, 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 of this EA, are as follows:

- Water Resources [including water management projects, 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 Gila chub 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 for Gila chub 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 Gila chub.
- Urban quality, historic and cultural resources, and design of the built environment (1502.16). The proposed critical habitat segments are not located in urban or other built environments, so 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...such as, citrus, tree nuts, olives, cranberries, fruits, and vegetables. 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. Nor would potential conservation measures to protect critical habitat primary constituent elements 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). None of the stream segments proposed as critical habitat have been designated Wild and Scenic Rivers, although portions of Cienega Creek, Mattie Canyon, and Empire Gulch are included in the Cienega Creek Wild and Scenic River Study Area. Designation of critical habitat for the Gila chub would not affect the eligibility of these 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 Chapter 3).

No military installations or military use areas are included in the proposed designation. Fort Huachuca is located near proposed critical habitat in Cochise County, Arizona; however, based on public comments received from the Department of the Army on the proposed rule, it is the Service's understanding that proposed critical habitat designation should not affect activities at that installation. Therefore, national security would not be affected and is not considered an issue for impact analysis.

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 includes responses to comments received.

2.0 CHAPTER 2 - ALTERNATIVES

2.1 DEVELOPMENT OF ALTERNATIVES

In developing the action alternatives, the Service based their deliberations and 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 the species (Miller and Lowe 1967, Minckley 1973, Rinne 1976, Minckley and Somerfeld 1979, DeMarais 1986, Bestgen and Propst 1989, Griffith and Tiersch 1989, Sublette et al. 1990, Rinne and Minckley 1991, Weedman et al. 1996). The Service also took into account all comments received from agencies and the public on the proposed rule for designating critical habitat for the Gila chub.

The Service developed two alternatives and one option for impact analysis:

- No Action Alternative
- Proposed Rule Alternative
- Exclusion Option

The Service also considered additional alternatives that were not carried forward for further analysis. These are described later in this chapter. The two alternatives and one option analyzed in Chapter 3 are described below.

2.2 NO ACTION ALTERNATIVE

The No Action alternative is defined as a decision to forgo the designation of critical habitat for Gila chub. This alternative serves to delineate the existing environment and conditions that are anticipated to result from the listing of the species, without designation of critical habitat. It is not clear that the Service could, under the law, adopt this alternative because the ESA specifies that the Service must designate critical habitat to the maximum extent prudent and determinable. Analysis of the No Action alternative, however, is required by NEPA, and it serves as a baseline for analyzing effects of action alternatives.

2.3 PROPOSED RULE ALTERNATIVE

Under the Proposed Rule Alternative, the Service would designate critical habitat for the Gila chub as described in the proposed rule (67 FR 51948), with minor modifications. Factors considered in identifying proposed critical habitat included features specific to each river system, such as size, connectivity, and habitat diversity, as well as factors pertinent to rangewide recovery, such as genetic diversity and representation of the species' historical range. Individual units of critical habitat must be of sufficient size to provide habitat large enough for Gila chub populations 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 primary constituent elements identified in Chapter 1, Section 1.4.1.3.

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 contain any of the primary constituent elements and do not provide habitat or biological features essential to the conservation of the Gila chub, and generally will not contribute to the species' recovery.

2.3.1 PROPOSED CRITICAL HABITAT UNITS AND STREAM SEGMENTS

The proposed critical habitat for Gila chub totals approximately 341 km (212 mi) in the following seven main river units:

Area 1: Upper Gila River
Area 2: Middle Gila River
Area 3: Babocomari River
Area 4: Lower San Pedro River
Area 5: Lower Santa Cruz River
Area 6: Upper Verde River
Area 7: Agua Fria River

Within the seven river units, 27 stream segments are proposed for designation as critical habitat for the Gila chub. These segments are described below. Figure 2.1 at end of this chapter depicts all seven units and the critical habitat segments within them. Figures 2.2–2.5 show the same information in greater detail. The seven river units were used for points of reference in defining the critical habitat boundaries, but designation of critical habitat is proposed only in tributaries of these main rivers, and not in the main rivers themselves. Landownership of the proposed critical habitat includes federal (USFS and BLM), state (Arizona), county (Pima County), tribal (San Carlos Apache Reservation), and private. The approximate length of critical habitat by ownership category is provided in Table 2.1.

Table 2.1. Approximate Proposed Critical Habitat for Gila Chub in Stream Kilometers and Miles

Landowner	New Mexico km (mi)	Arizona km (mi)	Total km (mi)	% of Total
Federal	18.9 (11.7)	171.1 (106.4)	190.0 (118.1)	55.7
State	0.0	17.1 (10.6)	17.1 (10.6)	5.0
County	0.0	17.2 (10.7)	17.2 (10.7)	5.0
Private	3.4 (2.1)	66.1 (41.1)	69.5 (43.2)	20.4
Tribal	0.0	47.1 (29.3)	47.1 (29.3)	13.8
Total	22.3 (13.8)	318.6 (198.1)	340.9 (211.9)	100.0

The proposed critical habitat includes the stream channels 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, i.e., the flow at which water begins to leave the channel and move into the floodplain.

While the segments include both occupied and unoccupied habitat, 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 primary constituent elements listed in Chapter 1, Section 1.4.1.3 of this document. For each stream segment, the upstream and downstream boundaries and landownership are described below.

2.3.1.1 Area 1: Upper Gila River

The Upper Gila River unit includes portions of Grant County, New Mexico, and Greenlee and Graham Counties, Arizona. Tributary streams proposed for critical habitat include Turkey Creek, Eagle Creek, East Eagle Creek, Harden Cienega Creek, and Dix Creek.

a. *Turkey Creek (New Mexico)* – 13.7 km (8.5 mi) of creek extending from the edge of the Gila Wilderness boundary at T14S, R16W, sec. 15 NW1/4 and continuing upstream to T13S, R15W, sec. 30 NE1/4. Landownership: Gila National Forest.

b. *Eagle Creek and East Eagle Creek* – 39.2 km (24.4 mi) of creek extending from its confluence with an unnamed tributary at T1N, R28E, sec. 31 SW1/4 upstream to the headwaters of East Eagle Creek just south of Highway 191 in T3N, R29E, sec. 28 SE1/4. Landownership: Apache-Sitgreaves National Forest and private.

c. *Harden Cienega Creek* – 22.6 km (14.0 mi) of creek extending from its confluence with the San Francisco River in GSRM T3S, R31E, sec. 3 SE1/4 continuing upstream to the headwaters in NMPM T14S, R21W, sec. 6 NE1/4. Landownership: Apache-Sitgreaves National Forest, Gila National Forest, and private.

d. *Dix Creek* – 7.7 km (4.84 mi). Portions of the Creek beginning 1.0 mile upstream from its confluence with the San Francisco River at a natural rock barrier in T3S, R31E, sec. 9 NE1/4 continuing upstream for 0.9 km (0.6 mi.) to the confluence of the right and left forks of Dix Creek in T3S, R31E, sec. 9 center. Continues upstream Left Fork Dix Creek 2.0 km (1.24 mi) to T3S, R31E, sec. 15 NW1/4. Right Fork Dix Creek continues upstream 4.8 km (3.0 mi) to T3S, R31E, sec. 20 SE1/4. Landownership: Apache-Sitgreaves National Forest.

2.3.1.2 Area 2: Middle Gila River

The Middle Gila River unit encompasses portions of Gila, Graham, and Pinal Counties, Arizona. Three tributaries in this area are proposed for critical habitat designation: Mineral Creek, Blue River, and Bonita Creek.

a. *Mineral Creek* – 14.4 km (9.0 mi) of creek extending its confluence with Devil's Canyon in T2S, R13E, sec. 35 NW1/4 continuing upstream to its headwaters in T2S, R14E, sec. 15 center at

the confluence of Mill Creek and an unknown drainage. Landownership: Tonto National Forest, State of Arizona, and private.

b. *Blue River* – 40.5 km (25.2 mi) of creek extending from its confluence with the San Carlos River in T1N, R19E, sec. 20 on the border of sec. 20 and 29, continuing upstream to T3N, R20E, sec. 21 NE1/4. Landownership: San Carlos Apache Reservation.

c. *Bonita Creek* – 30.6 km (19.0 mi) of Creek extending from T6S, R28E, sec. 21 SE1/4 continuing upstream to T4S, R27E, sec. 18 SW1/4. Landownership: BLM, San Carlos Apache Reservation, and private.

2.3.1.3 Area 3: The Babocomari River

The Babocomari River unit is in Santa Cruz County, Arizona. Tributaries in this area proposed for critical habitat designation are O'Donnell Canyon, Turkey Creek, and Post Canyon.

a. O'Donnell Canyon – 10.0 km (6.2 mi) of creek extending from its confluence with Turkey Creek at T21S, R18E, sec. 22 SE1/4 upstream to the confluences of Western, Middle, and Pauline Canyons in T22S, R18E, sec. 17 NE1/4. Landownership: BLM, Coronado National Forest, and private.

b. Turkey Creek – 6.3 km (3.9 mi) of creek extending from its confluence with O'Donnell Canyon in T21S, R18E, sec. 22 SE1/4 upstream to where Turkey Creek crosses AZ Highway 83 in T22S, R18E, sec. 9 NE1/4. Landownership: Coronado National Forest and private.

c. Post Canyon – 4.6 km (2.8 mi) of creek extending from its confluence with O'Donnell Canyon in T21S, R18E, sec. 22 SE1/4 upstream to Welch Spring at T21S, R18E, sec. 29 NW1/4. Landownership: BLM, Coronado National Forest, and private.

2.3.1.4 Area 4: Lower San Pedro River

The Lower San Pedro River unit includes portions of Cochise, Graham, and Pima Counties, Arizona. The three stream segments proposed for critical habitat designation in this area are in Bass Canyon, Hot Springs Canyon, and Redfield Canyon.

a. *Bass Canyon* – 5.5 km (3.4 mi) of creek extending from its confluence with Hot Springs Canyon in T12S, R20E, sec. 36 NE1/4 upstream to the confluence with Pine Canyon in T12S, R21E, sec. 20 SW1/4. Landownership: BLM and private.

b. *Hot Springs Canyon* – 10.5 km (6.5 mi) of creek extending from T13S, R20E, sec. 5 NW1/4 continuing upstream to its confluence with Bass Canyon in T12S, R20E, sec. 36 NE1/4. Landownership: BLM and private.

c. *Redfield Canyon* – 11.6 km (7.2 mi) of creek extending from the western boundary of T11S, R19E, sec. 35 upstream to its confluence with Sycamore Canyon in T11S, R20E, sec. 20 NE1/4. Landownership: BLM, State of Arizona, and private.

2.3.1.5 Area 5: Lower Santa Cruz River

The Lower Santa Cruz River unit is in Pima County, Arizona. Tributaries included in this proposed critical habitat designation are Cienega Creek, Mattie Canyon, Empire Gulch, and Sabino Canyon.

a. *Cienega Creek* – (Two Segments) First segment is 17.2 km (10.7 mi) of creek extending from where Cienega Creek becomes Pantano Wash in T16S, R16E, sec. 10, S1/2 upstream to where it crosses I-10 at T17S, R17E, sec. 1 NW1/4. Landownership: Pima County. Second segment is 13.6 km (8.4 mi) of creek extending from T18S, R18E, sec. 6 S1/2 upstream to its confluence with an unnamed stream at T19S, R17E, sec. 3 SW1/4. Landownership: BLM.

b. *Mattie Canyon* – 4.0 km (2.5 mi) of creek extending from its confluence with Cienega Creek in T18S, R17E, sec. 23 NE1/4 upstream to the Bureau of Land Management Boundary in T18S, R17E, sec. 25 SW1/4. Landownership: BLM.

c. *Empire Gulch* – 5.2 km (3.2 mi) of creek extending from its confluence with Cienega Creek in T19S, R17E, sec. 3 SE1/4 continuing upstream to T19S, R17E, sec. 16 NW1/4 on the western boundary of section 16. Landownership: BLM and State of Arizona.

d. *Sabino Canyon* – 11.1 km (6.9 mi) of creek extending from the southern boundary of the Coronado National Forest in T13S, R15E, sec. 9 SE1/4 upstream to its confluence with the West Fork of Sabino Canyon in T12S, R15E, sec. 22 NE1/4. Landownership: Coronado National Forest.

2.3.1.6 Area 6: Upper Verde River

The Upper Verde River unit is in Yavapai County, Arizona. Walker Creek, Red Tank Draw, Spring Creek, and Williamson Valley Wash, which are tributaries to Oak and Beaver Creeks, are all proposed for designation as critical habitat.

a. *Walker Creek* – 7.6 km (4.7 mi) of creek extending from Prescott National Forest Road 618 in T15N, R6E, sec. 33 SW1/4 upstream to its confluence with Spring Creek in T14N, R6E, sec. 1 SE1/4. Landownership: Coconino National Forest and private.

b. *Red Tank Draw* – 11.1 km (6.9 mi) of creek extending from the National Park Service boundary just upstream of its confluence with Wet Beaver Creek in T15N, R6E, sec. 31 NE1/4 upstream to the confluence of Mullican and Rarick Canyons in T15N, R6E, sec. 2 NW1/4. Landownership: Coconino National Forest and private.

c. *Spring Creek* – 5.7 km (3.6 mi) of creek extending from T16N, R4E, sec. 27 SE1/4 at the boundary of USFS land and continuing upstream to the Arizona Highway 89A crossing in T16N, R4E, sec. 16 SE1/4. Landownership: Coconino National Forest, State of Arizona, and private.

d. *Williamson Valley Wash* – 7.2 km (4.4 mi) of creek extending from the gaging station in T17N, R3W, sec. 7 SE1/4 upstream to the crossing of the Williamson Valley Road in T17N, R4W, sec. 36 NE1/4. Landownership: Private.

2.3.1.7 Area 7: Agua Fria River

The Agua Fria River unit is in Yavapai County, Arizona. Segments of six tributaries are proposed for critical habitat designation: Little Sycamore Creek, Sycamore Creek, Indian Creek, Silver Creek, Larry Creek, and Lousy Canyon.

a. *Little Sycamore Creek* – 4.7 km (2.9 mi) of creek extending from its confluence with Sycamore Creek in T11N, R4E, sec. 6 SW1/4 upstream to T11N, R4E, sec. 4 NE1/4. Landownership: Prescott National Forest and private.

b. *Sycamore Creek* – 18.3 km (11.4 mi) of creek extending from its confluence with Little Sycamore Creek at T11N, R4E, sec. 6 SW1/4 upstream to Nelson Place Spring in T11N, R5E, sec. 21 NE1/4. Landownership: Prescott National Forest and private.

c. *Indian Creek* – 8.4 km (5.2 mi) of creek extending from T11N, R3E, sec. 35 NE1/4 to Upper Water Springs in T11N, R4E, sec. 16 SE1/4. Landownership: BLM, Prescott National Forest, and private.

d. *Silver Creek* – 8.5 km (5.3 mi) of creek extending from T10N, R3E, sec. 10 SE1/4 continuing upstream to the spring in T10N, R4E, Sec. 4 SW1/4. Landownership: BLM and Tonto National Forest.

e. *Larry Creek* – Portions of the creek from an unnamed tributary and continuing upstream 0.7 km (0.4 mi) to the confluence of two adjoining unnamed tributaries, entirely within T9N, R3E, sec. 9 NW1/4. Landownership: BLM.

f. *Lousy Canyon* – Portions of the creek from the confluence of an unnamed tributary upstream to the fork with an unnamed tributary approximately 0.6 km (0.4 mi) upstream, entirely within T9N, R3E, sec. 5 NW1/4. Landownership: BLM.

2.4 EXCLUSION OPTION

This option was formulated to address the development of a fish management plan by the San Carlos Apache Tribe in Arizona. If the draft tribal fish management plan is finalized and approved by the Tribal Council, the Service will consider exclusion of San Carlos Apache tribal lands from the critical habitat under 4(b)(2) of the ESA. Exclusions would consist of the entire Blue River segment (40.5 km [25.2 mi]) and the portion of the Bonita Creek segment on tribal lands (6.6 km [4.1 mi]). Both reaches are within Area 2, the Middle Gila River critical habitat unit (see Figure 2.3). With this exclusion, proposed critical habitat designation for the Gila chub would comprise 26 stream segments totaling 293.8 km (182.6 mi).

Section 4(b)(2) of the ESA states that an area may be excluded from critical habitat if the Secretary of the Interior determines that benefits of such exclusion outweigh benefits of specifying an area as critical habitat, unless excluding an area will result in extinction. Criteria by which such exclusion may be made include factors such as economic impacts, impacts on national security, or the preservation of conservation partnerships. Areas considered for exclusion may include those covered by tribal conservation plans.

Pursuant to Secretarial Order 3206,[2] the Service acknowledges a unique and distinctive federal tribal trust responsibility and obligation toward the San Carlos Apache Tribe with respect to lands owned and managed by the Tribe. The Service recognizes common federal-tribal goals of conserving sensitive species (including candidate, proposed, and listed species) and the ecosystems upon which they depend, Indian self-government, and productive government-to-government relationships. Deferring to San Carlos Apache tribal fisheries management, and specifically to implementation of their fish management plan as it applies to protecting Gila chub and its habitat, is in keeping with the spirit and letter of Secretarial Order 3206, as well as section 4(b)(2) of the ESA. Excluding designated critical habitat on San Carlos Apache lands would promote voluntary conservation partnerships and benefit the Service's working relationship with the Tribe, which has been and is currently beneficial for the conservation of listed species and other natural resource management programs.

2.5 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD FOR FURTHER ANALYSIS

2.5.1 DEVELOPMENT OF CONSERVATION AGREEMENTS

Developing conservation agreements with agencies and private landowners to gain similar protection to that which would be provided by the designation of critical habitat would preclude the need to designate critical habitat. Such conservation agreements, however, would have to be negotiated with numerous federal and state agencies, a Native American tribe, and private landowners in two states, and the conservation actions would have to be implemented or underway. The development of a multi-state, multi-agency, multi-watershed conservation agreement, involving multiple private landowners, would be difficult at best, very costly in terms of time and agency resources, and since no such effort was underway at the time the proposed critical habitat designation was issued, it is unlikely that such an agreement could be developed within the statutory time frame for completing the designation process. This alternative was therefore rejected as being impracticable.

2.5.2 LAND ACQUISITION/CONSERVATION EASEMENTS

The time required and the cost of attempting to acquire land or obtain easements on approximately 341 km (212 mi) of streams would exceed the time and current funding available for this action. This alternative was also rejected as being impracticable.

[2] Secretarial Order No. 3206, Department of the Interior, Subject: American Indian Tribal Rights, Federal Tribal Trust Responsibilities and the Endangered Species Act, June 5, 1997.

2.6 COMPARISON OF ALTERNATIVES

Table 2.2 summarizes the potential effects of the alternative critical habitat designations. Potential effects on resources are summarized from the analyses presented in Chapter 3.

Table 2.2. Comparison of Potential Effects of Gila Chub Critical Habitat Designation Alternatives

Resource	No Action Alternative	Proposed Rule Alternative
Water Resources	No impact beyond those conservation measures resulting from the listing of Gila chub and associated requirements of section 7 of the ESA.	– Compared to No Action, a small, but unknown, increase in the number of additional new and reinitiated section 7 consultations, as well as outcomes and costs, based solely on the presence of designated critical habitat. – Addition of adverse modification analyses to section 7 consultations for Gila chub in designated critical habitat. The jeopardy and adverse modification analyses are parallel, though distinct, and outcomes of the analyses would be closely linked; therefore, reasonable and prudent alternatives developed under the jeopardy standard would probably not be changed substantially with addition of the adverse modification standard. – Minor adverse impacts (e.g., delays, increased costs) on proposed and ongoing water management projects due to additional section 7 consultations for critical habitat and resulting conservation measures (e.g., surveying, monitoring, use of best management practices). – Minor beneficial impacts on water resources due to increased conservation measures that help conserve PCEs and, by extension, natural stream hydrology and geomorphology. **EXCLUSION OPTION** – Critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for water management actions on San Carlos Apache lands. Potential effects would be analyzed under the jeopardy standard but not under the adverse modification standard. –If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub would be implemented and effective, then effects of designation would be similar to those of the Proposed Rule Alternative without the Exclusion Option.
Wetlands and Floodplains	No impact beyond those conservation measures resulting from the listing of Gila chub and associated requirements of section 7 of the ESA.	– Compared to No Action, a small, but unknown, increase in the number of additional new and reinitiated section 7 consultations, as well as outcomes and costs, based solely on the presence of designated critical habitat. – Addition of adverse modification analyses to section 7 consultations for Gila chub in designated critical habitat. The jeopardy and adverse modification analyses are parallel, though distinct, and outcomes of the analyses would be closely linked; therefore, reasonable and prudent alternatives developed under the jeopardy standard would probably not be changed substantially with addition of the adverse modification standard. – Minor beneficial impacts on water resources due to increased conservation measures that help conserve PCEs and, by extension, the integrity of riparian ecosystems, including wetlands and floodplains. **EXCLUSION OPTION** – Critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for actions on San Carlos Apache lands. Potential effects would be analyzed under the jeopardy standard but not under the adverse modification standard. –If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub would be implemented and effective, then effects of designation would be similar to those of the Proposed Rule Alternative without the Exclusion Option.

Table 2.2. Comparison of Potential Effects of Gila Chub Critical Habitat Designation Alternatives

Resource	No Action Alternative	Proposed Rule Alternative
Fish, Wildlife, and Plants (including candidate, proposed, threatened, and endangered species)	No impact beyond those conservation measures resulting from the listing of Gila chub and associated requirements of section 7 of the ESA.	– Compared to No Action, a small, but unknown, increase in the number of additional new and reinitiated section 7 consultations, as well as outcomes and costs, based solely on the presence of designated critical habitat. – Addition of adverse modification analyses to section 7 consultations for Gila chub in designated critical habitat. The jeopardy and adverse modification analyses are parallel, though distinct, and outcomes of the analyses would be closely linked; therefore, reasonable and prudent alternatives developed under the jeopardy standard would probably not be changed substantially with addition of the adverse modification standard. – Minor beneficial impacts on native fish, wildlife, and plants (including candidate, proposed, and listed species) due to increased conservation measures that help conserve PCEs and, by extension, the integrity of riparian ecosystems and all their components. – Negligible adverse impacts on nonnative fish from fish removal conservation measures. **EXCLUSION OPTION** – Critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for actions on San Carlos Apache lands. Potential effects would be analyzed under the jeopardy standard but not under the adverse modification standard. –If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub would be implemented and effective, then effects of designation would be similar to those of the Proposed Rule Alternative without the Exclusion Option.
Land Management	No impact beyond those conservation measures resulting from the listing of Gila chub and associated requirements of section 7 of the ESA.	– Compared to No Action, a small, but unknown, increase in the number of additional new and reinitiated section 7 consultations, as well as outcomes and costs, based solely on the presence of designated critical habitat. – Addition of adverse modification analyses to section 7 consultations for Gila chub in designated critical habitat. The jeopardy and adverse modification analyses are parallel, though distinct, and outcomes of the analyses would be closely linked; therefore, reasonable and prudent alternatives developed under the jeopardy standard would probably not be changed substantially with addition of the adverse modification standard. – Minor adverse impacts (e.g., delays, increased costs, project alterations) on proposed and ongoing land management projects due to additional section 7 consultations for critical habitat and resulting conservation measures (e.g., revising resource management plans, mapping, surveying, and monitoring Gila chub habitat). **EXCLUSION OPTION** – Critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for land management actions on San Carlos Apache lands. Potential effects would be analyzed under the jeopardy standard but not under the adverse modification standard. –If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub would be implemented and effective, then effects of designation would be similar to those of the Proposed Rule Alternative without the Exclusion Option.

Table 2.2. Comparison of Potential Effects of Gila Chub Critical Habitat Designation Alternatives

Resource	No Action Alternative	Proposed Rule Alternative
Wildland Fire Management	No impact beyond those conservation measures resulting from the listing of Gila chub and associated requirements of section 7 of the ESA.	– Compared to No Action, a small, but unknown, increase in the number of additional new and reinitiated section 7 consultations, as well as outcomes and costs, based solely on the presence of designated critical habitat. – Addition of adverse modification analyses to section 7 consultations for Gila chub in designated critical habitat. The jeopardy and adverse modification analyses are parallel, though distinct, and outcomes of the analyses would be closely linked; therefore, reasonable and prudent alternatives developed under the jeopardy standard would probably not be changed substantially with addition of the adverse modification standard. – 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 herbicides). Potential delays would be mitigated by alternative section 7 regulations for fire management that limit the delays allowed for completing consultations. **EXCLUSION OPTION** – Critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for fire management actions on San Carlos Apache lands. Potential effects would be analyzed under the jeopardy standard but not under the adverse modification standard. –If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub would be implemented and effective, then effects of designation would be similar to those of the Proposed Rule Alternative without the Exclusion Option.
Recreation	No impact beyond those conservation measures resulting from the listing of Gila chub and associated requirements of section 7 of the ESA.	– Compared to No Action, a small, but unknown, increase in the number of additional new and reinitiated section 7 consultations, as well as outcomes and costs, based solely on the presence of designated critical habitat. – Addition of adverse modification analyses to section 7 consultations for Gila chub in designated critical habitat. The jeopardy and adverse modification analyses are parallel, though distinct, and outcomes of the analyses would be closely linked; therefore, reasonable and prudent alternatives developed under the jeopardy standard would probably not be changed substantially with addition of the adverse modification standard. – Minor adverse impacts (e.g., delays, increased costs, project alterations) on recreation-related activities due to additional section 7 consultations for critical habitat and resulting conservation measures (e.g., limiting higher-impact activities such as OHV 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, by extension, the integrity of riparian ecosystems. **EXCLUSION OPTION** – Critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for recreation-related actions on San Carlos Apache lands. Potential effects would be analyzed under the jeopardy standard but not under the adverse modification standard. –If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub would be implemented and effective, then effects of designation would be similar to those of the Proposed Rule Alternative without the Exclusion Option.

Table 2.2. Comparison of Potential Effects of Gila Chub Critical Habitat Designation Alternatives

Resource	No Action Alternative	Proposed Rule Alternative
Socioeconomics	No impact beyond those conservation measures resulting from the listing of Gila chub and associated requirements of section 7 of the ESA.	– Compared to No Action, a small, but unknown, increase in the number of additional new and reinitiated section 7 consultations, as well as outcomes and costs, based solely on the presence of designated critical habitat. – Addition of adverse modification analyses to section 7 consultations for Gila chub in designated critical habitat. The jeopardy and adverse modification analyses are parallel, though distinct, and outcomes of the analyses would be closely linked; therefore, reasonable and prudent alternatives developed under the jeopardy standard would probably not be changed substantially with addition of the adverse modification standard. – Minor adverse impacts (e.g., project delays, increased costs, modified project plans) due to additional section 7 consultations for critical habitat and resulting conservation measures. **EXCLUSION OPTION** – Critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for actions on San Carlos Apache lands. Potential effects would be analyzed under the jeopardy standard but not under the adverse modification standard. –If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub would be implemented and effective, then effects of designation would be similar to those of the Proposed Rule Alternative without the Exclusion Option.
Livestock Grazing	No impact beyond those conservation measures resulting from the listing of Gila chub and associated requirements of section 7 of the ESA.	– Compared to No Action, a small, but unknown, increase in the number of additional new and reinitiated section 7 consultations, as well as outcomes and costs, based solely on the presence of designated critical habitat. – Addition of adverse modification analyses to section 7 consultations for Gila chub in designated critical habitat. The jeopardy and adverse modification analyses are parallel, though distinct, and outcomes of the analyses would be closely linked; therefore, reasonable and prudent alternatives developed under the jeopardy standard would probably not be changed substantially with addition of the adverse modification standard. – Minor adverse impacts (e.g., modified grazing patterns, increased costs) on livestock grazing due to additional section 7 consultations for critical habitat and resulting conservation measures (e.g., exclusion of livestock from critical habitat areas). **EXCLUSION OPTION** – Critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for livestock grazing-related actions on San Carlos Apache lands. Potential effects would be analyzed under the jeopardy standard but not under the adverse modification standard. –If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub would be implemented and effective, then effects of designation would be similar to those of the Proposed Rule Alternative without the Exclusion Option.

Table 2.2. Comparison of Potential Effects of Gila Chub Critical Habitat Designation Alternatives

Resource	No Action Alternative	Proposed Rule Alternative
Tribal Trust Resources	No impact beyond those conservation measures resulting from the listing of Gila chub and associated requirements of section 7 of the ESA.	– Compared to No Action, a small, but unknown, increase in the number of additional new and reinitiated section 7 consultations, as well as outcomes and costs, based solely on the presence of designated critical habitat. – Addition of adverse modification analyses to section 7 consultations for Gila chub in designated critical habitat. The jeopardy and adverse modification analyses are parallel, though distinct, and outcomes of the analyses would be closely linked; therefore, reasonable and prudent alternatives developed under the jeopardy standard would probably not be changed substantially with addition of the adverse modification standard. – Minor adverse impacts (e.g., increased costs) on tribal trust resources due to additional section 7 consultations 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, by extension, aquatic and riparian ecosystem integrity. **EXCLUSION OPTION** – Critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for actions on San Carlos Apache lands. Potential effects would be analyzed under the jeopardy standard but not under the adverse modification standard. –If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub would be implemented and effective, then effects of designation would be similar to those of the Proposed Rule Alternative without the Exclusion Option.
Environmental Justice	Impacts to minority and low-income populations would not change from current conditions and trends.	Unknown impacts to minority or low-income populations from critical habitat designation due to lack of site-specific demographic information and because the specific outcomes and impacts of section 7 consultations on critical habitat cannot be predicted. Further investigations would provide no useful information for evaluating the potential for disproportionate impacts on minority and low-income populations. **EXCLUSION OPTION** Lower potential than the Proposed Rule Alternative to disproportionately affect minority or low-income populations because critical habitat on San Carlos Apache lands would be excluded. The San Carlos Apache Reservation has a substantially higher percentage of minority and low-income populations than the State of Arizona as a whole.

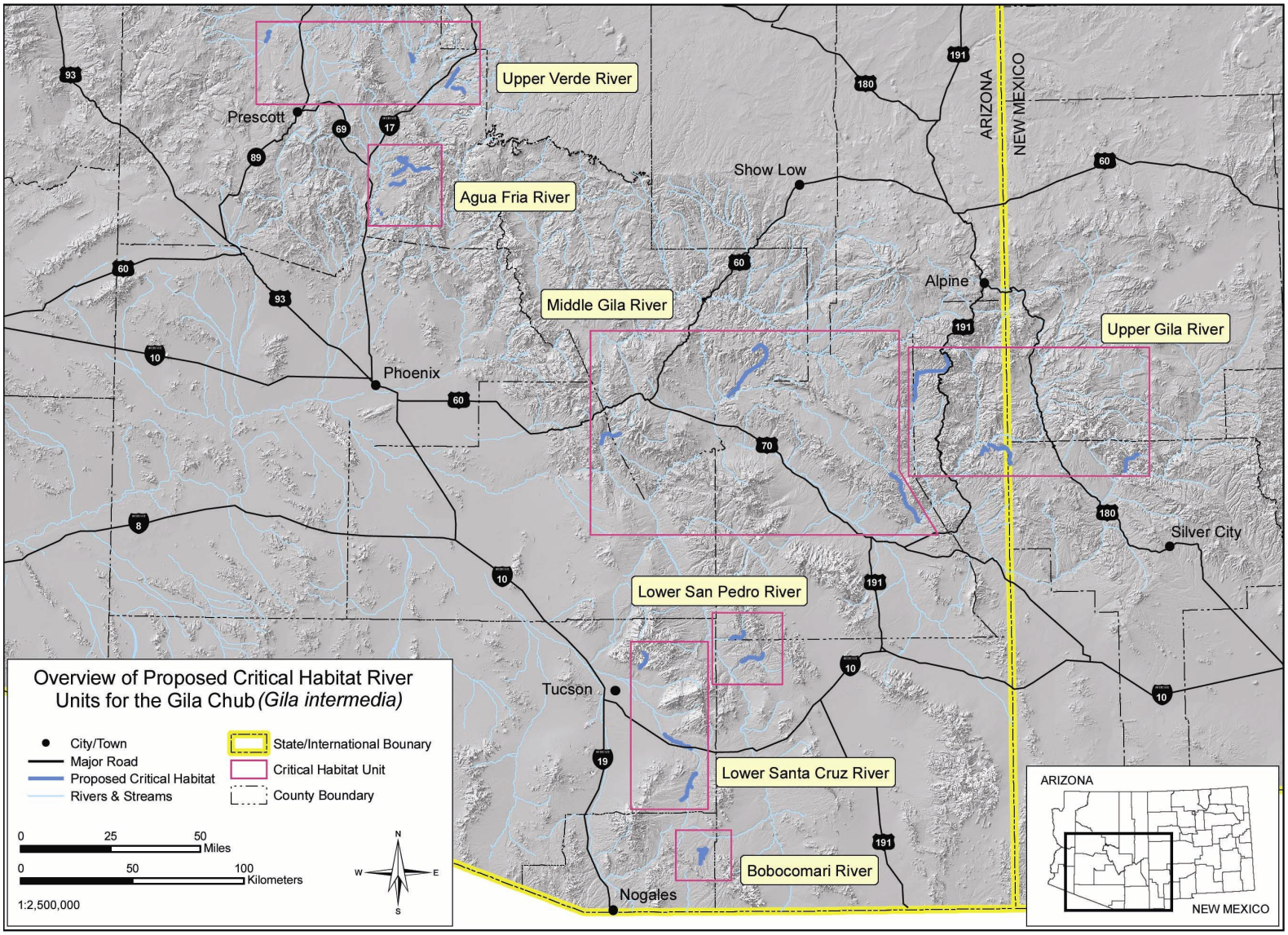

Figure 2.1. Overview of proposed critical habitat river units in Arizona and New Mexico.

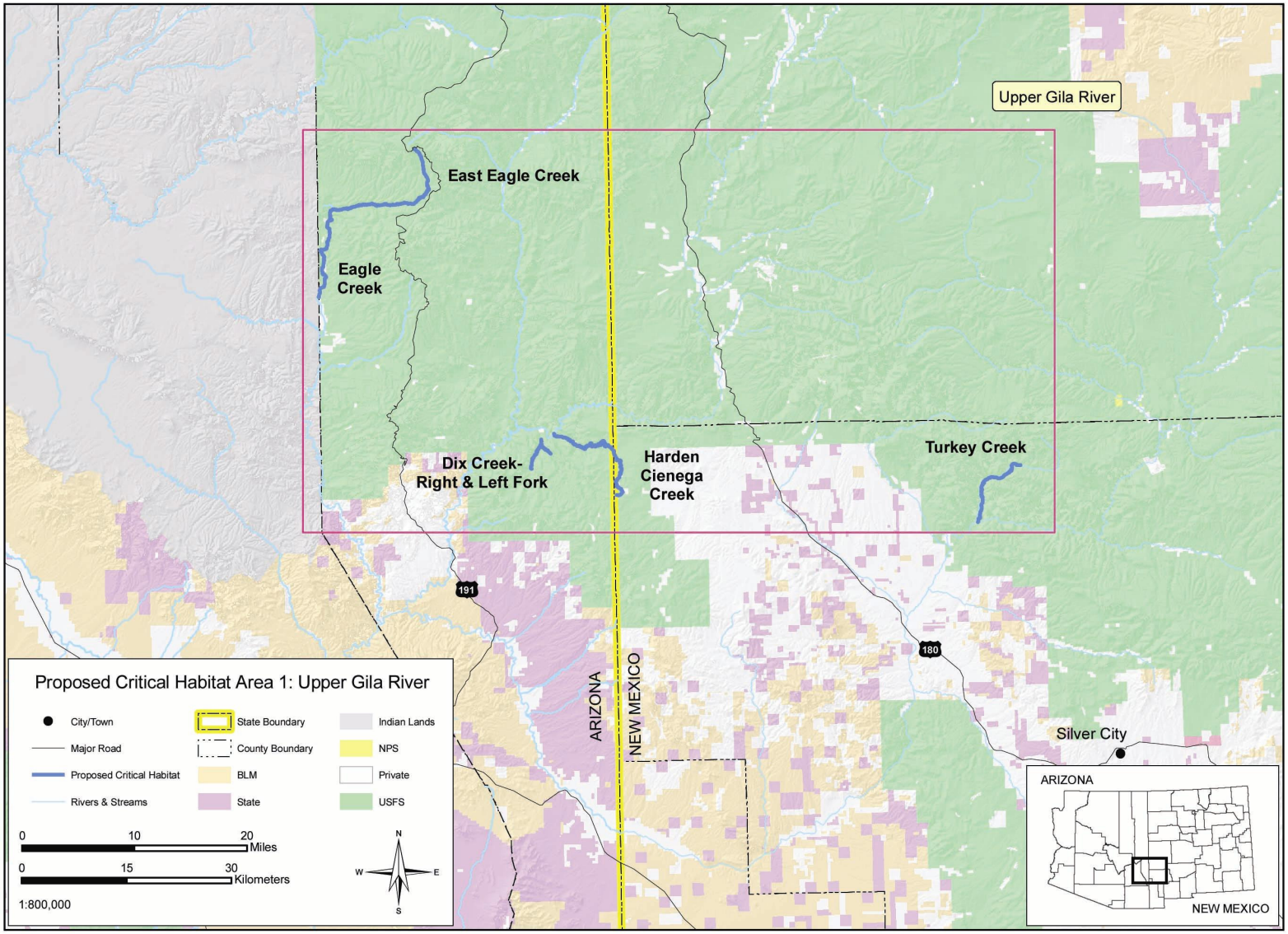

Figure 2.2. Proposed critical habitat in Area 1: Upper Gila River.

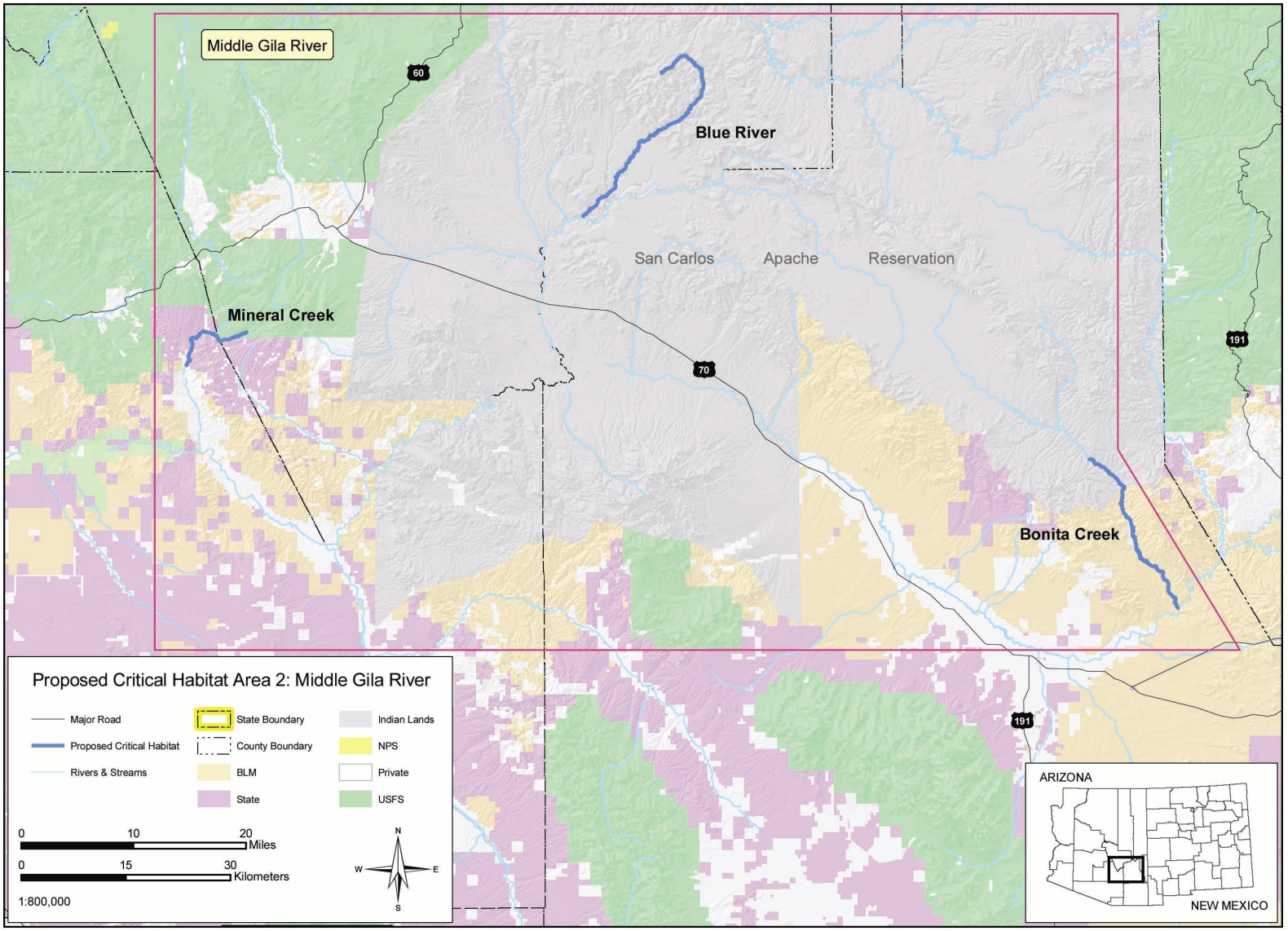

Figure 2.3. Proposed critical habitat in Area 2: Middle Gila River.

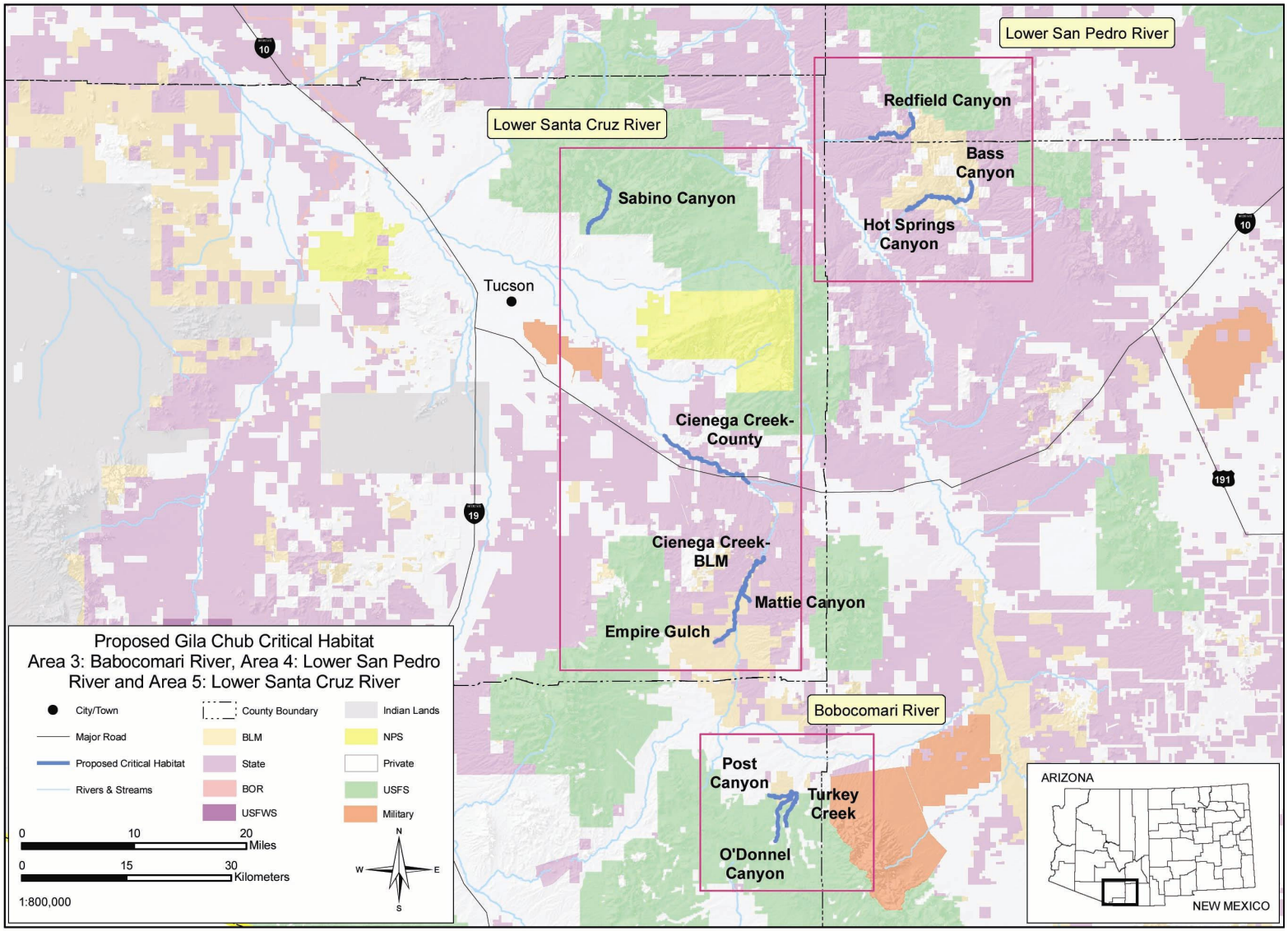

Figure 2.4. Proposed critical habitat in Area 3: Babocomari River; Area 4: Lower San Pedro River; and Area 5: Lower Santa Cruz River.

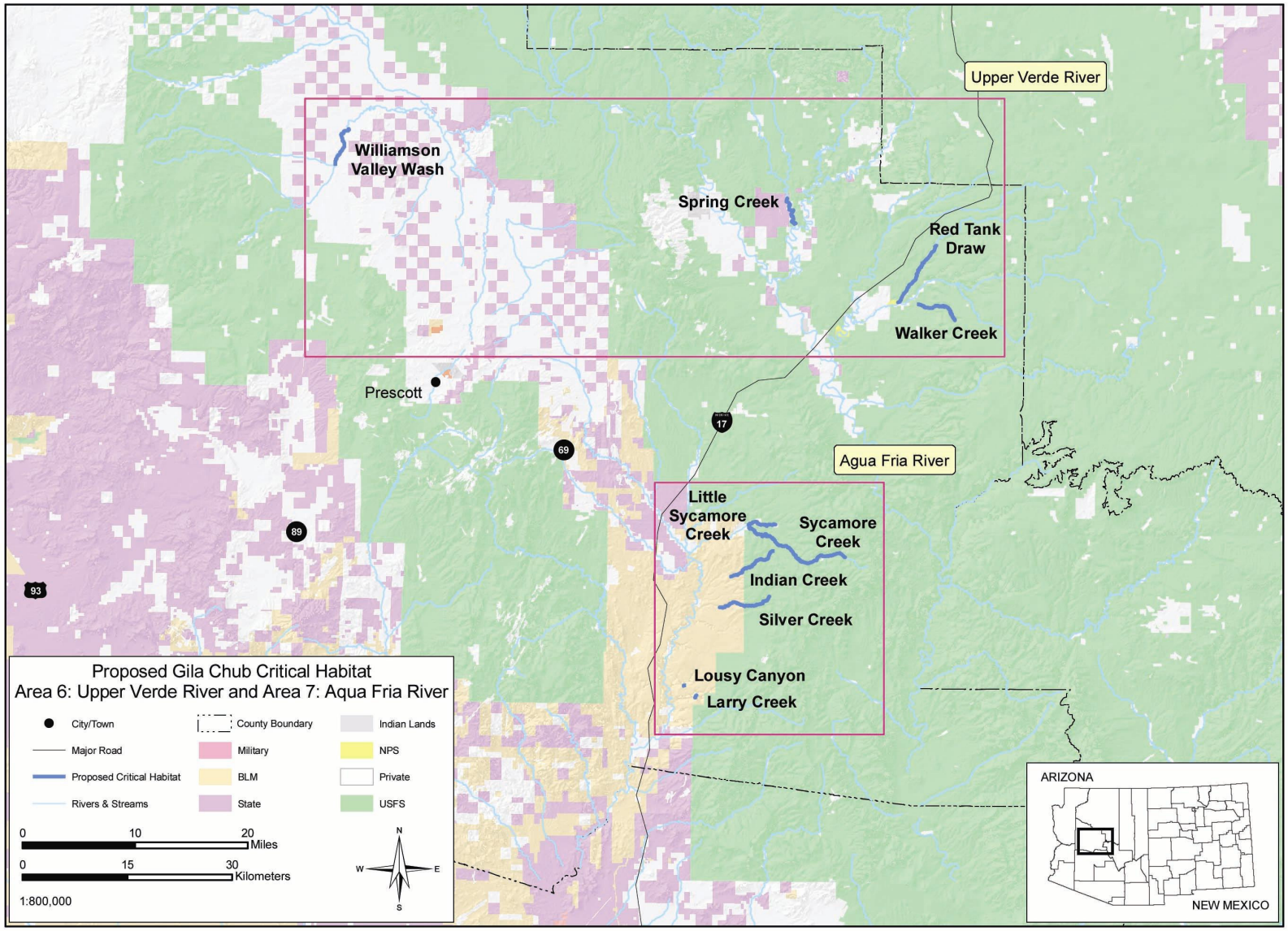

Figure 2.5. Proposed critical habitat in Area 6: Upper Verde River and Area 7: Agua Fria River.

3.0 CHAPTER 3 - 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 Gila chub. These resource categories were selected based on issues identified during the public comment period for the proposed rule, as well as on issues identified by the Service. Within each resource category, a description of the resource (Existing Conditions) is followed by an evaluation of the potential effects of critical habitat designation (Environmental Consequences). Potential effects are evaluated for each of the alternatives described in Chapter 2. To reiterate, under the No Action alternative, no critical habitat would be designated for Gila chub. Under the Proposed Rule Alternative, a total of approximately 341 km (212 mi) of critical habitat would be designated for Gila chub in 27 stream segments within seven river units in Arizona and New Mexico (see Figures 2.1–2.5 in Chapter 2). If the Exclusion Option is selected, 47.3 km (29.4 mi) of habitat (all of Blue River and a portion of Bonita Creek) on lands of the San Carlos Apache Tribe in Arizona would be excluded.

3.1.1 METHODOLOGY

Descriptions of the affected environment presented in Sections 3.2 through 3.11 below are based on published literature, available state and federal agency reports and management plans, the proposed rule for listing Gila chub as endangered with critical habitat (Service 2002a), formal conference opinions issued by the Service relative to potential impacts on Gila chub, biological opinions for other listed fish species in small southwestern streams, and the draft economic analysis for critical habitat (Industrial Economics 2005).

The assessment of potential impacts of Gila chub 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 1.4.1.2, Section 7 Consultation Process, in Chapter 1). 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 the actions of federal agencies do not adversely modify critical habitat. Individuals, organizations, local government, states, and other nonfederal agencies are potentially affected by the designation of critical habitat only if their actions have a federal nexus; that is, only if their 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. That is, designating critical habitat is likely to result in formal consultations over and above those required for a listed species with no designated critical habitat. For the purposes of this analysis, the Gila chub is treated as a listed species under all alternatives, including the No Action alternative. The expected number of consultations resulting from listing remains constant across all alternatives and serves as a baseline for comparison. Under No Action, it is assumed the species is listed

with no designated critical habitat. Under the Proposed Rule Alternative and the Exclusion Option, it is assumed the species is listed with designated critical habitat.

Critical habitat designation is expected to result in additional consultations, first, because 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 the listed species. Second, additional consultations may result from new information, guidance, or clarification provided in the critical habitat proposal.

It is not possible to predict with any 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 kind of actions will be subject to consultation and the outcome of those consultations. Because Gila chub was proposed for listing very recently (2002), the number of past consultations (or *conferences* in the case of proposed rather than listed species) is small (Table 3.1). Still, these conferences, combined with consultations for other fish species in the same or comparable habitat, do provide a sense of the types of impacts that may be anticipated from future, additional consultations for the Gila chub.

The assessment of impacts in this chapter focuses on the costs and outcomes of the potential increase in section 7 consultations resulting from the designation of critical habitat for Gila chub. Impacts of increased consultations include:

1. Additional expenditures of time and money by federal agencies, including the Service, and nonfederal proponents to complete the consultations.
2. Additional time and costs to implement the reasonable and prudent alternatives and (possibly) discretionary conservation recommendations specified in biological opinions.
3. A greater likelihood that the primary constituent elements identified in Section 1.4.1.3 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 to primary constituent elements. Such alterations may obviate the need for consultation. If a consultation is initiated, then the outcome of critical habitat designation could be modification of the proposal to limit impacts to primary constituent elements or imposition of reasonable and prudent alternatives that would reduce impacts to primary constituent elements.

For the purposes of this assessment, it is assumed that designation of critical habitat protects primary constituent elements for the Gila chub (e.g., natural streamflow and adequate water quality, cover, foodbase, etc.), and that the benefits of these protections extend indirectly to other components of interconnected ecosystems. Critical habitat exclusion areas (e.g., San Carlos Apache lands) may also be protective of primary constituent elements.

3.1.1.1 Economic Analysis

A separate analysis was conducted to assess the potential economic effects of measures to protect the Gila chub and its habitat in the proposed critical habitat areas (Industrial Economics 2005). Due to the difficulty in making a credible distinction, the economic analysis did not attempt to

distinguish between impacts of listing the species versus impacts of designating critical habitat. Dollar estimates of future economic impacts take into account *all* Gila chub-related conservation activities predicted to occur in the proposed critical habitat areas over the next 20 years, not just those attributable to designation of critical habitat. Where appropriate, information from the economic analysis was incorporated into this Environmental Assessment.

3.1.1.2 Gila Chub Section 7 Consultation History

Formal section 7 conferences for the Gila chub from the time of the proposed rule for listing the species with critical habitat through June 2005 are reported in Table 3.1. Only eleven formal conference opinions have been issued in that time and all concerned federal agency planning, resource management, or grazing lease actions. Conservation measures identified in these conference opinions are noted where appropriate in the resource sections below.

Table 3.1. Agency Actions That Have Undergone Formal Section 7 Conferences for Effects on Gila Chub

Action	Year	Federal Agency[1]	Activity
Formal conference on the Las Cienegas Bank Stabilization Project	2005	BLM	Streambank stabilization
Programmatic Biological and Conference Opinion on the Continued Implementation of the Land and Resource Management Plans for the Eleven National Forests and National Grasslands of the Southwestern Region	2005	USFS	Management of federal lands
Formal Consultation and Formal Conference for the Proposed Re-establishment of Spikedace, Loach Minnow, Gila Topminnow, Desert Pupfish, and Augmentation of Gila Chub into Multiple Springs and Stream within the Muleshoe Cooperative Management Area	2005	BLM	Fish restocking
Formal Conference on the Existing Phoenix Resource Management Plan for Agua Fria National Monument	2004	BLM	Management plan for grazing, transportation, fire management, and recreation
Re-initiation of Consultation/Conference on the Gila Box Riparian National Conservation Area Interdisciplinary Activity Plan	2004	BLM	Management of federal lands
BLM Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management	2004	BLM	Fire management
Martinez Canyon Native Fish Restoration (not in critical habitat)	2004	BLM	Fish restocking
Harden Cienega Grazing Allotment (Area 1 – Upper Gila River)	2004	USFS	Livestock grazing
New Bull Gap Road Section Project, Gila Box Riparian National Conservation Area	2003	BLM	Transportation
Effects of the proposed Las Cienegas National Conservation Area Resource Management Plan in Pima and Santa Cruz Counties, Arizona	2002	BLM	Management plan for wildlife management, grazing, recreation, and utility corridors
Re-initiation of 1999 Biological Opinion; Continuation of Livestock Grazing on the Coronado National Forest	2002	USFS	Livestock grazing

[1] BLM = U.S. Bureau of Land Management, USFS = U.S. Forest Service

3.2 WATER RESOURCES

3.2.1 EXISTING CONDITIONS

All stream segments proposed for Gila chub critical habitat designation fall within the Gila River basin, which encompasses approximately 160,000 square km (60,000 square mi). 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 on the Arizona-California border. Major tributaries include the San Francisco, Salt, Verde, San Simon, San Pedro, Santa Cruz, Agua Fria, and Hassayampa Rivers. Rainfall varies greatly from the upper portion of the basin to the lower, but the area is in general hot and arid with a biseasonal (winter-summer) precipitation pattern. Hydrograph patterns in the upper reaches reflect snowmelt, but the overall pattern for the basin 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 (Service 1999).

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 approximately 72 percent for irrigation and livestock uses, 25 percent for municipal and industrial uses, and 3 percent for mining operations (U.S. Bureau of Reclamation 2004). To facilitate consumptive use, numerous water storage and diversion structures have been built in the mainstem Gila River and its major tributaries. A recent federal statute, the Arizona Water Settlements Act of 2004 (Act), 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. The Act also authorizes construction of the New Mexico Unit of the Central Arizona Project, which could include a new reservoir in the Upper Gila River basin in New Mexico. Implementation of the Act could alter water use patterns in the vicinity of proposed Gila chub critical habitat.

The stream segments proposed for critical habitat are small headwater tributaries in the Gila River basin. Topography varies from narrow canyon reaches to valleys with broad floodplains. Primary unifying factors are low stream gradient, moderate-sized substrate, and relatively low streamflow. Discharge varies from very low in ungauged tributaries such as Little Sycamore Creek to somewhat higher flows in tributaries like Eagle Creek, which has a mean annual discharge of 0.74 cubic meters per second (26 cubic feet per second).[3] Segments include reaches with ephemeral, intermittent, and perennial streamflow; all segments have perennial pools that provide suitable habitat for Gila chub. Portions of Cienega Creek and Bonita Creek have been designated *Unique Waters of Arizona* by the State of Arizona. This status provides additional state protection from water quality degradation.

[3] Discharge measured at Eagle Creek Near Double Circle Ranch, Near Morenci, a gauge located near the downstream terminus of the proposed critical habitat (USGS Surface Water Data for Arizona: Calendar Year Streamflow Statistics, on-line at http://nwis.waterdata.usgs.gov/az/nwis/annual/calendar_year/?site_no=09446500).

No large surface water impoundments or diversions are located within or above any proposed critical habitat stream segment (Service 2002a). A major surface diversion is located downstream of proposed critical habitat in Eagle Creek to supply water for open-pit copper mining operations at the Phelps Dodge Morenci Mine, as well as potable water for the mining communities of Morenci and Clifton in Greenlee County, Arizona. Between the proposed critical habitat segment and the diversion, Eagle Creek is augmented by water pumped from Black River and a well field in the upper Eagle Creek drainage (not in proposed critical habitat); consequently, the Morenci diversion is not entirely dependent on natural flow from upper Eagle Creek. Surface flow in Cienega Creek is diverted below proposed critical habitat by the Vail Water Company.

Groundwater withdrawal that may affect surface flow occurs throughout the Gila River basin, with 57 wells documented within or near proposed critical habitat (Industrial Economics 2005). Most of these are small wells supplying water for private domestic uses, stock watering, small-scale irrigation, or for monitoring or testing purposes. The largest groundwater withdrawals are from Bonita Creek and Cienega Creek. To meet municipal water needs in and around Safford, Arizona, the City of Safford operates an infiltration gallery[4] in the Bonita Creek bed just downstream from proposed critical habitat, as well as 10 other wells in the area. The City currently diverts 3,876 acre feet/year at the infiltration gallery, but has rights to divert up to 5,310 acre-feet/year. To exercise its full water rights, the City may have to modify its current system and pump the additional water from wells near Bonita Creek upstream of the infiltration gallery. The City of Safford and the BLM have agreed to enter into a Memorandum of Understanding (MOU) concerning their relationship and respective activities concerning Bonita Creek. As part of this MOU, BLM would request a section 7 consultation with the Service covering all activities addressed in the MOU, including Safford's withdrawal of water up to its full allocation. The 2004 Arizona Water Settlements Act and an agreement with the Gila River Indian Community and others may affect the amount of water the City of Safford withdraws from the Bonita Creek basin in the future (Industrial Economics 2005).

The major potential groundwater withdrawals from Cienega Creek are by the Vail Water Company, which can pump up to 1,355 acre-feet/year to supply domestic water to various communities in Pima County, and by the BLM, which owns and operates three irrigation wells and one livestock well that together can pump 2,211 acre-feet/year (Industrial Economics 2005). Currently, the Vail Water Company well is not being used by the Company for water supply purposes, and a plan is underway to acquire rights to the well under the auspices of the Sonoran Desert Conservation Plan (Industrial Economics 2005).

Since the issuance in 2002 of the proposed rule to list Gila chub and designate critical habitat, one section 7 formal conference has been completed for actions involving the potential impacts of water management on Gila chub. This concerned a BLM project to stabilize banks on Cienega Creek (Service 2005b). Reasonable and prudent measures and terms and conditions in the conference opinion consisted of conducting the proposed action in a manner that would minimize mortality of Gila chub and to report on the effectiveness of conservation measures. The Service also recommended consideration of fish population monitoring to assess project effects. Section 7 consultations for fish species other than Gila chub in small streams have

[4] An infiltration gallery is a shallow groundwater collection system using perforated pipe.

concerned repair of small diversion structures and minor watershed protection and flood control projects. Conservation measures (both mandatory and recommended) have included using best management practices to minimize sedimentation and pollutants, conducting pre-project surveys, salvaging fish, installing temporary fish barriers, using on-site observers, monitoring, and conducting various studies. In one recent example of a section 7 consultation for groundwater pumping, a project to supply water for a military installation was modified to protect listed species and critical habitat in the San Pedro River (Service 2002b).

3.2.2 ENVIRONMENTAL CONSEQUENCES

3.2.2.1 No Action Alternative

Under the No Action alternative, the Gila chub would be listed under the ESA, but no section 7 consultations would be conducted pursuant to the critical habitat provisions of the ESA. The section 7 consultation process would only be initiated for *may affect* determinations of impacts on Gila chub. 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 Gila chub and associated requirements of section 7 of the ESA.

3.2.2.2 Proposed Rule Alternative

Compared to No Action, the Proposed Rule Alternative 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 analysis to section 7 consultations for Gila chub 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 Gila chub; therefore, water management projects 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.[5]

The outcomes of future consultations will be dependent on the details of project proposals and the analysis of effects, which are unknowable at this time. Nonetheless, it can still be expected, because most of the proposed stream segments are occupied by Gila chub, and because the jeopardy and adverse modification analyses are parallel, though distinct, that the outcomes of jeopardy and adverse modification analyses for this designation will be closely linked. Conservation of the Gila chub will 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

[5] See Section 1.4.1.2, Section 7 Consultation Process, in Chapter 1 for a discussion of the implications of the Ninth Circuit decision in Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service, 378 F.3d 1059 (9th Cir. 2004).

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 critical habitat) would 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 Gila chub primary constituent elements. 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 past water management consultations involving listed fish in small southwestern streams provide some indication of what can be expected. The proposed actions prompting these consultations have tended to be infrequent and small in scope. Conservation measures related to habitat protection have required few adjustments to project plans, with most measures involving monitoring and the use of best management practices, which are generally mandated by Clean Water Act permitting requirements in any case. It is likely that the outcomes, and consequently the impacts, of future section 7 consultations for Gila chub critical habitat would be similarly minor in scale. 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.

Designation of Gila chub critical habitat may affect the use of Bonita Creek water by the City of Safford, although this is unlikely. Safford currently withdraws 3,876 acre feet/year at their infiltration gallery, and has rights to withdraw up to 5,310 acre-feet/year. The infiltration gallery is located downstream of the proposed critical habitat segment and as currently operated is not expected to affect, or be affected by, designated Gila chub critical habitat. If Safford were to increase water depletion at the site, it is possible that effects would be seen upstream in proposed Gila chub critical habitat. Additional pumping from the wells located upstream of the infiltration gallery could also affect instream flow in Gila chub critical habitat. The City of Safford's MOU with BLM, their coordinated approach to activities in the Bonita Creek drainage, and the planned coordinated section 7 consultation should reduce the possibility that designation of critical habitat for Gila chub would affect Safford's water supply.

Designation of Gila chub critical habitat may have a minor adverse effect on use of groundwater wells near Cienega Creek. The Vail Water Company is not currently using its well for water supply purposes, and plans are already in place to purchase rights to the well to advance conservation goals in the area; therefore, it is unlikely that designation of Gila chub critical habitat would have any effect on the well's future operation or the regional municipal water supply. If groundwater depletions from the BLM wells were found to impact surface flow in Cienega Creek (hence Gila chub critical habitat), it is possible that alternative sources for up to 2,211 acre-feet/year of water may have to be found to satisfy current livestock watering and irrigation uses. It is probable, however, that BLM would take actions to protect steam flow in

Cienega Creek irrespective of Gila chub critical habitat designation. Conserving the creek's aquatic and riparian habitats is a high priority for the BLM and other cooperating entities in the region. Cienega Creek flows through two special management areas with a conservation focus: the Las Cienegas National Conservation Area (which includes BLM's Empire-Cienega Resource Conservation Area) and Pima County's Cienega Creek Natural Preserve. Cienega Creek also falls within the planning area of the Sonoran Desert Conservation Plan. The BLM would also have to take measures to avoid adversely affecting federally listed species that depend on a healthy riparian ecosystem in Cienega Creek (e.g., Gila topminnow, Chiricahua leopard frog, southwestern willow flycatcher, Huachuca water-umbel). Given existing management objectives and other legal mandates, it is unlikely that designation of critical habitat for Gila chub in Cienega Creek would of itself materially change operation of wells on BLM land.

A potential beneficial outcome of increasing section 7 consultations for water management activities would be maintenance of Gila chub primary constituent elements through conservation measures within designated critical habitat and off-site mitigation sites for water management impacts. Conserving Gila chub primary constituent elements would serve to maintain water quality, natural streamflow, and stream channel integrity, thereby benefiting water resources in general.

In summary, effects to future water management activities and water resources from critical habitat designation are expected to be minor and not constrain any intended water management activities for the site-specific reasons explained above and because 1) previous completed section 7 consultations for fish species in small southwestern streams have resulted in only minor project alterations; 2) few projects and operations would be subject to consultation based solely on the presence of designated critical habitat because most of the proposed segments are occupied by Gila chub; 3) the outcome of those few consultations based solely on critical habitat that do not reach the threshold of adverse modification could only result in discretionary conservation recommendations to reduce impacts to primary constituent elements, because there is no incidental take statement and/or reasonable and prudent measures 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 Exclusion Option

If the Proposed Rule Alternative were selected with the Exclusion Option, critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for water management actions on San Carlos Apache lands. Potential effects of such actions on occupied Gila chub habitat would be analyzed under the jeopardy standard but not under the adverse modification standard.

If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub will be implemented and effective, then it can reasonably be concluded that the plan would provide for the maintenance of Gila chub primary constituent elements on tribal lands. If that were the case, it is likely that the conservation measures would be similar to those under the Proposed Rule Alternative for all stream segments.

The effects on water management actions and water resources of implementing those conservation measures would therefore be similar to effects under the Proposed Rule Alternative without the Exclusion Option.

3.3 WETLANDS AND FLOODPLAINS

3.3.1 EXISTING CONDITIONS

Within the 300-foot buffer along stream segments, the proposed Gila chub critical habitat includes floodplains and wetland habitats, locally called *cienegas*, a Spanish word for marsh. Weedman et al. (1996) note a strong correlation between the historical distribution of Gila chub and cienega habitats, but cienegas have been largely lost throughout the Southwest due to marsh draining, dropping water tables caused by groundwater withdrawals and arroyo cutting, stream impoundments, and water diversions. Remaining cienegas continue to provide important habitat for Gila chub.

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, help regulate natural flooding cycles, and prevent erosion. Floodplains, during flood events, can interact with streams to supply nutrients, debris, and organic material back into the main channels; allow fish passage during high flow; and provide spawning sites and food supply for native fish species.

3.3.2 ENVIRONMENTAL CONSEQUENCES

3.3.2.1 No Action Alternative

Under the No Action alternative, the Gila chub would be listed under the ESA, but no section 7 consultations would be conducted pursuant to the critical habitat provisions of the ESA. The section 7 consultation process would only be initiated for *may affect* determinations of impacts on Gila chub. Consequently, this alternative would have no impact on wetlands and floodplains beyond those conservation measures resulting from the proposed listing of Gila chub and associated requirements of section 7 of the ESA.

3.3.2.2 Proposed Rule Alternative

Compared to No Action, the Proposed Rule Alternative 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 Gila chub in critical habitat. A potential outcome of section 7 consultations for critical habitat would be increased maintenance of Gila chub primary constituent elements 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 (see the impact analyses for Water Resources, Land Management, Recreation, Socioeconomics, and Livestock Grazing in this chapter).

3.3.2.3 Exclusion Option

If the Proposed Rule Alternative were selected with the Exclusion Option, critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for actions on San Carlos Apache lands. Potential effects of such actions on occupied Gila chub habitat would be analyzed under the jeopardy standard but not under the adverse modification standard.

If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub will be implemented and effective, then it can reasonably be concluded that the plan would provide for the maintenance of Gila chub primary constituent elements on tribal lands. If that were the case, it is likely that the conservation measures would be similar to those under the Proposed Rule Alternative for all stream segments. The effects on wetlands and floodplains of implementing those conservation measures would therefore be similar to effects under the Proposed Rule Alternative without the Exclusion Option.

3.4 FISH, WILDLIFE, AND PLANTS

3.4.1 EXISTING CONDITIONS

Several hundred species of fish, wildlife, and plants, as well as threatened and endangered species, occur in the riparian and aquatic habitats within the proposed critical habitat area. Riparian habitats provide numerous values for wildlife, including food, cover, water, and migration corridors (U.S. Army Corps of Engineers 1994). This value is evidenced by the occurrence of disproportionately large number of wildlife species that utilize riparian habitats relative to the areal extent of this habitat across the landscape (Hubbard 1977). Of particular importance to wildlife, fisheries, and listed species are the composition, quality, quantity, and extent of riparian habitat present.

Proposed critical habitat areas include one or more of the primary constituent elements for Gila chub described in Chapter 1, Section 1.4.1.3 or can be restored to provide those elements. The presence of these elements and the potential to restore these elements indicate the proposed areas contain a relatively intact riparian habitat that is of great importance to wildlife species. The occurrence of particular fish, wildlife, and plant species within the proposed critical habitat areas varies widely due to local and regional conditions such as elevation, climate, stream type, water management activities, proximity to land development, and grazing practices.

3.4.1.1 General Fish, Wildlife, and Plants

3.4.1.1.1 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 (Minckley 1973). The Monkey Springs pupfish (*Cyprinodon arcuatus*) is extinct, and extirpated species in the Gila basin include bonytail (*Gila elegans*), flannelmouth sucker (*Catostomus latipinnis*), and woundfin (*Plagopterus argentissimus*). Remaining native species that could occur in the proposed critical habitat areas include Gila topminnow (*Poeciliopsis occidentalis*), desert pupfish (*Cyprinodon macularius*), spikedace (*Meda fulgida*), loach minnow (*Tiaroga [=Rhinichthys] cobitis*), roundtail chub (*Gila robusta*), headwater chub (*Gila nigra*), desert sucker (*Catostomus clarkii*), Sonora sucker (*Catostomus insignis*), speckled dace (*Rhinichthys osculus*), and longfin dace (*Agosia chrysogaster*). See Section 3.4.1.2, below, for a description of threatened and endangered fish species that occur in the proposed critical habitat areas.

Numerous nonnative aquatic species also occur within the critical habitat areas, notably fish in the family Centrarchidae, which includes bluegill (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), and species of bass (*Micropterus* spp.). 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 been shown to displace native fish populations within a short time frame (Courtenay and Meffe 1989, Dudley 1995, Pima County 2002). Introduced crayfish (*Orconectes* spp.) and bullfrogs (*Rana catesbeiana*) may also be found in critical habitat areas and have profound adverse impacts on native fish communities and aquatic habitat structure.

3.4.1.1.2 Wildlife

Hundreds of mammal, bird, amphibian, reptile, and invertebrate species depend on riparian and aquatic habitats that are likely to occur in the proposed critical habitat area. Wildlife species commonly found in southwestern riparian habitats are listed in Brown (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 3.4.1.2, below, for a description of threatened and endangered wildlife species that are likely to occur in the critical habitat areas.

3.4.1.1.3 Plants

Riparian vegetation along the designated streams is dominated by cottonwood (*Populus* spp.) and willow (*Salix* spp.). Common component species at higher elevations include alder (*Alnus oblongifolia*) and boxelder (*Acer negundo*); component species at middle elevations include sycamore (*Platanus wrightii*), velvet ash (*Fraxinus pennsylvanica*), walnut (*Juglans major*), and canyon grape (*Vitis arizonica*); and component species at lower elevations include mesquite (*Prosopis juliflora*), willow (*Baccharis* sp.), and hackberry (*Celtis reticulata*). See Section 3.4.1.2, below, for a description of threatened and endangered plant species that are likely to occur in the proposed critical habitat areas.

3.4.1.2 Threatened, Endangered, Proposed, and Candidate Species

Wildlife species listed as endangered or threatened by the Service, or are proposed or candidates for listing, that have the potential to occur in the proposed critical habitat areas are listed in Table 3.2.

3.4.1.2.1 Gila Chub

Gila chub currently occur in small portions of tributary streams within the Gila River basin in Arizona and New Mexico. Weedman et al. (1996) reported 23 isolated populations, much reduced from the species' historical distribution. These 23 populations, plus four additional populations, form the basis of the proposed critical habitat for the species (Table 3.3). The four additional populations are in Turkey Creek in New Mexico, and in Mineral Creek, Lousy Canyon, and Larry Creek in Arizona. The Gila chub population in Turkey Creek was discovered in 2001 and persists today despite ash flows resulting from fires in the area in 2004 (Pers. comm., D.L. Propst, New Mexico Game and Fish Department, April 6, 2005). The Mineral Creek population was discovered in 2000, and Lousy Canyon and Larry Creek were stocked in 1995 with Gila chub translocated from Silver Creek.

The proposed critical habitat area is inclusive of all known populations of Gila chub considered essential to the conservation of the species. Two recently stocked populations are not included. On May 9, 2005, Arizona Game and Fish Department personnel stocked Gila chub into Romero and Bear Canyons in the Coronado National Forest in Pima County, Arizona (120 and 85 fish respectively) (Written comm., D. Mitchell, AGFD, May 10, 2005). Fish used for this stocking were salvaged from Sabino Canyon due to ash flow concerns from 2004 wildland fires. On the same day, 345 Gila chub were repatriated into Sabino Creek.

Table 3.3 provides status information as reported in the proposed rule for listing Gila chub with critical habitat (Service 2002a).

Table 3.2. Threatened, Endangered, Proposed, and Candidate Species That Have the Potential to Occur in Proposed Gila Chub Critical Habitat

Species Common Name	**Scientific Name**	**Status**	**Area 1** Graham, Grant, Greenlee	**Area 2** Gila, Graham, Pinal	**Area 3** Santa Cruz	**Area 4** Cochise, Graham	**Area 5** Pima	**Area 6** Yavapai	**Area 7** Yavapai
Bald Eagle	*Haliaeetus leucocephalus*	AD, T	X	X	X	X	X	X	X
Chiricahua leopard frog	*Rana chiricahuensis*	T	X	X	X	X	X	X	X
Desert pupfish	*Cyprinodon macularius*	E	X	X	X	X	X	X	X
Gila chub	*Gila intermedia*	PE	X	X	X	X	X	X	X
Gila topminnow	*Poeciliopsis occidentalis*	E	X	X	X	X	X	X	X
Loach minnow	*Tiaroga [=Rhinichthys] cobitis*	T	X	X		X	X	X	X
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	X	X	X	X	X	X	X
Spikedace	*Meda fulgida*	T	X	X		X	X	X	X
Yellow-billed cuckoo	*Coccyzus americanus*	C	X	X	X	X	X	X	X
Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	E	X	X	X	X	X		
Canelo Hills ladies' tress	*Spiranthes delitescens*	E			X	X			
Huachuca springsnail	*Pyrgulopsis thompsoni*	C			X	X			
Huachuca water umbel	*Lilaeopsis schaffneriana var. recurva*	E			X	X	X		

AD=Proposed delisting, C = Candidate for listing, E=Endangered, PE=Proposed Endangered, T=Threatened

Table 3.3. Status of Gila Chub within the Proposed Critical Habitat Areas

Area	Stream Reach	County	Gila Chub Status[1]
1	Turkey Creek	Grant (NM)	N/R
	Eagle & East Eagle Creeks	Greenlee (AZ), Graham (AZ)	Unstable - threatened
	Harden Cienega Creek	Grant (NM), Greenlee (AZ)	Unknown
	Dix Creek	Grant (NM), Greenlee (AZ)	Unknown
2	Mineral Creek	Gila, Pinal (AZ)	Unknown
	Blue River	Gila (AZ)	Unknown
	Bonita Creek	Graham (AZ)	Stable-threatened
3	O'Donnell Canyon	Santa Cruz (AZ)	Stable-threatened
	Turkey Creek	Santa Cruz (AZ)	N/R
	Post Canyon	Santa Cruz (AZ)	N/R
4	Bass Canyon	Cochise (AZ)	Stable-threatened
	Hot Springs Canyon	Cochise (AZ)	N/R
	Redfield Canyon	Graham (AZ)	Stable-threatened
5	Cienega Creek	Pima (AZ)	Stable-secure
	Mattie Canyon	Pima (AZ)	N/R
	Empire Gulch	Pima (AZ)	N/R
	Sabino Canyon	Pima (AZ)	Unstable - threatened
6	Walker Creek	Yavapai (AZ)	Stable-threatened
	Red Tank Draw	Yavapai (AZ)	N/R
	Spring Creek	Yavapai (AZ)	Stable-threatened
	Williamson Valley Wash	Yavapai (AZ)	Stable-threatened
7	Little Sycamore Creek	Yavapai (AZ)	Unstable - threatened
	Sycamore Creek	Yavapai (AZ)	Stable-threatened
	Indian Creek	Yavapai (AZ)	Unstable - threatened
	Silver Creek	Yavapai (AZ)	Stable-threatened
	Larry Creek	Yavapai (AZ)	Unknown
	Lousy Canyon	Yavapai (AZ)	Unknown

Source: Service (2002a)

[1] Gila chub status categories per Weedman et al. (1996):

Stable-secure: Gila chub are common; 5-10 years of data show stable reproducing population; no threats from nonnative species; no land or water use threats.

Stable-threatened: Gila chub are common to uncommon; lack of recruitment documented; potential threats from nonnative species exist; potential land and water use threatens future existence.

Unstable-threatened: Gila chub rare; limited distribution; threats from nonnative species exist; land and water use threatens existence.

Extirpated: Gila chub no longer found within range.

N/R = Not reported in Service (2002a).

3.4.1.2.2 Listed and Candidate Species

A number of other endangered fish species could potentially occur in critical habitat for Gila chub (see Table 3.2). The Desert Fishes Team (2003) summarized the status of threatened and

endangered fish in the Gila River basin. According to that report, desert pupfish and Gila topminnow, both endangered species, were stocked into Lousy Canyon in 2001 and are assumed to be extant populations. Gila topminnow were also stocked into Empire Gulch in 2001, and a natural population persists in Cienega Creek. The endangered spikedace and loach minnow persist within the proposed critical habitat areas in natural populations throughout the upper Gila River basin, including Eagle Creek. Spikedace are also thought to inhabit the Verde River, and loach minnow extend into the middle Gila River area.

A number of endangered birds could potentially occur in critical habitat for Gila chub as well (Table 3.2). The endangered southwestern willow flycatcher (*Empidonax traillii extimus*) is found in many of the proposed critical habitat river units for Gila chub. Critical habitat for the flycatcher includes the San Pedro River from the Hereford Bridge to Benson and from Aguaja Canyon to the Gila River; the Verde River from the upper end of the Verde Valley to Horseshoe Reservoir; the lower portions of Beaver and West Clear Creeks; the upper Gila River in the Cliff/Gila Valley; the East and West Forks of the Gila River; the upper Gila mainstem just below the Forks; and the San Francisco River from Frisco Hot Springs upstream to near the town of Luna; and the Tularosa River (Service 2004b).

The endangered cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) historically inhabited several riparian areas in the Gila River drainage. Critical habitat for the pygmy-owl includes the San Pedro River from Robles Canyon to the confluence with the Gila River and on the Gila River from the confluence with the San Pedro River to Florence (Service 2002c). The threatened bald eagle (*Haliaeetus leucocephalus*) nests along the Verde River and Tonto Creek, on the middle Gila River, and on the San Francisco River (AGFD 2002a). Wintering bald eagles may forage along any of the streams in proposed Gila chub critical habitat. The yellow-billed cuckoo (*Coccyzus americanus*), a candidate species, is strongly associated with mature riparian habitats and is likely to occur within proposed critical habitat areas (AGFD 2002b).

The threatened Chiricahua leopard frog (*Rana chiricahuensis*) is found in the Gila, San Francisco, San Pedro, Santa Cruz, and Verde River drainages (Service 2002d). The Huachuca springsnail (*Pyrgulopsis thompsoni*) is a candidate species thought to occur in the Babocomari, Santa Cruz, and San Pedro River basins, including O'Donnell Canyon, Cienega Creek, and Redfield Canyon (AGFD 2003).

One listed plant species, the endangered Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*), is likely to be found in proposed critical habitat for the Gila chub. This plant grows along the upper San Pedro River and has designated critical habitat from the Hereford Bridge to Benson (Service 1997).

3.4.2 ENVIRONMENTAL CONSEQUENCES

3.4.2.1 No Action Alternative

Under the No Action alternative, the Gila chub would be listed under the ESA, but no section 7 consultations would be conducted pursuant to the critical habitat provisions of the ESA. The section 7 consultation process would only be initiated for *may affect* determinations of impacts

on Gila chub. Consequently, this alternative would have no impact on fish, wildlife, and plants—including candidate, proposed, and listed species—beyond those conservation measures resulting from the proposed listing of Gila chub and associated requirements of section 7 of the ESA.

3.4.2.2 Proposed Rule Alternative

Compared to No Action, the Proposed Rule Alternative 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 Gila chub in critical habitat. A potential outcome of section 7 consultations for critical habitat would be increased maintenance of Gila chub primary constituent elements through conservation measures within designated critical habitat. This would serve to maintain water quality, natural streamflow characteristics, and stream morphology, as well as other primary constituent elements that sustain aquatic and riparian ecosystem integrity. As a result, all native fish, wildlife, and plants—including candidate, proposed, and listed species—that are components of those ecosystems would benefit.

The species most likely to benefit, in addition to Gila chub, 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 Proposed Rule Alternative 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 (see the impact analyses for Water Resources, Land Management, Recreation, Socioeconomics, and Livestock Grazing in this chapter).

Nonnative fish, such as green sunfish, that are considered harmful to Gila chub may be adversely affected if managers implement a program to remove them from critical habitat. Such a program may be instituted prepatory to reintroducing Gila chub into formerly occupied critical habitat. 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 Exclusion Option

If the Proposed Rule Alternative were selected with the Exclusion Option, critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for actions on San Carlos Apache lands. Potential effects of such actions on occupied Gila chub habitat would be analyzed under the jeopardy standard but not under the adverse modification standard.

If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub will be implemented and effective, then it can reasonably be concluded that the plan would provide for the maintenance of Gila chub primary constituent elements on tribal lands. If that were the case, it is likely that the conservation measures would be similar to those under the Proposed Rule Alternative for all stream segments. The effects on fish, wildlife, and plants, including special status species, of implementing those conservation measures would therefore be similar to effects under the Proposed Rule Alternative without the Exclusion Option.

3.5 LAND MANAGEMENT

3.5.1 AFFECTED ENVIRONMENT

Federal, state, county, and tribal governments that have management authority for proposed Gila chub critical habitat stream segments are shown in Table 3.4, below. In some cases (e.g., Silver Creek), different governments may have management responsibility for different portions of a given proposed critical habitat segment. Just over half of the proposed critical habitat (190 km [118.1 mi]) is on federal land, with 38.2% of all critical habitat on U.S. Forest Service (USFS) land and 17.6% on BLM land. These public lands are managed according to the pertinent management plan for each national forest and BLM field office.

Several proposed critical habitat segments are partially or entirely located within special federal, county, and private (The Nature Conservancy) management areas. Two proposed segments fall within designated wilderness: Turkey Creek in USFS's Gila Wilderness and Redfield Canyon in BLM's Redfield Canyon Wilderness. Both wilderness areas are managed to preserve wilderness values, with specific management guidance provided by the Gila National Forest Plan (1986) for the Gila Wilderness and BLM's Safford District Resource Management Plan (1991) for the Redfield Canyon Wilderness. Indian Creek, Silver Creek, Larry Creek, and Lousy Canyon fall within the recently designated Agua Fria National Monument. A resource management plan for the monument is under development. Bonita Creek falls within the Gila Box Riparian National Conservation Area (NCA), and O'Donnell Canyon, Post Canyon, upper Cienega Creek, Mattie Canyon, and Empire Gulch fall within the Las Cienegas NCA. These NCAs are managed according to resource management plans that were completed in 1998 and 2003, respectively.

Bass Canyon, Hot Springs Canyon, and Redfield Canyon fall within the Muleshoe Ranch Cooperative Management Area, a mosaic of public and private land cooperatively managed by the BLM, USFS, and The Nature Conservancy. The Muleshoe Ecosystem Management Plan for this preserve focuses on managing for the maintenance and restoration of ecological processes. O'Donnell Canyon falls within the Canelo Hills Cienega Preserve, which is partially owned and managed by The Nature Conservancy.

The lower 17.2-km segment of Cienega Creek falls within the Cienega Creek Natural Preserve, a 3,979-acre preserve established for the preservation and protection of the natural and scenic resources of the property. The preserve is owned by Pima County and is jointly managed by the Pima County Flood Control District and the Pima County Parks and Recreation Department.

Table 3.4. Land Manager and Special Management Designations for Proposed Gila Chub Critical Habitat Segments (Excluding Private Lands)

Land Manager		Special Management Designation[1]		Stream Segment	Area
U.S. Forest Service	Apache-Sitgreaves National Forest			Eagle and East Eagle Creeks Harden Cienega Creek Dix Creek	1
	Coconino National Forest			Walker Creek Red Tank Draw Spring Creek	6
	Coronado National Forest			O'Donnell Canyon Turkey Creek (Arizona) Post Canyon	3
				Sabino Canyon	5
	Gila National Forest	Gila Wilderness		Turkey Creek (New Mexico)	1
				Harden Cienega Creek	
	Prescott National Forest			Little Sycamore Creek Sycamore Creek Indian Creek	7
	Tonto National Forest			Mineral Creek	2
				Silver Creek	7
Bureau of Land Management	Phoenix Field Office	Agua Fria National Monument		Indian Creek Silver Creek Lousy Canyon	7
			Larry Canyon ACEC	Larry Creek	
	Safford Field Office	Gila Box Riparian NCA		Bonita Creek	2
		Muleshoe Ranch Cooperative Management Area		Bass Canyon Hot Springs Canyon Redfield Canyon	4
		Hot Springs ACEC		Hot Springs Canyon	
		Redfield Canyon Wilderness		Redfield Canyon	
	Tucson Field Office	Appleton-Whittell ACEC		O'Donnell Canyon Post Canyon	3
		Las Cienegas NCA		Cienega Creek Mattie Canyon Empire Gulch	5
		Empire-Cienega RCA			
State of Arizona				Mineral Creek	2
				Hot Springs Canyon Redfield Canyon	4
				Empire Gulch	5
				Spring Creek	6
Pima County, Arizona		Cienega Creek Natural Preserve		Cienega Creek	5
San Carlos Apache Tribe				Blue River Bonita Creek	2

[1] NCA = National Conservation Area; ACEC = Area of Critical Environmental Concern; RCA = Resource Conservation Area

Since the issuance in 2002 of the proposed rule to list Gila chub and designate critical habitat, eleven section 7 formal conferences have been completed for potential effects on Gila chub resulting from management actions by federal agencies (see Table 3.1). Four actions involved management planning, three involved resource management activities (native fish restocking and bank stabilization), two involved managing livestock grazing, and one involved a road realignment for public access. Because of the numerous types of activities covered in planning, conservation measures identified in the conference opinions to protect Gila chub habitat varied widely and included measures to reduce impacts from wildlife management programs, recreation, livestock grazing, and utility crossings (see Section 3.7, Recreation, and Section 3.9, Livestock Grazing, for specific examples). Development and implementation of resource-specific management plans, cooperative efforts with other management agencies, and public education programs are frequently included among recommended conservation measures.

3.5.2 ENVIRONMENTAL CONSEQUENCES

3.5.2.1 No Action Alternative

Under the No Action alternative, the Gila chub would be listed under the ESA, but no section 7 consultations would be conducted pursuant to the critical habitat provisions of the ESA. The section 7 consultation process would only be initiated for *may affect* determinations of impacts on Gila chub. Consequently, this alternative would have no impact on land management beyond those conservation measures resulting from the proposed listing of Gila chub and associated requirements of section 7 of the ESA.

3.5.2.2 Proposed Rule Alternative

Compared to No Action, the Proposed Rule Alternative 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 Gila chub 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 Gila chub; 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.[6] The outcomes of future consultations will depend on the details of project proposals and the analysis of effects, which are unknowable at this time. Nonetheless, it can still be expected, because most of the proposed stream segments are occupied by Gila chub, and because the jeopardy and adverse modification analyses are parallel, though distinct, that the outcomes of jeopardy and adverse modification analyses for this designation will be closely linked.

[6] See Section 1.4.1.2, Section 7 Consultation Process, in Chapter 1 for a discussion of the implications of the Ninth Circuit decision in Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service, 378 F.3d 1059 (9th Cir. 2004).

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 Gila chub primary constituent elements. 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 Gila chub 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 Gila chub 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 management are expected to be minor because 1) previous completed section 7 consultations for Gila chub and other fish species in small southwestern streams have resulted in only minor alterations to land management practices; 2) few projects and operations would be subject to consultation based solely on the presence of designated critical habitat because most of the proposed segments are occupied by Gila chub; 3) the outcome of those few consultations based solely on critical habitat that do not reach the threshold of adverse modification could only result in discretionary conservation recommendations to reduce impacts to primary constituent elements, because there is no incidental take statement and/or reasonable and prudent measures for adverse modification of 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. The jeopardy and adverse modification analyses are parallel, though distinct, and the outcomes of jeopardy and adverse modification analyses for this designation would be closely linked.

3.5.2.3 Exclusion Option

If the Proposed Rule Alternative were selected with the Exclusion Option, critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for land management actions on San Carlos Apache lands. Potential effects of such actions on occupied Gila chub habitat would be analyzed under the jeopardy standard but not under the adverse modification standard.

If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub will be implemented and effective, then it can reasonably be concluded that the plan would provide for the maintenance of Gila chub primary constituent elements on tribal lands. If that were the case, it is likely that the conservation measures would be similar to those under the Proposed Rule Alternative for all stream segments. The effects on land management of implementing those conservation measures would therefore be similar to effects under the Proposed Rule Alternative without the Exclusion Option.

3.6 WILDLAND FIRE MANAGEMENT

3.6.1 AFFECTED ENVIRONMENT

Wildland fires and fire management activities increasingly affect southwest riparian areas in general, and Gila chub 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 2002a).

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 multi-year 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, Ffolliott et al. 2004, Gresswell 1999, Minshall et al. 1990, Newcombe and MacDonald 1991, Norris et al. 1991, Rinne 1996, Rieman and Clayton 1997, 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).

In recent years, wildland fires have severely affected proposed Gila chub critical habitat. In July 2003, ash-laden runoff from the Aspen Fire eliminated fish habitat in Sabino Canyon near Tucson, Arizona. An emergency salvage effort conducted by federal agencies removed as many Gila chub as possible from the system before the first runoff events of the summer rainy season (Service 2004a). These fish were held in facilities off-site and restocked in Sabino Creek in May 2005 after it was determined that conditions were once again suitable for fish (Written comm., D. Foster, AGFD, June 16, 2005). A second population of Gila chub was affected in 2003 by the Dry Lake Complex Fire in the Gila National Forest in New Mexico. As a result of ash flows from the fire, the population of Gila chub in Turkey Creek has been greatly reduced (Probst 2004).

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 [P.L. 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 and/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; or
- 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%) of the proposed critical habitat for Gila chub overlaps WUI areas (Industrial Economics 2005). These areas, because they are closer to developed areas 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 the issuance in 2002 of the proposed rule for listing Gila chub and designating critical habitat, two section 7 formal conferences have been completed for actions involving fire management planning and potential effects on Gila chub (see Table 3.1). The first formal conference was for a BLM Arizona statewide land use plan amendment (Service 2004a). The second was for the existing BLM resource management plan for the Agua Fria National Monument (Service 2004c).

Conservation measures listed in the Conference Opinion for the BLM Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management (Service 2004a) exemplify the kinds of conservation measures that might be expected for future section 7 consultations for Gila chub. 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 Gila chub. Conservation efforts for protecting sensitive species and habitat generally include using Minimum Impact Suppression Tactics (M.I.S.T.) 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.

3.6.2 ENVIRONMENTAL CONSEQUENCES

3.6.2.1 No Action Alternative

Under the No Action alternative, the Gila chub would be listed under the ESA, but no section 7 consultations would be conducted pursuant to the critical habitat provisions of the ESA. The section 7 consultation process would only be initiated for *may affect* determinations of impacts on Gila chub. Consequently, this alternative would have no impact on fire management beyond those conservation measures resulting from the proposed listing of Gila chub and associated requirements of section 7 of the ESA.

3.6.2.2 Proposed Rule Alternative

Compared to No Action, the Proposed Rule Alternative 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 Gila chub in critical habitat. The additional section 7 consultations would most likely be for specific hazardous fuels reduction treatments in areas not occupied by Gila chub but designated as Gila chub critical habitat, or for after-the-fact 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 Gila chub primary constituent elements. These conservation measures, however, are unlikely to appreciably constrain fire 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 in any case, however, so, again, designation of critical habitat is unlikely to have more than 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 for designation of Gila chub 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 designation on public safety are expected to be negligible.

The effects of Gila chub critical habitat designation on fire management are also expected to be negligible because 1) few projects and operations would be subject to consultation based solely on the presence of designated critical habitat because most of the proposed segments are occupied by Gila chub; 2) the outcome of those few consultations based solely on critical habitat that do not reach the threshold of adverse modification could only result in discretionary conservation recommendations to reduce impacts to primary constituent elements, because there is no incidental take statement and/or reasonable and prudent measures for adverse modification of critical habitat; and 3) 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. The jeopardy and adverse modification analyses are parallel, though distinct, and the outcomes of jeopardy and adverse modification analyses for this designation would be closely linked.

3.6.2.3 Exclusion Option

If the Proposed Rule Alternative were selected with the Exclusion Option, critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for fire management actions on San Carlos Apache lands. Potential effects of such actions on occupied Gila chub habitat would be analyzed under the jeopardy standard but not under the adverse modification standard.

If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub will be implemented and effective, then it can reasonably be concluded that the plan would provide for the maintenance of Gila chub primary constituent elements on tribal lands. If that were the case, it is likely that the conservation measures would be similar to those under the Proposed Rule Alternative for all stream segments. The effects on fire management of implementing those conservation measures would therefore be similar to effects under the Proposed Rule Alternative without the Exclusion Option.

3.7 RECREATION

3.7.1 EXISTING CONDITIONS

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

Most of the proposed habitat segments receive only a low-level of recreational use because of their remoteness, difficult terrain, or landownership status (Industrial Economics 2005). There are exceptions, however. The segment most popular with recreationists is Sabino Canyon (Area 5), which is located near Tucson, Arizona, a metropolitan area of half a million residents. Sabino Canyon has been developed as a recreational site by the USFS and receives over a million visitors annually, many of them wading and swimming in the creek. The area has numerous

trails, picnic tables and other facilities, a paved road, and public transportation. In New Mexico, hot springs along Turkey Creek (Area 1) can receive heavy public use, but in general recreation is managed for low intensity. Several of the segments are accessible by trails and unpaved roads.

Numerous road crossings of Bonita Creek were cited in the proposed rule to list the Gila chub as a threat to the species and its habitat (Service 2002a). Since that time, Bull Gap Road has been realigned, diverting public traffic away from most creek crossings (Service 2003).[7] Public access to the creek has not been restricted, but the former crossings are no longer maintained by the BLM, and recreational use of the creek in the proposed habitat segment appears to be low. 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; stream crossings are limited to established roads (Industrial Economics 2005). In the Las Cienegas NCA, which includes Cienega Creek, Empire Gulch, and Mattie Canyon), OHV and other recreational activities are allowed. Use of OHVs is prohibited in the Gila Wilderness (managed by the USFS) and in Hot Springs Canyon riparian habitat in the Muleshoe CMA (managed by the BLM and The Nature Conservancy).

Since the issuance in 2002 of the proposed rule to list Gila chub and designate critical habitat, two Gila chub section 7 formal conferences have been completed for management plans that included recreational activities (see Table 3.1). Conservation activities recommended by the Service in their conference opinion for the Las Cienegas National Conservation Area Resource Management Plan included reducing the speed limit at stream crossings, posting speed limits, and creating a public education program (Service 2002e). Future recreation-related conservation measures may also include further restricting OHV use, camping, and other recreational activities in critical habitat. Nonnative fish that compete with or prey on Gila chub have been removed from proposed critical habitat in the past (e.g., in O'Donnell and Sabino Canyons). Similar programs are likely to occur in the future, and may affect recreational opportunities if sport fish are removed from areas frequented by anglers.

3.7.2 ENVIRONMENTAL CONSEQUENCES

3.7.2.1 No Action Alternative

Under the No Action alternative, the Gila chub would be listed under the ESA, but no section 7 consultations would be conducted pursuant to the critical habitat provisions of the ESA. The section 7 consultation process would only be initiated for *may affect* determinations of impacts on Gila chub. Consequently, this alternative would have no impact on recreational opportunities beyond those conservation measures resulting from the proposed listing of Gila chub and associated requirements of section 7 of the ESA.

3.7.2.2 Proposed Rule Alternative

Compared to No Action, the Proposed Rule Alternative 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

[7] Pers. comm., Heidi Blasius, BLM Safford Field Office, July 1, 2005.

an adverse modification of critical habitat analysis to section 7 consultations for Gila chub in critical habitat. The areas most likely to be affected are those not occupied by Gila chub but designated as Gila chub 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 Gila chub primary constituent elements. 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 Gila chub primary constituent elements 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) previous completed section 7 consultations for Gila chub and other fish species in small southwestern streams have resulted in only minor alterations to recreational opportunities; 2) few projects and operations would be subject to consultation based solely on the presence of designated critical habitat because most of the proposed segments are occupied by Gila chub; 3) the outcome of those few consultations based solely on critical habitat that do not reach the threshold of adverse modification could only result in discretionary conservation recommendations to reduce impacts to primary constituent elements, because there is no incidental take statement and/or reasonable and prudent measures for adverse modification of 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. The jeopardy and adverse modification analyses are parallel, though distinct, and the outcomes of jeopardy and adverse modification analyses for this designation would be closely linked.

3.7.2.3 Exclusion Option

If the Proposed Rule Alternative were selected with the Exclusion Option, critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for recreation-related actions on San Carlos Apache lands. Potential effects of such actions on occupied Gila chub habitat would be analyzed under the jeopardy standard but not under the adverse modification standard.

If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub will be implemented and effective, then it can reasonably be concluded that the plan would provide for the maintenance of Gila chub primary constituent elements on tribal lands. If that were the case, it is likely that the conservation

measures would be similar to those under the Proposed Rule Alternative for all stream segments. The effects on recreation of implementing those conservation measures would therefore be similar to effects under the Proposed Rule Alternative without the Exclusion Option.

3.8 SOCIOECONOMICS

Information in this section is based on a separate, detailed analysis of the economic effects of critical habitat designation for the Gila chub (Industrial Economics 2005). As noted in the introduction to this chapter, the economic analysis did not attempt to distinguish between impacts of listing the species and impacts of designating critical habitat. Dollar estimates of future economic impacts take into account *all* Gila chub-related conservation activities predicted to occur in the proposed critical habitat areas over the next 20 years, not just those attributable solely to designation of critical habitat.

The proposed action area for the socioeconomic analysis comprises the eight counties in Arizona and one county in New Mexico in which the proposed critical habitat segments are located. These counties are Cochise, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz, and Yavapai Counties in Arizona, and Grant County in New Mexico. The county-level data used for the analysis were drawn from tables compiled by the U.S. Census Bureau from data collected during the 2000 census. While riparian habitat constitutes a small portion of the land area in these counties, and county-level data may not precisely reflect the socioeconomic characteristics of the areas immediately surrounding the proposed critical habitat, these data provide context for the discussion of potential economic impacts. This section presents key information about population characteristics and general economic activity in the proposed action area. For information about ethnic and poverty characteristics see Section 3.11, Environmental Justice.

3.8.1 EXISTING CONDITIONS

3.8.1.1 Population Characteristics

Table 3.5 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. Over half of the total population resides in one county—Pima County, Arizona—which includes the City of Tucson, the only major city in the analysis area (population: 486,699 [U.S. Census Bureau, Census 2000]).

In Arizona, the counties containing proposed critical habitat account for about 29% of the state population. Pinal and Yavapai Counties are the fastest growing counties with 54.5% and 55.5% increase in population between 1990 and 2000, respectively. In Arizona, all counties containing proposed critical habitat have a lower per capita income than Arizona's average of approximately $20,000. In New Mexico, Grant County represents only about 1.7% of the State's population. Per capital income in Grant County is approximately $14,600, which is well below the state average of $17,261 (Industrial Economics 2005). In summary, all nine counties have a lower per capita income and eight have fewer persons per square mile than their respective statewide averages.

Table 3.5. Socioeconomic Profile of Counties Containing Critical Habitat for the Gila Chub

	County	Population (2000)	% of Statewide Population	Population Density (persons/ sq mi)	% Change (1990–2000)	Per Capita Income (1999)
Arizona	**State Total**	**5,130,632**	**100.0%**	**45.2**	**40%**	**$20,275**
	Cochise	117,755	2.3%	18.9	20.6%	$15,988
	Gila	51,335	1.0%	10.7	27.6%	$16,315
	Graham	33,489	0.7%	7.2	26.1%	$12,139
	Greenlee	8,547	0.2%	4.6	6.7%	$15,814
	Pima	843,746	16.4%	91.9	26.5%	$19,785
	Pinal	179,727	3.5%	33.4	54.5%	$16,025
	Santa Cruz	38,381	1.8%	31.0	29.3%	$13,278
	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**
	Grant	31,002	1.7%	7.8	12%	$14,597

Source: Industrial Economics (2005), Exhibit 2-4.

3.8.1.2 Economic Activity

The proposed action area contains over 32,000 business establishments, which employ approximately 430,000 individuals (Industrial Economics 2005). As shown in Table 3.6, the largest employment sectors are services, retail trade, and manufacturing. The services sector represents approximately 51% of the job base; retail trade represents 16.5%; and manufacturing represents nearly 9.2%. These three employment sectors combined comprise approximately 76.6% of all jobs in the nine counties.

Table 3.7 depicts economic activity within the nine counties that contain proposed critical habitat, as measured by annual payroll in 2002. The highest annual payroll is in the services sector, followed by manufacturing and retail (Industrial Economics 2005). Activities that have the potential to be economically affected by designation of critical habitat for the Gila chub are described below. If the activity is described elsewhere in this document, a cross-reference is provided.

San Carlos Apache Tribal Activities. The San Carlos Apache Tribe's economy includes cattle ranching, forestry operations, tourism, recreation, and a small service sector (Industrial Economics 2005). The Tribe has five cattle associations and operates two tribal ranches. Both proposed critical habitat segments on the San Carlos Apache Reservation (Blue River and a portion of Bonita Creek) are located within grazing leases. Along the Blue River, land is leased to two livestock associations with approximately 3,000 head of cattle combined; along Bonita Creek, land is leased to one livestock association with approximately 1,000 head of cattle and horses.

Table 3.6. Employees by Industry within Counties Containing Gila Chub Proposed Critical Habitat (2002)

Industry	County									TOTAL	% of Total Employees
	Cochise	Gila	Graham	Greenlee	Pima	Pinal	Santa Cruz	Yavapai	Grant		
Agriculture, Forestry, Hunting, Fishing	20-99	100-249	20-90	n/a	157	142	50	0-19	0-19	**825**	0.2
Mining	64	500-999	20-99	1,000-2,499	1,049	260	0-19	992	250-499	**6,480**	1.5
Utilities	539	96	20-99	20-99	1,779	269	20-99	276	20-99	**3,355**	0.8
Construction	1,635	948	236	20-99	23,760	1,562	514	5,753	678	**35,185**	8.0
Manufacturing	574	1,000-2,499	259	0-19	29,755	2,972	640	3,323	295	**40,336**	9.2
Wholesale Trade	493	362	221	20-99	7,634	621	1,980	1,653	139	**13,202**	3.0
Retail Trade	5,775	2,219	1,365	135	44,045	5,960	2,309	9,171	1,139	**72,118**	16.5
Transportation/ Warehousing	357	236	53	20-99	5,188	422	790	697	124	**7,966**	1.8
Information	551	178	112	20-99	6,983	317	85	761	187	**9,273**	2.1
Finance and Insurance	568	220	95	0-19	9,054	727	247	1,269	208	**12,407**	2.8
Real Estate	625	154	86	0-19	6,639	654	196	1,488	103	**9,964**	2.3
Auxiliaries	59	20-99	0-19	n/a	2,942	74	194	83	0	**3,470**	0.8
Unclassified	0-19	0	0-19	n/a	137	8	0-19	0-19	0-19	**240**	0.1
Services and Other Industries	14,457	5,582	2,671	593	153,991	14,516	3,003	23,829	3,823	**222,465**	51.0
TOTAL										**437,286**	**100.0**

Source: After Industrial Economics (2005), Exhibit 2-6.

Table 3.7. Annual Payroll for Selected Industries within Counties Containing Designated Critical Habitat ($ Thousands [2002])

Industry	Counties									TOTAL
	Cochise	**Gila**	**Graham**	**Greenlee**	**Pima**	**Pinal**	**Santa Cruz**	**Yavapai**	**Grant**	
Agriculture, Forestry, Hunting, Fishing	0	0	0	n/a	3,882	2,980	981	0	0	**597,987**
Mining	2,071	0	0	0	39,501	7,806	0	32,204	0	**81,582**
Utilities	30,908	4,920	0	0	103,127	14,911	0	15,193	0	**169,059**
Construction	39,395	21,783	5,367	0	741,519	37,474	10,495	153,399	19,712	**1,029,144**
Manufacturing	13,851	0	5,974	0	1,419,187	97,614	14,802	105,807	12,210	**1,669,445**
Retail Trade	109,278	45,189	24,960	2,093	1,002,171	113,756	43,311	199,456	20,026	**1,560,240**
Wholesale Trade	12,083	10,801	5,522	0	263,619	20,972	57,213	47,867	2,663	**420,740**
Transportation/Warehousing	8,539	6,121	1,378	0	165,093	9,995	19,185	15,096	1,425	**226,832**
Information	15,342	3,837	2,192	0	456,301	8,953	2,045	21,511	5,577	**515,758**
Finance and Insurance	14,636	6,642	2,857	0	359,879	31,317	5,515	41,973	5,276	**468,095**
Real Estate	12,684	3,267	1,500	0	168,767	12,301	3,877	32,561	1,720	**236,677**
Auxiliaries	1,347	0	0	n/a	94,145	2,896	6,163	1,560	n/a	**106,111**
Unclassified	0	99	0	n/a	6,799	332	0	0	0	**7,230**
Services and Other Industries	323,731	115,382	40,087	0	3,848,049	306,225	53,213	496,201	68,081	**5,250,969**

Source: After Industrial Economics (2005), Exhibit 2-5.

The San Carlos Apache Tribe has approximately 55,120 acres of accessible commercial timberland, less than 1% of which overlaps proposed critical habitat. All potentially affected timber grows along the upper Blue River. The Tribe does not conduct timber operations within a 66-foot buffer area from the banks of waterways; however, the buffer for critical habitat for Gila chub is 300 feet. Harvesting of timber between the 66-foot buffer and 300-foot buffer lines could be affected by critical habitat designation (Industrial Economics 2005).

On the San Carlos Apache Reservation, recreation in proposed critical habitat for the Gila chub consists predominantly of dispersed fishing and hunting (Industrial Economics 2005). Tribal income from these activities stems from the sale of fishing and hunting licenses, as well as recreation permits for tourists who want to camp on tribal lands. Recreationists also generate income by purchasing lodging, food, and supplies on tribal lands.

Economic impacts that may be incurred by the San Carlos Apache Tribe as a result of critical habitat designation stem from:

- administrative costs of complying with the ESA requirements and completing a fish management plan;
- limitations on livestock use of proposed critical habitat for grazing and water;
- limitations on timber harvest;
- limitations on recreational opportunities; and
- limitations on fire management activities (Industrial Economics 2005).

No formal section 7 conferences have been completed with the San Carlos Apache Tribe for potential effects on Gila chub resulting from activities on tribal lands. However, the potential remains for future section 7 consultations and conservation measures that may constrain tribal economic activities. See also Section 3.10, Tribal Trust Resources.

Water Management. See Section 3.2.

Species Management. Past and future actions specific to managing Gila chub and their habitat include stocking Gila chub in suitable habitat, removing nonnative fish considered to be a threat to Gila chub, constructing fish barriers, and surveying and monitoring (Service 2002a, Industrial Economics 2005). Since the issuance in 2002 of the proposed rule to list Gila chub and designate critical habitat, two section 7 formal conferences have been completed for potential effects on Gila chub resulting from species management actions (see Table 3.1). The Arizona Game and Fish Department proposed to stock Gila chub into Martinez Canyon in Pinal County (Service 2004d) and into Redfield, Cherry Springs, and Hot Springs Canyons within the Muleshoe Cooperative Management Area in Graham and Cochise Counties (Service 2005a).

Fire Management. See Section 3.6, Wildland Fire Management.

Recreation. See Section 3.7, Recreation.

Livestock Grazing. See Section 3.9, Livestock Grazing.

Mining. The mining of copper, iron, gold, sand and gravel, or other materials has resulted in loss of Gila chub habitat in the past and remains a potential threat to proposed critical habitat (Service 2002a). Potential adverse effects of mining activities on fish habitat include degraded water quality from contaminants and reduced flow rates due to dewatering of streams and groundwater pumping to supply water for mining operations. Sand and gravel mining removes riparian vegetation, destabilizes streambanks, and alters stream morphology, which results in habitat loss for fish (Brown et al. 1998). Mining operations are ongoing downstream of proposed critical habitat for the Gila chub, but no mines are currently active within or upstream of the proposed critical habitat boundaries. One mine site, owned by the Knapp Group, is located in the Mineral Creek segment. Minerals have been found at the site, but excavation has not yet been initiated by the owner (Industrial Economics 2005). The area is rich in commercial minerals. Ray Mine, Asarco's large open-pit copper mine, operates on Mineral Creek just downstream from proposed critical habitat.

No formal section 7 conferences have been completed for potential effects on Gila chub resulting from mining-related activities. However, the potential remains for future mining operations, section 7 consultations, and conservation activities that may constrain mining.

Residential and Commercial Development. Most of the proposed critical habitat stream segments are in remote locations on federal lands. These are riparian areas managed by federal agencies for their resource values and are not classified as eligible for exchange into private ownership, the only means by which future residential and commercial development could occur on public lands. Proposed critical habitat segments owned and managed by Pima County and The Nature Conservancy similarly are managed for their resource values and are excluded from future development. In contrast, private property, other than that owned by The Nature Conservancy, is susceptible to future development. This is particularly true for two segments, Spring Creek and Williamson Valley Wash, both in Yavapai County (critical habitat Area 6). With a population growth of 55.5% in 1990–2000, Yavapai County is one of the fastest-growing counties in Arizona (see Table 3.5).

Spring Creek is located in the Verde Valley, an area that grew by 52.5% in 1990–2000 (Yavapai County 2002). A portion of the proposed critical habitat in Spring Creek, including the springs that furnish perennial flow in the stream, is privately owned as Spring Creek Ranch. Recently, approximately 200 acres of Spring Creek Ranch was sold to a developer who plans to build a residential subdivision on the property. The long-time owner of the remainder of Spring Creek Ranch (that property is now owned jointly in trusts with educational institutions), expressed concern during the public comment period about the adverse effects that critical habitat designation would have on the monetary value of the ranch.

Proposed critical habitat in Williamson Valley Wash is entirely in private ownership. Williamson Valley is located in central Yavapai County within commuting distance of the rapidly growing City of Prescott. The entire Prescott Metropolitan Area is experiencing explosive growth; nearby Chino Valley, for example, grew by 62% between 1990 and 2000

(Yavapai County 2002). While Williamson Valley is still primarily rural, several subdivisions have been built in recent years and major new development is underway.

No formal section 7 conferences have been completed for potential effects on Gila chub resulting from residential or commercial development. However, the potential remains for future development, section 7 consultations, and conservation measures that may constrain development activity.

Transportation. Construction and maintenance of roads and bridges can adversely affect Gila chub habitat, primarily through sedimentation from disturbed soil and subsequent runoff. Approximately six roads, with some stream crossings, are located in the proposed critical habitat (Industrial Economics 2005). None of the roads are heavily used (except in Sabino Canyon, where shuttle buses, bicycles, and pedestrians account for most traffic). Given the relatively isolated and rural nature of the proposed critical habitat segments, most road use is likely by local ranchers, recreationists, and land managers. The presence of roads and stream crossings may raise public safety issues if these facilities are considered unsafe, and section 7 consultations for critical habitat were to delay needed repairs or maintenance. Since the issuance in 2002 of the proposed rule to list Gila chub and designate critical habitat, one section 7 formal conferences has been completed for potential effects on Gila chub resulting from a transportation-related action (see Table 3.1). BLM consulted with the Service regarding realignment of an unimproved road along Bonita Creek (Service 2003).

Conservation measures listed in that conference opinion included the construction of straw bale barriers to catch and hold any excess sediment, best management practices for road work and hazardous materials containment, and an education program for employees before work began on the effects of road construction on fish and water quality (Service 2003).

Timber Harvest. The only commercial timber harvest activities potentially affected by designation of critical habitat for Gila chub are those on San Carlos Apache tribal lands (Industrial Economics 2005). See the discussion of San Carlos Apache Tribal Activities, above. No formal section 7 conferences addressing harvesting of timber have been completed for Gila chub.

3.8.2 ENVIRONMENTAL CONSEQUENCES

3.8.2.1 No Action Alternative

Under the No Action alternative, the Gila chub would be listed under the ESA, but no section 7 consultations would be conducted pursuant to the critical habitat provisions of the ESA. The section 7 consultation process would only be initiated for *may affect* determinations of impacts on Gila chub. Consequently, this alternative would have no impact on socioeconomic conditions beyond those conservation measures resulting from the proposed listing of Gila chub and associated requirements of section 7 of the ESA.

3.8.2.2 Proposed Rule Alternative

Compared to No Action, the Proposed Rule Alternative 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 Gila chub in critical habitat. The additional consultations would result in adverse economic impacts in the form of 1) increased administrative costs to the Service, the action agencies, and project proponents, and 2) increased expenditures to implement additional reasonable and prudent alternatives and other conservation measures to maintain Gila chub primary constituent elements.

In their economic analysis, Industrial Economics (2005) estimated that conservation measures for Gila chub in the areas proposed for critical habitat would have an economic impact in eight categories: San Carlos Apache tribal activities, water management, species management, fire management, recreation, livestock grazing, mining, and transportation.[8] According to the economic analysis, residential/commercial development is unlikely to occur in most proposed critical habitat areas due to their remoteness. Proposed critical habitat segments in Yavapai County are mainly in areas zoned to preserve rural characteristcs; therefore, Industrial Economics (2005) does not anticipate impacts to development in Yavapai County.

In the economic analysis, future impacts were quantified in five categories (Table 3.8). Low and high dollar estimates were provided for costs incurred over the next 20 years. The total estimated costs ranged between $11.4 million and $28.1 million for the 20-year period. It must be reiterated here that, due to the difficulty in making a credible distinction, the economic analysis did not attempt to distinguish between impacts of listing the species versus impacts of designating critical habitat. Dollar estimates of future economic impacts took into account *all* Gila chub-related conservation activities predicted to occur in the proposed critical habitat areas over the next 20 years, not just those attributable to designation of critical habitat.

Table 3.8. Summary of Future Costs Related to Designation of Critical Habitat for the Gila Chub (2005–2024)

Resource	Low	High
San Carlos Apache Tribal Activities	$633,000	$5,386,000
Water Management	$9,000,000	$15,976,800
Species Management	$1,180,000	$2,196,000
Fire Management	362 acres of WUI	
Recreation	Modest	
Livestock Grazing	$450,900	$3,783,500
Mining	Uncertain	
Transportation	$86,000	$736,800
TOTAL	**$11,349,900**	**$28,079,100**

Source: Industrial Economics (2005), Exhibit ES-3.

[8] To perform their analysis of economic impacts, Industrial Economics (2005) used area of proposed critical habitat measured in acres rather than lengths of stream segments measured in kilometers or miles. To calculate area, they multiplied stream segment length by the 300-foot buffer on each side of the channel.

Dollar figures were not given for predicted effects on fire management, recreation, and mining (Industrial Economics 2005). Impacts to fire management were measured in acres, based on the assumption that effects of designation were most likely to occur in the Wildland/Urban Interface (WUI), where human activity is highest and development requiring fire protection is densest. A total of 362 acres of critical habitat was categorized as WUI. Economic impacts to recreation were considered "modest." Potential economic effects on mining were considered "uncertain" because owners of mining claims in proposed critical habitat may or may not attempt to develop those assets. The potential economic impact on timber harvest was not analyzed independently but was addressed in the analysis of effects on the San Carlos Apache Tribe (Industrial Economics 2005).

While it is not possible to tease out the costs resulting solely from section 7 consultations for critical habitat, those costs are expected to be minor because 1) few projects and operations would be subject to consultation based solely on the presence of designated critical habitat because most of the proposed segments are occupied by Gila chub; 2) the outcome of those few consultations based solely on critical habitat that do not reach the threshold of adverse modification could only result in discretionary conservation recommendations to reduce impacts to primary constituent elements, because there is no incidental take statement and/or reasonable and prudent measures for adverse modification of critical habitat; and 3) 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. The jeopardy and adverse modification analyses are parallel, though distinct, and the outcomes of jeopardy and adverse modification analyses for this designation would be closely linked.

The possibility is very small that safety issues would arise if maintenance of roads or stream crossings were delayed due to section 7 consultations for critical habitat. Few roads and crossings are located in the proposed critical habitat segments, and roads are generally unpaved and lightly traveled. If unsafe conditions developed, non-essential traffic (e.g., recreational use) could be suspended until the hazard is corrected, and essential local traffic (e.g., ranch-related) could be diverted around trouble spots. Crossings are unlikely to be a problem because the streams are small and tend to be easily forded; alternative crossings are likely to be available to accommodate local use. In summary, adverse impacts on public safety are not anticipated as a result of designation of critical habitat for Gila chub.

3.8.2.3 Exclusion Option

If the Proposed Rule Alternative were selected with the Exclusion Option, critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for actions on San Carlos Apache lands. Potential effects of such actions on occupied Gila chub habitat would be analyzed under the jeopardy standard but not under the adverse modification standard.

If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub will be implemented and effective, then it can reasonably be concluded that the plan would provide for the maintenance of Gila chub primary

constituent elements on tribal lands. If that were the case, it is likely that the conservation measures would be similar to those under the Proposed Rule Alternative for all stream segments. The effects on socioeconomic conditions of implementing those conservation measures would therefore be similar to effects under the Proposed Rule Alternative without the Exclusion Option.

3.9 LIVESTOCK GRAZING

3.9.1 AFFECTED ENVIRONMENT

Livestock grazing continues to contribute to the Gila chub's imperiled status (Service 2002a). Stream segments proposed for critical habitat designation for the Gila chub are located within 16 cattle grazing allotments managed by the BLM or the USFS, or are on private land that may be used for grazing (Industrial Economics 2005). On the San Carlos Apache Reservation, both the Blue River and Bonita Creek cross tribal grazing allotments. The current level of grazing varies considerably throughout the areas proposed as critical habitat. Depending on the stream segment and the allotment, livestock may have access to stream segments proposed as critical habitat, may have access to reaches upstream from proposed critical habitat and thus may adversely affect water quality downstream, or may be excluded from riparian corridors altogether.

Adverse impacts from poor livestock grazing practices on habitat for fishes like Gila chub include increased erosion and sedimentation in stream channels, elimination of undercut banks that provide cover, alteration of channel structure and composition of the stream bottom, loss of wetland and riparian vegetation, reduced backwater pools, decreased water quality, lowered minimum stream flow, and higher peak flows (Ohmart 1996, Platts 1991, Rinne 1985).

Since the issuance in 2002 of the proposed rule to list Gila chub and designate critical habitat, four section 7 formal conferences have been completed for actions involving livestock grazing and potential effects on Gila chub (see Table 3.1). Two conference opinions were issued for USFS grazing actions, and two for BLM management plans that involved grazing. Conservation actions resulting from these conferences varied according to specific circumstances and included winter-use only grazing in riparian areas; limiting streambank alteration, browsing, and herbaceous growth utilization in riparian areas; excluding livestock from certain areas; guidance for crossing streams when moving livestock; prohibiting salt and other livestock nutritional supplements within a specified distance from springs or riparian areas; and various monitoring requirements (Service 2002e, 2002f, 2004c).

3.9.2 ENVIRONMENTAL CONSEQUENCES

3.9.2.1 No Action Alternative

Under the No Action alternative, the Gila chub would be listed under the ESA, but no section 7 consultations would be conducted pursuant to the critical habitat provisions of the ESA. The section 7 consultation process would only be initiated for *may affect* determinations of impacts on Gila chub. Consequently, this alternative would have no impact on livestock grazing beyond those conservation measures resulting from the proposed listing of Gila chub and associated requirements of section 7 of the ESA.

3.9.2.2 Proposed Rule Alternative

Compared to No Action, the Proposed Rule Alternative 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 Gila chub in critical habitat. The areas most likely to be affected are those not occupied by Gila chub but designated as Gila chub 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 Gila chub primary constituent elements. 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 patterns.

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 Gila chub designated critical habitat. The impacts of designation on livestock grazing are also expected to be minor because 1) previous completed section 7 consultations for Gila chub and other fish species in small southwestern streams have resulted in only minor alterations to livestock grazing; 2) few operations would be subject to consultation based solely on the presence of designated critical habitat because most of the proposed segments are occupied by Gila chub; 3) the outcome of those few consultations based solely on critical habitat that do not reach the threshold of adverse modification could only result in discretionary conservation recommendations to reduce impacts to primary constituent elements, because there is no incidental take statement and/or reasonable and prudent measures for adverse modification of 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. The jeopardy and adverse modification analyses are parallel, though distinct, and the outcomes of jeopardy and adverse modification analyses for this designation would be closely linked.

3.9.2.3 Exclusion Option

If the Proposed Rule Alternative were selected with the Exclusion Option, critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for livestock grazing-related actions on San Carlos Apache lands. Potential effects of such actions on occupied Gila chub habitat would be analyzed under the jeopardy standard but not under the adverse modification standard.

If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub will be implemented and effective, then it can reasonably be concluded that the plan would provide for the maintenance of Gila chub primary constituent elements on tribal lands. If that were the case, it is likely that the conservation measures would be similar to those under the Proposed Rule Alternative for all stream segments. The effects on livestock grazing of implementing those conservation measures would therefore be similar to effects under the Proposed Rule Alternative without the Exclusion Option.

3.10 TRIBAL TRUST RESOURCES

3.10.1 EXISTING CONDITIONS

The U.S. Department of the Interior, 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 tribal trust resources potentially affected by Gila chub critical habitat designation are the lands of the San Carlos Apache tribe and the natural resources thereon. The San Carlos Apache Reservation encompasses over 1.8 million acres of forested mountains, grasslands, and desert terrain in southeastern Arizona. Natural resources include springs, streams, rivers, and lakes; wildlife and fisheries; rangeland and timber; agricultural land; mineral resources; and scenic resources. The San Carlos Apache Tribe's economy depends heavily on utilization of these resources, with ranching, forestry, tourism, and recreation being the largest sectors, along with a small service industry (Industrial Economics 2005). Two stream segments on tribal lands have been proposed as critical habitat: Blue River and Bonita Creek.

Since the issuance in 2002 of the proposed rule to list Gila chub with critical habitat, no section 7 formal conferences have been completed for actions potentially affecting Gila chub on San Carlos Apache lands.

3.10.2 ENVIRONMENTAL CONSEQUENCES

3.10.2.1 No Action Alternative

Under the No Action alternative, the Gila chub would be listed under the ESA, but no section 7 consultations would be conducted pursuant to the critical habitat provisions of the ESA. Section 7 consultations on San Carlos Apache tribal lands would only be initiated for *may affect* determinations of impacts on Gila chub. Consequently, this alternative would have no impact on tribal trust resources beyond those conservation measures resulting from the proposed listing of Gila chub and associated requirements of section 7 of the ESA.

3.10.2.2 Proposed Rule Alternative

The proposed designation of critical habitat under the Proposed Rule Alternative would include approximately 47.3 km (29.4 mi) of stream segments on the San Carlos Apache Reservation. Compared to No Action, the Proposed Rule Alternative would result in a small, but unknown, increase in the number of additional new and reinitiated section 7 consultations for actions on these tribal lands. Potential adverse impacts resulting from critical habitat designation on tribal trust lands could be 1) the perception of increased federal control and involvement in tribal land management by the San Carlos Apache Tribe; and 2) a perception by the San Carlos Apache Tribe of a decreased control or ability to management their lands for their own benefit.

The likely beneficial effect to tribal trust resources of increasing the number of section 7 consultations would be the conservation of Gila chub primary constituent elements. Maintaining Gila chub primary constituent elements has the ancillary beneficial effect of conserving water resources, riparian ecosystem integrity, and co-occurring fish, wildlife, and plants in designated critical habitat.

The beneficial effects of critical habitat designation on tribal trust resources are expected to be negligible to minor because 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 on San Carlos Apache land. The intensity of adverse impacts is unpredictable; future perceptions within the Tribe may be influenced by numerous unknowable variables.

3.10.2.3 Exclusion Option

If the Proposed Rule Alternative were selected with the Exclusion Option, critical habitat considerations would not be incorporated into Gila chub section 7 consultations conducted for actions on San Carlos Apache lands. Potential effects of such actions on occupied Gila chub habitat would be analyzed under the jeopardy standard but not under the adverse modification standard.

If the tribal fish management plan covers Gila chub habitat and provides assurances that the conservation measures outlined for Gila chub will be implemented and effective, then it can reasonably be concluded that the plan would provide for the maintenance of Gila chub primary constituent elements on tribal lands. If that were the case, it is likely that the conservation measures would be similar to those under the Proposed Rule Alternative for all stream segments. The effects on tribal trust resources of implementing those conservation measures would therefore be similar to effects under the Proposed Rule Alternative without the Exclusion Option.

3.11 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 Gila chub 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 Cochise, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz, and Yavapai Counties in Arizona, and Grant County in New Mexico. Designation would affect portions of all nine counties, although fewer kilometers of critical habitat would be designated in Gila and Graham Counties under the Exclusion Option. In 2000, the population of the analysis area totaled approximately 1,598,202 (Table 3.9). Over half of that total resides in one county—Pima County, Arizona—which includes the City of Tucson (U.S. Census Bureau, Census 2000); the majority of the analysis area is rural and sparsely populated.

Table 3.9. 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	1,440,497	5,130,632	28.1
New Mexico	31,002	1,819,046	1.7
TOTAL	**1,471,499**	**6,949,678**	**21.2**

Source: U.S. Census Bureau, Census 2000 and State County QuickFacts, accessed at http://quickfacts.census.gov/qfd.

3.11.1 MINORITY POPULATIONS

Table 3.10 provides 2000 Census data for racial minority (non-white) 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 and the state as a whole are the same (24.5%), while a somewhat higher percentage of Hispanic persons reside in the analysis area than in the state as whole (28.2% vs. 25.3%). In New Mexico a substantially lower percentage of racial minorities reside in the analysis area than in the state as a whole (24.3% vs. 33.2%), while a higher percentage of Hispanic persons reside in the analysis area than in the state as a whole (48.8% vs. 42.1%). For both categories (racial and Hispanic), the deviation from state figures is less than 10%.

The largest single racial minority in both Arizona and New Mexico is American Indian (Table 3.10). The percentage of the general population represented by American Indian groups within the analysis area (4% in Arizona and 1.4% in New Mexico) is lower than in the respective states as a whole (5% in Arizona and 9.5% in New Mexico). These figures, however, may understate the potential for effects of the proposed designation on American Indian populations because 47.3 km (29.4 mi), or approximately 14%, of proposed critical habitat fall within the San Carlos Apache Reservation in Arizona.

3.11.2 LOW-INCOME POPULATIONS

The estimated percentage of the population below the poverty level in the analysis area by state is depicted in Table 3.11 below. In Arizona, the percentage of individuals below the poverty level in the analysis area is slightly higher than in the state as a whole (14.8% vs. 13.9%). In New Mexico, the poverty level in the analysis area is comparable to that in the state as a whole (18.7% vs. 18.4%).

As indicated in the preceding section, 47.3 km (29.4 mi), or approximately 14%, of proposed critical habitat falls within the San Carlos Apache Reservation. According to the 2000 Census, the unemployment rate on the Reservation was 35.4%; however, tribal sources place the figure at 76% (Kitcheyan 2004). This compares to a 5.6% unemployment rate in the State of Arizona as a whole (U.S. Census Bureau, 2000 Census). Per capita income among the San Carlos Apache was $5,200 in 2000, or about one-fifth of the Arizona average, and the poverty level was 48.5%, far higher than the state average of 14.8% (U.S. Census Bureau, 2000 Census).

Table 3.10. Racial Minority (Non-white), American Indian, and Hispanic Populations within the Analysis Area

State	Racial Minority[1]		American Indian		Hispanic	
	Analysis Area (%)	Statewide (%)	Analysis Area (%)	Statewide (%)	Analysis Area (%)	Statewide (%)
Arizona	24.5	24.5	4.0	5.0	28.2	25.3
New Mexico	24.3	33.2	1.4	9.5	48.8	42.1

Source: U.S. Census Bureau, 2000 Census

[1] Racial minority populations comprise all persons who identified their race as other than white in the 2000 Census.

Table 3.11. 2000 Poverty Levels within the Analysis Area

State	Analysis Area Poverty Levels		State-wide Poverty Levels	
	Below Poverty Level	% of State Population	Below Poverty Level	% of State Population
Arizona	213,820	14.8	698,669	13.9
New Mexico	5,676	18.7	328,933	18.4

Source: U.S. Census Bureau, 2000 Census

In summary, census data indicate that a somewhat higher percentage of Hispanic populations and persons below the poverty level reside within the analysis area compared to state averages, although the differences are not large (ranging from less than 1% to just under 9%). Under the Proposed Rule Alternative, approximately 14% of proposed critical habitat would fall on the San Carlos Apache Reservation, which has a predominantly minority and low-income population.

The potential for disproportionate impacts to minority and low-income populations is unknown from designating critical habitat (and the increased number of section 7 consultations for ongoing and proposed actions that *may affect* these designated areas). This is because 1) site-

specific riparian-associated human demographics in the majority of affected areas are unknown; 2) designating critical habitat does not directly restrict land management and/or land use activities; and 3) the outcomes of section 7 consultations and the subsequent impacts upon these populations cannot be predicted. Section 7 consultation outcomes and the subsequent impacts upon 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.

While the potential for disproportionate impacts on minority and low-income populations cannot be predicted, relatively speaking, the Exclusion Option is less likely to result in such impacts than the Proposed Rule Alternative without the option because the Exclusion Option excludes critical habitat on the San Carlos Apache Reservation.

3.12 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.

Designating critical habitat for Gila chub 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 to Gila chub primary constituent elements and, by extension, to 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 Gila chub is small and spread over a wide area; much of it is relatively isolated; much of it is in public or tribal rather than private ownership; much of it is in special management areas already managed primarily to preserve resource values; and much of it 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. The very few additional section 7 consultations based solely on the presence of Gila chub designated critical habitat, and the outcomes from those consultations, would not add appreciably to the consequences of current management. Therefore, the incremental impact of designating critical habitat for Gila chub when added to other past, present, and reasonably foreseeable future actions in the analysis area would be negligible to minor.

4.0 CHAPTER 4 – ANALYSIS OF SIGNIFICANCE

4.1 CONSIDERATIONS IN DETERMINING SIGNIFICANCE

A primary purpose of preparing an environmental assessment under NEPA is to determine whether a proposed action would have significant impacts to 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, whose responsibility it is to ensure compliance with the National Environmental Policy Act (NEPA), intensity is determined by considering 10 criteria (CFR 40 1508.27[b]): 1) beneficial and adverse impacts; 2) the degree of impacts to health and safety; 3) impacts to 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 Endangered Species Act of 1973; and 10) whether the proposed action threatens a violation of federal, state, or local law.

4.2 SIGNIFICANCE DETERMINATION

The context of short- and long-term impacts of the proposed designation of critical habitat for the Gila chub includes the seven river units described under the Proposed Rule Alternative in Chapter 2 of this document, as well as the stream segments in the river areas that encompass designated critical habitat. The intensity of impacts of critical habitat designation are expected to be negligible to minor.

- The potential impacts to environmental resources would be both beneficial and adverse, and are expected to be negligible to minor for the reasons described in Chapter 3.
- No impacts to public health are anticipated, and impacts to public safety are unlikely.
- No impacts to unique characteristics of the geographic area are anticipated.
- The potential impacts to the quality of the environment are not likely to be highly controversial.

- For the most part, impacts of Gila chub critical habitat designation do not pose uncertain, unique, or unknown risks. Uncertainties exist about the potential for disproportionate impacts on minority and low-income populations primarily because the outcomes of future section 7 consultation and the subsequent impacts cannot be predicted. Further investigations would not resolve these uncertainties.
- The potential impacts of critical habitat designation do not set a precedent for future actions with significant effects and do not result in significant cumulative impacts.
- The potential impacts of critical habitat designation are not likely to affect sites, objects, or structures of historical, scientific, or cultural significance.
- The proposed action to designate critical habitat for Gila chub would have long-term beneficial impacts on this and other candidate, threatened, and endangered species.
- Proposed critical habitat designation would not violate any federal, state, or local laws.

5.0 CHAPTER 5 – LIST OF PREPARERS

Table 5.2. SWCA List of Preparers

Name	Education and Experience	Responsibility
Bill Leibfried	M.S. Biology 20 Years' Experience	Project Management
Dorothy House	M.A. Librarianship 35 Years' Experience	Technical Writing, NEPA Compliance
Kara Hilwig	M.S. Biology 11 Years' Experience	Biology

REFERENCES CITED

Arizona Game and Fish Department. 1988. Threatened native wildlife in Arizona. Phoenix. 32 pp.

Arizona Game and Fish Department (AGFD). 2002a. *Haliaeetus leucocephalus*. Unpublished draft abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona. 8 pp.

Arizona Game and Fish Department (AGFD). 2002b. *Coccyzus americanus occidentalis*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona. 4 pp.

Arizona Game and Fish Department (AGFD). 2003. *Pyrgulopsis thompsoni*. Unpublished draft abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona. 5 pp.

Betsgen, K.R., and D.L. Propst. 1989. Distribution, status, and notes on the ecology of *Gila robusta* (Cyprinidae) in the Gila River Drainage, New Mexico. Southwestern Naturalist 34:402–412.

Brown, A.V., M.M. Lyttle, and K.B. Brown. 1998. Impacts of gravel mining on gravel bed streams. Transactions of the American Fisheries Society 127:979–994.

Brown, D.E. (ed.) 1994. Biotic communities: Southwestern United States and northwestern Mexico. University of Utah Press, Salt Lake City.

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

Cain, T., J.N. Rinne, J.A. Stefferud, and A. Telles. 1997. Effects determinations for loach minnow, spikedace, Little Colorado spinedace, and Sonora chub on national forests in the Southwest Region. U.S. Forest Service, Albuquerque, New Mexico. 56 pp.

Courtenany, 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).

DeMarais, B.D. 1986. Morphological variation in Gila (Pisces, Cyprinidae) and geologic history: Lower Colorado River Basin. Unpublished M.S. thesis, Arizona State University, Tempe. 85 pp.

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

Diario Oficial de la Federación. 1994. Norma Oficial Mexicana NOM-059-ECOL-1994, que determina las especies y subespecies de flora y fauna silvestres terrestres y acuáticas, en peligro de extinción, amenazadas, raras y las sujetas a protección especial, y que establece especificaciones para su protección. Secretaría de Desarrollo Social, 16 de mayo de 1994.

Dobyns, H.F. 1981. From fire to flood: Historic human destruction of Sonoran Desert riverine oasis. Ballena Press Anthropological Papers No. 20. 222 pp.

Douglas, M.E., P.C. Marsh, and W.L. Minckley. 1994. Indigenous fishes of western North America and the hypothesis of competitive displacement: *Meda fulgida* (Cyprinidae) as a case study. Copeia 1994(1):9–19.

Dudley, R.K. 1995. The effects of green sunfish on the distribution, abundance and habitat use of Gila chub in Sabino Creek, Tucson, Arizona. M.S. thesis (draft), University of Arizona, Tucson.

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, Florida.

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

Griffith, J.S., and T.R. Tiersch. 1989. Ecology of fishes in Redfield Canyon, Arizona, with emphasis on *Gila robusta intermedia*. Southwestern Naturalist 34:131–164.

Hubbard, J.P. 1977. Importance of riparian ecosystems: Biotic considerations. Pages 14–18 *in* Johnson, R.R,. and D.A. Jones (tech. coord.). Importance, preservation and management of riparian habitat: A symposium. U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-43. Fort Collins, Colorado.

Industrial Economics, Inc. 2005. Draft economic analysis of critical habitat designation for the Gila chub. Prepared for the Division of Economics, U.S. Fish and Wildlife Service, Arlington, Virginia. June 27, 2005. Prepared by Industrial Economics, Incorporated, Cambridge, Massachusetts.

Kitcheyan, K.W. 2004. Testimony of Chairwoman Kathleen W. Kitcheyan of the San Carlos Apache Tribe: For the field hearing on improving housing opportunities for Native Americans. Before the Subcommittee on Housing and Community Opportunity of the Financial Services Committee, House of Representatives. Tuba City, Arizona, May 3, 2004.

Leopold, A. 1946. Erosion as a menace to the social and economic future of the Southwest. A paper read to the New Mexico Association for Science, 1922. Journal of Forestry 44:627–633.

Mayden, R.L., B.M.. Burr, L.M. Page, and R.R. Miller. 1992. The native freshwater fishes of North America. Pages 827–890 *in* Mayden, R.L. (ed.). Systematics, historical ecology, and North American freshwater fishes. Stanford University Press, Stanford, California.

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

Miller, R.R. 1945. A new cyprinid fish from southern Arizona and Sonora, Mexico, with the description of a new subgenus of Gila and a review of related species. Copeia, 1945:104–110.

Miller, R.R. 1961. Man and the changing fish fauna of the American Southwest. Papers of the Michigan Academy of Science, Arts, and Letters 46:365–404.

Miller, R.R., and C.H. Lowe. 1967. Fishes of Arizona, Part 2. Pages 133–151 *in* Lowe, C.H. The vertebrates of Arizona, 2d printing. University of Arizona Press, Tucson.

Minckley, W.L. 1973. Fishes of Arizona. Arizona Game and Fish Department, Phoenix. 293 pp.

Minckley, W.L. 1991. Native fishes of the Grand Canyon region: An obituary? Pages 124–177 *in* 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. Deacon (eds.). 1991. Battle against extinction: native fish management in the American West. University of Arizona Press, Tucson, Arizona. 517 pp.

Minckley, W.L., and G.K. Meffe. 1987. Differential selection by flooding in stream fish communities of the arid American Southwest. Pages 93–104 *in* Matthews, W.J. and D.C. Heins (eds.). Community and evolutionary ecology of North American stream fishes. University of Oklahoma Press, Norman.

Minckley, W.L., and M.R. Somerfeld. 1979. Resource inventory for the Gila River complex, eastern Arizona. U.S. Bureau of Land Management, Safford, Arizona. 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, Virginia.

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. 1996. Historical and present impacts of livestock grazing on fish and wildlife resources in western riparian habitats. Pages 245–279 *in* Krausman, P.R. (ed.). Rangeland wildlife. Society for Range Management, Denver, Colorado.

Pima County. 2002. An invasive species management program for Pima County. Sonoran Desert Conservation Plan.

Platts, W.S. 1991. Livestock grazing. Pages 389–424 *in* Meehan, W.R. (ed.). Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication19:389–423.

Propst, D.L. 1999. Threatened and endangered fishes of New Mexico. Technical Report No.1. New Mexico Department of Game and Fish, Santa Fe, New Mexico. 84 pp.

Probst, D.L. 2004. Systematic investigations of warmwater fish communities, FW-17-RD Performance Report, 1 July 2003–30 June 2004. New Mexico Department of Game and Fish, Santa Fe.

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. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 93 pp.

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. 1976. Cyprinid fishes of the genus *Gila* from the lower Colorado River basin. Wasmann Journal of Biology 34(1):65–107.

Rinne, J.N. 1985. Livestock grazing effects on southwestern streams: a complex research problem. Pages 295–300 *in* Johnson, R.R., C.D. Ziebell, D.R. Patton, and others (tech. coords.). Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service General Technical Report RM-120.

Rinne, J.N. 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.

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

Robbins, C.R., R.M. Bailey, C.E. Bond, J.E. Brooker, E. A. Lachner, R.N. Lea, and W.B. Scott. 1991. A list of common and scientific names of fishes from the United States and Canada. American Fisheries Society Special Publication, 20.

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.

Sublette, J.E., M.D. Hatch, and M. Sublette. 1990. The fishes of New Mexico. University of New Mexico Press, Albuquerque, New Mexico. 393 pp.

U.S. Army Corps of Engineers. 1994. Riparian zone ecology, restoration, and management, northwestern United States (Billings, Montana, June, 14–17, 1994). Notebook contents. Prepared for the Department of Defense Legacy Program, Washington, DC.

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

U.S. Census Bureau, Census 2000. Online at http://www.cen sus.gov/.

U.S. Fish and Wildlife Service (Service). 1991a. Spikedace recovery plan. Albuquerque, New Mexico. 38 pp.

U.S. Fish and Wildlife Service (Service). 1991b. Loach minnow recovery plan. Albuquerque, New Mexico. 38 pp.

U.S. Fish and Wildlife Service (Service). 1997. Endangered and threatened wildlife and plants; Determination of endangered status for three wetland species found in southern Arizona and northern Sonora, Mexico; Final Rule. Federal Register 62(3):665–689.

U.S. Fish and Wildlife Service (Service). 1999. Draft environmental assessment designation of critical habitat for the spikedace (*meda fulgida)* and the loach minnow (*Tiaroga [=Rhinichthys] cobitis*). Phoenix, Arizona.

U.S. Fish and Wildlife Service (Service). 2002a. Listing the Gila chub as endangered with critical habitat, Proposed Rule. Federal Register 67(154):51948–51985.

U.S. Fish and Wildlife Service (Service). 2002b. Re-initiation of consultation on Fort Huachuca Programmatic Biological Opinion (2-21-02-F-229 and 2-21-98-F-266).

U.S. Fish and Wildlife Service (Service). 2002c. Endangered and threatened wildlife and plants; Designation of Critical Habitat for the Arizona Distinct Population Segment of the Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*); Final Rule. Federal Register 67(229):71032–71064.

U.S. Fish and Wildlife Service (Service). 2002d. Endangered and threatened wildlife and plants; Listing of the Chiricahua Leopard Frog (*Rana chiricahuensis*). Final Rule with a Special Rule. Federal Register 67(114):40790–40811.

U.S. Fish and Wildlife Service (Service). 2002e. Biological and Conference Opinion Las Cienegas National Conservation Area Resource Management Plan. October 4, 2002. Phoenix, Arizona.

U.S. Fish and Wildlife Service (Service). 2002f. Re-initiation of 1999 Biological Opinion; Continuation of Livestock Grazing on the Coronado National Forest. Phoenix, Arizona.

U.S. Fish and Wildlife Service (Service). 2003. Conference Opinion for the New Bull Gap Road Section Project, Gila Box Riparian National Conservation Area (RNCA), Graham County, Arizona. December 4, 2003. Phoenix, Arizona.

U.S. Fish and Wildlife Service (Service). 2004a. Biological and Conference Opinion for the BLM Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management. Phoenix, Arizona.

U.S. Fish and Wildlife Service (Service). 2004b. Endangered and threatened wildlife and plants; Proposed designation of critical habitat for southwestern willow flycatcher (Empidonax traillii extimus); Proposed Rule. Federal Register 69(196):60705–60786.

U.S. Fish and Wildlife Service (Service). 2004c. Formal Conference on the Existing Phoenix Resource Management Plan for Agua Fria National Monument. Phoenix, Arizona.

U.S. Fish and Wildlife Service (Service). 2004d. Conference Opinion, Martinez Canyon Native Fish Restoration (not in critical habitat). Phoenix, Arizona.

U.S. Fish and Wildlife Service (Service). 2005a. Formal Consultation and Formal Conference for the Proposed Re-establishment of Spikedace, Loach Minnow, Gila Topminnow, Desert Pupfish, and Augmentation of Gila Chub into Multiple Springs and Stream within the Muleshoe Cooperative Management Area. Phoenix, Arizona.

U.S. Fish and Wildlife Service (Service). 2005b. Biological and Conference Opinion – Las Cienegas Bank Stabilization Project. Phoenix, Arizona.

Weedman, D., A.L. Girmendonk, and K. Young. 1996. Status Review of Gila chub, *Gila intermedia*, in the United States and Mexico. Technical Report 91, Nongame and Endangered Wildlife Program, Arizona Game and Fish Department. 120 pp.

Williams, J.E., D.B. Bowman, J.E. Brooks, A.A. Echelle, R.J. Edwards, D.A. Hendrickson, and J.J. Landye. 1985. Endangered aquatic ecosystems in North American deserts with a list of vanishing fishes of the region. Journal of the Arizona-Nevada Academy of Science 20(1):1–62.

Yavapai County. 2002. Yavapai County general plan INFO-SHEET (draft data). Online at http://www.co.yavapai.az.us/departments/ Dev/unitspc/ordregs/genplan/FactSheet.pdf.