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50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Endangered Status and Designation of Critical Habitat for Spikedace and Loach Minnow; Proposed Rule

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R2–ES–2010–0072; MO 92210–0–0009–B4]

RIN 1018–AX17

Endangered and Threatened Wildlife and Plants; Endangered Status and Designation of Critical Habitat for Spikedace and Loach Minnow

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to change the status of spikedace (*Meda fulgida*) and loach minnow (*Tiaroga cobitis*) from threatened to endangered under the Endangered Species Act of 1973, as amended, and to designate critical habitat for both species. In total, we are proposing approximately 1,168 kilometers (726 mi) of streams as critical habitat for spikedace, and 1,141 kilometers (709 miles) of streams as critical habitat for loach minnow. The proposed critical habitat is located in Apache, Cochise, Gila, Graham, Greenlee, Navajo, Pima, Pinal, and Yavapai Counties, Arizona, and Catron, Grant, and Hidalgo Counties in New Mexico.

DATES: We will consider comments received or postmarked on or before December 27, 2010. We must receive requests for public hearings, in writing, at the address shown in the **FOR FURTHER INFORMATION CONTACT** section by December 13, 2010.

ADDRESSES: You may submit comments by one of the following methods:

- *Federal eRulemaking Portal: http://www.regulations.gov.* Follow the instructions for submitting comments to Docket No. FWS–R2–ES–2010–0072.
- *U.S. mail or hand-delivery:* Public Comments Processing, Attn: [Docket Number FWS–R2–ES–2010–0072]; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, Suite 222; Arlington, VA 22203.

We will not accept e-mail or faxes. We will post all comments on *http://www.regulations.gov.* This generally means that we will post any personal information you provide us (see the Public Comments section below for more information).

FOR FURTHER INFORMATION CONTACT: Steve Spangle, Field Supervisor, U.S. Fish and Wildlife Service, Arizona Ecological Services Office, 2321 W. Royal Palm Road, Suite 103, Phoenix, AZ 85021; telephone (602) 242–0210; facsimile (602) 242–2513. If you use a telecommunications device for the deaf (TDD), call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Public Comments

This document consists of: (1) A proposed rule to reclassify spikedace (*Meda fulgida*) and loach minnow (*Tiaroga cobitis*) from threatened to endangered status; and (2) a proposed rule to designate critical habitat for the two species.

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from other concerned government agencies, the scientific community, industry, or any other interested party concerning this proposed rule. We particularly seek comments concerning:

(1) The factors that are the basis for making a listing determination for a species under section 4(a) of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*), which are:

(a) The present or threatened destruction, modification, or curtailment of its habitat or range;

(b) Overutilization for commercial, recreational, scientific, or educational purposes;

(c) Disease or predation;

(d) The inadequacy of existing regulatory mechanisms; or

(e) Other natural or manmade factors affecting its continued existence.

(2) Additional information concerning the range, distribution, and population size of this species, including the locations of any additional populations of this species.

(3) Any information on the biological or ecological requirements of the species.

(4) The reasons why we should or should not designate habitat as "critical habitat" under section 4 of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*) including whether there are threats to the species from human activity, the degree of which can be expected to increase due to the designation, and whether that increase in threat outweighs the benefit of designation such that the designation of critical habitat may not be prudent.

(5) Specific information on:

- The amount and distribution of spikedace and loach minnow habitat;
- What areas occupied at the time of listing and containing features essential to the conservation of the species should be included in the designation and why;
- Special management considerations or protections that features essential to the conservation of spikedace and loach minnow, as identified in this proposal, may require, including managing for the potential effects of climate change; and
- What areas not occupied at the time of listing are essential for the conservation of the species and why.

(6) Land use designations and current or planned activities in the subject areas and their possible impacts on proposed critical habitat.

(7) Any probable economic, national security, or other impacts of designating any area that may be included in the final designation. We are particularly interested in any impacts on small entities or families, and the benefits of including or excluding areas that exhibit these impacts.

(8) Whether we could improve or modify our approach to designating critical habitat in any way to provide for greater public participation and understanding, or to better accommodate public concerns and comments.

(9) Information on whether the benefit of an exclusion of any particular area outweighs the benefit of inclusion under section 4(b)(2) of the Act. We specifically solicit the delivery of spikedace- and loach minnow-specific management plans for areas included in this proposed designation. Management plans considered in previous critical habitat exclusions for spikedace and loach minnow are available through the contact information listed in the **FOR FURTHER INFORMATION CONTACT** section.

(10) Information on the projected and reasonably likely impacts of climate change on spikedace and loach minnow and on the critical habitat areas we are proposing.

You may submit your comments and materials concerning this proposed rule by one of the methods listed in the **ADDRESSES** section. We will not accept comments sent by e-mail or fax or to an address not listed in the **ADDRESSES** section.

We will post your entire comment—including your personal identifying information—on *http://www.regulations.gov.* If you provide personal identifying information, such as your street address, phone number, or e-mail address, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov,* or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Arizona Ecological Services Office (see **FOR FURTHER INFORMATION CONTACT)**.

Background

It is our intent to discuss only those topics directly relevant to the proposed reclassification and proposed designation of critical habitat for spikedace and loach minnow in this proposed rule. For more information on the species themselves, refer to the final listing rule (51 FR 23769, July 1, 1986 (spikedace), and 51 FR 39468, October 28, 1986 (loach minnow)) and the previous critical habitat designation (72 FR 13356, March 21, 2007).

Spikedace

The spikedace is a member of the minnow family Cyprinidae, and is the only species in the genus *Meda.* The spikedace was first collected from the San Pedro River in 1851. The spikedace is a small, slim fish less than 75 millimeters (mm) (3 inches (in)) in length (Sublette *et al.* 1990, p. 136). Spikedace have olive-gray to brownish skin, with silvery sides and vertically elongated black specks. Spikedace have spines in the dorsal fin (Minckley 1973, pp. 82, 112, 115).

Spikedace are found in moderate to large perennial streams, where they inhabit shallow riffles (those shallow portions of the stream with rougher, choppy water) with sand, gravel, and rubble substrates (Barber and Minckley 1966, p. 31; Propst *et al.* 1986, p. 12; Rinne and Kroeger 1988, p. 1; Rinne 1991, pp. 8–10). Specific habitat for this species consists of shear zones where rapid flow borders slower flow; areas of sheet flow at the upper ends of mid-channel sand or gravel bars; and eddies at downstream riffle edges (Rinne 1991, p. 11; Rinne and Kroeger 1988, pp. 1, 4). Recurrent flooding and a natural flow regime are very important in maintaining the habitat of spikedace and in helping maintain a competitive edge over invading nonnative aquatic species (Propst *et al.* 1986, pp. 76–81; Minckley and Meffe 1987, pp. 97, 103–104).

The spikedace was once common throughout much of the Gila River basin, including the mainstem Gila River upstream of Phoenix, and the Verde, Agua Fria, Salt, San Pedro, and San Francisco subbasins. Habitat destruction and competition and predation by nonnative aquatic species reduced its range and abundance (Miller 1961, pp. 365, 377, 397–398; Lachner *et al.* 1970, p. 22; Ono *et al.* 1983, p. 90; Moyle 1986, pp. 28–34; Moyle *et al.* 1986, pp. 416–423; Propst *et al.* 1986, pp. 82–84).

Spikedace are now restricted to portions of the upper Gila River (Grant, Catron, and Hidalgo Counties, New Mexico); Aravaipa Creek (Graham and Pinal Counties, Arizona); Eagle Creek (Graham and Greenlee Counties, Arizona); and the Verde River (Yavapai County, Arizona) (Marsh *et al.* 1990, pp. 107–108, 111; M. Brouder, U.S. Fish and Wildlife Service (Service), pers. comm. 2002; Stefferud and Reinthal 2005, pp. 16–21; Paroz *et al.* 2006, pp. 62–67; Propst 2007, pp. 7–9, 11–14).

In 2007, spikedace were translocated into Hot Springs Canyon, in Cochise County, Arizona, and Redfield Canyon, in Cochise and Pima Counties, Arizona, and these streams were subsequently augmented (Robinson 2008a, pp. 2, 6; T. Robinson, Arizona Game and Fish Department (AGFD), pers. comm. 2008b; D. Orabutt, AGFD, pers. comm. 2009; Robinson 2009a, pp. 2, 5–8). (We use the term "translocate" to describe stocking fish into an area where suitable habitat exists, but for which there are no documented collections.) Both Hot Springs and Redfield canyons are tributaries to the San Pedro River. Spikedace were also translocated into Fossil Creek, a tributary to the Verde River in Gila County, Arizona, in 2007, and were subsequently augmented in 2008 (Carter 2007b, p. 1; Carter 2008a, p. 1; Robinson 2009b, p. 9; Boyarski *et al.* 2010, in draft, p. 7). In 2008, spikedace were translocated into Bonita Creek, a tributary to the Gila River in Graham County, Arizona (H. Blasius, U.S. Bureau of Land Management (BLM), pers. comm. 2008; D. Orabutt, AGFD, pers. comm. 2009; Robinson *et al.* 2009a, p. 209), and were repatriated to the upper San Francisco River in Catron County, New Mexico (D. Propst, New Mexico Department of Game and Fish (NMDGF), pers. comm. 2010). (We use the term "repatriate" to describe stocking fish into an area where we have historical records of prior presence.) Augmentations with additional fish will occur for the next several years at all sites, if adequate numbers of fish are available. Monitoring at each of these sites is ongoing to determine if populations ultimately become self-sustaining.

The species is now common only in Aravaipa Creek in Arizona (AGFD 1994; Arizona State University (ASU) 2002; P. Reinthal, University of Arizona, pers. comm. 2008, Reinthal 2009, pp. 1–2) and one section of the Gila River south of Cliff, New Mexico (NMDGF 2008; Propst *et al.* 2009, pp. 14–17). The Verde River is presumed occupied; however, the last captured fish from this river was from a 1999 survey (M. Brouder, Service, pers. comm. 2002; AGFD 2004). Spikedace from the Eagle Creek population have not been seen for over a decade (Marsh 1996, p. 2), although they are still thought to exist in numbers too low for the sampling efforts to detect (Carter *et al.* 2007, p. 3; see Minckley and Marsh 2009). The Middle Fork Gila River population is thought to be very small and has not been seen since 1991 (Jakle 1992, p. 6), but sampling is localized and inadequate to detect a sparse population.

Population estimates have not been developed as a result of the difficulty in detecting the species, the sporadic nature of most surveys, and the difference in surveying techniques that have been applied over time. Based on the available maps and survey information, we estimate the spikedace's present range to be approximately 10 percent or less of its historical range, and the status of the species within occupied areas ranges from common to very rare. Data indicate that the population in New Mexico has declined in recent years (Paroz *et al.* 2006, p. 56). Historical and current records for spikedace are summarized in three databases (ASU 2002, AGFD 2004, NMDGF 2008), which are referenced throughout this document.

A species' geographic range is the total area that encompasses all known locations of that species. As noted above, spikedace occur in several streams in portions of Arizona and New Mexico. For purposes of this document, we have used watershed boundaries associated with the Verde, Salt, San Pedro, Gila, and San Francisco rivers to define the geographic range of spikedace. All known records of spikedace occur within these watershed boundaries.

We evaluated species detections and habitat descriptions in various databases, formal and informal survey records, agency and researcher field notes, and published literature to determine which geographic areas were reasonably occupied by the species at the time of listing. Surveys have been infrequent or inconsistent for this species. Further, even where surveys occur, the species can be difficult to detect due to its small body size. As a result, the lack of a positive detection in any specific area may not mean that the area is not occupied. Therefore, relying strictly on point-specific survey results

for historical occupancy information would likely create an incomplete picture of occupied area. The extent of a stream reach that is occupied up- or downstream of a known occupied site is generally limited only by availability of suitable habitat. Therefore, we assume that for areas where the species has been documented, it was likely also present in the adjacent stream segments if adjacent segments were connected and contain suitable habitat.

In addition, this document discusses areas occupied at the time of listing. We are defining areas occupied at the time of listing to include streams for which we have spikedace records up to 1986, when they were first listed. These records include the Agua Fria River; the Verde River and its tributaries Beaver Creek and West Clear Creek; the Salt River and its tributary Tonto Creek; the San Pedro River and its tributary Aravaipa Creek; Eagle Creek; the San Francisco River; and the Gila River and its tributaries East, Middle, and West Fork Gila, and Blue Creek.

Loach Minnow

The loach minnow is a member of the minnow family Cyprinidae. The loach minnow was first collected in 1851 from the San Pedro River in Arizona and was described by those specimens in 1865 by Girard (pp. 191–192). The loach minnow is a small, slender fish less than 80 mm (3 in) in length. It is olive-colored overall, with black mottling or splotches. Breeding males have vivid red to red-orange markings on the bases of fins and adjacent body, on the mouth and lower head, and often on the abdomen (Minckley 1973, p. 134; Sublette *et al.* 1990, p. 186).

Loach minnow are found in small to large perennial streams and use shallow, turbulent riffles with primarily cobble substrate and swift currents (Minckley 1973, p. 134; Propst *et al.* 1988, pp. 36–43; Rinne 1989, pp. 113–115; Propst and Bestgen 1991, pp. 29, 32–33). The loach minnow uses the spaces between, and in the lee (sheltered) side of, rocks for resting and spawning. It is rare or absent from habitats where fine sediments fill these interstitial spaces (Propst and Bestgen 1991, p. 34).

Loach minnow are now restricted to portions of the Gila River and its tributaries, the West, Middle, and East Fork Gila River (Grant, Catron, and Hidalgo Counties, New Mexico) (Paroz and Propst 2007, p. 16; Propst 2007, pp. 7–8, 10–11, 13–14); the San Francisco and Tularosa rivers and their tributaries Negrito and Whitewater creeks (Catron County, New Mexico) (Propst *et al.* 1988, p. 15; ASU 2002; Paroz and Propst 2007, p. 16; Propst 2007, pp. 4–5); the Blue River and its tributaries Dry Blue, Campbell Blue, Pace, and Frieborn creeks (Greenlee County, Arizona and Catron County, New Mexico) (Miller 1998, pp. 4–5; ASU 2002; C. Carter 2005, pp. 1–5; C. Carter, AGFD, pers. comm. 2008b; Clarkson *et al.* 2008, pp. 3–4; Robinson 2009c, p. 3); Aravaipa Creek and its tributaries Turkey and Deer creeks (Graham and Pinal Counties, Arizona) (Stefferud and Reinthal 2005, pp. 16–21); Eagle Creek (Graham and Greenlee Counties, Arizona), (Knowles 1994, pp. 1–2, 5; Bagley and Marsh 1997, pp. 1–2; Marsh *et al.* 2003, pp. 666–668; Carter *et al.* 2007, p. 3; Bahm and Robinson 2009a, p. 1); and the North Fork East Fork Black River (Apache and Greenlee Counties, Arizona) (Leon 1989, pp. 1–2; M. Lopez, AGFD pers. comm. 2000; S. Gurtin, AGFD, pers. comm. 2004; Carter 2007b, p. 2; Robinson *et al.* 2009b, p. 4); and possibly the White River and its tributaries, the East and North Fork White River (Apache, Gila, and Navajo Counties, Arizona). The present range is 15 to 20 percent of its historical range, and the status of the species within occupied areas ranges from common to very rare.

As noted above, a species' range includes the total area that encompasses all known locations of that species. As with spikedace, loach minnow are known to occur in several streams in portions of Arizona and New Mexico. For purposes of this document, we have used watershed boundaries associated with the Verde, Salt, San Pedro, Gila, and San Francisco rivers to determine the range of loach minnow. All known loach minnow records occur within these watershed boundaries.

We evaluated species detections and habitat descriptions in various databases, formal and informal survey records, agency and researcher field notes, and published literature to determine which geographic areas were reasonably occupied by the species at the time of listing. Surveys have been infrequent or inconsistent for this species. Further, even where surveys occur, the species can be difficult to detect due to its small body size. As a result, the lack of a positive detection in any specific area may not mean that the area is not occupied. Therefore, relying strictly on point-specific survey results for historical occupancy information would likely create an incomplete picture of occupied areas. The extent of a stream reach that is occupied up- or downstream of a known occupied site is generally limited only by availability of suitable habitat. Therefore, we assume that for areas where the species has been documented, it was likely also present in the adjacent stream segments if adjacent segments were connected and contain suitable habitat.

In addition, this document discusses areas occupied at the time of listing. We are defining areas occupied at the time of listing to include streams for which we have loach minnow records up to 1986, when the species was first listed. These records include the Verde River and its tributary Beaver Creek; the White River and its tributary East Fork White River; Aravaipa Creek; the San Pedro River; Eagle Creek; the Blue River and its tributaries Campbell Blue, Dry Blue, and Little Blue creeks; the San Francisco River and its tributary Tularosa River; and the Gila River and its tributaries West Fork, Middle Fork, and East Fork Gila Rivers and Whitewater Creek. In addition, loach minnow were identified from several tributary streams following 1986. As no reintroduction efforts had taken place prior to discovering each of these populations, it is assumed they were occupied at listing, but undetected. We are therefore including these areas as occupied at listing: Deer Creek and Turkey Creek (tributaries to Aravaipa Creek); Frieborn Canyon and Pace Creek (tributaries to the Blue River); and North Fork East Fork Black River, and Negrito Creek (tributary to the Tularosa River).

Although suitable habitat existed in Hot Springs, Redfield Canyons, Fossil Creek, or Bonita Creek, loach minnow had not previously been documented there. In 2007, loach minnow were translocated into Hot Springs and Redfield canyons in Cochise County, Arizona (Robinson 2008a, pp. 2, 6; T. Robinson, AGFD, pers. comm. 2008b; D. Orabutt, AGFD, pers. comm. 2009); both of these streams are tributaries to the San Pedro River. Fish were also translocated into Fossil Creek, a tributary to the Verde River in Gila County, Arizona (Carter 2007a, p. 1; Carter 2008a, p. 1; Robinson 2009b, p. 9; Orabutt and Robinson 2010, in draft, p. 12). In 2008, loach minnow were translocated into Bonita Creek, a tributary to the Gila River in Graham County, Arizona (H. Blasius, BLM, pers. comm. 2008; D. Orabutt, AGFD, pers. comm. 2009). Augmentations with additional fish will occur for the next several years. Monitoring will be conducted at each of these sites to determine if populations ultimately become established at these new locations.

Loach minnow is now common only in Aravaipa Creek, the Blue River, and limited portions of the San Francisco, upper Gila, and Tularosa rivers in New Mexico. Since listing, loach minnow have been found in small tributary

streams, including Pace, Frieborn, Negrito, Turkey, and Deer creeks (Stefferud and Reinthal 2005, pp. 16–21; Paroz and Propst 2007, p. 16; NMDGF 2008). In addition, two previously undocumented populations of loach minnow have been discovered, one in Eagle Creek (Knowles 1994, p. 1; Marsh *et al.* 2003, p. 666) and one in the North Fork East Fork Black River (Bagley *et al.* 1997, p. 8). However, following a wildfire in the Black River watershed, a salvage rescue operation in the area known to be occupied by the loach minnow in 2004 resulted in the capture of only two loach minnow (S. Gurtin, AGFD, pers. comm. 2004). Both of these newly identified populations appear to be very small, but each represents a remnant portion of the historical range that was thought to be extirpated. Little information is available on the White River population due to the proprietary nature of Tribal survey information. Historical and current records for loach minnow are summarized in three databases (ASU 2002, AGFD 2004, NMDGF 2008), which are referenced throughout this document.

Previous Federal Actions

The spikedace was listed as threatened on July 1, 1986 (51 FR 23769); the loach minnow was listed as threatened on October 28, 1986 (51 FR 39468). The Service received a petition to uplist these species from threatened to endangered status on September 22, 1993. On July 11, 1994, we published 90-day and 12-month findings on the petition to amend the List of Threatened and Endangered Wildlife (59 FR 35303). We found that the petitioners presented substantial scientific information indicating that reclassifying spikedace and loach minnow as endangered was warranted but precluded by other listing actions (59 FR 35303). We restated this conclusion on January 8, 2001 (66 FR 1295), and considered the reclassification of spikedace and loach minnow each year in our Candidate Notice of Review. Our most recent Candidate Notice of Review was published on November 9, 2009 (74 FR 57804).

We designated critical habitat for both species on March 8, 1994 (59 FR 10898 (loach minnow); 59 FR 10906 (spikedace)). Those critical habitat designations were set aside by court order in *Catron County Board of Commissioners, New Mexico* v. *U.S. Fish and Wildlife Service,* CIV No. 93–730 HB (D.N.M. 1994) due to our failure to analyze the effects of critical habitat designation under the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq.*).

We subsequently published a proposed critical habitat designation on December 10, 1999 (64 FR 69324), and a final critical habitat designation on April 25, 2000 (65 FR 24328). However, in *New Mexico Cattle Growers' Association and Coalition of Arizona/New Mexico Counties for Stable Economic Growth* v. *United States Fish and Wildlife Service,* CIV 02–0199 JB/LCS (D.N.M), the plaintiffs challenged the April 25, 2000, critical habitat designation for the spikedace and loach minnow because the economic analysis had been prepared using the same methods that the Tenth Circuit had held to be invalid. The Service agreed to a voluntary vacatur of the critical habitat designation, except for the Tonto Creek Complex. On August 31, 2004, the United States District Court for the District of New Mexico set aside the April 25, 2000, critical habitat designation in its entirety and remanded it to the Service for preparation of a new proposed and final designation.

On December 20, 2005, we published a proposed critical habitat designation (70 FR 75546), and on March 21, 2007, we published a final critical habitat designation (72 FR 13356) for the spikedace and loach minnow. In *Coalition of Arizona/New Mexico Counties for Stable Economic Growth, et al* . v. *Salazar, et al.* (D.N.M.), two sets of plaintiffs challenged the Service's critical habitat designation for the spikedace and the loach minnow on the grounds that we designated critical habitat without adequate delineation or justification. We filed a motion for voluntary remand of the final rule on February 2, 2009, in order to reconsider the final rule in light of a recently issued Department of the Interior Solicitor's Opinion, which discusses the Secretary of the Interior's authority to exclude areas from a critical habitat designation under section 4(b)(2) of the ESA. On May 4, 2009, the Court granted our motion for voluntary remand.

There are differences in the areas included in this proposed designation from those included in the critical habitat designations published in 1994, 2000, and 2007. We have gained new information on species' distribution since the 1994 designation. We have acknowledged the flaws in the 2007 designation through our voluntary vacatur. This proposal is most similar to the 2000 designation. However, in contrast to the 2000 designation, we have not included every complex for spikedace and for loach minnow. Instead, we have attempted to consider occupancy data and habitat parameters specific to each species, and identified some areas that are suitable for one or the other species, but not both. While there is still considerable overlap in the designation, so that most areas are designated for both species, we have included some areas only for spikedace or only for loach minnow within this proposed designation.

For more information on previous Federal actions concerning the spikedace and loach minnow, refer to previous publications, including listing documents published in 1985 and 1986 (50 FR 25380, June 18, 1985; 50 FR 25390, June 18, 1985; 51 FR 39468, October 28, 1986; 51 FR 23769, July 1, 1986), as well as previous critical habitat designations in 1994 (59 FR 10898, March 8, 1994; 59 FR 10906, March 8, 1994), 1999 and 2000 (64 FR 69324, December 10, 1999; 65 FR 24328, April 25, 2000), and 2005 and 2007 (70 FR 75546, December 20, 2005; 72 FR 13356, March 21, 2007).

Summary of Factors Affecting the Species

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. Both spikedace and loach minnow currently exist in a small portion of their historical range (10 percent, or less, for spikedace, and 15 to 20 percent for loach minnow), and the threats continue throughout its range. Accordingly, our assessment and determination applies to each species throughout its entire range.

Section 4 of the Act (16 U.S.C. 1533), and implementing regulations (50 CFR part 424), set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be endangered or threatened based on any of the following five factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; or (5) other natural or manmade factors affecting its continued existence. In making this finding, information pertaining to spikedace and loach minnow, in relation to the five factors provided in section 4(a)(1) of the Act, are discussed below.

In considering what factors might constitute threats to a species, we must look beyond the exposure of the species to a factor to evaluate whether the species may respond to the factor in a way that causes actual impacts to the species. If there is exposure to a factor

and the species responds negatively, the factor may be a threat and we attempt to determine how significant a threat it is. The threat is significant if it drives, or contributes to, the risk of extinction of the species such that the species warrants listing as endangered or threatened as those terms are defined in the Act.

A. The Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

The majority of historical native habitat for spikedace and loach minnow has been altered or destroyed. Activities such as groundwater pumping, surface water diversions, impoundments, dams, channelization (straightening of the natural watercourse, typically for flood control purposes), improperly managed livestock grazing, wildfire, agriculture, mining, road building, residential development, and recreation all contribute to habitat loss and stream habitat degradation in Arizona and New Mexico (Minckley and Deacon 1991, pp. 15–18; Tellman *et al.* 1997, pp. 1, 4; Propst 1999, pp. 14–15; Minckley and Marsh 2009, pp. 24–48).

The aforementioned activities are human-caused; thus the local and regional effects of most of these activities are expected to increase with an increasing local human population. As of 2005, Arizona was recognized as the second fastest in Statewide population growth in the nation. The population of the State of Arizona is projected to grow by 66 percent by the year 2030, while the population in New Mexico is expected to grow by 33 percent (Southwest Climate Change 2009, p. 1). Arizona experienced a 28.6 percent population growth from 2000 to 2009, while New Mexico experienced growth at 10.5 percent during the same period (U.S. Census Bureau 2010, pp. 1, 3). An example of this population growth is on the Verde River (Yavapai County, Arizona), which likely includes a remnant spikedace population, and is important recovery habitat for spikedace and loach minnow. Yavapai County experienced a 28.8 percent increase in human population between 2000 and 2009. Groundwater use for municipal, industrial, and agricultural purposes has continued to increase since 1971 (Arizona Water Atlas 2010, p. 292) which increases the competition for the limited water resources used by spikedace and loach minnow.

Portions of some rivers receive protection as specially designated areas. In the upper Gila River, spikedace and loach minnow habitat receives some protection along the portions of the river that flow through the U.S. Forest Service Gila Wilderness and the Gila River Research Natural Area, which have use and access restrictions. Some portions of the river in the Gila National Forest are still affected by past and present uses within the watershed and riparian zone, such as grazing, timber harvest, and road development, and by water diversion for public and private uses. Other areas designated for special uses and subject to access and use restrictions include the Blue Range Primitive Area, the lower Gila River Bird Habitat Management Area, and the Gila River Research Natural Area.

Water Withdrawals

Water resources are limited in the Southwestern United States and have led to the conversion of portions of habitat to intermittent streams or reservoirs unsuitable for spikedace or loach minnow. Growing water demands reduce southern Arizona perennial surface water in the Gila Basin, and threaten aquatic species. Historically, water withdrawals led to the conversion of large portions of flowing streams into intermittent streams, large reservoirs, or dewatered channels, thus eliminating suitable spikedace and loach minnow habitat in impacted areas (Propst *et al.* 1986, p. 3; Tellman *et al.* 1997, pp. 37, 50, 63–64, 66, 103). These habitat changes, together with the introduction of nonnative fish species (see factors C and E), have resulted in the extirpation of spikedace and loach minnow throughout an estimated 80 to 90 percent of their historical ranges.

After leaving the Mogollon Mountains in New Mexico, the Gila River is affected by agricultural and industrial water diversions, impoundment, and channelization. In the Gila River, agricultural diversions and groundwater pumping have caused declines in the water table, and surface flows in the central portion of the river basin are diverted for agriculture (Leopold 1997, pp. 63–64; Tellman *et al.* 1997, pp. 101–104; Arizona Department of Water Resources 2000, pp. 16–17). On the mainstem Salt River, impoundments have permanently limited the flow regime and suitability for spikedace or loach minnow.

Of particular concern to spikedace and loach minnow survival in the Gila River is the implementation of Public Law 108–451, the Arizona Water Settlements Act. Title II of the Arizona Water Settlements Act would facilitate the exchange of Central Arizona Project water within and between southwestern river basins in Arizona and New Mexico. The Arizona Water Settlements Act may also result in the construction of new water development projects. For example, Section 212 of the Arizona Water Settlements Act pertains to the New Mexico Unit of the Central Arizona Project. Development of the New Mexico Unit may facilitate diversion of water via the construction of an on- or off-stream reservoir on the Gila River in New Mexico. Implementation of the Arizona Water Settlement Act is in its early stages on the Gila River, such that the exact location, scope, scale, timing, and effects of those efforts on the spikedace and its habitat in the Gila River cannot be definitively analyzed at present. However, should water be diverted from the river, there would be a diminished flow that could potentially result in direct and indirect loss and degradation of habitat for aquatic and riparian species. Because the Gila River is a stronghold for spikedace and loach minnow, impacts to those portions of the Gila River in New Mexico are of particular concern for the persistence of these species.

The San Francisco River has undergone sedimentation, riparian habitat degradation, and extensive water diversion and at present has an undependable water supply throughout much of its length. Groundwater pumping also poses a threat to surface flows in the remaining spikedace and loach minnow habitat in Eagle Creek. Groundwater withdrawal in Eagle Creek, primarily for water supply for a large open-pit copper mine at Morenci, dries portions of the stream (Sublette *et al.* 1990, p. 19; Service 2005; Propst *et al.* 1986, p. 7). Mining is the largest industrial water user in southeastern Arizona. The Morenci mine on Eagle Creek is North America's largest producer of copper, covering 60,000 acres. Water for the mine is imported from the Black River, diverted from Eagle Creek as surface flows, or withdrawn from the Upper Eagle Creek Well Field (Arizona Department of Water Resources 2009, p. 1).

Aravaipa Creek is relatively protected from further habitat loss because it is within a Bureau of Land Management (BLM) Wilderness and is a Nature Conservancy preserve. However, Aravaipa Creek is affected by upstream uses in the watershed, primarily groundwater pumping for irrigation. Irrigation can reduce creek flows, as crop irrigation uses large amounts of water, especially during the summer months when the creek flows are already at their lowest. Increased groundwater pumping from wells is known to be linked to reduced creek flows (Fuller 2000, pp. 4–8).

Water depletion is also a concern for the Verde River. In 2000, the Arizona Department of Water Resources (2000,

p. 1–1) reported that the populations of major cities and towns within the Verde River watershed had more than doubled in the last 20 years, resulting in more than a 39 percent increase in municipal water usage. The Arizona Department of Water Resources (2000, p. 1–1) anticipated that human populations in the Verde River watershed are expected to double again before 2040, resulting in more than a 400 percent increase over the 2000 water usage. The middle and lower Verde River has limited or no flow during portions of the year due to agricultural diversion and upstream impoundments, and has several impoundments in its middle reaches, which could expand the area of impacted spikedace and loach minnow habitat. The Little Chino basin within the Verde River watershed has already experienced significant groundwater declines that have reduced flow in Del Rio Springs (Arizona Department of Water Resources 2000, pp. 1–1, 1–2). Blasch *et al.* (2006, p. 2) suggests that groundwater storage in the Verde River watershed has already declined due to groundwater pumping and reductions in natural channel recharge resulting from streamflow diversions.

Also impacting water in the Verde River, the City of Prescott, Arizona, experienced a 22 percent increase in population between 2000 and 2005 (U.S. Census Bureau 2010b, p. 1), averaging around 4 percent growth per year (City of Prescott 2010, p. 1). In addition, the towns of Prescott Valley and Chino Valley experienced growth rates of 66 and 67 percent, respectively (Arizona Department of Commerce 2009a, p. 1; 2009b, p. 1). This growth is facilitated by groundwater pumping in the Verde River basin. In 2004, the cities of Prescott and Prescott Valley purchased a ranch in the Big Chino basin in the headwaters of the Verde River, with the intent of drilling new wells to supply up to approximately 4,000 acre-feet (AF) of groundwater per year. If such drilling occurs, it could have serious adverse effects on the mainstem and tributaries of the Verde River. Scientific studies have shown a link between the Big Chino aquifer and spring flows that form the headwaters of the Verde River. It is estimated that 80 to 86 percent of baseflow in the upper Verde River comes from the Big Chino aquifer (Wirt 2005, p. G8). However, while these withdrawals could potentially dewater the upper 42 kilometers (km) (26 miles (mi)) of the Verde River (Wirt and Hjalmarson 2000, p. 4), it is uncertain that this project will occur given the legal and administrative challenges it faces. This upper portion of the Verde River is considered currently occupied by spikedace, and barrier construction and stream renovation plans are underway with the intention of using this historically occupied area for recovery of native fishes including loach minnow. Reductions of available water within this reach could preclude its use for recovery purposes. This area is currently considered occupied by spikedace, that are considered genetically (Tibbets 1993, pp. 25–29) and morphologically (Anderson and Hendrickson 1994, pp. 148, 150–154) distinct from all other spikedace populations.

There are numerous surface water diversions in spikedace and loach minnow habitats, including the Verde River, Blue River, San Francisco River, Gila River, and Eagle Creek. Larger dams may prevent movement of fish between populations and dramatically alter the flow regime of streams through the impoundment of water (Ligon *et al.* 1995, pp. 184–189). These diversions also require periodic maintenance and re-construction, resulting in potential habitat damages and inputs of sediment into the active stream.

Water withdrawals have occurred historically, and continue to occur, throughout the ranges of spikedace and loach minnow. Groundwater pumping and surface diversions used for agricultural, industrial, and municipal purposes can lead to declines in the water table and dewatering of active stream channels. Ongoing water withdrawals are known to occur on the Gila, San Francisco, and Verde rivers, and are occurring at limited levels, with the potential for increased withdrawal, on Aravaipa Creek.

Stream Channelization

Sections of many Gila Basin rivers and streams have been, and continue to be, channelized for flood control, which disrupts natural channel dynamics (sediment scouring and deposition) and promotes the loss of riparian plant communities. Channelization changes the stream gradient above and below the channelization. Water velocity increases in the channelized section, which results in increased rates of erosion of the stream and its tributaries, accompanied by gradual deposits of sediment in downstream reaches that may increase the risk of flooding (Emerson 1971, p. 326; Simpson 1982, p. 122). Channelization can affect spikedace and loach minnow habitat by reducing its complexity, eliminating cover, reducing nutrient input, improving habitat for nonnative species, changing sediment transport, altering substrate size, increasing flow velocities, and reducing the length of the stream (and therefore the amount of aquatic habitat available) (Gorman and Karr 1978, pp. 512–513; Simpson 1982, p. 122; Schmetterling *et al.* 2001, pp. 7–10). Historical and ongoing channelization will continue to contribute to riparian and aquatic habitat decline most notably eliminating cover and reducing nutrient input.

Water Quality

In the past, the threat from water pollution was due primarily to catastrophic pollution events (Rathbun 1969, pp. 1–5; Eberhardt 1981, pp. 3–6, 8–10) or chronic leakage (Eberhardt 1981, pp. 2, 16) from large mining operations. Although this is not as large a problem today as it was historically, some damage to spikedace and loach minnow populations still occurs from occasional spills or chronic inability to meet water quality standards (*United States* v. *ASARCO,* No. 98–0137 PHX–ROS (D. Ariz. June 2, 1998)). Mine tailings from a number of past and present facilities throughout the Gila Basin would threaten spikedace populations if catastrophic spills occur (Arizona Department of Health Services 2010, p. 3). Spills or discharges have occurred in the Gila River and affected streams within the watersheds of spikedace and loach minnow, including the Gila River, San Francisco River, San Pedro River, and some of their tributaries (Environmental Protection Agency 1997, pp. 24–67; Arizona Department of Environmental Quality 2000, p. 6; Church *et al.* 2005, p. 40; Arizona Department of Environmental Quality 2007, p. 1).

In January of 2006, the Arizona Department of Environmental Quality announced that it had been conducting a remedial investigation at the Klondyke Tailings site on Aravaipa Creek, which currently supports one of the two remaining populations where spikedace and loach minnow are considered common. The Klondyke tailings site was a mill that processed ore to recover lead, zinc, copper, silver, and gold between the 1920s and the 1970s. There are eight contaminants in the tailings and soil at the Klondyke tailings site that are at levels above regulatory limits. These contaminants include antimony, arsenic, beryllium, cadmium, copper, lead, manganese, and zinc. Samples of shallow groundwater collected at the site contained arsenic, beryllium, cadmium, chromium, lead, and nickel above regulatory limits (Arizona Department of Environmental Quality 2006, p. 2). A preliminary study in Aravaipa Creek has found high levels of

lead in two other native fish species, Sonora sucker (*Catostomus insignis*) and roundtail chub (*Gila robusta*), as well as in the sediment and in some of the invertebrates. These lead levels are high enough that they could negatively impact reproduction (P. Reinthal, University of Arizona pers. comm. 2010). We do not know with certainty whether these levels of lead would affect spikedace or loach minnow, but we assume the same negative effects would occur.

Pollution is increasingly more widespread and more often from non-point sources. Urban and suburban development is one source of non-point pollution. Increasing the area subject to runoff from roads, golf courses, and other sources of petroleum products, pesticides, and other toxic materials, can cause changes in fish communities (Wang *et al.* 1997, pp. 6, 9, 11). Nutrient and sediment loads are increasing in urban areas (King *et al.* 1997, pp. 7–24, 38, 39) and, combined with depleted stream flows, can be serious threats to aquatic ecosystem during some periods of the year. Bridges and roads increase with increasing rural and urban populations in Arizona (Arizona Department of Transportation 2000, pp. 1–3), and pose significant risks to the fish from increases in toxic materials along roadways (Trombulak and Frissall 2000, pp. 22–24). As noted previously, human populations within the ranges of spikedace and loach minnow are expected to increase over the next 20 years. Therefore, we expect a corresponding increase in non-point source pollution.

Based on historical records and long-term tree-ring records, wildfires have increased in the ponderosa pine forests of the Southwest, including the range of the spikedace and loach minnow (Swetnam and Betancourt 1990, pp. 1017, 1019; Swetnam and Betancourt 1998, pp. 3131–3135). This is due to a combination of decades of fire suppression, increases in biomass due to increased precipitation after 1976, and warming temperatures coupled with recent drought conditions (University of Arizona 2006, pp. 1, 3). As wildfires increase, so does the use of fire retardant chemical applications. Some fire retardant chemicals are ammonia-based, which is toxic to aquatic wildlife; however, many formulations also contain yellow prussiate of soda (sodium ferrocyanide), which is added as an anticorrosive agent. Such formulations are toxic for fish, aquatic invertebrates, and algae (Angeler *et al.* 2006, pp. 171–172; Calfee and Little 2003, pp. 1527–1530; Little and Calfee 2002, p. 5; Buhl and Hamilton 1998, p. 1598; Hamilton *et al.* 1998, p. 3; Gaikwokski *et al.* 1996, pp. 1372–1373). Toxicity of these formulations is enhanced by sunlight (Calfee and Little 2003, pp. 1529–1533). In a 2008 biological opinion issued by the U.S. Fish and Wildlife Service to the Forest Service on the nationwide use of fire retardants, the U.S. Fish and Wildlife Service concluded that the use of fire retardants can cause mortality to fish by exposing them to ammonia. We concluded in the opinion that the proposed action, which included the application of fire retardants throughout the range of the species, was likely to jeopardize the continued existence of the spikedace and loach minnow (Service 2008a).

Severe wildfires capable of extirpating or decimating fish populations are a relatively recent phenomenon, and result from the cumulative effects of historical or ongoing grazing (removes the fine fuels needed to carry fire) and fire suppression (Madany and West 1983, pp. 665–667; Savage and Swetnam 1990, p. 2374; Swetnam 1990, p. 12; Touchan *et al.* 1995, pp. 268–271; Swetnam and Baisan 1996, p. 29; Belsky and Blumenthal 1997, pp. 315–316, 324–325; Gresswell 1999, pp. 193–194, 213). Historical wildfires were primarily cool-burning understory fires with return intervals of 4 to 8 years in ponderosa pine (Swetnam and Dieterich 1985, pp. 390, 395). Cooper (1960, p. 137) concluded that prior to the 1950s, crown fires were extremely rare or nonexistent in the region. However, since 1989, high-severity wild fires, and subsequent floods and ash flows, have caused the extirpation of several populations of Gila trout in the Gila National Forest, New Mexico (Propst *et al.* 1992, pp. 119–120, 123; Brown *et al.* 2001, pp. 140–141). It is not known if spikedace or loach minnow have suffered local extirpations; however, native fishes, including spikedace and loach minnow, in the West Fork Gila River, showed 60 to 80 percent decreases in population following the Cub Fire in 2002, due to flooding events after the fire (Rinne and Carter 2008, pp. 171). Increased fines and ash may be continuing to affect the populations on the West Fork Gila, near the Gila Cliff Dwellings (D. Propst. NMDGF, pers. comm. 2004).

Effects of fire may be direct and immediate or indirect and sustained over time. Because spikedace and loach minnow are found primarily in the lower elevation, higher-order streams, they are most likely affected by the indirect effects of fire (*e.g.,* ash flows), not direct effects (*e.g.,* drastic changes in pH, ammonium concentrations). Indirect effects of fire include ash and debris flows, increases in water temperature, increased nutrient inputs, and sedimentation (Propst *et al.* 1992, pp. 119–120; Gresswell 1999, pp. 194–211; Rinne and Carter 2008, pp. 169–171). Of these, ash flows probably have the greatest effect on spikedace and loach minnow. Ash and debris flows may occur months after fires, when barren soils are eroded during monsoonal rain storms (Bozek and Young 1994, pp. 92–94). Ash and fine particulate matter created by fire can fill the interstitial spaces between gravel particles, eliminating spawning habitat or, depending on the timing, suffocating eggs that are in the gravel. Ash and debris flows can also decimate aquatic invertebrate populations that the fish depend on for food (Molles 1985, p. 281).

Recreation

The impacts to spikedace and loach minnow from recreation can include movement of livestock along streambanks, trampling, loss of vegetation, and increased danger of fire (Northern Arizona University 2005, p. 136; Monz *et al.* 2010, pp. 553–554). In the arid Gila River Basin, recreational impacts are disproportionately distributed along streams as a primary focus for recreation (Briggs 1996, p. 36). Within the range of spikedace and loach minnow, the majority of the occupied areas occur on Federal lands, which are managed for recreation and other purposes. Spikedace and loach minnow are experiencing increasing habitat impacts from such use in some areas. For example, Fossil Creek experienced an increase in trail use at one site, with an estimated 8,606 hikers using the trail in 1998, and an estimated 19,650 hikers using the trail in 2003. Dispersed camping also occurs in the area. The greatest impacts from camping were vegetation loss and litter (Northern Arizona University 2005, pp. 134–136). Similar impacts have been observed at Aravaipa Creek. Vegetation loss is often accompanied by soil compaction, which when combined with vegetation loss, can result in increased runoff and sedimentation in waterways (Monz *et al.* 2010, pp. 551–553; Andereck 1993, p. 2).

Roads and Bridges

Roads impact Gila River Basin streams (Dobyns 1981, pp. 120–129, 167, 198–201), including spikedace, loach minnow, and their habitats (Jones *et al.* 2000, pp. 82–83). The need for bridges and roads increases with increasing rural and urban populations in Arizona (Arizona Department of

Transportation 2000, pp. 1–3). In addition, existing roads and bridges have ongoing maintenance requirements that result in alterations of stream channels within spikedace and loach minnow habitats (Service 1994a, pp. 8–12; Service 1995a, pp. 10–12; Service 1995b, pp. 5–7; Service 1997a, pp. 10–15; Service 1997b, pp. 54–77). Bridge construction or repair causes channel alteration and, if not carefully executed, can result in long-term channel adjustments, altering habitats upstream and downstream. In some areas, low-water ford crossings exist within occupied spikedace and loach minnow habitats and cause channel modification and habitat disruption. Low-water crossings on general-use roads exist in a number of areas that may support spikedace and loach minnow. These crossings frequently require maintenance following minor flooding.

Repeated road repairs near the Gila Cliff Dwellings on the West Fork Gila River have occurred because the bridge span is too short to accommodate peak flows. This is a common problem on bridges that cross the Gila River, and on other rivers occupied by spikedace and loach minnow in the Southwest. In an attempt to protect bridges, large amounts of fill (such as boulders, rip rap, and dirt) are used to confine and redirect the river. Typically, this habitat alteration is detrimental to spikedace and loach minnow because it changes the channel gradient and substrate composition, and reduces habitat availability. Eventually, peak flows remove the fill material, roads and bridges are damaged, and the resulting repairs and reconstruction lead to additional habitat disturbance (Service 1998, 2002, 2005, 2008b, 2008c, 2009, 2010a).

Livestock Grazing

Livestock grazing has been one of the most widespread and long-term adverse impacts to native fishes and their habitat (Miller 1961, pp. 394–395, 399), but is one of the few threats where adverse effects to species such as spikedace and loach minnow are decreasing, due to improved management on Federal lands (Service 1997c, pp. 121–129, 137–141; Service 2001, pp. 50–67). This improvement occurred primarily by discontinuing grazing in the riparian and stream corridors. However, although adverse effects are less than in the past, livestock grazing within watersheds where spikedace and loach minnow and their habitats are located continues to cause adverse effects. These adverse effects occur through watershed alteration and subsequent changes in the natural flow regime, sediment production, and stream channel morphology (Platts 1990, pp. I–9—I–11; Belsky *et al.* 1999, pp. 1–3, 8–10; Service 2001, pp. 50–67).

Livestock grazing can destabilize stream channels and disturb riparian ecosystem functions (Platts 1990, pp. I–9—I–11; Armour *et al.* 1991, pp. 7–10; Tellman *et al.* 1997, pp. 20–21, 33, 47, 101–102). Improper livestock grazing can negatively affect spikedace and loach minnow through removal of riparian vegetation (Propst *et al.* 1986, p. 3; Clary and Webster 1989, p. 1; Clary and Medin 1990, p. 1; Schulz and Leininger 1990, p. 295; Fleishner 1994, pp. 631–633, 635–636), which can result in reduced bank stability and higher water temperatures (Kauffman and Krueger 1984, pp. 432–434; Platts and Nelson 1989, pp. 453, 455; Fleishner 1994, pp. 635–636; Belsky *et al.* 1999, pp. 2–5, 9–10). Livestock grazing can also cause increased sediment in the stream channel, due to streambank trampling and riparian vegetation loss (Weltz and Wood 1986, pp. 364–368; Pearce *et al.* 1998, pp. 302, 307; Belsky *et al.* 1999, p. 10). Livestock can physically alter the streambank through trampling and shearing, leading to bank erosion (Trimble and Mendel 1995, pp. 243–244; Belsky *et al.* 1999, p. 1). In combination, loss of riparian vegetation and bank erosion can alter channel morphology, including increased erosion and deposition, increased sediment loads, downcutting, and an increased width-to-depth ratio, all of which lead to a loss of spikedace and loach minnow habitat components. Livestock grazing management also continues to include construction and maintenance of open stock tanks, which are often stocked with nonnative aquatic species harmful to spikedace and loach minnow (Service 1997b, pp. 54–77) if they escape or are transported to waters where these native fish occur.

Summary of Factor A

Impacts associated with roads and bridges, changes in water quality, and recreation have altered or destroyed many of the rivers, streams, and watershed functions in the ranges of the spikedace and loach minnow. As discussed above, activities such as groundwater pumping, surface water diversions, impoundments, dams, channelization, improperly managed livestock grazing, wildfire, agriculture, mining, road building, residential development, and recreation all contribute to riparian habitat loss and degradation of aquatic resources in Arizona and New Mexico. Changes in flow regimes are expected to continue into the foreseeable future. Therefore, we find that the spikedace and loach minnow are threatened by the destruction, modification, or curtailment of their habitats.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Currently, collection of spikedace and loach minnow in Arizona is prohibited by Arizona Game and Fish Commission Order 40, except where such collection is authorized by special permit (AGFD 2009, p. 5). The collection of these species is prohibited in the State of New Mexico except by special scientific permit (NMDGF 2010, p. 4). Because spikedace and loach minnow do not grow larger than 80 mm (3 in), we believe that angling for this species is not a threat. No known commercial uses exist for spikedace or loach minnow. A limited amount of scientific collection occurs, but does not pose a threat to these species because it is regulated by the States. Therefore, we have determined that overutilization for commercial, recreational, scientific, or educational purposes is not a threat to spikedace or loach minnow.

C. Disease or Predation

The introduction and spread of nonnative species has been identified as one of the primary factors in the continuing decline of native fishes throughout North America and particularly in the Southwest (Miller 1961, pp. 365, 397–398; Lachner *et al.* 1970, p. 21; Ono *et al.* 1983, pp. 90–91; Carlson and Muth 1989, pp. 222, 234; Fuller *et al.* 1999, p. 1). Miller *et al.* (1989, pp. 22, 34, 36) concluded that introduced nonnative species were a causal factor in 68 percent of fish extinctions in North America in the last 100 years. For the 70 percent of fish species that are still extant, but are considered to be endangered or threatened, introduced nonnative species are a primary cause of the decline (Lassuy 1995, pp. 391–394). Release or dispersal of new nonnative aquatic organisms is a continuing phenomenon in the species' range (Rosen *et al.* 1995, p. 254). Currently, all native fishes in Arizona and 80 percent of native fishes in the Southwest are on either State or Federal protection lists.

Nonnative fish introductions in the Southwestern United States began before 1900, and have steadily increased in frequency (Rinne and Stefferud 1996b, p. 29). New species are continually being introduced through various mechanisms, including aquaculture, aquarium trade, sport fish stocking, live bait use, interbasin water

transfers, and general "bait bucket transport," where people move fish from one area to another without authorization and for a variety of purposes (Service 1994b, pp. 12–16; Service 1999, pp. 24–59). Nearly 100 kinds of nonnative fishes have been stocked or introduced into streams in the Southwest (Minckley and Marsh 2009, p. 51). Nonnative fishes known to occur within the historical range of the spikedace include channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), red shiner (*Cyprinella lutrensis*), fathead minnow (*Pimephales promelas*), green sunfish (*Lepomis cyanellus*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), rainbow trout (*Oncorhynchus mykiss*), mosquitofish (*Gambusia affinis*), carp (*Cyprinus carpio*), bluegill (*Lepomis macrochiris*), yellow bullhead (*Ameiurus natalis*), black bullhead (*Ameiurus melas*), and goldfish (*Carassius auratus*) (ASU 2002).

In the Gila River basin, introduction of nonnative species is considered a primary factor in the decline of native fish species (Minckley 1985, pp. 1, 68; Williams *et al.* 1985, pp. 1–2; Minckley and Deacon 1991, pp. 15–17; Douglas *et al.* 1994, pp. 9–11; Clarkson *et al.* 2005 p. 20; Olden and Poff 2005, pp. 79–87). Aquatic and semi-aquatic mammals, reptiles, amphibians, crustaceans, mollusks (snails and clams), parasites, disease organisms, and aquatic and riparian vascular plants outside of their historical range, have all been documented to adversely affect aquatic ecosystems (Cohen and Carlton 1995, pp. i–iv). The effects of nonnative fish competition on spikedace and loach minnow can be classified as either interference or exploitive. Interference competition occurs when individuals directly affect others, such as by fighting, producing toxins, or preying upon them (Schoener 1983, p. 257). Exploitive competition occurs when individuals affect others indirectly, such as through use of common resources (Douglas *et al.* 1994, p. 14). Interference competition in the form of predation is discussed here, while a discussion of the history of nonnative species introductions and resulting interference competition for resources are discussed under Factor E below.

Predation

Nonnative channel catfish, flathead catfish, and smallmouth bass all prey on spikedace and loach minnow, as indicated by prey remains of native fishes in the stomachs of these species (Propst *et al.* 1986, p. 82; Propst *et al.* 1988, p. 64; Bonar *et al.* 2004, pp. 13, 16–21). Channel catfish move into riffles to feed, preying on the same animals most important to loach minnows, while juvenile flathead catfish prey on loach minnows (Service 1991a, p. 5). Smallmouth bass are known to co-occur with spikedace and are documented predators of the species (Service 1991b, p. 6). Green sunfish are also thought to be a predator, likely responsible for replacement of native species like spikedace and loach minnow. While no direct studies have been completed on predation by green sunfish on spikedace or loach minnow, they are a known predator of fish that size, and they occur within areas occupied by these species.

Declines of native fish species appear linked to increases in nonnative fish species. For example, in 1949, 52 spikedace were collected at Red Rock on the Gila River, while channel catfish composed only 1.65 percent of the 607 fish collected. However, in 1977, only six spikedace were located at the same site, and the percentage of channel catfish had risen to 14.5 percent of 169 fish collected. The decline of spikedace and the increase of channel catfish is likely related (Anderson 1978, pp. 2, 13, 50–51). Similarly, interactions between native and nonnative fishes were observed in the upper reaches of the East Fork of the Gila River. Prior to the 1983 and 1984 floods in the Gila River system, native fish were limited, with spikedace being rare or absent, while nonnative channel catfish and smallmouth bass were moderately common. After the 1983 flooding, adult nonnative predators were generally absent, and spikedace were collected in moderate numbers in 1985 (Propst *et al.* 1986, p. 83).

The majority of areas considered occupied by spikedace and loach minnow have seen a shift from a predominance of native fishes to a predominance of nonnative fishes. For spikedace, this is best demonstrated on the upper Verde River, where native species dominated the total fish community at greater than 80 percent from 1994 to 1996, before dropping to approximately 20 percent in 1997 and 19 percent in 2001. At the same time, three nonnative species increased in abundance between 1994 and 2000 (Rinne *et al.* 2004, pp. 1–2). Similar changes in the dominance of nonnative fishes have occurred on the Middle Fork Gila River, with a 65 percent decline of native fishes between 1988 and 2001 (Propst 2002, pp. 21–25).

In other areas, nonnative fishes may not dominate the system, but their abundance has increased, while spikedace and loach minnow abundance has declined. This is the case for the Cliff-Gila Valley area of the Gila River, where nonnative fishes increased from 1.1 percent to 8.5 percent, while native fishes declined steadily over a 40-year period (Propst *et al.* 1986, pp. 27–32). At the Redrock and Virden valleys on the Gila River, the relative abundance in nonnative fishes in the same time period increased from 2.4 percent to 17.9 percent (Propst *et al.* 1986, pp. 32–34). Four years later, the relative of abundance of nonnative fishes increased to 54.7 percent at these sites (Propst *et al.* 1986, pp. 32–36). The percentage of nonnative fishes increased by almost 12 percent on the Tularosa River between 1988 and 2003, while on the East Fork Gila River, nonnative fishes increased to 80.5 percent relative abundance in 2003 (Propst 2005, pp. 6–7, 23–24). Nonnative fishes are also considered a management issue in other areas including Eagle Creek, the San Pedro River, West Fork Gila River, and to a lesser extent on the Blue River and Aravaipa Creek.

Generally, when the species composition of a community shifts in favor of nonnative fishes, a decline in spikedace or loach minnow abundance occurs (Olden and Poff 2005, pp. 79–86). Propst *et al.* (1986, p. 38) noted this during studies of the Gila River between 1960 and 1980. While native species, including spikedace, dominated the study area initially, red shiner, fathead minnow, and channel catfish were more prevalent following 1980. Propst *et al.* (1986, pp. 83–86) noted that drought and diversions for irrigation first brought a decline in habitat quality, followed by the establishment of nonnative fishes in remaining suitable areas, thus reducing the availability and utility of these areas for native species. It should be noted that the effects of nonnative fishes often occur with, or are exacerbated by, changes in flow regimes or declines in habitat conditions (see Factor A above) and should be considered against the backdrop of historical habitat degradation that has occurred over time (Minckley and Meffe 1987, pp. 94, 103; Rinne 1991, p. 12).

Nonnative channel catfish, flathead catfish, and smallmouth bass are present in most spikedace habitats, including the Verde River (Minckley 1993, pp. 7–13; Jahrke and Clark 1999, pp. 2–7; Rinne 2004, pp. 1–2; Bahm and Robinson 2009, pp. 1–4; Robinson and Crowder 2009, pp. 3–5); the Gila River (Propst *et al.* 1986, pp. 14–31; Springer 1995, pp. 6–10; Jakle 1995, pp. 5–7; Propst *et al.* 2009, pp. 14–17); the San Pedro River (Jakle 1992, pp. 3–5; Minckley 1987, pp. 2, 16); the San Francisco River (Papoulias *et al.* 1989, pp. 77–80; Propst *et al.* 2009, pp. 5–6);

the Blue River (ASU 1994, multiple reports; ASU 1995, multiple reports; Clarkson *et al.* 2008, pp. 3–4); the Tularosa River, East Fork Gila River, West Fork Gila River, and Middle Fork Gila River (Propst *et al.* 2009, pp. 7–13; NMDGF 2009 *in draft,* pp. 2–14); and Eagle Creek (Marsh *et al.* 2003, p. 667; ASU 2008, multiple reports; Bahm and Robinson 2009a, pp. 2–6).

Pilger *et al.* (2010, pp. 311–312) studied the food webs in six reaches of the Gila River. Their study attempted to quantify resource overlap among native and nonnative fishes. Their study determined that nonnative fishes consumed a greater diversity of invertebrates and more fish than native species, and that nonnative fishes consumed predacious invertebrates and terrestrial invertebrates more frequently than native fishes. They found that, on average, the diets of adult nonnative fishes were comprised of 25 percent fish, but that there was high variability among species. Only 6 percent of the diet of channel catfish was fish, while fish made up 84 percent of the diet of flathead catfish. They found that both juvenile and adult nonnative species could pose a predation threat to native fishes.

As noted below under Factor E, nonnative fishes also compete for resources with native fishes. While nonnative fishes were preying on native fishes, small-bodied nonnative fishes are potentially affecting native fishes through competition (discussed further under Factor E), so that native fishes are impacted by both competition and predation. Pilger *et al.* (2010, p. 312) note that removal and preclusion of nonnative predators and competitors may be necessary for conservation of native fishes in the upper Gila River in order to mitigate the effects they have on native species. Pilger *et al.* (2010, p. 312) note that, in the upper Verde River, native fishes have declined precipitously since the mid-1990s, which may indicate that a stressor threshold has been crossed. They conclude that there are declining trends of native fish abundances in the upper Gila River, and that the coexistence of native and nonnative fishes there may indicate that the threshold has not been reached, but may be imminent.

Disease

Various parasites may affect spikedace and loach minnow. Asian tapeworm (*Bothriocephalus acheilognathi*) was introduced into the United States with imported grass carp (*Ctenopharyngodon idella*) in the early 1970s. It has since become well established in areas throughout the southwestern United States. The definitive host in the life cycle of Asian tapeworm is a cyprinid fish (carp or minnow), and therefore it is a potential threat to spikedace and loach minnow, as well as other native cyprinids in Arizona. The Asian tapeworm adversely affects fish health by impeding the digestion of food as it passes through the intestinal track. Emaciation and starvation of the host can occur when large enough numbers of worms feed off of the fish directly. An indirect effect is that weakened fish are more susceptible to infection by other pathogens. Asian tapeworm invaded the Gila River basin and was found during the Central Arizona Project's fall 1998 monitoring in the Gila River at Ashurst-Hayden Dam. It has also been confirmed from Bonita Creek in 2010 and from Fossil Creek in 2004 and 2010 (U.S. Fish and Wildlife Service National Wild Fish Health Survey 2004, 2010). This parasite can infect many species of fish and is carried into new areas along with nonnative fishes or native fishes from contaminated areas.

The parasite (*Ichthyophthirius multifiliis*) (Ich) usually occurs in deep waters with low flow and is a potential threat to spikedace and loach minnow. Ich has occurred in some Arizona streams, probably encouraged by high temperatures and crowding as a result of drought (Mpoame 1982, pp. 45–47). This parasite was observed being transmitted on the Sonora sucker (*Catostomus insignis*), although it does not appear to be host-specific and could be transmitted by other species (Mpoame 1982, p. 46). It has been found on desert and Sonoran suckers, as well as roundtail chub (Robinson *et al.* 1998, p. 603). This parasite becomes embedded under the skin and within the gill tissues of infected fish. When Ich matures, it leaves the fish, causing fluid loss, physiological stress, and sites that are susceptible to infection by other pathogens. If Ich is present in large enough numbers, it can also impact respiration because of damaged gill tissue. There are recorded spikedace mortalities in captivity due to Ich. Ich is known to be present in Aravaipa Creek (Mpoame 1982, p. 46), which is currently occupied by both spikedace and loach minnow.

Anchor worm (*Lernaea cyprinacea*), an external parasite, is unusual in that it has little host specificity, infecting a wide range of fishes and amphibians. Infection by this parasite has been known to kill large numbers of fish due to tissue damage and secondary infection of the attachment site (Hoffnagle and Cole 1999, p. 24). Presence of this parasite in the Gila River basin is a threat to spikedace, loach minnow, and other native fishes. In July 1992, the BLM found anchor worms in Bonita Creek. They have also been documented in Aravaipa Creek and the Verde River (Robinson *et al.* 1998, pp. 599, 603–605). Both spikedace and loach minnow occur in Bonita and Aravaipa Creeks.

Summary of Factor C

Both spikedace and loach minnow have been severely impacted by the presence of nonnative predators. Aquatic nonnative species have been introduced or spread into new areas through a variety of mechanisms, including intentional and accidental releases, sport stocking, aquaculture, aquarium releases, and bait-bucket release. Channel catfish, flathead catfish, and smallmouth bass appear to be the most prominent predators, although other species contribute to the decline of native fishes in the Southwest, including spikedace and loach minnow. Spikedace and loach minnow have been replaced by nonnative fishes in several Arizona streams. In addition to threats from predation, we also conclude that both spikedace and loach minnow are reasonably certain to become impacted by parasites that have been documented in the Gila River basin and that are known to adversely affect or kill fish hosts. For these reasons, we find that the spikedace and loach minnow are threatened by disease and predation.

D. The Inadequacy of Existing Regulatory Mechanisms

Because of the complex, indirect, and cumulative nature of many of the threats to spikedace and loach minnow, existing regulatory mechanisms are often inadequate to address or ameliorate the threats. Causes of the declining status of these species are a mix of many human activities and natural events, which makes it difficult to remove those threats through regulation. Spikedace is listed by New Mexico as an endangered species, while loach minnow is listed as threatened (Bison-M 2010). These designations provide the protection of the New Mexico Wildlife Conservation Act. However, the primary focus of the New Mexico Wildlife Conservation Act and other State legislation is to prevent actual destruction or harm to individuals of the species. Since most of the threats to these species come from actions that do not directly kill individuals, but indirectly result in their death from the lack of some habitat requirement or an inability to reproduce, the State protection is only

partially effective for this species. Similarly, spikedace and loach minnow are listed as species of concern by the State of Arizona. The listing under the State of Arizona law does not provide protection to the species or their habitats; however, AGFD regulations prohibit possession of these species (AGFD 2006, Appendix 10, p. 4).

As discussed above under Factor C, the introduction and spread of nonnative aquatic species is a major threat to spikedace and loach minnow. Neither the States of New Mexico and Arizona nor the Federal government has adequate regulatory mechanisms to address this issue. Programs to introduce, augment, spread, or permit such actions for nonnative sport, bait, aquarium, and aquaculture species continue. Regulation of these activities does not adequately address the spread of nonnative species, as many introductions are conducted through incidental or unregulated actions.

New Mexico water law does not include provisions for instream water rights to protect fish and wildlife and their habitat. Arizona water law does recognize such provisions; however, because this change is relatively recent, instream water rights have low priority and are often overcome by more senior diversion rights. Arizona State law also allows surface water depletion by groundwater pumping.

There are many Federal statutes that potentially afford protection to spikedace and loach minnow. A few of these are section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*), Federal Land Policy and Management Act (43 U.S.C. 1701–1782), National Forest Management Act (16 U.S.C. 1600 *et seq.*), NEPA, and the Act. However, in practice these statutes have not been able to provide sufficient protection to prevent the downward trend in the populations and habitat of spikedace and loach minnow and the upward trend in threats. Section 404 of the Clean Water Act regulates placement of fill into waters of the United States, including most of spikedace and loach minnow habitat. However, many actions highly detrimental to spikedace and loach minnow and their habitats, such as gravel mining and irrigation diversion structure construction and maintenance, are often exempted from the Clean Water Act. Other detrimental actions, such as bank stabilization and road crossings, are covered under nationwide permits that receive little or no Service review. A lack of thorough, site-specific analyses for projects can allow substantial adverse effects to spikedace, loach minnow, and their habitat.

The Federal Land Policy and Management Act and National Forest Management Act provide mechanisms for protection and enhancement of spikedace, loach minnow, and their habitat on Federal lands; however, these laws have been in effect longer than the 24 years since spikedace and loach minnow were listed. Although the Forest Service has made significant progress on some stream enhancements (Fossil Creek, Blue River), the multiple-use mission and limited staffing and resources has limited measureable on-the-ground success, and the status of these species has continued to decline.

Spikedace and loach minnow are currently listed as threatened under the Act and therefore are afforded the protections of the Act. Special rules were promulgated for spikedace and loach minnow in 1986, which prohibit taking of the species, except under certain circumstances in accordance with applicable State fish and wildlife conservation laws and regulations. Violations of the special rules are considered violations of the Act (50 CFR 17.44(p) for spikedace and 50 CFR 17.44(q) for loach minnow). As a result of the special rules for spikedace and loach minnow, the AGFD is issuing scientific collecting permits. This authority was granted at 50 CFR 17.44(p) for spikedace and 50 CFR 17.44(q) for loach minnow. This is confirmed through Arizona Commission Order 40 and New Mexico special permit (19 New Mexico Administrative Code 33.6.2).

Under section 7 of the Act, Federal agencies must insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the adverse modification or destruction of designated critical habitat. The Service promulgated regulations extending take prohibitions under section 9 for endangered species to threatened species. Prohibited actions under section 9 include, but are not limited to, take (i.e., harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in such activity). Critical habitat designation alerts the public that the areas designated as critical habitat are important for the future recovery of the species, as well as invoking the review of these areas under section 7 of the Act with regard to any possible Federal actions in that area.

Section 10 of the Act allows for the permitting of take in the course of otherwise lawful activities by private entities, and may involve habitat conservation plans which can ultimately benefit spikedace or loach minnow. The habitat conservation plan prepared by Salt River Project is expected to benefit spikedace and loach minnow in the Verde River.

Summary of Factor D

In summary, prohibitions against taking the species have been in place for decades, but these prohibitions have limited ability to address the numerous habitat impacts, particularly water diversion and the distribution and abundance of nonnative fishes, affecting spikedace and loach minnow. Therefore, we find that the spikedace and loach minnow are threatened by the inadequacy of existing regulatory mechanisms.

E. Other Natural or Manmade Factors Affecting the Species' Continued Existence

Nonnative Fishes

As described under Factor C above, nonnative fishes pose a significant threat to Gila River basin native fishes, including spikedace and loach minnow (Minckley 1985, pp. 1, 68; Williams *et al.* 1985, pp. 3, 17–20; Minckley and Deacon 1991, pp. 15–17). Competition with nonnative fish species is considered a primary threat to spikedace and loach minnow (predation by nonnative fish species is discussed under Factor C). The effects of nonnative fish species are often exacerbated by changes in flow regimes or declines in habitat conditions associated with water developments, as discussed above, and should be considered against the backdrop of historical habitat degradation that has occurred over time (Minckley and Meffe 1987, pp. 94, 103; Rinne 1991, p. 12). Stefferud and Rinne (1996b, p. 25) note that a long history of water development and diversion coupled with nonnative fish introductions has resulted in few streams in Arizona retaining their native fish communities. Using the Gila River as an example, Propst *et al.* (1988, p. 67) note that natural (e.g., drought) and human-induced (e.g., flow level reductions through irrigation diversion) factors combined to reduce loach minnow abundance in the Gila River. They note that where canyon habitat would normally continue to contain surface flows and suitable habitat for loach minnow, the establishment of nonnative fishes in canyon reaches has reduced their suitability as habitat for the minnow. Minckley and Douglas (1991, pp. 7–17) concluded that, for fishes native to the Southwest, the combination of changes in stream discharge patterns and nonnative fish

introductions have reduced the range and numbers of all native species of fish, and has led to extinction of some.

As with many fish in the West, spikedace and loach minnow lacked exposure to a wider range of species, so that they seem to lack the competitive abilities and predator defenses developed by fishes from regions where more species are present (Moyle 1986, pp. 28–31; Douglas *et al.* 1994, pp. 9–10). As a result, the native western fish fauna is significantly impacted by interactions with nonnative species. The introduction of more aggressive and competitive nonnative fish has led to significant losses of spikedace and loach minnow (Douglas *et al.* 1994, pp. 14–17).

The aquatic ecosystem of the central Gila River basin has relatively small streams with warm water and low gradients, and many of the native aquatic species are small. Therefore, the primary threat to native fishes comes from small, nonnative fish species (Deacon *et al.* 1964, pp. 385, 388). Examples of this are the impacts of mosquitofish and red shiner, which may compete with, or predate upon, native fish in the Gila River basin (Meffe 1985, pp. 173, 177–185; Douglas *et al.* 1994, pp. 1, 13–17).

Nonnative fishes known to occur within the historical range of spikedace and loach minnow in the Gila River basin include channel catfish, flathead catfish, red shiner, fathead minnow, green sunfish, largemouth bass, smallmouth bass, rainbow trout, western mosquitofish, carp, warmouth (*Lepomis gulosus*), bluegill, yellow bullhead, black bullhead, and goldfish (Miller 1961, pp. 373–394; Nico and Fuller 1999, pp. 16, 21–24; Clark 2001, p. 1; AGFD 2004, Bahm and Robinson 2009b, p. 3). Additionally, as discussed above, parasites introduced incidentally with nonnative species may jeopardize spikedace and loach minnow populations. For spikedace and loach minnow, every habitat that has not been renovated or protected by barriers has at least six nonnative fish species present, at varying levels of occupation. In addition, occupied habitats have also been invaded by nonnative crayfish (*Orconectes virilis*) (Taylor *et al.* 1996, p. 31; Carter *et al.* 2007, p. 4; Robinson and Crowder 2009, p. 3; Robinson *et al.* 2009b, p. 4). Crayfish are known to eat eggs, especially those bound to the substrate (Dorn and Mittlebach 2004, p. 2135), as is the case for spikedace and loach minnow. Additionally, crayfish cause decreases in macroinvertebrates, amphibians, and fishes (Hanson *et al.* 1990, p. 69; Lodge *et al.* 2000, p. 11). Several of the nonnative species now in spikedace and loach minnow habitats arrived there since the species were listed, such as red shiner in Aravaipa Creek (Stefferud and Reinthal 2005, p. 51) and Asian tapeworm in the middle Gila River.

Interference competition occurs with species such as red shiner. Nonnative red shiners compete with spikedace for suitable habitats, as the two species occupy essentially the same habitat types. The red shiner has an inverse distribution pattern in Arizona to spikedace (Minckley 1973, p. 138). Where the two species occur together, there is evidence of displacement of spikedace to less suitable habitats than previously occupied (Marsh *et al.* 1989, pp. 67, 107). As a result, if red shiners are present, suitable habitat for spikedace is reduced. In addition, the introduction of red shiner and the decline of spikedace have occurred simultaneously (Minckley and Deacon 1968, pp. 1427–1428; Douglas *et al.* 1994, pp. 13, 16–17). The red shiner was introduced in the mainstem Colorado River in the 1950s, spreading upstream to south-central Arizona by 1963, and by the late 1970s eastward into New Mexico. Spikedace disappeared at the same time and in the same progressively upstream direction, likely as a result of interactions with red shiner and in response to impacts of various water developments (Minckley and Deacon 1968, pp. 1427–1428; Minckley and Deacon 1991, pp. 7, 15; Douglas *et al.* 1994, pp. 13–17).

One study focused on potential impacts of red shiner on spikedace in three areas: (1) Portions of the Gila River and Aravaipa Creek having only spikedace; (2) a portion of the Verde River where spikedace and red shiner co-occurred for three decades; and (3) a portion of the Gila River where red shiner invaded areas and where spikedace have never been recorded. The study indicated that, for reaches where only spikedace were present, spikedace displayed a preference for slower currents and smaller particles in the substrate than were generally available throughout the Gila River and Aravaipa Creek systems. Where red shiner occur in the Verde River, the study showed that red shiner occupied waters that were generally slower with smaller particle sizes in the substrate than were, on average, available in the system. The study concludes that spikedace, where co-occurring with red shiner, move into currents swifter than those selected when in isolation, while red shiner occupy the slower habitat, whether alone or with spikedace (Douglas *et al.* 1994, pp. 14–16). Red shiners are known to occur in the Verde River (Minckley 1993, p. 10; Jahrke 1999, pp. 2–7; Bahm and Robinson 2009b, pp. 3–5), Aravaipa Creek (P. Reinthal, University of Arizona, pers. comm. 2008; Reinthal 2009, pp. 1–2), Blue River (ASU 2004, multiple reports; ASU 2005, multiple reports), and Gila River (Minckley 1973, pp. 136–137; Marsh *et al.* 1989, pp. 12–13; Propst *et al.* 2009, pp. 14–18).

As with spikedace, exploitive competition also appears to occur between red shiner and loach minnow. Red shiners occur in all places known to be formerly occupied by loach minnow, and are absent or rare in places where loach minnow persists. Because of this, red shiner has often been implicated in the decline of loach minnow. Loach minnow habitat is markedly different than that of red shiner, so interaction between the two species is unlikely to cause shifts in habitat use by loach minnow (Marsh *et al.* 1989, p. 39). Instead, studies indicate that red shiner move into voids left when native fishes such as loach minnow are extirpated due to habitat degradation in the area (Bestgen and Propst 1986, p. 209). Should habitat conditions improve and the habitat once again become suitable for loach minnow, the presence of red shiner may preclude occupancy of loach minnow, although the specific mechanism of this interaction is not fully understood.

Prior to 1960, the Glenwood-Pleasanton reach of the Gila River supported a native fish assemblage of eight different species. Post-1960, four of these species became uncommon, and ultimately three of them were extirpated. In studies completed between 1961 and 1980, it was determined that loach minnow was less common than it had been, while the diversity of the nonnative fish community had increased in comparison to the pre-1960 period. Following 1980, red shiner, fathead minnow, and channel catfish were all regularly collected. Drought and diversions for irrigation resulted in a decline in habitat quality, with canyon reaches retaining most habitat components for native species. However, establishment of nonnative fishes in the canyon reaches has reduced the utility of these areas for native species (Propst *et al.* 1988, pp. 51–56).

Western mosquitofish were introduced outside of their native range to help control mosquitoes. Because of their aggressive and predatory behavior, mosquitofish may negatively affect populations of small fishes through predation and competition (Courtenay and Meffe 1989, pp. 320–324).

Introduced mosquitofish have been particularly destructive to native fish communities in the American West, where they have contributed to the elimination or decline of populations of federally endangered and threatened species, such as the Gila topminnow (*Poeciliopsis occidentalis occidentalis*) (Courtenay and Meffe 1989, pp. 323–324).

Pilger *et al.* (2010, p. 312) found that the generalist feeding strategy of small-bodied nonnative fishes could further affect native fishes through competition, particularly if there is a high degree of overlap in habitat use. In their study on the upper Gila River, they determined that the diets of nonnative, small-bodied fishes and all age groups of native fishes overlapped, so that the presence of both juvenile and adult nonnative species could pose a competitive threat to native fishes (Pilger *et al.* 2010, p. 311).

Restoration efforts have led to limited success in removing large-bodied predators, but the small-bodied competitors present more of a challenge. In the desert Southwest, the habitat conditions are so limited that native fish reintroductions can occur only in those areas where the competition and predation of nonnative fishes can be physically precluded, such as above a fish barrier.

Drought

The southwestern United States is currently experiencing drought conditions (University of Nebraska-Lincoln 2010, p. 1). Drought conditions are reported as severe to extreme for the watersheds within the Verde River, San Pedro River, Bonita Creek, Eagle Creek, Blue River, and San Francisco River subbasins in Arizona (Arizona Department of Water Resources 2009, p. 1). Portions of New Mexico are also considered abnormally dry, but not in areas currently occupied by spikedace and loach minnow (University of Nebraska-Lincoln 2010, p. 1). While spikedace and loach minnow have survived many droughts in their evolutionary histories, the present status of these species and their habitats are so degraded that the effects of the drought are more difficult for the species to withstand. In some areas of spikedace and loach minnow habitat, drought results in lower streamflow, and consequently warmer water temperatures beyond the species' tolerance limits, and more crowded habitats with higher levels of predation and competition. In other areas, drought reduces flooding, that would normally rejuvenate habitat and tend to reduce populations of some nonnative species, which are less adapted to the large floods of southwestern streams (Minckley and Meffe 1987, pp. 94, 104; Stefferud and Rinne 1996a, p. 80). The conjunction of drought with ongoing habitat loss and alteration; increased predation, competition, and disease from nonnative species; the uncertainties associated with climate change; and the general loss of resiliency in highly altered aquatic ecosystems have had negative consequences for spikedace and loach minnow populations.

Genetics

Each remaining population of spikedace is genetically distinct. Genetic distinctiveness in the Verde River and Gila River fishes indicates that these populations have been historically isolated. The center of the spikedace's historical distribution is permanently altered, and the remaining populations are isolated and represent the fringes of the formerly occupied range. Isolation of these populations has important ramifications for the overall survival of the species. Loss of any population may be permanent, as there is little ability to repopulate isolated areas, due largely to habitat alterations in areas between remaining populations (Propst *et al.* 1986, pp. 38, 86). No genetic exchange is possible between the remaining populations of spikedace without human assistance. In addition, because genetic variation is important to the species' fitness and adaptive capability, losses of genetic variation represent a threat to the species (Meffe and Carroll 1997, pp. 162–172).

Spikedace believed to remain in the upper Verde River are genetically different than those that were translocated to Fossil Creek; however, there is a minimal opportunity for the two populations to interbreed due to the length of the river between the two occupied areas. While the Verde River supports many of the habitat features for spikedace, it currently supports a high number of nonnative species that compete with, and prey on, spikedace. We anticipate that, until extensive management takes place, spikedace in the two areas will remain isolated. The spikedace translocation in Fossil Creek has been in place for approximately 2 years. It is not known if that translocation effort will succeed.

As with spikedace, each remaining population of loach minnow is genetically distinct. Genetic subdivision into three geographic regions indicates that gene flow has been low but not historically absent (Tibbets 1993, pp. 22–24, 33). The center of the loach minnow's historical distribution is permanently gone, and the remaining populations are isolated and represent the fringes of the formerly occupied range. Isolation of these populations has important ramifications for the overall survival of the species. Loss of any population may be permanent, as there is little ability to repopulate isolated areas, due largely to habitat alterations in areas between remaining populations (Propst *et al.* 1988, p. 65). No genetic exchange is likely between the remaining populations of loach minnow without human assistance. In addition, because genetic variation is important to the species' fitness and adaptive change, losses of genetic variation represent a threat to the species' ability to adapt and persist, and further compromise their continued existence (Meffe and Carroll 1997, pp. 162–172).

Climate Conditions

Climate conditions have contributed to the status of the spikedace and loach minnow now and will likely continue into the foreseeable future. While floods may benefit the species, habitat drying affects the occurrence of natural events, such as fire, drought, and forest die-off, and increases the chances of disease and infection.

Climate simulations of Palmer Drought Severity Index (PSDI) (a calculation of the cumulative effects of precipitation and temperature on surface moisture balance) for the Southwest for the periods of 2006–2030 and 2035–2060 predict an increase in drought severity with surface warming. Additionally, drought still increases during wetter simulations because the effect of heat-related moisture loss (Hoerling and Eicheid 2007, p. 19). Annual mean precipitation is likely to decrease in the Southwest as well as the length of snow season and snow depth (IPCC 2007, p. 887). Most models project a widespread decrease in snow depth in the Rocky Mountains and earlier snowmelt (IPCC 2007, p. 891). Exactly how climate change will affect precipitation is less certain, because precipitation predictions are based on continental-scale general circulation models that do not yet account for land use and land cover change effects on climate or regional phenomena. Consistent with recent observations in changes from climate, the outlook presented for the Southwest predicts warmer, drier, drought-like conditions (Seager *et al.* 2007, p. 1181; Hoerling and Eischeid 2007, p. 19). A decline in water resources with or without climate change will be a significant factor in the compromised watersheds of the desert southwest.

Summary of Factor E

The small and declining spikedace and loach minnow populations make these species susceptible to natural environmental variability, including climate conditions such as drought. The high level of nonnative fish species competing for food resources and spawning conditions will exacerbate the compromised conditions where spikedace and loach minnow can occur. These native fishes are unable to maintain a competitive edge in areas where resources are already limited, and these resources are likely to become more limited due to water developments and drought. The demands on water resources, decreases in precipitation, and increases in temperatures are likely to further limit the areas where spikedace or loach minnow can persist. Therefore, we find that the spikedace and loach minnow are threatened by other natural or manmade factors.

Available Conservation Measures

Conservation measures provided to spikedace and loach minnow under the Act include several reintroduction and augmentation projects. Some of these projects have already begun; others are in the planning stage. Project planning is underway for renovation efforts in Blue River and Spring Creek in Arizona. Other recovery actions include reintroduction or translocation of spikedace into streams within its historical range. In 2007, translocations included 210 spikedace into Hot Springs Canyon, 210 spikedace into Redfield Canyon, and 124 spikedace into Fossil Creek. Monitoring and augmentation with 500 additional spikedace each at Hot Springs and Redfield and 600 additional spikedace at Fossil Creek occurred at these sites in 2008. In 2008, 448 spikedace were reintroduced into Bonita Creek, Arizona. Spikedace were also reintroduced into the San Francisco River in New Mexico. Augmentation and monitoring will occur at these sites as well. Monitoring conducted at each of these sites will be used to determine if populations ultimately become self-sustaining at these new locations.

Several translocation projects for loach minnow are also in the planning stages. These projects may occur with or without construction of fish barriers. Loach minnow may also benefit from the Blue River and Spring Creek renovation projects mentioned above.

Additional recovery actions include translocations or reintroduction of loach minnow into streams within its historical range. In 2007, translocations included 205 loach minnow into Hot Springs Canyon, 205 loach minnow into Redfield Canyon, and 124 loach minnow into Fossil Creek. Monitoring and augmentation with 1,000 additional loach minnow each at Hot Springs and Redfield canyons and 2,004 additional loach minnow at Fossil Creek occurred in 2008. In 2008, 678 loach minnow were translocated into Bonita Creek, Arizona. Augmentation and monitoring will occur at this site as well. Monitoring conducted at each of these sites will be used to determine if populations ultimately become self-sustaining at these new locations.

The AGFD and Bureau of Reclamation continue to fund equipment and staff to run the Bubbling Ponds Native Fish Research Facility through the Gila River Basin Native Fishes Conservation Program (formerly known as the Central Arizona Project Fund Transfer Program). Salt River Project's habitat conservation plan was signed in 2008, and is expected to benefit both the spikedace and the loach minnow in the Verde River watershed. Also in 2008, AGFD staff managed original source stock and their progeny at the Bubbling Ponds facility, totaling 740 Gila River spikedace, 1,650 Aravaipa Creek spikedace, 670 Blue River loach minnow, and 3,250 Aravaipa Creek loach minnow. Plans are underway to bring in stock from every extant population of loach minnow, including those in the San Francisco River, the three forks of the Gila River, the upper Gila River in New Mexico, and Eagle and the Black River system in Arizona. Bubbling Ponds will serve as a refuge for some populations, and as a captive breeding facility for others, depending on the status of the population and availability of translocation sites.

Proposed Determination

As required by the Act, we considered the five factors in assessing whether the spikedace and loach minnow are endangered or threatened throughout all or a significant portion of their range. We carefully assessed the best scientific and commercial information available regarding reclassification of the spikedace and the loach minnow from threatened to endangered. We believe there are many threats to both species, including habitat loss and modifications (Factor A) caused by historical and ongoing land uses such as water diversion and pumping, livestock grazing, and road construction. However, competition with, or predation by, nonnative species, such as channel and flathead catfish, green sunfish, and red shiner, is likely the largest remaining threat to the species (Factors C and E). Existing regulatory mechanisms (Factor D) have not proven adequate to halt the decline of spikedace or loach minnow since the time of their listing as threatened species. In addition, the warmer, drier, drought-like conditions predicted to occur due to climate change (Factor E) will further reduce available resources for spikedace and loach minnow.

In 1991, we completed a 5-year review for spikedace and loach minnow in which we determined that the species' status was very precarious and that a change in status from threatened to endangered was warranted. Since that time, although some recovery actions have occurred, the majority of the areas historically occupied by spikedace and loach minnow have seen a shift from a predominance of native fishes to a predominance of nonnative fishes. The low numbers of spikedace and loach minnow, their isolation in tributary waters, drought, ongoing water demands, and other threats indicate that the species are now in danger of extinction throughout their ranges.

We determined in 1994 that reclassifying spikedace and loach minnow to endangered status was warranted but precluded (59 FR 35303, July 11, 1994), and restated this conclusion on January 8, 2001 (66 FR 1295). We reanalyzed the determination each year in our Candidate Notice of Review, and determined that reclassification to endangered is warranted, with the most recent Candidate Notice of Review published on November 9, 2009 (74 FR 57804). Based on this information, as well as the above review of the best scientific and commercial information available, we find that both species meet the definition of endangered species under the Act, and propose that spikedace and loach minnow be reclassified as endangered.

If we finalize the reclassification of spikedace and loach minnow to endangered status, we would remove the special rules for these species at 50 CFR 17.44(p) and 17.44(q), respectively. Special rules apply only to threatened species; therefore, if spikedace and loach minnow were listed as endangered, these special rules would no longer apply.

Critical Habitat

Background

Critical habitat is defined in section 3 of the Act as:

(i) The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are

found those physical or biological features:

(I) Essential to the conservation of the species and

(II) 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, upon a determination that such areas are essential for the conservation of the species.

Conservation, as defined under section 3 of the Act, means to use and the use of all methods and procedures that are necessary to bring an endangered or threatened species to the point at which the measures provided under the Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Critical habitat receives protection under section 7 of the Act through the prohibition against Federal agencies carrying out, funding, or authorizing actions that are likely to result in the destruction or adverse modification of critical habitat. Section 7(a)(2) requires consultation on Federal actions that may affect critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Such designation does not allow the government or public to access private lands. Such designation does not require implementation of restoration, recovery, or enhancement measures. Where a landowner seeks or requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the consultation requirements of section 7(a)(2) would apply, but even in the event of a destruction or adverse modification finding, the obligation of the Federal agency and the applicant is not to restore or recover the species, but to implement reasonable and prudent alternatives to avoid destruction or adverse modification of critical habitat.

For inclusion in a critical habitat designation, the habitat within the geographical area occupied by the species at the time it was listed must contain the physical and biological features (PBFs) essential to the conservation of the species, and be included only if those features may require special management considerations or protection. Critical habitat designations identify, to the extent known using the best scientific and commercial data available, habitat areas that provide essential life cycle needs of the species (areas on which are found the PBFs laid out in the appropriate quantity and spatial arrangement for the conservation of the species). Under the Act and regulations at 50 CFR 424.12, we can designate critical habitat in areas outside the geographical area occupied by the species at the time it is listed only when we determine that those areas are essential for the conservation of the species and that designation limited to those areas occupied at the time of listing would be inadequate to ensure the conservation of the species.

Section 4 of the Act requires that we designate critical habitat on the basis of the best scientific and commercial data available. Further, our Policy on Information Standards Under the Endangered Species Act (published in the **Federal Register** on July 1, 1994 (59 FR 34271)), the Information Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554; H.R. 5658)), and our associated Information Quality Guidelines, provide criteria, establish procedures, and provide guidance to ensure that our decisions are based on the best scientific data available. They require our biologists, to the extent consistent with the Act and with the use of the best scientific data available, to use primary and original sources of information as the basis for recommendations to designate critical habitat.

When determining which areas should be designated as critical habitat, our primary source of information is generally developed during the listing process for the species. Additional information sources may include the recovery plan for the species, articles in peer-reviewed journals, conservation plans developed by States and counties, scientific status surveys and studies, biological assessments, or other unpublished materials and expert opinion or personal knowledge.

Habitat is often dynamic, and species may move from one area of a river system to another over time. Furthermore, we recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be required for recovery of the species.

Areas that are important to the conservation of the species, but are outside the critical habitat designation, will continue to be subject to conservation actions we implement under section 7(a)(1) of the Act. Areas that support populations are also subject to the regulatory protections afforded by the section 7(a)(2) jeopardy standard, as determined on the basis of the best available scientific information at the time of the agency action. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans (HCPs), or other species conservation planning efforts if new information available at the time of these planning efforts calls for a different outcome.

Physical and Biological Features (PBFs)

In accordance with section 3(5)(A)(i) and 4(b)(1)(A) of the Act and the regulations at 50 CFR 424.12, in determining which areas within the geographical area occupied at the time of listing to propose as critical habitat, we consider the physical and biological features essential to the conservation of the species which may require special management considerations or protection. These include, but are not limited to:

(1) Space for individual and population growth and for normal behavior;

(2) Food, water, air, light, minerals, or other nutritional or physiological requirements;

(3) Cover or shelter;

(4) Sites for breeding, reproduction, or rearing (or development) of offspring; and

(5) Habitats that are protected from disturbance or are representative of the historic, geographical, and ecological distributions of a species.

We considered the specific PBFs essential to the conservation of the species and in the appropriate quantity and spatial arrangement for the conservation of the species. We derived the specific PBFs from the biological needs of spikedace and loach minnow.

Space for Individual and Population Growth and for Normal Behavior

Spikedace

Microhabitats. Habitat occupied by spikedace can be broken down into smaller, specialized habitats called microhabitats. These microhabitats vary by stream, by season, and by species' life stage. Studies on habitat use have been completed on the Gila River in New Mexico, and the Verde River and Aravaipa Creek in Arizona. Generally, spikedace occupy moderate to large perennial streams at low elevations over substrates (river bottom material) of sand, gravel, and cobble (Barber and Minckley 1966, p. 31; Propst *et al.* 1986, pp. 3, 12; Rinne and Kroeger 1988, p. 1). Occupied streams are typically of low gradient (Barber *et al.* 1970, p. 10; Rinne and Kroeger 1988, p. 2; Rinne 1991, pp. 8–12; Rinne and Stefferud 1996, p. 17), and less than 1 meter (m) (3.28 feet (ft)) in depth (Propst *et al.* 1986, p. 41; Minckley and Marsh 2009, p. 155).

Larval spikedace occur most frequently in slow-velocity water near stream margins or along pool edges. Most larvae are found over sand substrates. Juvenile spikedace tend to be found over a greater range of water velocities than larvae, but still in shallow areas. Juvenile spikedace occupy areas with a gravel or sand substrate, although some have been found over cobble substrates as well. Larvae and juveniles may occasionally be found in quiet pools or backwaters (*e.g.,* pools that are connected with, but out of, the main river channel) (Sublette *et al.* 1990, p. 138).

Adult spikedace occur in the widest range of flow velocities. They are typically associated with shear zones (areas within a stream where more rapidly flowing water abuts water moving at slower velocities), downstream of sand bars, and in eddies or small whirlpools along downstream margins of riffles (those shallow portions of the stream with rougher, choppy water). Adult spikedace are found in shallow water over predominantly gravel-dominated substrates (Propst *et al.* 1986, p. 40; Rinne 1991, pp. 8–12; Rinne and Stefferud 1997, p. 21; Rinne and Deacon 2000, p. 106; Rinne 2001, p. 68), but also over cobble and sand substrates (Minckley and Marsh 2009, p. 155; Rinne and Kroeger 1988, p. 3; Sublette *et al.* 1990, p. 138).

In addition to substrate type, the amount of embeddedness (filling in of spaces by fine sediments) is also important to spikedace. Spikedace more commonly occur in areas with low to moderate amounts of fine sediment and substrate embeddedness, which is important for the healthy development of eggs. Spawning has been observed in areas with sand and gravel beds and not in areas where fine materials smaller than sand coats the sand or gravel substrate. Additionally, low to moderate fine sediments ensure that eggs remain well-oxygenated and will not suffocate due to sediment deposition (Propst *et al.* 1986, p. 40).

Water temperatures of occupied spikedace habitat vary with time of year. Water temperatures have been collected at Aravaipa Creek, and on the Gila River in the Forks area and at the Cliff-Gila Valley. Summer water temperatures were between 19.3 degrees Celsius (°C) (66.7 degrees Fahrenheit (°F)) (Gila River, Forks Area) and 27 °C (80.6 °F) (Aravaipa Creek). Winter water temperatures ranged between 8.9 °C (48.0 °F) at Aravaipa Creek and 11.7 °C (53.1 °F) in the Cliff-Gila Valley (Barber and Minckley 1966, p. 316; Barber *et al.* 1970, pp. 11, 14; Propst *et al.* 1986, p. 57).

Recent studies by the University of Arizona focused on temperature tolerances of spikedace. In the study, fish were acclimated to a given temperature, and then temperatures were increased by 1 °C (1.8 °F) per day until test temperatures were reached. The study determined that no spikedace survived exposure of 30 days at 34 or 36 °C (93.2 or 96.8 °F), and that 50 percent mortality occurred after 30 days at 32.1 °C (89.8 °F). In addition, growth rate was slowed at 32 °C (89.6 °F), as well as at the lower test temperatures of 10 and 4 °C (50 and 39.2 °F). Multiple behavioral and physiological changes were observed, indicating the fish became stressed at 30, 32, and 33 °C (86, 89.6 and 91.4 °F) treatments. The study concludes that temperature tolerance in the wild may be lower due to the influence of additional stressors, including disease, predation, competition, or poor water quality. Survival of fish in the fluctuating temperature trials in the study likely indicates that exposure to higher temperatures for short periods during a day would be less stressful to spikedace. The study concludes that 100 percent survival of spikedace at 30 °C (86 °F) in the experiment suggests that little juvenile or adult mortality would occur due to thermal stress if peak water temperatures remain at or below that level (Bonar *et al.* 2005, pp. 7–8, 29–30).

Spikedace occupy streams with low to moderate gradients (Propst *et al.* 1986, p. 3; Rinne and Stefferud 1997, p. 14; Stefferud and Rinne 1996, p. 21; Sublette *et al.* 1990, p. 138). Specific gradient data are generally lacking, but the gradient of occupied portions of Aravaipa Creek and the Verde River varied between approximately 0.3 to < 1.0 percent (Barber *et al.* 1970, p. 10; Rinne and Kroeger 1988, p. 2; Rinne and Stefferud 1997, p. 14).

Table 1 compares specific parameters of habitat occupied by spikedace at various ages as identified through studies completed to date. Studies on flow velocity in occupied spikedace habitat have been completed on the Gila River, Aravaipa Creek, and the Verde River (Barber and Minckley 1966, p. 321; Minckley 1973, p. 114; Anderson 1978, p. 17; Schreiber 1978, p. 4; Turner and Tafanelli 1983, pp. 15–16; Propst *et al.* 1986, pp. 39–41; Rinne and Kroeger 1988, p. 1; Hardy *et al.* 1990, pp. 19–20, 39; Sublette *et al.* 1990, p. 138; Rinne 1991, pp. 9–10; Rinne 1999, p. 6).

TABLE 1—HABITAT PARAMETERS FOR VARYING LIFE STAGES OF SPIKEDACE

	Larvae	Juveniles	Adults
Flow Velocity in centimeters per second (inches per second).	8.4 (3.3)	16.8 (6.6)	23.3–70.0 (9.2–27.6).
Depth in centimeters (inches)	3.0–48.8 (1.2–19.2)	3.0–45.7 (1.2–18.0)	6.1–42.7 (2.4–16.8).
Gradient (percent)	No data	No data	0.3 to < 1.0.
Substrate	Primarily sand, with some over gravel or cobble.	Primarily gravel, with some sand and cobble.	Sand, gravel, cobble, and low amounts of fine sediments.

In studies on the Gila River, there were seasonal shifts in microhabitats used, involving depth or velocity, depending on the study site. It is believed that seasonal shifts in microhabitat use reflect selection by spikedace for particular microhabitats. In the cold season, when their metabolic rate decreases, spikedace near the Forks

area on the Gila River seek protected areas among the cobble of stream channel margins, where water is shallower and warmer. In other areas such as the Cliff-Gila Valley, cobbled banks for protection were generally not available, but slow-velocity areas in the lee of gravel bars and riffles were common, and spikedace shifted to these protected areas of slower velocity during the cold season. Seasonal changes in microhabitat preference by spikedace are not entirely understood, and additional study is needed (Propst *et al.* 1986, pp. 47–49).

Studies indicate a geographic variation in the portion of the stream used by spikedace. On the Verde River, outside of the April to June breeding season, 80 percent of the spikedace collected used run and glide habitat. For this study, a glide was defined as a portion of the stream with a lower gradient (0.3 percent), versus a run which had a slightly steeper gradient (0.3–0.5 percent) (Rinne and Stefferud 1996, p. 14). In contrast, spikedace in the Gila River were most commonly found in riffle areas of the stream with moderate to swift currents (Anderson 1978, p. 17) and some run habitats (J.M. Montgomery 1985, p. 21), as were spikedace in Aravaipa Creek (Barber and Minckley 1966, p. 321).

Flooding. In part, suitable habitat conditions are maintained by flooding. Periodic flooding appears to benefit spikedace in three ways: (1) Removing excess sediment from some portions of the stream; (2) removing nonnative fish species from a given area; and (3) increasing prey species diversity. Items 2 and 3 will be addressed in greater detail below.

Flooding in Aravaipa Creek has resulted in the transport of heavier loads of sediments, such as cobble, gravel, and sand, that are deposited where the stream widens, gradient flattens, and velocity and turbulence decreases. Dams formed by such deposition can temporarily cause water to back up and break into braids downstream of the dam. The braided areas provide excellent nurseries for larval and juvenile fishes (Velasco 1997, pp. 28–29).

On the Gila River in New Mexico, flows fluctuate seasonally with snowmelt, causing spring pulses and occasional floods, and late-summer or monsoonal rains produce floods of varying intensity and duration. These high flows likely rejuvenate spikedace spawning and foraging habitat (Propst *et al.* 1986, p. 3). Floods likely benefit native fish by breaking up embedded bottom materials (Mueller 1984, p. 355). A study of the Verde River analyzed the effects of flooding in 1993 and 1995, finding that the floods either stimulated spawning, enhanced recruitment of three native species, or eliminated one of the nonnative fish species (Stefferud and Rinne 1996a, p. 80).

In summary, based on the best scientific and commercial information available for spikedace, we have developed the following ranges in habitat parameters, as follows:

- Shallow water generally less than 1 m (3.3 ft) in depth;
- Slow to swift flow velocities between 5 and 80 cm per second (sec) (1.9 and 31.5 in. per sec);
- Glides, runs, riffles, the margins of pools and eddies, and backwater components;
- Sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness, as maintained by a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments;
- Low gradients of less than approximately one percent;
- Water temperatures in the general range of 8 to 28 °C (46.4 to 82.4 °F); and
- Elevations below 2,100 m (6,890 ft).

Loach Minnow

Microhabitat. The best scientific and commercial information available indicates that, in general, loach minnow live on the bottom of small to large streams or rivers with low gradients within shallow, swift, and turbulent riffles. They are also known to occupy pool, riffle, and run habitats in some areas. They live and feed among clean, loose, gravel-to-cobble substrates. Their reduced air bladder (the organ that aids in controlling a fish's ability to float without actively swimming) allows them to persist in high-velocity habitats with a minimal amount of energy, and they live in the interstitial spaces (openings) between rocks (Anderson and Turner 1977, pp. 2, 6–7, 9, 12–13; Barber and Minckley 1966, p. 315; Lee *et al.* 1980, p. 365; Britt 1982, pp. 10–13, 29–30; J.M. Montgomery 1985, p. 21; Marsh *et al.* 2003, p. 666; Minckley 1981, p. 165; Propst *et al.* 1988, p. 35; Rinne 1989, p. 109; Velasco 1997, p. 28; Sublette *et al.* 1990, p. 187; AGFD 1994, pp. 1, 5–11; Bagley *et al.* 1995, pp. 11, 13, 16, 17, 22; Rinne 2001, p. 69; Minckley and Marsh 2009, p. 174). Loach minnow are sometimes found in or near filamentous (threadlike) algae, which are attached to the stream substrates (Anderson and Turner 1977, p. 5; Lee *et al.* 1980, p. 365; Minckley 1981, p. 165; Sublette *et al.* 1990, p. 187; Marsh and Minckley 2009, p. 174).

Microhabitats used by loach minnow vary by life stage and stream. Adult loach minnow occupy a broad range of water velocities, with the majority of adults occurring in swift flows. Their eggs are adhesive, and are placed on the undersurfaces of rocks in the same riffles that they themselves occupy. After hatching, larval loach minnow move from the rocks under which they were spawned to areas with slower velocities than the main stream, typically remaining in areas with significantly slower velocities than juveniles and adults. Larval loach minnow occupy areas that are shallower and significantly slower than areas where eggs are found (Propst *et al.* 1988, p. 37; Propst and Bestgen 1991, p. 32). Juvenile loach minnow generally occur in areas where velocities are similar to those used by adults, and that have higher flow velocities than those occupied by larvae (Propst *et al.* 1988, pp. 36–37).

Substrate is an important component of loach minnow habitat. Studies in Aravaipa Creek and the Gila River indicate that loach minnow prefer cobble and large gravel, avoiding areas dominated by sand or fine gravel. This may be because loach minnow maintain a relatively stationary position on the bottom of a stream in flowing water. An irregular bottom, such as that created by cobble or larger gravels, creates pockets of lower water velocities around larger rocks where loach minnow can remain stationary with less energy expenditure (Turner and Tafanelli 1983, pp. 24–25). In the Gila and San Francisco rivers, the majority of loach minnow captured occurred in the upstream portion of a riffle, rather than in the central and lower sections of the riffle, where loose materials are more likely to fall out of the water column and settle on the stream bottom. This is likely due to the availability of interstitial spaces in the cobble-rubble substrate, which became filled with sediment more quickly in the central and lower sections of a riffle (Propst *et al.* 1984, p. 12).

Varying substrates are used during different life stages of loach minnow. Adults occur over cobble and gravel, and place their eggs in these areas. Larval loach minnow are found where substrate particles are smaller than those used by adults. Juvenile loach minnow occupy areas with substrates of larger particle size than larvae. Generally, adults exhibited a narrower preference for depth and substrate than did juveniles, and were associated with gravel to cobble substrates within a narrower range of depths (Propst *et al.*

1988, pp. 36–39; Propst and Bestgen 1991, pp. 32–33).

Loach minnow have a fairly narrow range in temperature tolerance, and their upstream distributional limits in some areas may be linked to low winter stream temperature (Propst *et al.* 1988, p. 62). Suitable temperature regimes appear to be fairly consistent across geographic areas. Studies of Aravaipa Creek, East Fork White River, the San Francisco River, and the Gila River determined that loach minnow were present in areas with water temperatures in the range of 9 to 22 °C (48.2 to 71.6 °F) (Britt 1982, p. 31; Propst *et al.* 1988, p. 62; Leon 1989, p. 1; Propst and Bestgen 1991, p. 33; Vives and Minckley 1990, p. 451).

Recent studies by the University of Arizona focused on temperature tolerances of loach minnow. In one study, fish were acclimated to a given temperature, and then temperatures were increased by 1 °C (1.8 °F) per day until test temperatures were reached. The study determined that no loach minnow survived for 30 days at 32 °C (89.6 °F), and that 50 percent mortality occurred after 30 days at 30.6 °C (87.1 °F). In addition, growth rate slowed at 28 and 30 °C (82.4 and 86.0 °F) compared to growth at 25 °C (77 °F), indicating that loach minnow were stressed at sublethal temperatures. Survival of fish in the fluctuating temperature trials of the study likely indicates that exposure to higher temperatures for short periods during a day would be less stressful to loach minnow. The study concludes that temperature tolerance in the wild may be lower due to the influence of additional stressors, including disease, predation, competition, or poor water quality. The study concludes that since 100 percent survival of loach minnow at 28 °C (82.4 °F) was observed, that little juvenile or adult mortality would occur due to thermal stress if peak water temperatures remain at or below that level (Bonar *et al.* 2005, pp. 6–8, 28, 33).

Gradient may influence the distribution and abundance of loach minnow. In studies of the San Francisco River, Gila River, Aravaipa Creek, and the Blue River, loach minnow occurred in stream reaches where the gradient was generally low, ranging from 0.3 to 2.2 percent (Rinne 1989, p. 109; Rinne 2001, p. 69).

Table 2 compares specific parameters of microhabitats occupied by loach minnow at various ages as identified through studies completed to date. Studies on habitat occupied by loach minnow have been completed on the Gila River, Tularosa River, San Francisco River, Aravaipa Creek, Deer Creek, and Eagle Creek (Barber and Minckley 1966, p. 321; Britt 1982, pp. 1, 5, 10–12, 29; Turner and Tafanelli 1983, pp. 15–20, 26; Propst *et al.* 1984, pp. 7–12; Propst *et al.* 1988, pp. 32, 36–39; Rinne 1989, pp. 111–113, 116; Propst and Bestgen 1991, p. 32; Vives and Minckley 1990, pp. 451–452; Propst and Bestgen 1991, pp. 32–33; Velasco 1997, pp. 5–6; Marsh *et al.* 2003, p. 666).

TABLE 2—HABITAT PARAMETERS FOR VARYING LIFE STAGES OF LOACH MINNOW

	Egg	Larvae	Juveniles	Adults
Flow Velocity in centimeters per second (inches per second).	3.0–91.4 (1.2–36.0) ...	0.0–48.8 (0.0–19.2) ...	3.0–85.3 (1.2–33.6) ...	0.0–79.2 (0.0–31.2).
Depth in centimeters (inches)	3.0–30.5 (1.2–12)	3.0–45.7 (1.2– 8.0)	6.1–42.7 (2.4–16.8) ...	6.1–45.7 (2.4–18.0).
Substrate	Large gravel to rubble	No data	No data	Gravel to cobble.

There are some differences in microhabitats occupied by loach minnow in different areas. Studies completed in New Mexico determined that there were significant differences in water velocities occupied among the three study sites, with the mean velocities at 37.4 (Tularosa River), 56.3 (Forks area of the Gila River) and 60.5 cm per second (Cliff-Gila Valley site on the Gila River). Differences in water depth were not as pronounced, however. Much of the variation in microhabitat utilization may be explained by habitat availability, as the compared streams varied in size (Propst *et al.* 1988, pp. 37–43).

Flooding. Flooding also plays an important role in habitat suitability for loach minnow. In areas where substantial diversions (structures created to divert water to pools for pumping from the stream) or impoundments have been constructed, loach minnow are less likely to occur (Propst *et al.* 1988, pp. 63–64; Propst and Bestgen 1991, p. 37). This is in part due to habitat changes caused by the construction of the diversions, and in part due to the reduction of beneficial effects of flooding on loach minnow habitat. Flooding appears to positively affect loach minnow population dynamics by resulting in higher recruitment (reproduction and survival of young) and by decreasing the abundance of nonnative fishes (addressed further below) (Stefferud and Rinne 1996b, p. 1).

Flooding also cleans, rearranges, and rehabilitates important riffle habitat (Propst *et al.* 1988, pp. 63–64). Flooding allows for the scouring of sand and gravel in riffle areas, which reduces the degree of embeddedness of cobble and boulder substrates (Britt 1982, p. 45). Typically, sediment is carried along the bed of a stream and deposited at the downstream, undersurface side of cobbles and boulders. Over time, this can result in the filling of cavities created under cobbles and boulders (Rinne 2001, p. 69). Flooding removes the extra sediment, and cavities created under cobbles by scouring action of the flood waters provides enhanced spawning habitat for loach minnow.

Studies on the Gila, Tularosa, and San Francisco rivers found that flooding is primarily a positive influence on native fish, and apparently had a positive influence on the relative abundance of loach minnow (Britt 1982, p. 45). Rather than following a typical pattern of winter mortality and population decline, high levels of loach minnow recruitment occurred after the flood, and loach minnow relative abundance remained high through the next spring. Flooding enhanced and enlarged loach minnow habitat, resulting in a greater survivorship of individuals through winter and spring (Propst *et al.* 1988, p. 51). Similar results were observed on the Gila and San Francisco rivers following flooding in 1978 (Britt 1982, p. 45).

In summary, based on the best scientific and commercial information available for loach minnow, we have developed generalized ranges in habitat parameters within streams or rivers, as follows:

- Shallow water generally less than 1 m (3.3 ft) in depth;
- Slow to swift flow velocities between 0 and 80 cm per sec (0.0 and 31.5 in. per sec);
- Pools, runs, riffles and rapids;
- Sand, gravel, cobble, and rubble substrates with low or moderate amounts of fine sediment and substrate embeddedness, as maintained by a

natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, flow regime that allow for adequate river functions, such as flows capable of transporting sediments;

- Water temperatures in the general range of 8 to 25 °C (46.4 to 77 °F);
- Low stream gradients of less than approximately 2.5 percent; and
- Elevations below 2,500 m (8,202 ft).

Food, Water, Air, Light, Minerals, or Other Nutritional or Physiological Requirements

Spikedace

Food. Spikedace are active, highly mobile fish that visually inspect drifting materials both at the surface and within the water column. Gustatory inspection, or taking the potential prey items into the mouth before either swallowing or rejecting it, is also common (Barber and Minckley 1983, p. 37). Prey body size is small, typically ranging from 2 to 5 mm (0.08 to 0.20 in) long (Anderson 1978, p. 36).

Stomach content analysis of spikedace determined that mayflies, caddisflies, true flies (Order Diptera), stoneflies, and dragonflies (Order Odonata) are all potential prey items. In one Gila River study, the frequency of occurrence was 71 percent for mayflies, 34 percent for true flies, and 25 percent for caddisflies (Propst *et al.* 1986, p. 59). A second Gila River study of four samples determined that total food volume was composed of 72.7 percent mayflies, 17.6 percent caddisflies, and 4.5 percent true flies (Anderson 1978, pp. 31–32). At Aravaipa Creek, mayflies, caddisflies, true flies, stoneflies, and dragonflies were all prey items for spikedace, as were some winged insects and plant materials (Schreiber 1978, pp. 12–16, 29, 35–37). Barber and Minckley (1983, pp. 34–38) found that spikedace at Aravaipa Creek also consumed ants and wasps (Order Hymenoptera), spiders (Order Areneae), beetles (Order Coleoptera), true bugs, and water fleas (Order Cladocera).

Spikedace diet varies seasonally (Barber and Minckley 1983, pp. 34–38). Mayflies dominated stomach contents in July, but declined in August and September, increasing in importance again between October and June. When mayflies were available in lower numbers, spikedace consumed a greater variety of foods, including true bugs, true flies, beetles, and spiders.

Spikedace diet varies with age class as well. Young spikedace fed on a diversity of small-bodied invertebrates occurring in and on sediments along the margins of the creek. True flies were found most frequently, but water fleas and aerial adults of aquatic and terrestrial insects also provide significant parts of the diet. As juveniles grow and migrate into the swifter currents of the channel, mayfly nymphs (invertebrates between the larval and adult life stages, similar to juveniles) and adults increase in importance (Barber and Minckley 1983, pp. 36–37).

Spikedace are dependent on aquatic insects for sustenance, and the production of the aquatic insects consumed by spikedace occurs mainly in riffle habitats (Propst *et al.* 1986, p. 59). Barber and Minckley (1983, pp. 36–37, 40) found that spikedace in pools had eaten the least diverse food, while those from riffles contained a greater variety of taxa, indicating that the presence of riffles in good condition and abundance help to ensure that a sufficient number and variety of prey items will continue to be available for spikedace.

Aquatic invertebrates that constitute the bulk of the spikedace diet have specific habitat parameters of their own. Mayflies occur primarily in fresh water with an abundance of oxygen. Spikedace consume mayflies from the genus *Baetidae* (Schreiber 1978, p. 36), which are free-ranging species of rapid waters that maintain themselves in currents by clinging to pebbles. Spikedace also consumed individuals from two other mayfly genera (*Heptageniidae* and *Ephemerellidae*), which are considered "clinging species," as they cling tightly to stones and other objects and may be found in greatest abundance in crevices and on the undersides of stones (Pennak 1978, p. 539). The importance of gravel and cobble substrates is illustrated by the fact that the availability of these prey species, which make up the bulk of the spikedace diet, requires these surfaces to persist.

The availability of food for spikedace is affected by flooding. The onset of flooding corresponds with an increased diversity of food items, as inflowing flood water carries terrestrial invertebrates, such as ants, bees, and wasps, into aquatic areas (Barber and Minckley 1983, p. 39).

Water. As a purely aquatic species, spikedace are entirely dependent on streamflow habitat for all stages of their life cycle. Therefore, perennial flows are an essential feature. Areas with intermittent flows may serve as connective corridors between occupied or seasonally occupied habitat through which the species may move when the habitat is wetted.

In addition to water quantity, water quality is important to spikedace. Water with no or low levels of pollutants is essential for the survival of spikedace. For spikedace, pollutants such as copper, arsenic, mercury, cadmium, human and animal waste products, pesticides, suspended sediments, ash, and gasoline or diesel fuels should not be present at high levels (D. Baker, Service, pers. comm. 2005). In addition, for freshwater fish, dissolved oxygen should generally be greater than 3.5 cubic centimeters per liter (cc per l) (Bond 1979, p. 215). Below this, some stress to fish may occur.

Fish kills have been documented within the range of the spikedace, including on the San Francisco River (Rathbun 1969, pp. 1–2) and the San Pedro River (Eberhardt 1981, pp. 1–4, 6–9, 11–12, 14, 16, and Tables 2–8). Occupancy by spikedace at the San Francisco River site is less certain, but spikedace were present in the Gila River upstream of its confluence with the San Francisco. Spikedace were present in the San Pedro River up through 1969 within the area affected by the Cananea Mine spill, which extended 97 km (60 mi) north of the United States/Mexico border (Eberhardt 1981, p. 3). All aquatic life within this 97-km (60-mi) stretch was killed between 1977 and 1979, and no spikedace records are known after that time. For both the San Francisco and San Pedro rivers, leaching ponds associated with copper mines released waters into the streams, resulting in elevated levels of toxic chemicals. For the San Pedro River, this included elevated levels of iron, copper, manganese, and zinc. Both incidents resulted in die-offs of species inhabiting the streams. Eberhardt (1981, pp. 1, 3, 9, 10, 14–15) noted that no bottom-dwelling aquatic insects, live fish, or aquatic vegetation of any kind were found in the area affected by the spill. Rathbun (1969, pp. 1–2) reported similar results for the San Francisco River. As detailed above under the threats discussion, spills or discharges have occurred in the Gila River and affected streams within the watersheds of spikedace, including the Gila River, San Francisco River, San Pedro River, and some of their tributaries (Environmental Protection Agency 1997, pp. 24–67; Arizona Department of Environmental Quality 2000, p. 6; Church *et al.* 2005, p. 40; Arizona Department of Environmental Quality 2007, p. 1).

Based on the information above, we identify an appropriate prey base and water quality to be a PBF for spikedace, as follows:

- An abundant aquatic insect food base consisting of mayflies, true flies,

black flies, caddisflies, stoneflies, and dragonflies;

• Streams with no or no more than low levels of pollutants;

• Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted;

• Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

Loach Minnow

Food. Loach minnow are opportunistic, feeding on riffle-dwelling larval mayflies, black flies, and true flies, as well as from larvae of other aquatic insect groups such as caddisflies and stoneflies. Loach minnow in the Gila, Tularosa, and San Francisco rivers consumed primarily true flies and mayflies, with mayfly nymphs being an important food item throughout the year. Mayfly nymphs constituted the most important food item throughout the year for adults studied on the Gila and San Francisco Rivers, while larvae of true flies (insects of the order Diptera) were most common in the winter months (Propst *et al.* 1988, p. 27; Propst and Bestgen 1991, p. 35). In Aravaipa Creek, loach minnow consumed 11 different prey items, including mayflies, stoneflies, caddisflies, and true flies. Mayflies constituted the largest percentage of their diet during this study except in January, when true flies made up 54.3 percent of the total food volume (Schreiber 1978, pp. 40–41).

Loach minnow consume different prey items during their various life stages. Both larvae and juveniles primarily consumed true flies, which constituted approximately 7 percent of their food items in one year, and 49 percent the following year in one study. Mayfly nymphs were also an important dietary element at 14 percent and 31 percent during a one-year study. Few other aquatic macroinvertebrates were consumed (Propst *et al.* 1988, p. 27). In a second study, true fly larvae and mayfly nymphs constituted the primary food of larval and juvenile loach minnow (Propst and Bestgen 1991, p. 35).

The availability of pool and run habitats affects availability of prey species. While most of the food items of loach minnow are riffle species, two are not, including true fly larvae and mayfly nymphs. Mayfly nymphs, at times, made up 17 percent of the total food volume of loach minnow in a study at Aravaipa Creek (Schreiber 1978, pp. 40–41). The presence of a variety of habitat types is, therefore, important to the persistence of loach minnow in a stream, even though they are typically associated with riffles.

Water Quality. Water, with no or low pollutant levels, is important for the conservation of loach minnow. For loach minnow, waters should have no more than low levels of pollutants, such as copper, arsenic, mercury, cadmium, human and animal waste products, pesticides, suspended sediments, and gasoline or diesel fuels (D. Baker, Service, pers. comm. 2005). In addition, for freshwater fish, dissolved oxygen should generally be greater than 3.5 cc per l (Bond 1979, p. 215). Below this, some stress to the fish may occur.

Fish kills associated with previous mining accidents, as well as other contaminants issues, are detailed under the spikedace discussion above. These incidents occurred within the historical range of the loach minnow. As with spikedace, loach minnow were known to occur in the area affected by the Cananea Mine spill up through 1961. All aquatic life within the affected area was killed between 1977 and 1979, and no loach minnow records are known after that time. On the San Francisco River, loach minnow are known to have occurred in the general area of the spill in the 1980s and 1990s (ASU 2002). Additional spills or discharges have occurred in the Gila River and affected streams within the watersheds occupied by loach minnow, including the Gila River, San Francisco River, San Pedro River, and some of their tributaries (Environmental Protection Agency 1997, pp. 24–67; Arizona Department of Environmental Quality 2000, p. 6; Church *et al.* 2005, p. 40; Arizona Department of Environmental Quality 2007, p. 1).

Based on the information above, we identify an appropriate prey base and water quality to be a PBF for the loach minnow, as follows:

• An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddisflies, stoneflies, and dragonflies;

• Streams with no or no more than low levels of pollutants;

• Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted; and

• Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

Cover or Shelter

Spikedace. No specific information on habitat parameters used specifically for cover and shelter is available for spikedace. Therefore, we have not identified any specific physical and biological features specific to cover and shelter for spikedace.

Loach Minnow. As noted above, adult loach minnow are sometimes associated with filamentous algae, which may serve as a protective cover (Anderson and Turner 1977, p. 5; Lee *et al.* 1980, p. 365; Minckley 1981, p. 165; Sublette *et al.* 1990, p. 187; Marsh and Minckley 2009, p. 174).

Loach minnow adults place their adhesive eggs on the undersides of rocks, with the rock serving as protective cover. Probst *et al.* (1988, p. 21) found that the rocks used were typically elevated from the surface of the streambed on the downstream side, with most rocks flattened and smooth-surfaced. Adult loach minnow remain with the eggs, so that the rock serves as a protective cover for them as well (Propst *et al.* 1988, pp. 21–25, 36–39).

Sites for Breeding, Reproduction, or Rearing (or Development) of Offspring

Spikedace

Suitable sites. Spikedace occur in specific habitat during the breeding season, with female and male spikedace becoming segregated. Females occupy pools and eddies, while males occupy riffles flowing over sand and gravel beds in water approximately 7.9 to 15.0 cm (3.1 to 5.9 in) deep. Females then enter the riffles occupied by the males before eggs are released into the water column (Barber *et al.* 1970, pp. 11–12).

Spikedace eggs are adhesive and develop among the gravel and cobble of the riffles following spawning. Spawning in riffle habitat ensures that the eggs are well oxygenated and are not normally subject to suffocation by sediment deposition due to the swifter flows found in riffle habitats. However, after the eggs have adhered to the gravel and cobble substrate, excessive sedimentation could cause suffocation of the eggs (Propst *et al.* 1986, p. 40).

Larval and juvenile spikedace occupy peripheral portions of streams that have slower currents (Anderson 1978, p. 17; Propst *et al.* 1986, pp. 40–41). Gila River studies found larval spikedace in velocities of 8.4 cm per second (3.3 in. per sec) while juvenile spikedace occupy areas with velocities of approximately 16.8 cm per second (6.6 in. per sec) (Propst *et al.* 1986, p. 41).

Once they emerge from the gravel of the spawning riffles, spikedace larvae disperse to stream margins where water velocity is very slow or still. Larger larval and juvenile spikedace (those fish 25.4 to 35.6 mm (1.0 to 1.4 in) in length) occurred over a greater range of water velocities than smaller larvae, but still occupied water depths of less than 32.0 cm (12.6 in) (Propst *et al.* 1986, p. 40). Juveniles and larvae are also occasionally found in quiet pools or backwaters (e.g., pools that are connected with, but out of, the main river channel) lacking streamflow (Sublette *et al.* 1990, p. 138).

During a study on the Gila River, 60 percent of spikedace larvae were found over sand-dominated substrates, while 18 percent were found over gravel, and an additional 18 percent found over cobble-dominated substrates. While 45 percent of juvenile spikedace were found over sand substrates, an additional 45 percent of the juveniles were found over gravel substrates, with the remaining 10 percent associated with cobble-dominated substrates. Juveniles occupy a wider range in flow velocities than larvae (0.0 to 57.9 cm per second (22.8 in. per second)), but occurred at similar depths as larvae (Propst *et al.* 1986, pp. 40–41).

As noted above, excessive sedimentation can lead to suffocation of eggs. Clean substrates are therefore essential for successful breeding. Both flooding and unaltered flow regimes are essential for maintenance of suitable substrates. As noted above under habitat requirements, periodic flooding appears to benefit spikedace by removing excess sediment from some portions of the stream, breaking up embedded bottom materials, or rearranging sediments in ways that restore suitable habitats. Flooding may also stimulate spawning or enhance recruitment (Mueller 1984, p. 355; Propst *et al.* 1986, p. 3; Stefferud and Rinne 1996a, p. 80; Minckley and Meffe 1987, pp. 99, 100; Rinne and Stefferud 1997, pp. 159, 162; Velasco 1997, pp. 28–29).

Streams in the southwestern United States have a wide fluctuation in flows and some are periodically dewatered. While portions of stream segments included in this proposed designation may experience dry periods, they are still considered important because the spikedace is adapted to stream systems with fluctuating water levels. While they cannot persist in dewatered areas, spikedace will use these areas as connective corridors between occupied or seasonally occupied habitat when they are wetted. Areas that serve as connective corridors are those ephemeral or intermittent stream segments that connect two or more other perennial stream segments.

Therefore, based on the information above, we identify the following to be PBFs for spikedace:

- Sand, gravel, and cobble substrates;
- Riffle habitat;
- Slower currents along stream margins with appropriate stream velocities for larvae;
- Appropriate water depths for larvae and juvenile spikedace;
- Flow velocities that encompass the range of 8.5 cm per sec (3.3 in. per sec) to 57.9 cm per sec (22.8 in. per sec); and
- Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

Loach Minnow

Adult loach minnow attach eggs to the undersurfaces of rocks in the same riffles in which they are typically found. In studies conducted on the Gila River, water velocities in these areas ranged from 3.0 to 91.4 cm per second (36.0 in. per second). The majority of rocks with attached eggs were found in water flowing at approximately 42.7 cm per second (16.8 in. per second). The range of depths in which rocks with eggs attached were found was 3.0 to 30.5 cm (1.2 to 12 in), with the majority found between 6.1 and 21.3 cm (2.4 and 8.4 in) (Propst *et al.* 1988, pp. 36–39).

Loach minnow larvae occupy shallower and slower water than eggs. In Gila River studies, larvae occurred in flow velocities averaging 7.9 cm per second (3.1 in. per second), and in depths between 3.0 to 45.7 cm (1.2 to 18 in). Juveniles occurred in areas with higher velocities, ranging between 35.1 and 85.3 cm per second (13.8 and 33.6 in. per second). Juveniles occurred in slightly deeper water of approximately 6.1 to 42.7 cm (2.4 to 16.8 in) (Propst *et al.* 1988, pp. 36–39).

As noted above under general habitat requirements, flooding is important in maintaining loach minnow habitat, including habitats used for breeding. Flooding reduces embeddedness of cobble and boulder substrates under which eggs are placed (Britt 1982, p. 45).

The construction of water diversions have reduced or eliminated riffle habitat in many stream reaches, resulting in pool development. Loach minnow are generally absent in stream reaches affected by impoundments. While the specific factors responsible for this are not known, it is likely related to modification of thermal regimes, habitat, food base, or discharge patterns (Propst *et al.* 1988, p. 64; Minckley 1973, pp. 1–11).

Therefore, based on the information above, we identify the following to be PBFs for loach minnow:

- Cobble substrates;
- Riffle habitats;
- Slower currents along stream margins with appropriate stream velocities for larvae;
- Appropriate water depths for larvae and juvenile loach minnow;
- Flow velocities that encompass the range of 6.1 to 42.7 cm (2.4 to 16.8 in); and
- Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

Habitats Protected From Disturbance or Representative of the Historical, Geographical, and Ecological Distributions of the Species

Spikedace

Nonnative aquatic species. One of the primary reasons for the decline of native species is the presence of nonnative fishes, as described above under Factors C and E above. Interactions with nonnative fishes can occur in the form of interference competition (e.g., predation) or exploitive competition (competition for resources), and introduced species are considered a primary factor in the decline of native species (Anderson 1978, pp. 50–51; Miller *et al.* 1989, p. 1; Lassuy 1995, p. 392). Multiple nonnative fish species are now present in the range of spikedace and loach minnow. In addition, nonnative parasites are also present.

Flooding may help to reduce the threat presented by nonnative species. Minckley and Meffe (1987, pp. 99–100) found that flooding, as part of a natural flow regime, may temporarily remove nonnative fish species, which are not adapted to flooding patterns in the Southwest. Thus flooding consequently removes the competitive pressures of nonnative fish species on native fish species which persist following the flood. Minckley and Meffe (1987, pp. 99–100) studied the differential response of native and nonnative fishes in seven unregulated and three regulated streams or stream reaches that were sampled before and after major flooding and noted that fish faunas of canyon-bound reaches of unregulated streams invariably shifted from a mixture of native and nonnative fish species to predominantly, and in some cases exclusively, native fishes after

large floods. Samples from regulated systems indicated relatively few or no changes in species composition due to releases from upstream dams at low, controlled volumes. However, during emergency releases, effects to nonnative fish species were similar to those seen with flooding on unregulated systems. There is some variability in fish response to flooding. Some nonnative species, such as smallmouth bass and green sunfish, appear to be partially adapted to flooding, and often reappear in a few weeks (Minckley and Meffe 1987, p. 100).

The information presented above indicates the detrimental effects of interference and exploitive competition with nonnative species to spikedace, as well as the issues presented by the introduction of nonnative parasites. Therefore, based on this information, we identify the necessary PBFs for spikedace to be:

- Habitat devoid of nonnative aquatic species, or habitat in which nonnative aquatic species are at levels that allow persistence of spikedace.

Loach Minnow

As with spikedace (discussed above), interference and exploitive competition with nonnative species can be detrimental to loach minnow. Interference competition, in the form of predation, may result from interactions between loach minnow and nonnative channel and flathead catfish, while exploitive competition likely occurs with red shiner. The discussion under Factor C above on disease and predation includes information on other nonnative aquatic species, such as Asian tapeworm, anchor worm, and Ich, which are also detrimental to loach minnow.

The discussion under spikedace on flooding and its benefits in potentially minimizing threats from nonnative fishes applies to loach minnow as well.

The information presented above indicates the detrimental effects of interference and exploitive competition with nonnative species to loach minnow, as well as the issues presented by the introduction of nonnative parasites. Therefore, based on this information, we identify the PBFs for loach minnow as follows:

- Habitat devoid of nonnative aquatic species, or habitat in which nonnative aquatic species are at levels that allow persistence of loach minnow; and
- Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

Physical and Biological Features for Spikedace and Loach Minnow

Based on the above needs and our current knowledge of the life history, biology, and ecology of the species and the habitat requirements for sustaining the essential life history functions of the species, we have determined that PBFs for the spikedace are:

(1) Habitat to support all egg, larval, juvenile, and adult spikedace. This habitat includes perennial flows with a stream depth generally less than 1 m (3.3 ft), and with slow to swift flow velocities between 5 and 80 cm per second (1.9 and 31.5 in. per second). Appropriate stream microhabitat types include glides, runs, riffles, the margins of pools and eddies, and backwater components over sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness. Appropriate habitat will have a low gradient of less than approximately 1.0 percent, at elevations below 2,100 m (6,890 ft). Water temperatures should be in the general range of 8.0 to 28.0 °C (46.4 to 82.4 °F);

(2) An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddisflies, stoneflies, and dragonflies;

(3) Streams with no or no more than low levels of pollutants;

(4) Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted;

(5) No nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low as to allow persistence of spikedace; and

(6) Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

Based on the above needs and our current knowledge of the life history, biology, and ecology of the species and the habitat requirements for sustaining the essential life history functions of the species, we have determined that PBFs for the loach minnow are:

(1) Habitat to support all egg, larval, juvenile, and adult loach minnow. This habitat includes perennial flows with a stream depth of generally less than 1 m (3.3 ft), and with slow to swift flow velocities between 0 and 80 cm per second (0.0 and 31.5 in. per second). Appropriate microhabitat types include pools, runs, riffles, and rapids over sand, gravel, cobble, and rubble substrates with low or moderate amounts of fine sediment and substrate embeddedness. Appropriate habitats have a low stream gradient of less than 2.5 percent, are at elevations below 2,500 m (8,202 ft). Water temperatures should be in the general range of 8.0 to 25.0 °C (46.4 to 77 °F);

(2) An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddisflies, stoneflies, and dragonflies;

(3) Streams with no or no more than low levels of pollutants;

(4) Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted;

(5) No nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low to allow persistence of loach minnow; and

(6) Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

Special Management Considerations or Protection

When designating critical habitat, we assess whether the specific areas determined to be occupied at the time of listing contain the PBFs and may require special management considerations or protection. We believe each area included in this proposed designation requires special management and protections as described in our unit descriptions.

Special management considerations for each area will depend on the threats to the spikedace or loach minnow, or both, in that critical habitat area. For example, threats requiring special management include nonnative fish species and the continued spread of nonnative fishes into spikedace or loach minnow habitat. Other threats requiring special management include the threat of fire, retardant application during fire, and excessive ash and sediment following fire. Poor water quality and adequate quantities of water for all life stages of spikedace and loach minnow threaten these fish and may require special management actions or protections. Improper livestock grazing can be a threat to spikedace and loach minnow and their habitats, although concern for this threat has lessened due to improved management practices. The construction of water diversions can

include increasing water depth behind diversion structures, and has reduced or eliminated riffle habitat in many stream reaches. In addition, loach minnow are generally absent in stream reaches affected by impoundments. While the specific factor responsible for this is not known, it is likely related to modification of thermal regimes, habitat, food base, or discharge patterns.

We have included below in our description of each of the critical habitat areas for the spikedace and loach minnow a discussion of the threats occurring in that area requiring special management or protections.

Criteria Used To Identify Critical Habitat

As required by section 4(b) of the Act, we used the best scientific and commercial data available in determining areas within the geographical area occupied at the time of listing that contain the features essential to the conservation of spikedace and loach minnow, and areas outside of the geographical areas occupied at the time of listing that are essential for the conservation of spikedace and loach minnow. Sources of data for these two species include multiple databases maintained by universities and State agencies for Arizona and New Mexico, existing recovery plans, endangered species reports (Propst *et al.* 1986, 1988), and numerous survey reports on streams throughout the species' range. We have also reviewed available information that pertains to the habitat requirements of this species. Sources of information on habitat requirements include existing recovery plans, endangered species reports, studies conducted at occupied sites and published in peer-reviewed articles, agency reports, and data collected during monitoring efforts.

The recovery plans for spikedace and loach minnow were both finalized in 1991 (Service 1991a; Service 1991b), and are in need of revision. We are in the process of convening a recovery team for this purpose. In the interim, we have developed an internal preliminary assessment of potential steps necessary for achieving recovery of spikedace and loach minnow.

The current distribution of both spikedace and loach minnow is much reduced from their historical distribution. We anticipate that recovery will require establishing populations in streams and watersheds that more closely approximate their historical distribution in order to ensure there are adequate numbers of fish in stable populations, and that these populations occur over a wide geographic area. This will help to ensure that catastrophic events, such as wildfire or contaminant spills, cannot simultaneously affect all known populations. We developed necessary steps for downlisting as well as delisting. For spikedace, our preliminary assessment recommends that downlisting criteria include that one additional stable population be established in either the Salt or Verde subbasin, and the number of occupied streams be increased from 8 (the current level) to 10 rangewide. Occupancy may be established through natural means (*i.e.,* expansion by the fish themselves) or through translocation efforts. For delisting of spikedace, our preliminary assessment indicates that a stable population should be established in the remaining subbasin, and that occupied streams within the historical range of the species be increased to 12. In addition, the goal is to ensure that all genetic lineages are adequately represented in the 12 occupied streams, where appropriate and feasible.

For loach minnow, our preliminary assessment recommends that, in order to delist the species, the number of occupied streams be increased from 19 (the current level) to 22, with one occupied stream in each of the major watersheds. For delisting, the preliminary assessment recommends increasing the number of occupied streams to 25, with at least one occupied stream in each of the major watersheds, and that remaining genetic lineages be adequately represented in at least one stream, where appropriate and feasible.

The preliminary assessment makes other recommendations, including establishing protective measures for connective areas, maintaining captive breeding stocks, and developing plans for augmentation of captive breeding stock.

Our preliminary assessment of the habitats needed for conservation of these species attempts to provide geographic distribution across the ranges of the species, represent the full ranges of habitat and environmental variability the species have occupied, and preserve existing genetic diversity. We anticipate that the final recovery plans developed by the Recovery Team, once formed, may vary from this assessment, and will likely provide additional criteria and prioritization of recovery actions. However, we believe that the broad goals used in our preliminary assessment will be similar to those for the recovery planning process as recovery will require expanding the currently contracted ranges and establishing additional populations.

We determined that all areas proposed for designation contain the PBFs for spikedace or loach minnow. There are no developed areas within the proposed designation except for barriers constructed on streams or road crossings of streams, which do not remove the suitability of these areas for these species.

We used the following ruleset to determine which areas to include within this proposal:

(1) Evaluate the suitability of stream segments that are within the geographic area occupied at the time of listing and:

(a) Retain those segments that contain sufficient PBFs to support life-history functions essential for the conservation of the species, and

(b) Eliminate those areas that were known to be occupied at listing, but that no longer support any PBFs for the species or that have been permanently altered so that restoration is unlikely, or both.

(2) Evaluate stream segments not known to be within the geographic area occupied at listing, but that are within the historical range of the species to determine if they are essential to the survival and recovery of the species. Essential areas are those that:

(a) Serve as an extension of habitat in the unit, as existing habitat is insufficient to recover the species;

(b) Expand the geographic distribution across the range of the species, as the current geographic distribution is reduced to 10 to 20 percent of historical range, and concentrates fish in a few remaining areas that are more likely susceptible to catastrophic events; and

(c) Connect to other occupied areas, which will enhance genetic exchange between populations.

We considered the known occupancy of the area, as well as the suitability and level of adverse impacts to habitat within each unit. We believe the areas proposed provide for the conservation of the spikedace and the loach minnow because they include habitat for all extant populations, provide habitat for all known genetic lineages, and include habitat for connectivity and dispersal opportunities within units. Such opportunities for dispersal assist in maintaining the population structure and distribution of the two species.

As a final step, we evaluated those stream segments retained through the above analysis, and refined the starting and end points by evaluating the presence or absence of appropriate PBFs. We selected upstream and downstream cutoff points to exclude areas that are highly degraded and are not likely restorable. For example,

permanently dewatered areas, permanently developed areas, or areas in which there was a change to unsuitable parameters (*e.g.,* a steep gradient, bedrock substrate) were used to mark the start or endpoint of a stream segment proposed for designation. Critical habitat stream segments were then mapped using ArcMap (Environmental Systems Research Institute, Inc.), a Geographic Information Systems program.

The areas proposed for designation as critical habitat are designed to provide sufficient riverine and associated floodplain area for breeding, non-breeding, and dispersing adult spikedace and loach minnow, as well as for the habitat needs for juvenile and larval stages of these fishes. In general, the physical and biological features of critical habitat for spikedace and loach minnow are contained within the riverine ecosystem formed by the wetted channel and the adjacent floodplains within 91.4 lateral m (300 lateral ft) on either side of bankfull stage, except where bounded by canyon walls. Areas within the lateral extent also contribute to the PBFs, including water quality and intermittent areas through which fish may move when wetted. Spikedace and loach minnow use the riverine ecosystem for feeding, breeding, and sheltering while breeding and migrating.

This proposed designation takes into account the naturally dynamic nature of riverine systems and floodplains (including riparian and adjacent upland areas) that are an integral part of the stream ecosystem. For example, riparian areas are seasonally flooded habitats (i.e., wetlands) that are major contributors to a variety of functions vital to fish within the associated stream channel (Brinson *et al.* 1981, pp. 2–61, 2–69, 2–72, 2–75, 2–84 through 2–85; Federal Interagency Stream Restoration Working Group 1998). They are responsible for energy and nutrient cycling, filtering runoff, absorbing and gradually releasing floodwaters, recharging groundwater, maintaining streamflow, protecting stream banks from erosion, and providing shade and cover for fish and other aquatic species. Healthy riparian and adjacent upland areas help ensure water courses maintain the habitat important for aquatic species (e.g., see Forest Service 1979, pp. 18, 109, 158, 264, 285, 345; Middle Rio Grande Biological Interagency Team 1993, pp. 64, 89, 94; Castelle *et al.* 1994, pp. 279–281), including the spikedace and loach minnow. Habitat quality within the mainstem river channels in the historical range of the spikedace and loach minnow is intrinsically related to the character of the floodplain and the associated tributaries, side channels, and backwater habitats that contribute to the key habitat features (e.g., substrate, water quality, and water quantity) in these reaches. We have determined that a relatively intact riparian area, along with periodic flooding in a relatively natural pattern, is important for maintaining the PBFs necessary for long-term conservation of the spikedace and the loach minnow.

The lateral extent (width) of riparian corridors fluctuates considerably between a stream's headwaters and its mouth. The appropriate width for riparian buffer strips has been the subject of several studies and varies depending on the specific function required for a particular buffer (Castelle *et al.* 1994, pp. 879–881). Most Federal and State agencies generally consider a zone 23 to 46 m (75 to 150 ft) wide on each side of a stream to be adequate (National Resource Conservation Service 1998, pp. 2–3; Moring *et al.* 1993, p. 204; Lynch *et al.* 1985, p. 164), although buffer widths as wide as 152 m (500 ft) have been recommended for achieving flood attenuation benefits (U.S. Army Corps 1999, pp. 5–29). In most instances, however, riparian buffer zones are primarily intended to reduce (i.e., buffer) detrimental impacts to the stream from sources outside the river channel. Consequently, while a riparian corridor 23 to 46 m (75 to 150 ft) in width may function adequately as a buffer, it is likely inadequate to preserve the natural processes that provide spikedace and loach minnow PBFs.

The lateral extent of streams included in this proposed designation is 91.4 m (300 ft) to either side of bankfull stage. We believe this width is necessary to accommodate stream meandering and high flows, and in order to ensure that this proposal contains the features essential to the conservation of the species. Bankfull stage is defined as the upper level of the range of channel-forming flows, which transport the bulk of available sediment over time. Bankfull stage is generally considered to be that level of stream discharge reached just before flows spill out onto the adjacent floodplain. The discharge that occurs at bankfull stage, in combination with the range of flows that occur over a length of time, govern the shape and size of the river channel (Rosgen 1996, pp. 2–2 to 2–4; Leopold 1997, pp. 62–63, 66). The use of bankfull stage and 91.4 m (300 ft) on either side recognizes the naturally dynamic nature of riverine systems, recognizes that floodplains are an integral part of the stream ecosystem, and contains the area and associated features essential to the conservation of the species.

We determined the 91.4-m (300-ft) lateral extent for several reasons. First, the implementing regulations of the Act require that critical habitat be defined by reference points and lines as found on standard topographic maps of the area (50 CFR 424.12(c)). Although we considered using the 100-year floodplain, as defined by the Federal Emergency Management Agency, we found that it was not included on standard topographic maps, and the information was not readily available from Federal Emergency Management Agency or from the U.S. Army Corps of Engineers for the areas we are proposing to designate. We suspect this is related to the remoteness of many of the stream reaches where these species occur. Therefore, we selected the 91.4-m (300-ft) lateral extent, rather than some other delineation, for three biological reasons: (1) The biological integrity and natural dynamics of the river system are maintained within this area (*i.e.,* the floodplain and its riparian vegetation provide space for natural flooding patterns and latitude for necessary natural channel adjustments to maintain appropriate channel morphology and geometry, store water for slow release to maintain base flows, provide protected side channels and other protected areas, and allow the river to meander within its main channel in response to large flow events); (2) conservation of the adjacent riparian area also helps to provide important nutrient recharge and protection from sediment and pollutants; and (3) vegetated lateral zones are widely recognized as providing a variety of aquatic habitat functions and values (*e.g.,* aquatic habitat for fish and other aquatic organisms, moderation of water temperature changes, and detritus for aquatic food webs) and help improve or maintain local water quality (see U.S. Army Corps of Engineers' Final Notice of Issuance and Modification of Nationwide Permits, March 9, 2000, 65 FR 12818).

When determining critical habitat boundaries within this proposed rule, we made every effort to avoid including structures such as bridges, diversion structures, or other structures which lack suitable PBFs for the spikedace and loach minnow. The scope of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Any such structures and the land under them inadvertently left inside critical habitat boundaries shown on the maps are excluded by text in this proposed rule.

Therefore, a Federal action involving these lands (if and when designated) would not trigger section 7 consultation with respect to critical habitat and the prohibition of destruction or adverse modification, unless the specific action may affect adjacent critical habitat. Where a developed structure is within the proposed critical habitat designation (*e.g.,* paved low water crossing, a portion of a stream flowing under a bridge), the area would be considered to be proposed critical habitat if it continues to contain one or more of the PBFs.

We propose eight units for designation based on sufficient PBFs being present to support spikedace or loach minnow life processes. Some segments contain all PBFs and support multiple life processes. Some segments contain only a portion of the PBFs necessary to support the spikedace or the loach minnow's particular use of that habitat.

Proposed Critical Habitat Designation

We are proposing 1,168 km (726 mi) of streams as critical habitat for spikedace, and 1,141 km (709 mi) of streams as critical habitat for loach minnow. Of this total mileage, 874 km (543 mi) of streams are overlapping (*i.e.,* proposed for designation for both species). The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for spikedace and loach minnow. The eight units we propose as critical habitat occur in portions of the Verde River and its tributaries; the Salt River and its tributaries; the San Pedro River and its tributaries; Bonita Creek; Eagle Creek; the San Francisco River and its tributaries; the Blue River and its tributaries; and the Gila River and its tributaries. Tables 3 and 4 show the occupied units for the spikedace and the loach minnow. Table 5 provides a breakdown of river miles by type of landowner or manager for all proposed critical habitat units for the spikedace and the loach minnow.

TABLE 3—OCCUPANCY OF PROPOSED CRITICAL HABITAT UNITS BY SPIKEDACE

Stream segment	Occupied at time of listing	Currently occupied?	Translocated population
Unit 1—Verde River Subbasin			
Verde River mainstem	Yes	Yes	No.
Granite Creek	No	No	No.
Oak Creek	No	No	No.
Beaver and Wet Beaver Creek	Yes	No	No.
West Clear Creek	Yes	No	No.
Fossil Creek	No	Yes	Yes.
Unit 2—Salt River Subbasin			
Tonto Creek	Yes	No	No.
Greenback Creek	No	No	No.
Rye Creek	No	No	No.
Spring Creek	No	No	Proposed.
Rock Creek	No	No	Proposed.
Unit 3—San Pedro River Subbasin			
San Pedro River	Yes	No	No.
Hot Springs Canyon	No	Yes	Yes.
Bass Canyon	No	No	No.
Redfield Canyon	No	Yes	Yes.
Aravaipa Creek	Yes	Yes	No.
Deer Creek	No	No	No.
Turkey Creek	No	No	No.
Unit 4—Bonita Creek Subbasin			
Bonita Creek mainstem	No	Yes	Yes.
Unit 5—Eagle Creek Subbasin			
Eagle Creek mainstem	Yes	Yes	No.
Unit 6—San Francisco River Subbasin			
San Francisco River	Yes	Yes	Yes.
Unit 7—Blue River Subbasin			
Blue River	No	No	Proposed.
Campbell Blue Creek	No	No	No.
Dry Blue Creek	No	No	No.
Little Blue Creek	No	No	No.
Pace Creek	No	No	No.
Frieborn Creek	No	No	No.

TABLE 3—OCCUPANCY OF PROPOSED CRITICAL HABITAT UNITS BY SPIKEDACE—Continued

Stream segment	Occupied at time of listing	Currently occupied?	Translocated population
Unit 8—Gila River Subbasin			
Gila River	Yes	Yes	No.
West Fork Gila River	Yes	Yes	No.
Middle Fork Gila River	Yes	Yes	No.
East Fork Gila River	Yes	Yes	No.
Mangas Creek	Yes	Yes	No.

TABLE 4—OCCUPANCY OF PROPOSED CRITICAL HABITAT UNITS BY LOACH MINNOW

Unit	Known to be occupied at listing	Currently occupied	Translocated population
Unit 1—Verde River Subbasin			
Verde River mainstem	Yes	No	No.
Granite Creek	No	No	No.
Oak Creek	No	No	No.
Beaver and Wet Beaver Creek	Yes	No	No.
Fossil Creek	No	Uncertain	Yes.
Unit 2—Salt River Subbasin			
White River mainstem	Yes	Uncertain	No.
East Fork White River	Yes	Uncertain	No.
North Fork White River	Yes	Uncertain	No.
East Fork Black River	No	No	No.
Boneyard Creek	No	No	No.
Coyote Creek	Yes	Yes	No.
Unit 3—San Pedro River Subbasin			
San Pedro mainstem	Yes	No	No.
Hot Springs Canyon	No	Yes	Yes.
Bass Canyon	No	No	No.
Redfield Canyon	No	Yes	Yes.
Aravaipa Creek	Yes	Yes	No.
Deer Creek	Yes	Yes	No.
Turkey Creek	Yes	Yes	No.
Unit 4—Bonita Creek Subbasin			
Bonita Creek mainstem	No	Yes	Yes.
Unit 5—Eagle Creek Subbasin			
Eagle Creek mainstem	Yes	Yes	No.
Unit 6—San Francisco River Subbasin			
San Francisco mainstem	Yes	Yes	No.
Tularosa River	Yes	Yes	No.
Negrito Creek	Yes	Yes	No.
Whitewater Creek	Yes	No	No.
Unit 7—Blue River Subbasin			
Blue River mainstem	Yes	Yes	No.
Campbell Blue Creek	Yes	Yes	No.
Dry Blue Creek	Yes	Yes	No.
Little Blue Creek	Yes	No	No.
Pace Creek	Yes	Yes	No.
Frieborn Creek	Yes	Yes	No.
Unit 8—Gila River Subbasin			
Gila River mainstem	Yes	Yes	No.
West Fork Gila River	Yes	Yes	No.
Middle Fork Gila River	Yes	Yes	No.

TABLE 4—OCCUPANCY OF PROPOSED CRITICAL HABITAT UNITS BY LOACH MINNOW—Continued

Unit	Known to be occupied at listing	Currently occupied	Translocated population
East Fork Gila River	Yes	Yes	No.
Mangas Creek	Yes	Yes	No.

TABLE 5—PROPOSED CRITICAL HABITAT UNITS FOR SPIKEDACE AND LOACH MINNOW

[Area estimates reflect all land within critical habitat unit boundaries]

Unit	Federal		State		Local or tribal *		Private		Total	
	Km	Mi	Km	Mi	Km	Mi	Km	Mi	Km	Mi
1	146	90	4	2	11	7	112	70	273	169
2	119	74	0	0	46	28	12	7	177	109
3	89	55	17	11	4	2	50	31	160	99
4	18	11	0	0	0	0	5	3	23	14
5	21	13	0	0	27	17	27	17	75	47
6	146	91	3	2	0	0	70	44	219	137
7	93	58	0	0	0	0	14	9	107	67
8	156	97	2	1	0	0	90	56	248	154
Total	788	489	26	16	88	54	380	237	1,282	796

Note: Area sizes may not sum due to rounding. Total figures for Complex 1 vary from those in the text description below. The additional stream miles fall within different landowner categories which were not summarized here.

We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for spikedace and loach minnow or both, below. Table 6 at the end of this section summarizes the criteria from the ruleset (above) under which units were included.

Unit 1: Verde River Subbasin

Within this Verde River Subbasin, we are proposing to designate 281.2 km (174.8 mi) on the Verde River and its tributaries Granite Creek, Oak Creek, Beaver and Wet Beaver Creek, West Clear Creek, and Fossil Creek for spikedace. For loach minnow, we are proposing to designate 218.2 km (135.6 mi) on the Verde River and its tributaries Granite Creek, Oak Creek, Beaver and Wet Beaver Creek, and Fossil Creek. All of the mileage included in the proposed designation for loach minnow is included within the proposed designation for spikedace.

The Verde River and its tributaries included within the proposed designation are in Yavapai and Gila Counties, Arizona. From Sullivan Lake, near its headwaters, the Verde River flows for 201 km (125 mi) downstream to Horseshoe Reservoir. The Verde River is unique in comparison to many desert streams such as the Salt or Gila rivers in that it is free-flowing for its upper 201 km (125 mi). The Verde River is also perennial for that length (Sullivan and Richardson 1993, pp. 19–21; The Nature Conservancy 2006).

Due to the low number of remaining populations and severely restricted range, spikedace are at risk of extirpation from this watershed. Portions of this unit are known to be have been occupied at listing, while others have historical records or newly translocated populations. We determined that this area is essential to the conservation of both species because it contains physical habitat features to support the species (PBF 1), perennial streams with no or low levels of pollutants (PBFs 3 and 4), has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6), and provides suitable areas for a possible future barrier construction and species augmentation to support both species' recovery. Securing both species in this watershed will contribute significantly to the species' eventual recovery.

Approximately 1.2 km (0.8 mi) of the Verde River and 0.2 km (0.1 mi) of Beaver Creek/Wet Beaver Creek occur on lands owned by the Yavapai-Apache Nation. These areas will be considered for exclusion from the final critical habitat designation under section 4(b)(2) of the Act (see "*Application of Section 4(b)(2) of the Act*" section below for additional information).

Spikedace and loach minnow. For both spikedace and loach minnow, we are including within this proposal 3.2 km (2.0 mi) of Granite Creek from the confluence with the Verde River upstream to an unnamed spring. Above the spring there are insufficient flows to maintain these species. There are no known records of spikedace or loach minnow from Granite Creek specifically, but it is within the historical range known to be occupied by both species. As a perennial tributary of the Verde River in the area with the highest species density, Granite Creek is considered an important expansion area for spikedace recovery. Granite Creek is also considered an important expansion area for loach minnow recovery. These portions of Granite Creek are essential to the conservation of both species because they contain suitable habitat for all life stages of spikedace and loach minnow (PBF 1); have an appropriate food base (PBF 2); and consist of perennial streams with no or low levels of pollutants (PBFs 3 and 4). In addition, they are connected to portions of the Verde River believed to be occupied by spikedace.

Granite Creek occurs predominantly on lands managed by the AGFD in their Upper Verde Wildlife Area. The primary emphasis in this area is on management of riparian habitat and maintenance of native fish diversity. The parcel is 100 hectares (ha) (249 acres (ac)). It is surrounded by private lands on which a variety of actions, including livestock

grazing, may occur. The essential features in this unit may require special management considerations or protections due to competition with or predation by nonnative aquatic species present in both the Verde River and Granite Creek, sand and gravel operations, severe drought (University of Nebraska-Lincoln 2010) and other water demands, and potentially livestock grazing on private lands and associated impacts to uplands, riparian vegetation, and the stream.

This proposed designation includes 54.3 km (33.7 mi) of Oak Creek from the confluence with the Verde River upstream to the confluence with an unnamed tributary near the Yavapai and Coconino County boundary. The lower portions of the creek contain suitable, although degraded, habitat. Above the unnamed tributary, the creek becomes unsuitable due to urban and suburban development and to increasing gradient and substrate size.

There are no known records of spikedace or loach minnow from Oak Creek specifically, but it occurs within the historical range known to be occupied by both species. Oak Creek contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). Oak Creek is currently being evaluated by a multi-agency team for translocation of spikedace and loach minnow. As noted below in the Fossil Creek discussion, areas suitable for such actions are rare in the desert southwest. As a perennial tributary of the Verde River, and a potential translocation site, Oak Creek contains the physical features that can provide an important expansion area for spikedace and loach minnow recovery. We determined that this area is essential to the conservation of both species because it provides suitable areas for a possible future barrier construction and species augmentation to support both species' recovery.

Oak Creek occurs on a mix of private and Coconino National Forest lands. The essential features in this unit may require special management considerations or protections due to competition with and predation by nonnative aquatic species; recreation including off-road vehicles (ORVs) and associated damage to streams, vegetation and streambanks; severe drought (University of Nebraska-Lincoln 2010, p. 1); and residual effects of livestock grazing and impacts to uplands, riparian vegetation, and the stream.

We are including within the proposed designation 33.5 km (20.8 mi) of Beaver and Wet Beaver Creek from the confluence with the Verde River upstream to the confluence with Casner Canyon. Beaver Creek and its upstream extension in Wet Beaver Creek historically supported spikedace (ASU 2002; AGFD 2004) and contains suitable, although degraded, habitat. This area is not within the geographic area occupied at listing, but it is within the historical range known to be occupied by the species. There is one historical record for loach minnow from Beaver Creek but none from Wet Beaver Creek. There is one historical record for loach minnow on the mainstem Verde River approximately 7.2 km (4.5 mi) above the confluence with Beaver and Wet Beaver Creek (ASU 2002; AGFD 2004). Beaver and Wet Beaver Creek currently contain suitable habitat for all life stages of spikedace and loach minnow (PBF 1); have appropriate food bases (PBF 2); consist of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and have appropriate hydrologic regimes to maintain suitable habitat characteristics (PBF 6). As noted under Granite and Oak creeks, habitat within this portion of the species' ranges is limited to the Verde River Unit, including the Verde and a few of its perennial tributaries like Beaver and Wet Beaver Creek. Inclusion of Beaver and Wet Beaver Creek expands the overall unit size, adding to available habitat in this portion of the species' historical range, as well as expands recovery potential for the species in this portion of their historical ranges. This area is therefore essential to the conservation of both species.

Beaver and Wet Beaver Creek occur on a mix of private, National Park, and Coconino National Forest lands. The essential features in this unit may require special management considerations or protection due to residual impacts associated with past livestock grazing and impacts to uplands, riparian vegetation, and the stream; competition with and predation by nonnative aquatic species; severe drought (University of Nebraska-Lincoln 2010, p. 1); and increasing human development within the watershed.

We are including within this proposal 7.5 km (4.7 mi) of Fossil Creek extending from the confluence with the Verde River upstream to the confluence with an unnamed tributary. Fossil Creek was not known to be occupied by spikedace or loach minnow at listing. Although sufficient flows were previously lacking through this area, in 2005, following decommissioning of the Childs-Irving Power Plant, formerly diverted flows were returned to Fossil Creek (Robinson 2009b, p. 3). Spikedace and loach minnow were translocated into this important recovery stream in 2007 (Carter 2007a, p. 1), and additional fish were added in 2008 (Carter 2008a, pp. 1–2).

Fossil Creek contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). With the severe reductions in the species' overall distribution, and an already initiated translocation effort, Fossil Creek is essential to the recovery of spikedace and loach minnow as it supports one of the few remaining populations for both species. The translocation of spikedace and loach minnow into Fossil Creek is part of a larger conservation planning effort to restore a native fishery to the creek.

Fossil Creek occurs primarily on Federal lands, forming the boundary between the Coconino and Tonto National Forests. The essential features in this unit may require special management considerations or protection due to residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; severe drought (University of Nebraska-Lincoln 2010, p. 1); and recreation.

Spikedace only. We are including within this unit 171.8 km (106.7 mi) of the Verde River from Sullivan Lake downstream to the confluence with Fossil Creek. The Verde River mainstem is within the geographic area occupied at the time of listing (ASU 2002; M. Brouder, pers. comm. 2002; AGFD 2004; C. Crowder, AGFD, pers. comm. 2009). Survey efforts are not continuous or consistent, and the current status of the population in this area is uncertain. Spikedace can be difficult to detect in monitoring efforts due to their small size, small population sizes, and yearly fluctuations in populations. Populations have been known to appear and disappear over time, which makes specific determinations on status and exact locations of populations difficult to determine. For example, spikedace were not detected in surveys conducted in 1950, or again in the 1970s or early 1980s in Eagle Creek, but were subsequently detected in 1985 and 1987 (Marsh *et al* . 1990, pp. 107–108). However, given the abundance of nonnative fishes, it is likely that any

remaining spikedace are very rare and only in the uppermost reaches of the Verde River.

While current occupancy remains uncertain, the Verde River is essential to the conservation of the species. It currently contains suitable habitat for all life stages of spikedace (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). The Verde River is the only occupied stream system in this geographic portion of the species' historical range, and represents one of four units in this proposed designation in which spikedace are most likely to be found. Protection of the species in this portion of the historical range will contribute to the long-term conservation of the species. Finally, spikedace in the Verde River are genetically (Tibbets 1993, pp. 25–27, 34) and morphologically (Anderson and Hendrickson 1994, pp. 148, 154) distinct from all other spikedace populations.

The essential features in this unit may require special management considerations and protections due to water diversions; existing and proposed groundwater pumping potentially resulting in drying of habitat; residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream channel; human development of surrounding areas; increased recreation including off-road vehicle use; severe drought (University of Nebraska-Lincoln 2010, p. 1); and competition with or predation by nonnative aquatic species.

We are including 10.9 km (6.8 mi) of West Clear Creek from the confluence with the Verde River upstream to the confluence with Black Mountain Canyon. Gradient and channel morphology changes above Black Mountain Canyon make the upstream area unsuitable for spikedace. The lower portion of West Clear Creek was known to be occupied by spikedace at listing (ASU 2002; AGFD 2004) and contains suitable habitat for all life stages of spikedace (PBF 1); has an appropriate food base (PBF 2); and consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4). West Clear Creek is under consideration as a translocation site for spikedace by a multi-agency team. The presence of PBFs, its past occupancy, and its consideration for translocation of spikedace indicate the suitability of this area, which will serve as an important expansion area for spikedace recovery.

West Clear Creek is on private and Coconino National Forest lands. West Clear Creek runs through private land for several miles in the vicinity of the Town of Camp Verde. The essential features in this unit may require special management considerations or protection due to impacts associated with rural residential uses adjacent to the channel; agriculture; residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; severe drought (University of Nebraska-Lincoln 2010, p. 1); and competition with and predation by nonnative aquatic species.

Loach minnow only. We include within this unit 119.7 km (74.4 mi) of the Verde River from Sullivan Lake downstream to the confluence with Wet Beaver Creek. This mileage partially overlaps mileage proposed for designation as critical habitat for spikedace, which extends further downstream on the Verde River than this segment for loach minnow. This area is within the geographic area occupied by loach minnow at the time of listing. Surveys completed during the 1930s detected both species near Wet Beaver Creek. Spikedace and loach minnow were known to co-occur throughout much of their historical ranges. While spikedace were detected as far south as West Clear Creek, loach minnow were not. Subsequent surveys in more recent years have failed to detect either species. While incomplete, there are no known records of loach minnow from any point lower on the Verde River than Wet Beaver Creek.

The Verde River contains the suitable physical habitat features for all life stages of loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). The Verde River is located in the far northwestern portion of the species' range, and is the only river system in that geographic portion of the species' range. The suitability and location make the Verde River essential to the conservation of the loach minnow.

Land ownership and actions requiring special management considerations and protections for loach minnow are as summarized for spikedace in the above description of the Verde River for spikedace.

Unit 2: Salt River Subbasin

Spikedace and Loach Minnow

We are not proposing to designate any portion of the mainstem Salt River as critical habitat for spikedace at this time. Those portions below Theodore Roosevelt Reservoir have been altered by numerous dams and reservoirs, permanently limiting the natural flow regime and resulting in regulated flows. Those portions of the Salt River above the Reservoir support three historical records of spikedace near the confluence with Cibecue Creek. However, the Salt River, as well as the lower portions of Cibecue Creek, are canyon bound. While spikedace may occur in or travel through canyon areas, long stretches of canyon-bound river typically do not support the wider, shallower streams in which spikedace occur. Canyons are typically associated with a bedrock substrate, rather than the sand, gravel, or cobble over which spikedace are typically found. Where the river does have wider areas, it is currently dominated by nonnative fish species. Due to its limited available habitat, limited habitat suitability, and permanent alteration for reservoirs, we are not able to conclude that this area is essential to the conservation of the spikedace at this time.

In previous designations, we have included portions of Tonto Creek, Rye Creek, and Greenback Creek as critical habitat for loach minnow. These areas have no historical records for loach minnow. The limited mileage and habitat features make these areas less important to the overall conservation of loach minnow, and our current assessment is that the suitability for loach minnow in these streams is limited. We believe the habitat in the White and Black River systems is more suitable for loach minnow, and inclusion of these areas as critical habitat is sufficient to meet the preliminary recovery goals for the Salt River basin. We continue to propose these areas for spikedace critical habitat, as there are no records for spikedace from either the White or Black river systems, so that Tonto Creek and its tributaries represent the only occupied habitat within the Salt River subbasin for that species.

Spikedace. Unit 2 consists of 98.78 km (61.3 mi) of river on Tonto Creek and its tributaries Greenback, Rye, and Spring creeks, as well as Rock Creek, a tributary to Spring Creek, in Gila County, Arizona. The Salt River subbasin is a significant portion of spikedace historical range but currently has no known extant populations of spikedace. Large areas of the subbasin are unsuitable, either because of topography or because of reservoirs and other stream-channel alterations. Historical records for spikedace are from the Salt River near the confluence with

Cibecue Creek; the Salt River immediately below what is now Theodore Roosevelt Reservoir; and the Salt River in what is now Saguaro Lake (ASU 2002; AGFD 2004). With the exception of the record near Cibecue, existing locations have been substantially modified by the development of a series of dams and reservoirs. Streamflow between these reservoirs is regulated, removing the natural flow regime previously associated with the Salt River.

We are including within this proposal 47.8 km (29.7 mi) of Tonto Creek from the confluence with Greenback Creek upstream to the confluence with Houston Creek. Tonto Creek below Greenback Creek is influenced by Theodore Roosevelt Reservoir, resulting in unsuitable habitat below Greenback Creek. Those portions of Tonto Creek above the confluence with Houston Creek are of a gradient and substrate that are not suitable to spikedace. Tonto Creek was known to be occupied at listing (Abarca and Weedman 1993, p. 1; ASU 2002; AGFD 2004) but is not currently occupied. Tonto Creek supports perennial reaches that contain suitable habitat for all life stages of spikedace (PBF 1); has an appropriate food base (PBF 2); and consists of perennial flow with no or low levels of pollutants (PBFs 3 and 4).

The Salt River tributaries included in this proposal, Tonto Creek, Greenback Creek, Rye Creek, Spring Creek, and Rock Creek, occur almost entirely on the Tonto National Forest, with a few parcels of private land interspersed among Forest lands. The essential features in this unit may require special management considerations or protection due to residual impacts from past livestock grazing and impacts to uplands, riparian vegetation, and the stream; competition with and predation by nonnative aquatic species; moderate drought (University of Nebraska-Lincoln 2010, p. 1); water diversions that diminish flows in the active channel; and road maintenance that results in repeated impacts to the channel.

We are including within the proposed designation 15.1 km (9.4 mi) of Greenback Creek beginning at the confluence with Tonto Creek and continuing upstream to the confluence with Lime Springs. Portions of Greenback Creek are intermittent, but may connect Greenback Creek to Tonto Creek during seasonal flows. There are no known records of spikedace from Greenback Creek, but it is a tributary to Tonto Creek, which was known to be occupied at listing. Greenback Creek contains suitable habitat for all life stages of spikedace (PBF 1); has an appropriate food base (PBF 2); and consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4). As noted above, the Salt River subbasin is a significant portion of spikedace historical range, but there are limited areas of suitable habitat. The suitable habitat, its connection with Tonto Creek, and fact that it occurs almost entirely on Federal lands make Greenback Creek an important expansion area for spikedace recovery, and it is therefore essential to the conservation of the species.

We are including within this proposal 2.8 km (1.8 mi) of Rye Creek from the confluence with Tonto Creek upstream to the confluence with Brady Canyon. There are no known records of spikedace from Rye Creek, but it occurs within the historical range known to be occupied by the species. The entire portion of the proposed designation is perennial. Rye Creek contains suitable habitat for all life stages of spikedace (PBF 1); has an appropriate food base (PBF 2); and consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4). As with Greenback Creek, Rye Creek serves as connected perennial stream habitat that expands the available habitat associated with Tonto Creek and the Salt River subbasin, and it is therefore essential to the conservation of the species.

We are including within this proposal 27.2 km (16.9 mi) of Spring Creek from the confluence with Tonto Creek upstream to its confluence with Sevenmile Canyon. There are no known records of spikedace from Spring Creek, but it occurs within the historical range known to be occupied by the species. The entire portion of the proposed designation is perennial. Spring Creek contains suitable habitat for all life stages of spikedace (PBF 1); has an appropriate food base (PBF 2); and consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4). Spring Creek serves as connected perennial stream habitat that expands the available habitat associated with Tonto Creek and the Salt River subbasin, and it is therefore essential to the conservation of the species. In addition, for both Rock and Spring creeks, conservation efforts for spikedace are underway. The feasibility of constructing a barrier and translocating spikedace to Spring Creek, a tributary to Tonto Creek, has been initiated with draft NEPA documents under development.

We are including within this proposal 5.8 km (3.6 mi) of Rock Creek from its confluence with Spring Creek upstream to its confluence with Buzzard Roost Canyon. There are no known records of spikedace from Rock Creek, but it occurs within the historical range known to be occupied by the species. Rock Creek contains suitable habitat for all life stages of spikedace (PBF 1); has an appropriate food base (PBF 2); and consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4). Rock Creek will further expand the available habitat in the Salt River Subbasin. As noted above under Spring Creek, conservation planning efforts are underway that will likely lead to a translocation of spikedace into Rock Creek. The suitable habitat, perennial flows, and location within the Salt River subbasin make Rock Creek essential to the conservation of the spikedace.

Loach minnow. Unit 2 consists of 51.9 km (32.2 mi) of the White River and its tributary East Fork White River; and East Fork Black River, North Fork East Fork Black River, and Coyote and Boneyard creeks in Gila, Navajo, and Apache Counties, Arizona. Portions of this unit are known to have been occupied at listing, while others have historical records. The Salt River subbasin is a significant portion of loach minnow historical range, and the Salt River mainstem was known at listing to have historical records near the confluence with Cibecue Creek. The Black and White Rivers, which join to form the Salt River, are also known to have been occupied at listing. Within this subbasin, loach minnow have been extirpated from all but a small portion of the Black and White Rivers.

We are including within this proposal 29.0 km (18.0 mi) of the White River from the confluence with the Black River upstream to the confluence with the North and East Forks of the White River. Loach minnow were known at the time of listing to have occurred in this portion of the White River (M. Douglas, ASU, pers. comm. 1988; ASU 2002). The White River contains suitable habitat for all life stages of loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). Current occupancy of this area is unknown due to the proprietary nature of Tribal survey information. The length of perennial flows with suitable habitat parameters, historical occupancy, and potential current occupancy make this area essential to the conservation of the loach minnow.

The proposed designation on the White River is entirely within lands owned by the White Mountain Apache Tribe. This area will be considered for exclusion from the final critical habitat

designation under section 4(b)(2) of the Act (see "*Application of Section 4(b)(2) of the Act*" section below for additional information).

The essential features in this unit may require special management considerations or protection due to residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; competition with and predation by nonnative aquatic species; and moderate drought (University of Nebraska-Lincoln 2010, p. 1).

We are including within this proposal 17.2 km (10.7 mi) of the East Fork White River from the confluence with North Fork White River upstream to the confluence with Bones Canyon. Loach minnow were known at the time of listing to have occurred in these portions of the East Fork White River (Leon 1989; pp. 1–2; ASU 2002; Service 2006, pp. 2–3). These areas contains suitable habitat for all life stages of loach minnow (PBF 1); have an appropriate food base (PBF 2); consist of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and have an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). As perennial streams within the Salt River subbasin, these streams are considered essential to the recovery and survival of loach minnow.

The proposed designation on East Fork White River is entirely within lands owned by the White Mountain Apache Tribe. This area will be considered for exclusion from the final critical habitat designation under section 4(b)(2) of the Act (see "*Application of Section 4(b)(2) of the Act*" section below for additional information).

The essential features in this unit may require special management considerations or protection due to residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; competition with and predation by nonnative aquatic species; and moderate drought (University of Nebraska-Lincoln 2010, p. 1).

The North Fork White River was not specifically known to be occupied at the time of listing, but has been known to be occupied at times since listing. However, the North Fork White River is not thought to be able to support a breeding population of loach minnow, but rather, the collections of loach minnow in the North Fork of the White River are thought to be attributable to upstream migration from the breeding population found in the East Fork White River. It is suspected that high temperatures may be a limiting factor in the establishment of viable loach minnow populations in the North Fork White River (Raleigh Consultants 1995). Further, this reach is comprised of swift, deep runs which are not characteristic of the preferred shallow riffle habitat of the loach minnow (Raleigh Consultants 1996). Due to these factors, we cannot conclude that the North Fork White River supports adequate PBFs to support essential life history functions of loach minnow and we are not including this area within the proposed critical habitat designation.

The Salt River Subbasin also includes a total of 32.0 km (20 mi) of the East Fork Black River and its tributary Coyote Creek, and the North Fork East Fork Black River and its tributary Boneyard Creek. We are including within this proposal 19.1 km (11.9 mi) of the East Fork Black River extending from the confluence with the West Fork Black River upstream to the confluence with Boneyard Creek. East Fork Black River contains suitable habitat for all life stages of loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). The presence of multiple PBFs, and the presence of a distinct genetic population in the adjoining North Fork East Fork River, makes this area essential to the conservation of loach minnow.

Those portions of the East Fork Black River, the portions of the North Fork East Fork Black River, and the portions of Boneyard and Coyote Creek included within this proposal are entirely on Apache-Sitgreaves National Forests lands. The essential features in this unit may require special management considerations or protection due to residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; and competition with and predation by nonnative aquatic species. Native trout species are regularly stocked into the Black River and may also increase competition for resources and predation by trout. Wildfire has occurred in this area in the past, and there may be minimal increases in sediment carried into the stream from burned areas in the uplands.

We are including within this proposal 7.1 km (4.4 mi) of the North Fork East Fork Black River extending from the confluence with East Fork Black River upstream to the confluence with an unnamed tributary. Above this tributary, the river has finer substrate and lacks riffle habitat, making it unsuitable for loach minnow. The North Fork East Fork Black River is currently occupied (ASU 2002; S. Gurtin, AGFD, pers. comm. 2004; Robinson *et al.* 2009b, p. 1), and is presumed to have been occupied at listing. The North Fork East Fork Black River contains suitable habitat for all life stages of loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). As with the East Fork Black River, the presence of multiple PBFs, its occupied status, and the presence of a distinct genetic population make this area essential to the conservation of loach minnow.

We are including within the proposal 2.3 km (1.4 mi) of Boneyard Creek extending from the confluence with the East Fork Black River upstream to the confluence with an unnamed tributary. Occupancy of this area is uncertain, but it is connected to the North Fork East Fork Black River which is occupied by loach minnow (ASU 2002; S. Gurtin, AGFD, pers. comm. 2004; Robinson *et al.* 2009b, p. 1). It contains suitable habitat for all life stages of loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). As with the East Fork Black and North Fork East Fork Black rivers, the presence of multiple PBFs, and the presence of a distinct genetic population in the adjacent river, makes this area essential to the conservation of loach minnow.

We are including within this proposal 3.4 km (2.1 mi) of Coyote Creek, extending from the confluence with East Fork Black River upstream to the confluence with an unnamed tributary. This area is considered occupied and is connected to the North Fork East Fork Black River, which is occupied by loach minnow (M. Lopez, AGFD, pers. comm. 2000; ASU 2002; S. Gurtin, AGFD, pers. comm. 2004, Robinson *et al.* 2009b, p. 1). The portions of Coyote Creek proposed for inclusion in this proposed designation contain suitable habitat for all life stages of loach minnow (PBF 1); have an appropriate food base (PBF 2); and consist of perennial streams with no or low levels of pollutants (PBFs 3 and 4). As with the East Fork Black and North Fork East Fork Black rivers and Boneyard Creek, the presence of multiple PBFs, its occupied status, and the presence of a distinct genetic population make this area essential to the conservation of loach minnow.

Unit 3: San Pedro Subbasin

Spikedace and loach minnow. Unit 3 consists of 159.7 km (99.3 mi) of habitat on the upper San Pedro River, Aravaipa Creek and its tributaries Deer and Turkey creeks, Redfield and Hot Springs canyons, as well as Bass Canyon, tributary to Hot Springs Canyon, in Cochise, Pima, Pinal, and Graham Counties, Arizona. The San Pedro subbasin contains streams that are known to have been occupied by both species at listing, some of which are currently occupied, as well as streams with translocated populations of spikedace and loach minnow.

We are including within this proposal 60.0 km (37.2 mi) on the upper San Pedro River from the international border with Mexico downstream to the confluence with the Babocomari River. North of this confluence, the San Pedro was perennial, but does not currently support adequate flows for spikedace and loach minnow. Portions of the San Pedro River included within this proposed designation were known to be occupied by both species at listing. Multiple occurrence records of each species indicate the suitability of this area (ASU 2002; AGFD 2004). This portion of the San Pedro River contains suitable habitat for all life stages of loach minnow (PBF 1); has an appropriate food base (PBF 2); and consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4). The BLM has identified this area as having high restoration potential for spikedace and loach minnow. This portion of the San Pedro represents the southernmost extension of the two species' historical range. Suitable habitat within this geographic area is limited. Because of the presence of more than one PBF (including perennial flows), the abundance of historical records, and its importance to the overall range of the species, this area is considered essential to the conservation of both species.

The majority of this area is on lands managed by the BLM, with small portions of private and State lands. The essential features in this unit may require special management considerations or protection due to residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; competition with and predation by nonnative aquatic species; water developments; severe drought (University of Nebraska-Lincoln 2010, p. 1); and increasing human development within the watershed.

We are including within this proposal 44.9 km (27.91 mi) of Aravaipa Creek from the confluence with the San Pedro River upstream to the confluence with Stowe Gulch. Stowe Gulch is the upstream limit of sufficient perennial flows to support spikedace and loach minnow; no records of either species are known from above this point. Aravaipa Creek currently supports one of the largest remaining populations of spikedace and loach minnow, and has been monitored since 1943 (ASU 2002; Stefferud and Reinthal 2005, pp. 15–21; AGFD 2004; P. Reinthal, University of Arizona pers. comm. 2008; Reinthal 2009, pp. 1–2). Aravaipa Creek is unique in that it supports an intact native fish fauna comprised of seven species (Stefferud and Reinthal 2005, p. 11). It contains suitable habitat for all life stages of spikedace (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows (PBF 3); has no nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low to allow persistence of spikedace (PBF 5); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). The presence of all PBFs, and long-term presence and current occupancy by spikedace, makes this area essential to the conservation of the species.

Land ownership at Aravaipa Creek is predominantly BLM, with large parcels of private and State land on either end of the river. The essential features in this unit may require special management considerations or protection due to contaminants issues with lead, arsenic, and cadmium; surface and groundwater removal; limited recreation; severe drought (University of Nebraska-Lincoln 2010, p. 1); and channelization in upstream portions (Stefferud and Reinthal 2005, pp. 36–38).

We are including within this proposal 3.7 km (2.3 mi) of Deer Creek from the confluence with Aravaipa Creek upstream to the boundary of the Aravaipa Wilderness. Above this point, habitat is no longer suitable for spikedace or loach minnow. We are also including 4.3 km (2.7 mi) of Turkey Creek from the confluence with Aravaipa Creek upstream to the confluence with Oak Grove Canyon. Above this point, flows are not suitable for spikedace or loach minnow. Loach minnow are known to have occupied Deer and Turkey creeks at listing, while spikedace are not. Each of these tributary streams contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has appropriate food bases (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6).

Both Deer and Turkey creeks occur on lands managed by the BLM. The essential features in these two streams may require special management due to surface and groundwater removal; limited recreation; severe drought (University of Nebraska-Lincoln 2010, p. 1); occasional issues with nonnative aquatic species; and proposed utilities projects, such as the SunZia Southwest Transmission Project, which is currently in the study phase (Service 2010b, pp. 1–7). Deer and Turkey Creek are tributaries to Aravaipa Creek which is currently occupied by spikedace and so serve as an extension of the occupied habitat, and are therefore essential to the conservation of the species.

We are including within this proposal 19.0 km (11.8 mi) of stream in Hot Springs Canyon from the confluence with the San Pedro River upstream to the confluence with Bass Canyon. (The stream in Hot Springs Canyon is not named and is known only as Hot Springs Canyon.) There are no known records of spikedace or loach minnow from Hot Springs Canyon, but it is within the geographical range known to be occupied by both species. Following coordination by a multi-agency team, spikedace and loach minnow were translocated into Hot Springs Canyon in 2007, with augmentations in 2008 and 2009 (Robinson 2008a, pp. 1, 15–16; Robinson *et al.* 2010, pp. 4–5). Hot Springs Canyon contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); has no nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low to allow persistence of spikedace and loach minnow (PBF 5); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). The current occupancy by spikedace and loach minnow and presence of all PBFs, which extend the habitat available in this unit, make this area essential to the conservation of the species.

Hot Springs Canyon occurs on a mix of State, private, and BLM lands. The essential features in these two streams may require special management due to low flows or dewatering associated with severe drought (University of Nebraska-Lincoln 2010, p. 1) and climate change, and proposed utilities projects (as noted above under Aravaipa Creek (Service 2010, pp. 1–7)).

We are including within this proposal 22.5 km (14.0 mi) of stream in Redfield

Canyon from the confluence with the San Pedro River upstream to the confluence with Sycamore Canyon. (The stream in Redfield Canyon is not named and is known only as Redfield Canyon.) Above Sycamore Canyon, perennial water becomes very scarce, and the habitat becomes steeper, and more canyon-confined. Although there are no known records of spikedace or loach minnow from Redfield Canyon, it is within the geographical range known to be occupied by both species. Following coordination by a multi-agency team, spikedace and loach minnow were translocated into Redfield Canyon in 2007, with augmentations in 2008 (Robinson 2008b, pp. 1, 15–16; Robinson *et al.* 2010, pp. 4–5). Redfield Canyon contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); has no nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low to allow persistence of spikedace and loach minnow (PBF 5); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). Redfield Canyon was specifically identified within the species' Recovery Plan as an area with potential for spikedace (Service 1991a, p. 21; Service 1991b, p. 20). The current occupancy by spikedace and loach minnow and presence of all PBFs, which extends the available habitat in this unit, make this area essential to the conservation of the species.

Redfield Canyon occurs on primarily State lands, with small areas of private and Federal (BLM) lands. The essential features in Redfield Canyon may require special management due to occasional issues with nonnative aquatic species, low flows or dewatering associated with severe drought (University of Nebraska-Lincoln 2010, p. 1) and climate change, and proposed utilities projects (such as the SunZia Southwest Transmission Project as noted above under Aravaipa Creek).

We are including within this proposal 5.5 km (3.4 mi) of stream in Bass Canyon from the confluence with Hot Springs Canyon upstream to the confluence with Pine Canyon. (The stream in Bass Canyon is not named and is known only as Hot Springs Canyon.) There are no known records of spikedace or loach minnow from Bass Canyon, but it is within the geographical range known to be occupied by both species, and spikedace and loach minnow have been translocated into Hot Springs Canyon, to which Bass Canyon is connected and is a tributary stream (see discussion above under Hot Springs Canyon). Bass Canyon contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has no nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low to allow persistence of spikedace and loach minnow (PBF 5). Bass Canyon serves as an extension to Hot Springs Canyon and supports multiple PBFs. We therefore consider it to be essential to the conservation of both species.

The essential features in these two streams may require special management due to low flows or dewatering associated with severe drought (University of Nebraska-Lincoln 2010, p. 1) and climate change, and proposed utilities projects (such as the SunZia Southwest Transmission Project as noted above under Aravaipa Creek).

Cooperative conservation efforts for spikedace and loach minnow are ongoing in Hot Springs Canyon, Bass Canyon, and Redfield Canyon. To date, those activities have resulted in the translocation, augmentation, and monitoring of five native fishes, including spikedace and loach minnow. A multi-agency committee continues to work cooperatively on this multi-stream, multi-species conservation effort.

Unit 4: Bonita Creek Subbasin

Spikedace and Loach Minnow

We are including within this proposal 23.8 km (14.8 mi) of Bonita Creek from the confluence with the Gila River upstream to the confluence with Martinez Wash in Graham County, Arizona. The Bonita Creek subbasin is not known to have been occupied at listing but is within the geographical range known to have been occupied by both species. In 2008, spikedace and loach minnow were translocated into the lower portions of Bonita Creek (T. Robinson, AGFD, pers. comm. 2008c), with a small population of spikedace placed above the City of Safford's infiltration gallery, but below the southern boundary of the San Carlos Indian Reservation, in 2009. As noted above for Fossil Creek and Hot Springs Canyon and Redfield Canyon, there are limited opportunities for translocating or reintroducing populations of spikedace, and the reduction in the species' distribution necessitates that additional populations be established to recover the species. Bonita Creek is considered essential to the survival and recovery of spikedace and loach minnow because it contains suitable habitat for all life stages of spikedace (PBF 1); has an appropriate food base (PBF 2); and consists of perennial flow with no or low levels of pollutants (PBFs 3 and 4). It also allows for the expansion of the geographic distribution of the species' ranges.

Land ownership at Bonita Creek is almost entirely Federal under the BLM, with a few small private parcels. The proposed designation ends at the San Carlos Indian Reservation boundary. Critical habitat within this subbasin requires special management for nonnative aquatic species, some recreation, residual effects of past livestock grazing, moderate drought (University of Nebraska-Lincoln 2010, p. 1), and water diversion. Following rehabilitation of the stream, Bonita Creek will have no to at most low levels of nonnative aquatic species (PBF 5).

Cooperative conservation efforts for spikedace and loach minnow are ongoing in Bonita Creek. To date, those activities have resulted in the removal of nonnative fish species and translocation of spikedace, loach minnow, Gila topminnow, and desert pupfish into Bonita Creek. A Memorandum of Understanding was signed with the City of Safford regarding water management for Bonita Creek as part of this effort.

Unit 5: Eagle Creek Subbasin

Spikedace and loach minnow. We are including within this proposal 75.5 km (46.9 mi) of Eagle Creek from the Freeport McMoRan diversion dam upstream to the confluence with East Eagle Creek in Greenlee and Graham Counties, Arizona. Freeport McMoRan is a copper mining company formerly known as Phelps Dodge. Eagle Creek was known to be occupied at the time of listing by both spikedace and loach minnow. Loach minnow and spikedace are both considered present, but likely in small numbers, as suitable habitat is present (Marsh 1996, p. 2; ASU 2002; Bahm and Robinson 2009a, p. 1).

Eagle Creek contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6) above the barrier, which serves as the endpoint of this unit.

Eagle Creek occurs primarily on San Carlos Apache Tribal and Apache-Sitgreaves National Forests' lands, along with small parcels of State, private, and BLM lands. The essential features in

this stream may require special management considerations or protection due to competition with and predation by nonnative aquatic species; residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; mining activities in the uplands; moderate drought (University of Nebraska-Lincoln 2010, p. 1); and road construction and maintenance within and adjacent to the stream channel.

Those portions of Eagle Creek in Graham County are on the San Carlos Apache Reservation. Additionally, portions of Eagle Creek also flow through private lands belonging to Freeport McMoRan. These areas will be considered for exclusion from the final critical habitat designation under section 4(b)(2) of the Act (see "Application of Section 4(b)(2) of the Act" section below for additional information).

Unit 6: San Francisco River Subbasin

Spikedace and loach minnow. We are including within this proposal 181.0 km (112.3 mi) of the San Francisco River extending from the confluence with the Gila River in Greenlee County, Arizona upstream to the confluence with the Tularosa River in Catron County, New Mexico. Above the confluence with the Tularosa River, habitat is no longer suitable for spikedace or loach minnow. The San Francisco River, downstream of the Tularosa River confluence, was known to be occupied by spikedace at listing, and a reintroduction of spikedace occurred in 2008, above the town of Alma, New Mexico (NMDGF 2009, p. 1). This area was also known to be occupied by loach minnow at listing, and is currently occupied by loach minnow (NMDGF 2008; Propst *et al.* 2009, pp. 5–6). The San Francisco River is perennial throughout this length, and contains suitable habitat for all life stages of spikedace (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). The San Francisco River is one of the larger intact streams remaining within the species' ranges, with an overall length of approximately 202 km (125 mi). Because it represents one of the largest remaining rivers in the species' historical ranges, was historically occupied, has a reintroduced population of spikedace, is currently occupied by loach minnow, and supports several of the PBFs for spikedace, this area is essential to the conservation of spikedace and loach minnow.

Land ownership on the San Francisco River includes primarily BLM and Apache-Sitgreaves National Forests with small parcels of private and State lands in Arizona, and the Gila National Forest with small parcels of private lands in New Mexico. The essential features in this stream may require special management considerations or protection due to livestock grazing and impacts to uplands, riparian vegetation, and the stream; moderate drought (University of Nebraska-Lincoln 2010, p. 1) in those portions in Arizona; competition with and predation by nonnative aquatic species; water diversions; road construction and maintenance; and channelization.

We are not including portions of the Tularosa River, Whitewater Creek, or Negrito Creek as critical habitat for spikedace in this proposal. There are no known records of spikedace from these streams, and spikedace have not been known to occur any higher in the San Francisco River than Pleasanton (Paroz and Propst 2007, pp. 13–15).

Loach minnow only: We are proposing 30.0 km (18.6 mi) of the Tularosa River from the confluence with the San Francisco River upstream to the town of Cruzville, New Mexico. Above Cruzville, habitat becomes unsuitable for loach minnow. The Tularosa River is currently occupied by loach minnow (Propst *et al.* 2009, pp. 4–5). The Tularosa River is perennial throughout this reach, and contains suitable habitat for all life stages of loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). This area is considered essential to the conservation of loach minnow because it is currently occupied, supports more than one of the PBFs, and is connected to occupied habitat on the San Francisco River.

We are including within this proposal 6.8 km (4.2 mi) of Negrito Creek extending from the confluence with the Tularosa River upstream to the confluence with Cerco Canyon. Above this point, gradient and channel morphology make the creek unsuitable for loach minnow. Negrito Creek has been recently occupied by loach minnow, and is within the historical range known to be occupied by the species at listing. Negrito Creek is perennial through this reach, and contains suitable habitat for all life stages of loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). This area is considered essential to the conservation of loach minnow because of its occupancy history, and because it supports more than one of the PBFs and expands suitable habitat for loach minnow in this unit.

Negrito Creek occurs primarily on the Gila National Forest, with a few parcels of private land interspersed with the Forest lands. The essential features in this stream may require special management considerations or protection due to residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream, as well as other disturbances in the watershed.

We are also including within this proposed designation 1.9 km (1.2 mi) of Whitewater Creek from the confluence with the San Francisco River upstream to the confluence with Little Whitewater Creek. Upstream of this point, gradient and channel changes make the habitat unsuitable for loach minnow. Whitewater Creek was known to be occupied by loach minnow at the time of listing and has perennial flows. It serves as an extension of habitat on the San Francisco River. Whitewater Creek contains suitable habitat for all life stages of loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6).

Whitewater Creek occurs entirely on private lands. The essential features in this stream may require special management considerations or protection due to residual impacts from past livestock grazing and impacts to uplands, riparian vegetation, and the stream; water diversions; competition with and predation by nonnative aquatic species; road construction and maintenance; and channelization.

Unit 7: Blue River Subbasin

Spikedace and loach minnow. We are including within this unit 106.6 km (66.3 mi) of the Blue River, Campbell Blue Creek, and Little Blue Creek in Greenlee County, Arizona, and portions of Campbell Blue, Pace, Frieborn, and Dry Blue creeks in Catron County, New Mexico. The Blue River Subbasin is not specifically known to have been occupied by spikedace. The Blue River and its tributary streams included within this unit are known to have been occupied by loach minnow at listing, and are currently occupied by loach minnow (AGFD 1994, pp. 4–14; Bagley *et al.* 1995, multiple survey records;

Carter 2005, pp. 1–8; Clarkson *et al.* 2008, pp. 3–4).

The tributaries Campbell Blue Creek and Little Blue Creek occur primarily on Federal lands on the Apache-Sitgreaves National Forests, along with a few parcels of private lands. The tributaries Pace Creek and Frieborn Creek occur entirely on Federal lands on the Gila National Forest in New Mexico. The essential features in these streams may require special management considerations or protection due to residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; moderate drought (University of Nebraska-Lincoln 2010, p. 1); and competition with and predation by nonnative aquatic species.

Included within this proposed designation are 81.4 km (50.6 mi) of the Blue River from the confluence with the San Francisco River upstream to the confluence of Campbell Blue and Dry Blue creeks. Loach minnow are known to occur throughout the Blue River, while spikedace have not been documented. Because the range of spikedace has been severely reduced with only four remaining populations, additional areas for expansion of spikedace numbers will be required to ensure the survival and recovery of the species. In addition, planning among several State and Federal agencies is underway for restoration of native fish species, including spikedace, in the Blue River through construction of a barrier that will exclude nonnative fish from moving upstream. Barrier feasibility studies have been completed, as has a draft Memorandum of Understanding with land managers and residents in this area. The larger size of this stream, compared to smaller, tributary streams within the species' range, along with its perennial flows and conservation management activities, present a unique opportunity for spikedace. Federal land ownership throughout the majority of this proposed critical habitat unit would facilitate management for the species. In addition, the Blue River is occupied by loach minnow, and contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low pollutant issues (PBFs 3 and 4); has no nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low to allow persistence of spikedace and loach minnow (PBF 5); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). Because of its suitability, the Blue River can expand the geographic distribution of spikedace, and is therefore essential to its survival and recovery.

Landownership surrounding the Blue River is primarily Federal lands on the Apache-Sitgreaves National Forests, with small parcels of private lands. The essential features in this stream may require special management considerations or protection due to livestock grazing and impacts to uplands, riparian vegetation, and the stream (Service 2008); moderate drought (University of Nebraska-Lincoln 2010, p.1); water diversions and associated habitat alteration and water decreases in the active channel; and road construction and maintenance.

We are including within this proposal 12.4 km (7.7 mi) of Campbell Blue Creek extending from the confluence of Dry Blue and Campbell Blue Creeks upstream to the confluence with Coleman Canyon. Above Coleman Canyon, the creek changes and becomes steeper and rockier, making it unsuitable for spikedace and loach minnow. As with the Blue River, Campbell Blue Creek is not known to have been occupied by spikedace. Campbell Blue is currently occupied by loach minnow (Carter 2005, pp. 1–8). Campbell Blue Creek contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); has no nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low to allow persistence of spikedace and loach minnow (PBF 5); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). Because it supports more than one PBF and serves as an extension of available habitat on the Blue River, Campbell Blue Creek is essential to the conservation of spikedace and loach minnow.

We are including within this proposal 5.1 km (3.1 mi) of Little Blue Creek. This includes the lower, perennial portions of Little Blue Creek extending from the confluence with the Blue River upstream to the confluence with a canyon. Above the canyon, flows are not perennial. There are no spikedace records from Little Blue Creek; however, it was known to be occupied at listing by loach minnow. Little Blue Creek contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). Because it supports more than one PBF and serves as an extension of available habitat on the Blue River, this area is essential to the conservation of spikedace and loach minnow.

We are including within this proposal 1.2 km (0.8 mi) of Pace Creek from the confluence with Dry Blue Creek upstream to a barrier falls. Habitat above the barrier is considered unsuitable. There are no known records of spikedace from Pace Creek; however, it is currently occupied by loach minnow (ASU 2002; NMDGF 2008), and is presumed to have been occupied by loach minnow at listing. Its occupancy by loach minnow, a species which often co-occurs with spikedace, is also indicative of its suitability. Pace Creek contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). Because it supports more than one PBF and serves as an extension of available habitat on the Blue River, and is currently occupied by loach minnow, this area is essential to the conservation of spikedace and loach minnow.

We are including within this proposal 1.8 km (1.1 mi) of Frieborn Creek from the confluence with Dry Blue Creek upstream to an unnamed tributary. There are no known records for spikedace in Frieborn Creek; however, it is currently occupied by loach minnow. Its occupancy by loach minnow, a co-occurring species for spikedace, indicates its suitability. Frieborn Creek contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). Because it supports more than one PBF and serves as an extension of available habitat on the Blue River, this area is essential to the conservation of spikedace and loach minnow.

We are including within this proposal 4.7 km (3.0 mi) of Dry Blue Creek from the confluence with Campbell Blue Creek upstream to the confluence with Pace Creek. Dry Blue Creek is not known to be occupied by spikedace; however, it currently supports loach minnow, a co-occurring species for spikedace (ASU 2002; NMDGF 2008). Loach minnow are presumed to have been present at listing. In addition, Dry Blue Creek contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate

food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). Because it supports more than one PBF and serves as an extension of available habitat on the Blue River, this area is essential to the conservation of spikedace and loach minnow.

The essential features in this subbasin may require special management considerations or protection due to residual impacts of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; moderate drought (University of Nebraska-Lincoln 2010, p. 1); and competition with and predation by nonnative aquatic species.

Unit 8. Gila River Subbasin

Spikedace and loach minnow. The upper Gila River subbasin includes portions of the mainstem Gila River and four tributaries including West Fork Gila River, Middle Fork Gila River, East Fork Gila River, and Mangas Creek in Hidalgo, Grant, and Catron Counties, New Mexico. The Gila River subbasin also includes the Gila River in Greenlee, Graham, Maricopa, and Pinal Counties in Arizona. All streams included within this unit were known to be occupied by both species at listing.

We are including within the proposal 165.1 km (102.6 mi) of the Gila River from the confluence with Moore Canyon (near the Arizona-New Mexico border) upstream to the confluence of the East and West Forks. Below Moore Canyon, the river is substantially altered by agriculture, diversion, and urban development. In addition, no spikedace or loach minnow records are known from Moore Canyon downstream in Pinal County, Arizona. The portions of the Gila River included within the proposed designation support the largest remaining populations of spikedace and loach minnow (NMDGF 2008; Propst *et al.* 2009, pp. 14–17). The Gila River contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). The mainstem Gila River in New Mexico is considered essential to the survival and recovery of the species because it supports the largest remaining population of spikedace and loach minnow, and contains several of the PBFs for both species.

Spikedace and loach minnow on the Gila River mainstem occur primarily on Federal lands managed by the BLM and the Gila National Forest, interspersed with private and State lands. The essential features in this stream may require special management considerations or protection due to residual impacts of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; competition with and predation by nonnative aquatic species; road construction and maintenance; water diversions; and recreation.

Portions of streams on the Gila River mainstem within this unit are owned and managed by Freeport McMoRan. This area may be considered for exclusion from the final critical habitat designation under section 4(b)(2) of the Act (see "*Application of Section 4(b)(2) of the Act*" section below for additional information).

We are including within the proposal 13.0 km (8.1 mi) of the West Fork Gila River from the confluence with the East Fork Gila River upstream to the confluence with EE Canyon. Flows throughout this reach are perennial. Above EE Canyon, the river becomes unsuitable for spikedace and loach minnow due to gradient and channel morphology. The West Fork Gila River is currently occupied by both species (NMDGF 2008; Propst *et al.* 2009, pp. 7–9). The West Fork Gila River contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). This area is considered essential to the survival and recovery of spikedace and loach minnow due to its historical and current occupancy and multiple PBFs. In addition, the West Fork Gila River is connected to habitat occupied by both species on the Gila River.

The West Fork Gila River occurs primarily on a mix of Federal lands on the Gila National Forest, the National Park Service, and private lands. The essential features in this stream may require special management considerations or protection due to competition with and predation by nonnative aquatic species, road construction and maintenance, and watershed impacts associated with past wildfires.

We are including within the proposal 42.1 km (26.2 mi) of the East Fork Gila River from the confluence with the West Fork Gila River upstream to the confluence of Beaver and Taylor Creeks. The East Fork Gila River is currently occupied by spikedace and loach minnow (NMDGF 2008; Propst *et al.* 2009 pp. 12–13). The East Fork Gila River contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low pollutant levels (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). The East Fork Gila River is essential to the survival and recovery of both species because of its historical and current occupancy and several PBFs. In addition, the East Fork Gila River is connected to habitat occupied by spikedace and loach minnow on the Gila River.

The East Fork Gila River occurs primarily on Federal lands on the Gila National Forest, with small parcels of private lands interspersed. The essential features in this stream may require special management considerations or protection due to residual impacts of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; competition with and predation by nonnative aquatic species; and watershed impacts associated with past wildfires.

We are including within the proposal 9.1 km (5.7 mi) of Mangas Creek from the confluence with the Gila River upstream to the confluence with Willow Creek. Mangas Creek was not specifically known to be occupied at listing by spikedace or loach minnow, but is within the historical ranges of the species. Mangas Creek is currently occupied by spikedace and loach minnow (NMDGF 2008). Mangas Creek contains suitable habitat for all life stages of spikedace and loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). This area is considered essential to the conservation of these species because it is currently occupied, has several PBFs, and is connected to portions of the Gila River occupied by spikedace and loach minnow.

Mangas Creek occurs primarily on private lands, occasionally crossing the Gila National Forest or State land parcels. The essential features in this stream may require special management considerations or protection due to dispersed livestock grazing, and potential competition with and predation by nonnative aquatic species.

Portions of the Gila River mainstem and the majority of Mangas Creek proposed for inclusion as critical habitat within this unit are owned and managed by Freeport McMoRan. These areas may

be considered for exclusion from the final critical habitat designation under section 4(b)(2) of the Act (see "*Application of Section 4(b)(2) of the Act*" section below for additional information).

Spikedace only. The Agua Fria River is located on the extreme western edge of the species' range, on the lower portions of the Gila River in Yavapai and Maricopa Counties, Arizona. The Agua Fria River supports stretches of perennial flows interspersed with sections of intermittent flows before entering the Lake Pleasant reservoir created by Pleasant Dam. Suitable habitat areas on the Agua Fria River are therefore minimal, with perennial stretches mixed with predominantly intermittent stretches, and isolated from any mainstem system by a large reservoir. The Gila River at the confluence with the Agua Fria River is not perennial, so that the Agua Fria River does not act as an extension of suitable habitat in the adjacent mainstem river. Due to these factors, we cannot conclude that the Agua Fria River is essential to the conservation of spikedace at this time.

We are including within the proposal 12.5 km (7.7 mi) of the Middle Fork Gila River extending from the confluence with West Fork Gila River upstream to the confluence with Big Bear Canyon. This area is currently occupied by spikedace and is connected to currently occupied habitat on the West Fork of the Gila River (NMDGF 2008; Propst *et al.* 2009, pp. 9–11). The Gila River contains suitable habitat for all life stages of spikedace (PBF 1); has an appropriate food base (PBF 2); consists of perennial streams with no or low pollutant issues (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). This area is considered essential to the survival and recovery of the species because of its historical and current occupancy and multiple PBFs. In addition, the Middle Fork Gila River is connected to habitat occupied by spikedace on the West Fork Gila River.

The Middle Fork Gila River occurs primarily on Federal lands managed by the Gila National Forest, with small parcels of private lands interspersed with Federal lands. The essential features in this stream may require special management considerations or protection due to residual impacts of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; competition with and predation by nonnative aquatic species; and watershed impacts associated with past wildfires.

Loach minnow only. In addition to the areas described above for this unit, we are including within the proposed designation 19.1 km (11.9 mi) of the Middle Fork Gila River extending from the confluence with West Fork Gila River upstream to the confluence with Brothers West Canyon. The 12.5 km (7.7 mi) designated on the Middle Fork Gila River for spikedace is completely within this 19.1 km (11.9 mi) designated for loach minnow. This area is currently occupied by loach minnow (NMDGF 2008; Propst *et al.* 2009, pp. 9–11). The Middle Fork Gila River contains suitable habitat for all life stages of loach minnow (PBF 1); has an appropriate food base (PBF 2); consists of perennial flows with no or low levels of pollutants (PBFs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PBF 6). This area is considered essential to the survival and recovery of loach minnow due to its historical and current occupancy, its multiple PBFs, and its connection to the West Fork of the Gila River, which is currently occupied by loach minnow. See the description above, describing the proposed designation along the West and Middle Forks of the Gila River for spikedace for details on land ownership and special management needs.

Loach minnow were found in Bear Creek in 2005 (Schiffmiller 2005, pp. 1–4; NMDGF 2008); however, we are not including Bear Creek within this proposed designation. Bear Creek contains limited reaches of perennial flows in the upstream portions. However, most of the stream is intermittent. It is believed that loach minnow detected in 2005 came from the Gila River during a period when the upstream, perennial section was temporarily connected to the Gila River. However, we do not believe this area supports suitable conditions for loach minnow; therefore we do not believe this area is occupied on a regular or frequent basis. While we have documentation of the species from Bear Creek in 2005, there is no evidence of persistence of the species here, and the unsuitable habitat conditions indicate that this area is not essential to the survival and recovery of loach minnow.

TABLE 6—STREAM SEGMENTS CONSIDERED IN THIS CRITICAL HABITAT PROPOSAL, AND THE RULESET CRITERIA UNDER WHICH THEY ARE IDENTIFIED

Stream	Occupied by spikedace and loach minnow at the time of listing	Ruleset criteria met *
Verde River	Yes	1a.
Granite Creek	No	2a, 2c.
Oak Creek	No	2a.
Beaver and Wet Beaver Creek	No	2a.
Fossil Creek	No	2a.
West Clear Creek (spikedace only)	Yes	1a.
Salt River (spikedace only)	Yes	1b.
Agua Fria River (spikedace only)	Yes	1b.
Tonto Creek (spikedace only)	Yes	1a.
Greenback Creek (spikedace only)	No	2a, 2b.
Rye Creek (spikedace only)	No	2a, 2b.
Spring Creek (spikedace only)	No	2a, 2b.
Rock Creek (spikedace only)	No	2a, 2b.
White River (loach minnow only)	Yes	1a.
North Fork White River (loach minnow only)	Yes	1b.
East Fork White River (loach minnow only)	Yes	1a.
East Fork Black River (loach minnow only)	Yes	1a.
North Fork East Fork Black River (loach minnow only)	Yes	1a.
Boneyard Creek (loach minnow only)	Yes	1a.
Coyote Creek (loach minnow only)	Yes	1a.

TABLE 6—STREAM SEGMENTS CONSIDERED IN THIS CRITICAL HABITAT PROPOSAL, AND THE RULESET CRITERIA UNDER WHICH THEY ARE IDENTIFIED—Continued

Stream	Occupied by spikedace and loach minnow at the time of listing	Ruleset criteria met *
San Pedro River	Yes	1a.
Aravaipa Creek	Yes	1a.
Deer Creek	Yes (loach minnow)	1a
	No (spikedace)	2a, 2c.
Turkey Creek	Yes (loach minnow)	1a
	No (spikedace)	2a, 2c.
Hot Springs Canyon	No	2a.
Redfield Canyon	No	2a.
Bass Canyon	No	2a.
Bonita Creek	No	2b.
Eagle Creek	Yes	1a.
San Francisco River	Yes	1a.
Tularosa River (loach minnow only)	Yes	1a.
Negrito Creek (loach minnow only)	Yes	1a.
Whitewater Creek (loach minnow only)	Yes	1a.
Blue River	No—spikedace	2b
	Yes—loach minnow	1a.
Campbell Blue Creek	No—spikedace	2b
	Yes—loach minnow	1a.
Little Blue Creek	No—spikedace	2b
	Yes—loach minnow	1a.
Pace Creek	No—spikedace	2b
	Yes—loach minnow	1a.
Dry Blue Creek	No—spikedace	2b
	Yes—loach minnow	1a.
Frieborn Creek	No—spikedace	2b
	Yes—loach minnow	1a.
Gila River	Yes	1a.
West Fork Gila River	Yes	1a.
Middle Fork Gila River	Yes	1a.
East Fork Gila River	Yes	1a.
Mangas Creek	Yes	1a.

(*1a) Occupied at listing, and contains one or more of the PBFs.
(1b) Occupied at listing, and no longer supports PBFs or has been permanently altered so that recovery is unlikely.
(2a) Not known to be occupied at listing, within the historical range of the species, has one or more PBFs and serves as an extension of habitat in the unit.
(2b) Not known to be occupied at listing, within the historical range of the species, has one or more PBFs, and expands the geographic distribution across the range of the species.
(2c) Not known to be occupied at listing, within the historical range of the species, has one or more PBFs, and is connected to other occupied areas.

Effects of Critical Habitat Designation

Section 7 Consultation

Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that actions they fund, authorize, or carry out are not likely to destroy or adversely modify critical habitat. Decisions by the Fifth and Ninth Circuits Court of Appeals have invalidated our definition of "destruction or adverse modification" (50 CFR 402.02) (see *Gifford Pinchot Task Force* v. *U.S. Fish and Wildlife Service,* 378 F. 3d 1059 (9th Cir. 2004) and *Sierra Club* v. *U.S. Fish and Wildlife Service et al.*, 245 F.3d 434, 442 (5th Cir. 2001)), and we do not rely on this regulatory definition when analyzing whether an action is likely to destroy or adversely modify critical habitat. Under the statutory provisions of the Act, we determine destruction or adverse modification on the basis of whether, with implementation of the proposed Federal action, the affected critical habitat would remain functional (or retain those PBFs that relate to the ability of the area to periodically support the species) to serve its intended conservation role for the species.

If a species is listed or critical habitat is designated, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. As a result of this consultation, we document compliance with the requirements of section 7(a)(2) through our issuance of:

(1) A concurrence letter for Federal actions that may affect, but are not likely to adversely affect, listed species or critical habitat; or

(2) A biological opinion for Federal actions that may affect, and are likely to adversely affect, listed species or critical habitat.

When we issue a biological opinion concluding that a project is likely to jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat, we also provide reasonable and prudent alternatives to the project, if any are identifiable. We define "Reasonable and prudent alternatives" at 50 CFR 402.02 as alternative actions identified during consultation that:

• Can be implemented in a manner consistent with the intended purpose of the action,

• Can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction,

• Are economically and technologically feasible, and

• Would, in the Director's opinion, avoid jeopardizing the continued existence of the listed species or destroying or adversely modifying critical habitat.

Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 require Federal agencies to reinitiate consultation on previously reviewed actions in instances where we have listed a new species or subsequently designated critical habitat that may be affected and the Federal agency has retained discretionary involvement or control over the action (or the agency's discretionary involvement or control is authorized by law). Consequently, Federal agencies may sometimes need to request reinitiation of consultation with us on actions for which formal consultation has been completed, if those actions with discretionary involvement or control may affect subsequently listed species or designated critical habitat.

Federal activities that may affect spikedace and loach minnow or their designated critical habitat require section 7 consultation under the Act. Activities on State, Tribal, local, or private lands requiring a Federal permit (such as a permit from the U.S. Army Corps of Engineers under section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) or a permit from us under section 10 of the Act) or involving some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency) are subject to the section 7 consultation process. Federal actions not affecting listed species or critical habitat, and actions on State, Tribal, local or private lands that are not federally funded, authorized, or permitted, do not require section 7 consultations.

Application of the Jeopardy and Adverse Modification Standard

Application of the Jeopardy Standard

Prior to and following listing and designation of critical habitat, the Service applies an analytical framework for jeopardy analyses that relies heavily on the importance of core area populations to the survival and recovery of the species. The section 7(a)(2) analysis is focused not only on these populations but also on the habitat conditions necessary to support them.

The jeopardy analysis usually expresses the survival and recovery needs of the species in a qualitative fashion without making distinctions between what is necessary for survival and what is necessary for recovery. Generally, if a proposed Federal action is incompatible with the viability of the affected core area population(s), inclusive of associated habitat conditions, a jeopardy finding is considered to be warranted, because of the relationship of each core area population to the survival and recovery of the species as a whole.

Application of the "Adverse Modification" Standard

The key factor related to the adverse modification determination is whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species, or retain those PBFs that relate to the ability of the area to periodically support the species. Activities that may destroy or adversely modify critical habitat are those that alter the PBFs to an extent that appreciably reduces the conservation value of critical habitat for spikedace and loach minnow. As discussed above, the role of critical habitat is to support the life-history needs of the species and provide for the conservation (including recovery) of the species.

Section 4(b)(8) of the Act requires us to briefly evaluate and describe, in any proposed or final regulation that designates critical habitat, activities involving a Federal action that may destroy or adversely modify such habitat, or that may be affected by such designation.

Activities that, when carried out, funded, or authorized by a Federal agency, may affect critical habitat and therefore should result in consultation for spikedace and loach minnow include, but are not limited to:

(1) Actions that would diminish flows within the active stream channel. Such activities could include, but are not limited to: Water diversions, channelization, construction of any barriers or impediments within the active river channel, removal of flows in excess of those allotted under a given water right, construction of permanent or temporary diversion structures, and groundwater pumping within aquifers associated with the river. These actions could affect water depth, velocity, and flow pattern, all of which are essential to the different life stages of spikedace or loach minnow.

(2) Actions that significantly alter the water chemistry of the active channel. Such activities could include, but are not limited to: release of chemicals, biological pollutants, or other substances into the surface water or connected groundwater at a point source or by dispersed release (non-point source); and storage of chemicals or pollutants that can be transmitted, via surface water, groundwater, or air into critical habitat. These actions can affect water chemistry, and in turn the prey base of spikedace and loach minnow.

(3) Actions that would significantly increase sediment deposition within a stream channel. Such activities could include, but are not limited to: Excessive sedimentation from livestock overgrazing, road construction, commercial or urban development, channel alteration, timber harvest, ORV use, recreational use, or other watershed and floodplain disturbances. These activities could adversely affect reproduction of the species by preventing hatching of eggs, or by eliminating suitable habitat for egg placement by loach minnow. In addition, excessive levels of sedimentation can make it difficult for these species to locate prey.

(4) Actions that result in the introduction, spread, or augmentation of nonnative aquatic species in occupied stream segments, or in stream segments that are hydrologically connected to occupied stream segments, even if those segments are occasionally intermittent, or introduction of other species that compete with or prey on spikedace or loach minnow. Possible actions could include, but are not limited to: Introduction of parasites or disease, stocking of nonnative fishes, stocking of sport fish, stocking of nonnative amphibians, or other related actions. These activities can affect the growth, reproduction, and survival of spikedace and loach minnow.

(5) Actions that would significantly alter channel morphology. Such activities could include, but are not limited to: Channelization, impoundment, road and bridge construction, mining, dredging, and destruction of riparian vegetation. These activities may lead to changes in water flows and levels that would degrade or eliminate the spikedace or loach minnow, their habitats, or both. These actions can also lead to increased sedimentation and degradation in water

quality to levels that are beyond the tolerances of spikedace and loach minnow.

Exemptions

Application of Section 4(a)(3) of the Act

The Sikes Act Improvement Act of 1997 (Sikes Act) (16 U.S.C. 670a) required each military installation that includes land and water suitable for the conservation and management of natural resources to complete an integrated natural resources management plan (INRMP) by November 17, 2001. An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found on the base. Each INRMP includes:

- An assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species;
- A statement of goals and priorities;
- A detailed description of management actions to be implemented to provide for these ecological needs; and
- A monitoring and adaptive management plan.

Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management; fish and wildlife habitat enhancement or modification; wetland protection, enhancement, and restoration where necessary to support fish and wildlife; and enforcement of applicable natural resource laws.

The National Defense Authorization Act for Fiscal Year 2004 (Pub. L. 108–136) amended the Act to limit areas eligible for designation as critical habitat. Specifically, section 4(a)(3)(B)(i) of the Act (16 U.S.C. 1533(a)(3)(B)(i)) now provides: "The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation."

There are no Department of Defense lands within the proposed designation.

Exclusions

Application of Section 4(b)(2) of the Act

Section 4(b)(2) of the Act states that the Secretary must designate and revise critical habitat on the basis of the best available scientific data after taking into consideration the economic impact, national security impact, and any other relevant impact of specifying any particular area as critical habitat. The Secretary may exclude an area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific data available, that the failure to designate such area as critical habitat will result in the extinction of the species. In making that determination, the legislative history is clear that the Secretary has broad discretion regarding which factor(s) to use and how much weight to give to any factor.

Under section 4(b)(2) of the Act, we may exclude an area from designated critical habitat based on economic impacts, impacts on national security, or any other relevant impacts. In considering whether to exclude a particular area from the proposed designation, we must identify the benefits of including the area in the proposed designation, identify the benefits of excluding the area from the proposed designation, and determine whether the benefits of exclusion outweigh the benefits of inclusion. If, based on this analysis, we make this determination, then we can exclude areas only if such exclusion would not result in the extinction of the species.

When considering the benefits of inclusion for an area, we consider the additional regulatory benefits that area would receive from the protection from adverse modification or destruction as a result of actions with a Federal nexus, the educational benefits of mapping essential habitat for recovery of the listed species, and any benefits that may result from a designation due to State or Federal laws that may apply to critical habitat.

When considering the benefits of exclusion, we consider, among other things, whether exclusion of a specific area is likely to result in conservation; the continuation, strengthening, or encouragement of partnerships; implementation of a management plan that provides equal to or more conservation that a critical habitat designation would provide; or some combination of these.

After evaluating the benefits of inclusion and the benefits of exclusion, we carefully weigh the two sides to determine if the benefits of exclusion outweigh those of inclusion. If we determine that they do, we then determine whether exclusion would result in extinction of the species. If exclusion of an area from critical habitat will result in extinction, we will not exclude it from the designation.

Exclusions Based on Economic Impacts

Under section 4(b)(2) of the Act, we are required to consider the economic impacts of specifying any particular area as critical habitat. In order to consider economic impacts, we are preparing an analysis of the economic impacts of the proposed critical habitat designation and related factors. An economic analysis was completed for the 2007 designation of spikedace and loach minnow critical habitat (72 FR 13355, March 21, 2007). This analysis concluded, in part, that there would be potential impacts on several economic activities, including water diversion repair, livestock grazing, recreation, species management, residential and commercial development, and transportation, as well as administrative costs associated with species conservation activities. A new economic analysis will be completed on this currently proposed designation.

We will announce the availability of the draft economic analysis as soon as it is completed, at which time we will seek public review and comment. At that time, copies of the draft economic analysis will be available for downloading from the Internet at *http://www.regulations.gov,* or by contacting the Arizona Ecological Services Office directly (see **FOR FURTHER INFORMATION CONTACT** section). During the development of a final designation, we will consider economic impacts, public comments, and other new information, and areas may be excluded from the final critical habitat designation under section 4(b)(2) of the Act and our implementing regulations at 50 CFR 424.19.

Exclusions Based on National Security Impacts

Under section 4(b)(2) of the Act, we consider whether there are lands owned or managed by the Department of Defense (DOD) where a national security impact might exist. In preparing this proposal, we determined that the lands within the proposed designation of critical habitat for spikedace and loach minnow are not owned or managed by the DOD, and therefore we anticipate no impacts to national security. We are not considering any areas for exclusion from the final critical habitat designation based on impacts on national security.

Exclusions Based on Other Relevant Impacts

Under section 4(b)(2) of the Act, we consider any other relevant impacts, in addition to economic impacts and impacts to national security. We consider a number of factors including

whether the landowners have developed any HCPs or other management plans for the area, or whether there are conservation partnerships that would be encouraged by designation of, or exclusion from, critical habitat. In addition, we look at any Tribal issues, and consider the government-to-government relationship of the United States with Tribal entities. We also consider any social impacts that might occur because of the designation.

When we evaluate the existence of a conservation plan when considering the benefits of exclusion, we consider a variety of factors, including but not limited to, whether the plan is finalized; how it provides for the conservation of the essential physical and biological features; whether there is a reasonable expectation that the conservation management strategies and actions contained in a management plan will be implemented into the future; whether the conservation strategies in the plan are likely to be effective; and whether the plan contains a monitoring program or adaptive management to ensure that the conservation measures are effective and can be adapted in the future in response to new information.

During the preparation of the 2007 critical habitat designation (72 FR 13355, March 21, 2007), we received management plans from the White Mountain Apache Tribe, San Carlos Apache Tribe, and Freeport McMoRan (formerly Phelps Dodge). Additionally, a Tribal Resolution was prepared by the Yavapai Apache Nation. Areas covered by these plans and the resolution were excluded from the previous final critical habitat designation. On October 3, 2008, a formal opinion was issued by the Solicitor of the Department of the Interior, "The Secretary's Authority to Exclude Areas from a Critical Habitat Designation under Section 4(b)(2) of the Endangered Species Act" (U.S. Department of the Interior 2008). The opinion clearly lays out that areas which are under consideration for exclusion from critical habitat under section 4(b)(2) of the Act should be included in the proposed rule and excluded from the final rule. Thus, the areas that we excluded from the 2007 designation may not be automatically excluded from this new proposal, but must be reconsidered for exclusion during the new final designation process. We will consider these materials and any other relevant information pertaining to these entities during the development of the final rule to determine if any of these areas should be excluded from the final critical habitat designation under section 4(b)(2) of the Act.

Finally, portions of the Verde River are included in the area covered by the Salt River Project's HCP. We will consider the HCP and any other relevant information during the development of the final rule to determine if this area should be excluded from the final critical habitat designation under section 4(b)(2) of the Act.

A final determination on whether we should exclude any of these areas from critical habitat for the spikedace and loach minnow will be made when we publish the final rule designating critical habitat. We will take into account public comments and carefully weigh the benefits of exclusion versus inclusion of these areas. We may also consider areas not identified above for exclusion from the final critical habitat designation based on information we may receive during the preparation of the final rule (*e.g.,* management plans for additional areas).

Peer Review

In accordance with our joint policy published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our critical habitat designation is based on scientifically sound data, assumptions, and analyses. We will invite these peer reviewers to comment during this public comment period on our specific assumptions and conclusions in this proposed designation of critical habitat.

We will consider all comments and information we receive during this comment period on this proposed rule during our preparation of a final determination. Accordingly, the final decision may differ from this proposal.

Public Hearings

Section 4(b)(5)(E) of the Act requires us to hold at least one public hearing on this proposal, if properly requested. Requests for public hearings must be made in writing within 45 days of the publication of this proposal in the **Federal Register** (see **DATES**). We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings in the **Federal Register** and local newspapers at least 15 days prior to the first hearing.

Required Determinations

Regulatory Planning and Review—Executive Order 12866

The Office of Management and Budget (OMB) has determined that this rule is not significant under Executive Order 12866 (E.O. 12866). OMB bases its determination upon the following four criteria:

(a) Whether the rule will have an annual effect of $100 million or more on the economy or adversely affect an economic sector, productivity, jobs, the environment, or other units of the government.

(b) Whether the rule will create inconsistencies with other Federal agencies' actions.

(c) Whether the rule will materially affect entitlements, grants, user fees, loan programs, or the rights and obligations of their recipients.

(d) Whether the rule raises novel legal or policy issues.

Regulatory Flexibility Act

Under the Regulatory Flexibility Act (RFA; 5 U.S.C. 601 *et seq.,* as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency must publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended RFA to require Federal agencies to provide a certification statement of the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities.

At this time, we lack the available economic information necessary to provide an adequate factual basis for the required RFA finding. Therefore, we defer the RFA finding until completion of the draft economic analysis prepared under section 4(b)(2) of the Act and E.O. 12866. This draft economic analysis and any public comment on these issues will provide the required factual basis for the RFA finding. Therefore, upon completion of the draft economic analysis, we will announce availability of the draft economic analysis of the proposed designation in the **Federal Register** and reopen the public comment period for the proposed designation. We will include with this announcement, as appropriate, an initial regulatory flexibility analysis or a certification that the rule will not have a significant economic impact on a substantial number of small entities accompanied by the factual basis for that determination.

Unfunded Mandates Reform Act

In accordance with the Unfunded Mandates Reform Act (2 U.S.C. 1501 *et seq.*), we make the following findings:

(a) This rule will not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, or Tribal governments, or the private sector, and includes both "Federal intergovernmental mandates" and "Federal private sector mandates." These terms are defined in 2 U.S.C. 658(5)–(7). "Federal intergovernmental mandate" includes a regulation that "would impose an enforceable duty upon State, local, or tribal governments" with two exceptions. It excludes "a condition of Federal assistance." It also excludes "a duty arising from participation in a voluntary Federal program," unless the regulation "relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and tribal governments under entitlement authority," if the provision would "increase the stringency of conditions of assistance" or "place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding," and the State, local, or Tribal governments "lack authority" to adjust accordingly. At the time of enactment, these entitlement programs were: Medicaid; Aid to Families with Dependent Children work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement. "Federal private sector mandate" includes a regulation that "would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance or (ii) a duty arising from participation in a voluntary Federal program."

The designation of critical habitat does not impose a legally binding duty on non-Federal Government entities or private parties. Under the Act, the only regulatory effect is that Federal agencies must ensure that their actions do not destroy or adversely modify critical habitat under section 7. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary Federal aid program, the Unfunded Mandates Reform Act would not apply, nor would critical habitat shift the costs of the large entitlement programs listed above onto State governments.

(b) We lack the available economic information to determine if a Small Government Agency Plan is required. Therefore, we defer this finding until completion of the draft economic analysis prepared under section 4(b)(2) of the Act.

Takings

In accordance with E.O. 12630 (Government Actions and Interference with Constitutionally Protected Private Property Rights), we will analyze the potential takings implications of designating critical habitat for the spikedace and the loach minnow in a takings implications assessment. Following completion of the proposed rule, a draft Economic Analysis will be completed for the proposed designation. The draft Economic Analysis will provide the foundation for us to use in preparing a takings implications assessment.

Federalism

In accordance with E.O. 13132 (Federalism), this proposed rule does not have significant Federalism effects. A Federalism assessment is not required. In keeping with Department of the Interior and Department of Commerce policy, we requested information from, and coordinated development of, this proposed critical habitat designation with appropriate State resource agencies in Arizona and New Mexico, and Tribal governments. The designation may have some benefit to these governments because the areas that contain the features essential to the conservation of the species are more clearly defined, and the physical and biological features of the habitat necessary for the conservation of the species are specifically identified. This information does not alter where and what federally sponsored activities may occur. However, it may assist local governments in long-range planning (rather than having them wait for case-by-case section 7 consultations to occur).

Where State and local governments require approval or authorization from a Federal agency for actions that may affect critical habitat, consultation under section 7(a)(2) would be required. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency.

Civil Justice Reform

In accordance with E.O. 12988 (Civil Justice Reform), the Office of the Solicitor has determined that the rule does not unduly burden the judicial system and that it meets the requirements of sections 3(a) and 3(b)(2) of the Order. We have proposed designating critical habitat in accordance with the provisions of the Act. This proposed rule uses standard property descriptions and identifies the physical and biological features within the designated areas to assist the public in understanding the habitat needs of the spikedace and the loach minnow.

Paperwork Reduction Act of 1995

This rule does not contain any new collections of information that require approval by OMB under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act (NEPA)

It is our position that, outside the jurisdiction of the U.S. Court of Appeals for the Tenth Circuit, we do not need to prepare environmental analyses as defined by NEPA (42 U.S.C. 4321 *et seq.*) in connection with designating critical habitat under the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244). This position was upheld by the U.S. Court of Appeals for the Ninth Circuit (*Douglas County* v. *Babbitt,* 48 F.3d 1495 (9th Cir. 1995), cert. denied 516 U.S. 1042 (1996)). However, when the range of the species includes States within the Tenth Circuit, such as that of the spikedace and the loach minnow, under the Tenth Circuit ruling in *Catron County Board of Commissioners* v. *U.S. Fish and Wildlife Service,* 75 F.3d 1429 (10th Cir. 1996), we will undertake a NEPA analysis for critical habitat designation and notify the public of the availability of the draft environmental

assessment for this proposal when it is finished.

Clarity of the Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(a) Be logically organized;

(b) Use the active voice to address readers directly;

(c) Use clear language rather than jargon;

(d) Be divided into short sections and sentences; and

(e) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in the **ADDRESSES** section. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994, Government-to-Government Relations with Native American Tribal Governments (59 FR 22951), E.O. 13175, and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 "American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act", we readily acknowledge our responsibilities to work directly with Tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to Tribes.

For this proposal, we are including stream portions of the White River and East Fork White River on lands belonging to the White Mountain Apache Tribe; portions of Eagle Creek on lands belonging to the San Carlos Apache Tribe; and portions of the Verde River on lands belonging to the Yavapai-Apache Nation. We are including these areas because we have found them to be essential to the survival and recovery of the species.

During the process of developing the 2007 designation of critical habitat for spikedace and loach minnow, the Yavapai Apache Nation submitted a Tribal Resolution, while the White Mountain Apache and San Carlos Apache tribes submitted management plans. Based on these plans, we excluded critical habitat on their lands from the previous final designation. We have notified the Tribes that a new critical habitat proposal is underway, and provided them with information on the timeline. We anticipate working with all three entities to address river systems on their lands prior to publication of a final rule. Additionally, these areas may again be considered for exclusion from the final critical habitat designation under section 4(b)(2) of the Act (see "*Application of Section 4(b)(2) of the Act*" section above for additional information).

Energy Supply, Distribution, or Use

On May 18, 2001, the President issued an Executive Order (E.O. 13211; Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use) on regulations that significantly affect energy supply, distribution, and use. E.O. 13211 requires agencies to prepare Statements of Energy Effects when undertaking certain actions. We do not expect this action to significantly affect energy supplies, distribution, or use. One project, the SunZia Southwest Transmission Project, is currently in the study phase. This project involves the construction of up to two 500 kV transmission lines with key interconnections to the existing extra-high voltage grid in Arizona and New Mexico. The specific route of the transmission lines has not yet been determined, and may or may not cross critical habitat proposed in this rule (AGFD 2010, p. 1). Alternative alignments, which would not cross proposed critical habitat areas, are under consideration (Service 2010, p. 5). Therefore, this action is not a significant energy action, and no Statement of Energy Effects is required. However, we will further evaluate this issue as we conduct our economic analysis, and review and revise this assessment as warranted.

References Cited

A complete list of references cited is available on the Internet at *http://www.regulations.gov* and upon request from the Arizona Ecological Services Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this package are the staff members of the Arizona Ecological Services Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500; unless otherwise noted.

2. In § 17.11(h), revise the entries for "Spikedace" and "Minnow, loach" under "FISHES" in the List of Endangered and Threatened Wildlife to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*		*
Fishes							
*	*	*	*	*	*		*
Minnow, loach	*Tiaroga cobitis*	U.S.A. (AZ, NM), Mexico.	Entire	E		17.95(e)	NA

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*		*
Spikedace	*Meda fulgida*	U.S.A. (AZ, NM), Mexico.	Entire	E		17.95(e)	NA
*	*	*	*	*	*		*

§ 17.44 [Amended]

3. In § 17.44, remove and reserve paragraphs (p) and (q).

4. In § 17.95, amend paragraph (e) by revising the entries for "Spikedace (*Meda fulgida*),"and "Loach Minnow (*Tiaroga cobitis*)" to read as follows:

§ 17.95 Critical habitat—fish and wildlife.

* * * * *

(e) *Fishes.*

* * * * *

Loach Minnow (*Tiaroga cobitis*)

(1) Critical habitat units are depicted for Apache, Cochise, Gila, Graham, Greenlee, Navajo, Pinal, and Yavapai Counties, Arizona, and for Catron, Grant, and Hidalgo Counties, New Mexico, on the maps below.

(2) The physical and biological features of critical habitat for the loach minnow are:

(i) Habitat to support all egg, larval, juvenile, and adult loach minnow. This habitat includes perennial flows with a stream depth of generally less than 1 m (3.3 ft), and with slow to swift flow velocities between 0 and 80 cm per second (0.0 and 31.5 in. per second). Appropriate microhabitat types include pools, runs, riffles, and rapids over sand, gravel, cobble, and rubble substrates with low or moderate amounts of fine sediment and substrate embeddedness. Appropriate habitats have a low gradient of less than 2.5 percent, and are at elevations below 2,500 m (8,202 ft). Water temperatures should be in the general range of 8.0 to 25.0 °C (46.4 to 77 °F);

(ii) An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddisflies, stoneflies, and dragonflies.

(iii) Streams with no or no more than low levels of pollutants.

(iv) Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.

(v) No nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low to allow persistence of loach minnow.

(vi) Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

(3) We have determined that all designated areas contain at least one PBF for loach minnow. There are no developed areas within the designation except for manmade barriers constructed on streams, low water road crossings of streams, and areas beneath bridges, all of which do not remove the suitability of these areas for this species. Where a manmade structure is within the proposed critical habitat designation, the structure would be considered to be proposed critical habitat if it continues to contain one or more of the PBFs. If the structure does not contain one or more of the PBFs, the structure is excluded by text in this proposed rule. For excluded structures, a Federal action involving these lands (if and when designated) would not trigger section 7 consultation with respect to critical habitat and the prohibition of destruction or adverse modification, unless the specific action may affect adjacent critical habitat.

(4) Each stream segment includes a lateral component that consists of 300 feet (91.4 meters) on either side of the stream channel measured from the stream edge at bank full discharge. This lateral component of critical habitat contains and contributes to the physical and biological features essential to the loach minnow and is intended as a surrogate for the 100-year floodplain.

(5) Critical habitat map units. Data layers defining map units were created on a base of USGS 7.5′ quadrangles along with shapefiles generated by the Arizona Land Resource Information Service for land ownership, streams, counties, and the Public Land Survey System. Information on species locations was derived from databases developed by the Arizona Game and Fish Department, the New Mexico Department of Game and Fish, and Arizona State University.

(6) Note: Index map for loach minnow critical habitat units follows.

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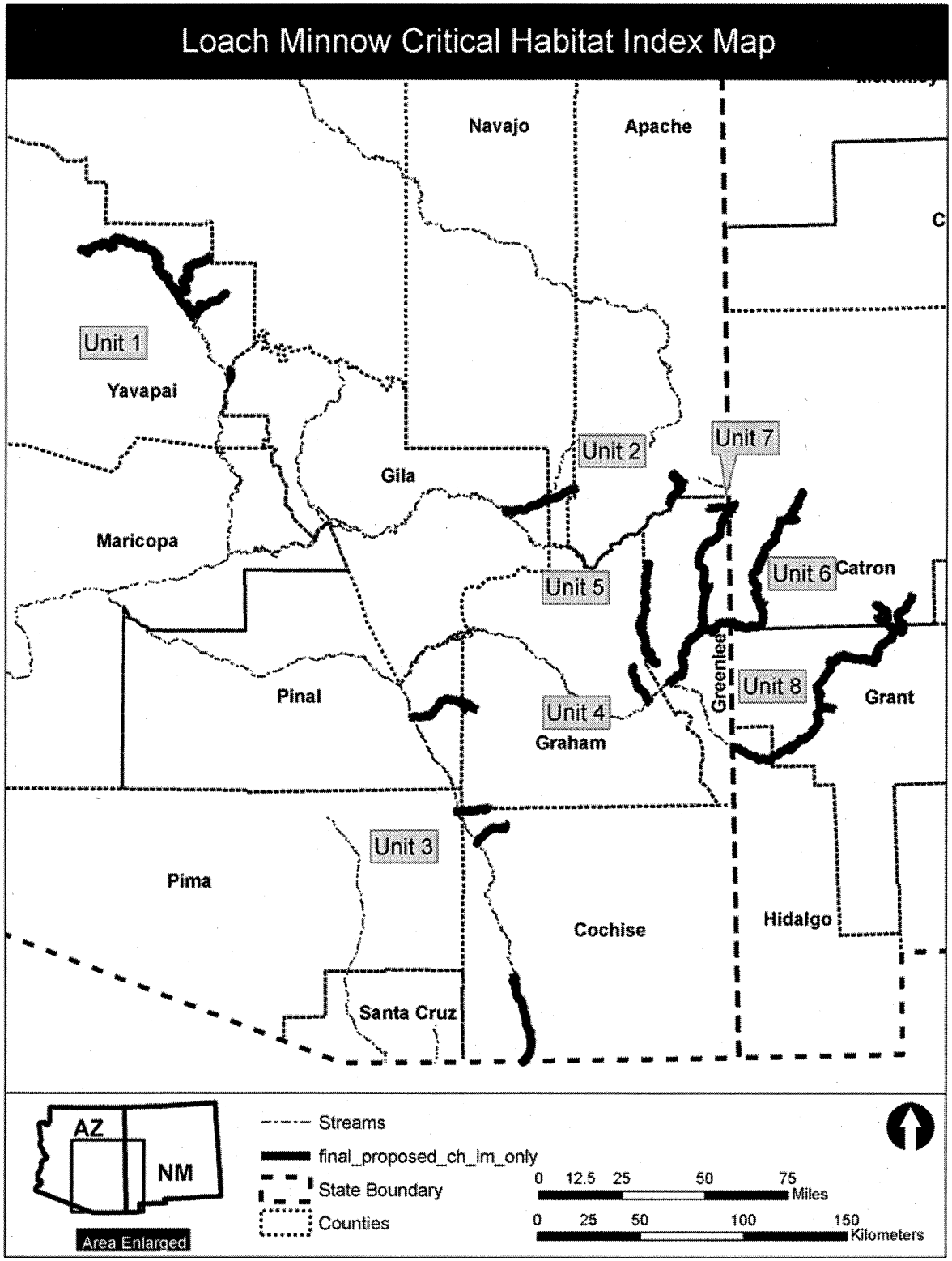


(7) Unit 1: Verde River Subbasin, Yavapai County, Arizona.

(i) Verde River for approximately 119.7 km (74.4 mi), extending from the confluence with Beaver and Wet Beaver Creek in Township 14 North, Range 5 East, southeast quarter of section 30 upstream to Sullivan Dam in Township 17 North, Range 2 West, northwest quarter of section 15.

(ii) Granite Creek for approximately 3.2 km (2.0 mi), extending from the confluence with the Verde River in Township 17 North, Range 2 West, northeast quarter of section 14 upstream to a spring in Township 17 North, Range 2 West, southwest quarter of the southwest quarter of section 13.

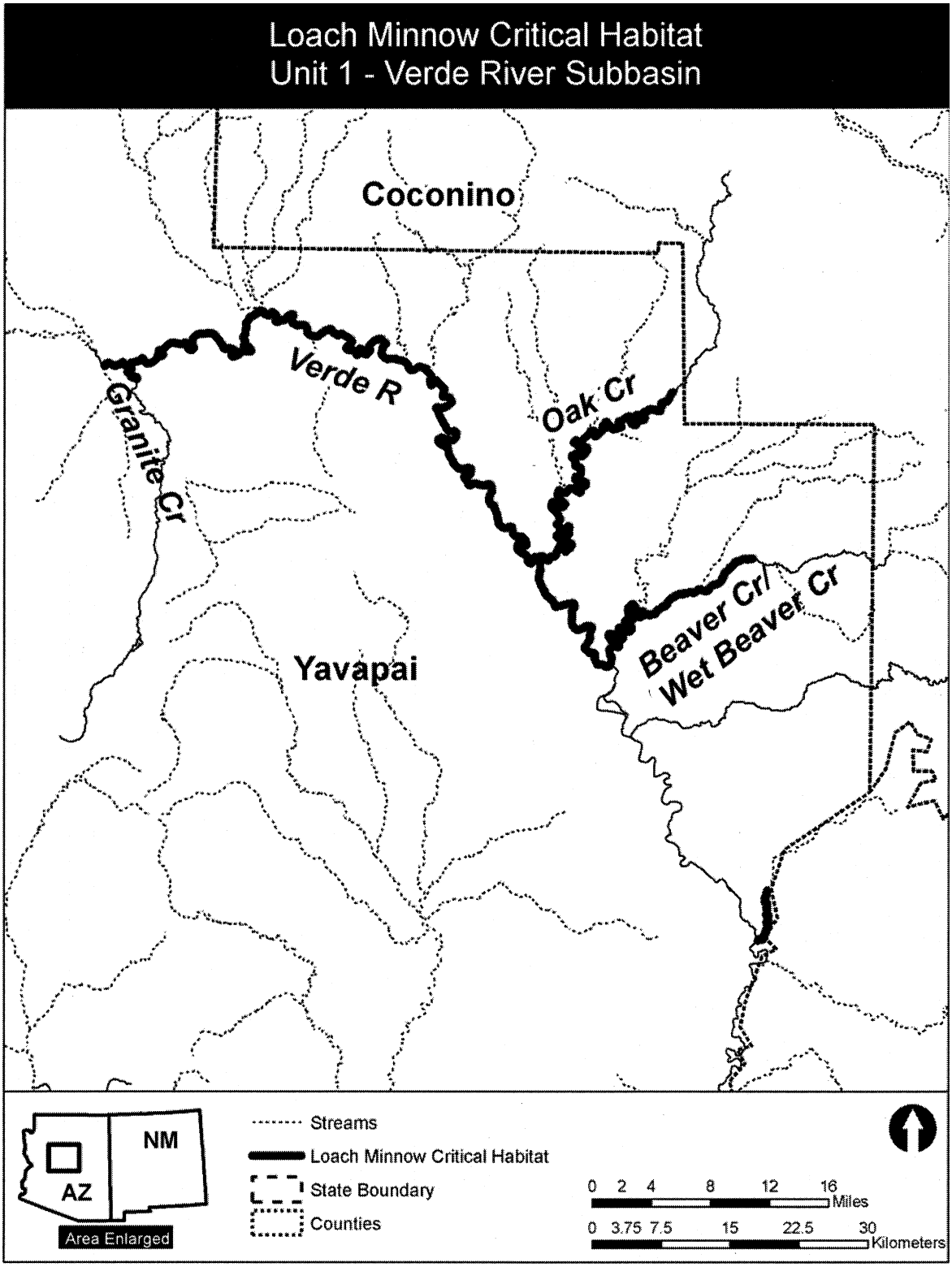
(iii) Oak Creek for approximately 54.3 km (33.7 mi), extending from the confluence with the Verde River in Township 15 North, Range 4 East, southeast quarter of section 20 upstream to the confluence with an unnamed

tributary from the south in Township 17 North, Range 5 East, southeast quarter of the northeast quarter of section 24.

(iv) Beaver Creek and Wet Beaver Creek for approximately 33.5 km (20.8 mi), extending from the confluence with the Verde River in Township 14 North, Range 5 East, southeast quarter of section 30 upstream to the confluence with Casner Canyon in Township 15 North, Range 6 East, northwest quarter of section 23.

(v) Fossil Creek for approximately 7.5 km (4.7 mi) extending from the confluence with the Verde River in Township 11 North, Range 5 East, northeast quarter of section 25 upstream to the confluence with an unnamed tributary from the northwest in Township 11.5 North, Range 7 East, center of section 29.

(vi) **Note:** Map of Unit 1, Verde River Subbasin (Map 2), follows.



(8) Unit 2: Salt River Subbasin, Apache, Gila, and Navajo Counties, Arizona.

(i) White River for approximately 29.0 km (18.0 mi) from the confluence with the Black River at Township 4.5 North, Range 20 East, northeast quarter of section 35 upstream to the confluence with the North and East Forks of the White River at Township 5 North, Range 22 East, northwest quarter of section 35.

(ii) East Fork White River for approximately 17.2 km (10.7 mi) from the confluence with North Fork White River at Township 5 North, Range 22 East, northeast quarter of section 35 upstream to the confluence with Bones Canyon at Township 5 North, Range 24 East, southwest quarter of section 18.

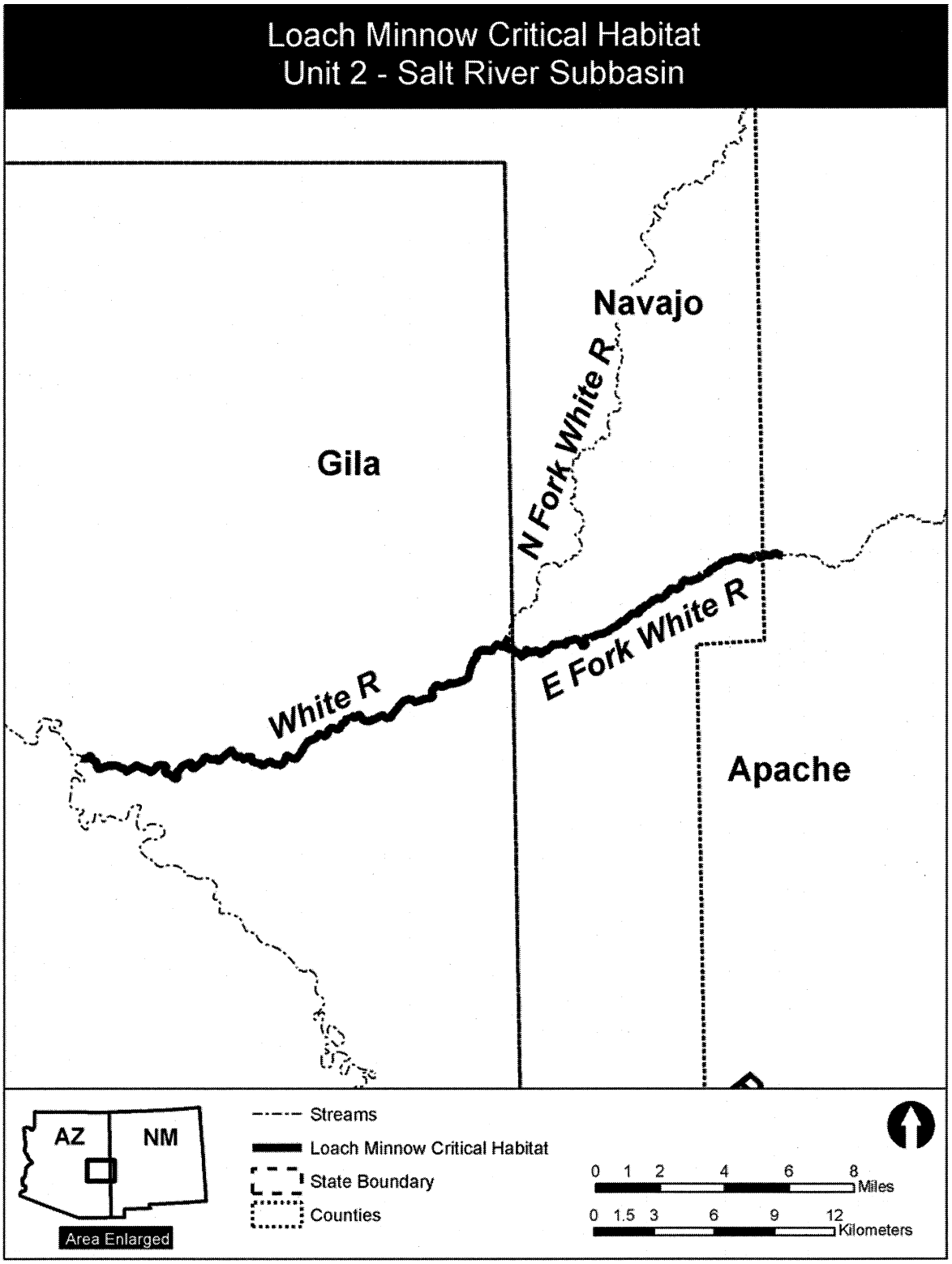
(iii) East Fork Black River for approximately 19.1 km (11.9 mi) from the confluence with the West Fork Black River at Township 4 North, Range 28 East, southeast quarter of section 11 upstream to the confluence with an unnamed tributary approximately 0.82 km (0.51 mi) downstream of the Boneyard Creek confluence at Township 5 North, Range 29 East, northwest quarter of Section 5.

(iv) North Fork East Fork Black River for approximately 7.1 km (4.4 mi) of the North Fork East Fork Black River extending from the confluence with East Fork Black River at Township 5 North, Range 29 East, northwest quarter of section 5 upstream to the confluence with an unnamed tributary at Township 6 North, Range 29 East, center of Section 30.

(v) Boneyard Creek for approximately 2.3 km (1.4 mi) extending from the confluence with the East Fork Black River at Township 5 North, Range 29 East, SW quarter of section 5 upstream to the confluence with an unnamed tributary at Township 6 North, Range 29 East, southeast quarter of section 32.

(vi) Coyote Creek for approximately 3.4 km (2.1 mi) from the confluence with East Fork Black River at Township 5 North, Range 29 East, northeast quarter of section 8 upstream to an unnamed confluence at Township 5 North, Range 29 East, northwest quarter of section 10.

(vii) **Note:** Map of Unit 2, Salt River Subbasin (Map 3), follows.



(9) Unit 3: San Pedro Subbasin, Cochise, Pinal, and Graham Counties, Arizona.

(i) San Pedro River for approximately 60.0 km (37.2 mi) extending from the International Boundary with Mexico in Township 24 South, Range 22 East, section 19 downstream to the confluence with the Babocomari River in the San Juan de las Boquillas y Nogales land grant.

(ii) Aravaipa Creek for approximately 44.9 km (27.9 mi) extending from the confluence with the San Pedro River in Township 7 South, Range 16 East, center of section 9 upstream to the confluence with Stowe Gulch in Township 6 South, Range 19 East, southeast quarter of the northeast quarter of section 35.

(iii) Deer Creek—3.7 km (2.3 mi) of the creek extending from the confluence with Aravaipa Creek at Township 6 South, Range 18 East, section 14

upstream to the boundary of the Aravaipa Wilderness at Township 6 South, range 19 East, section 18.

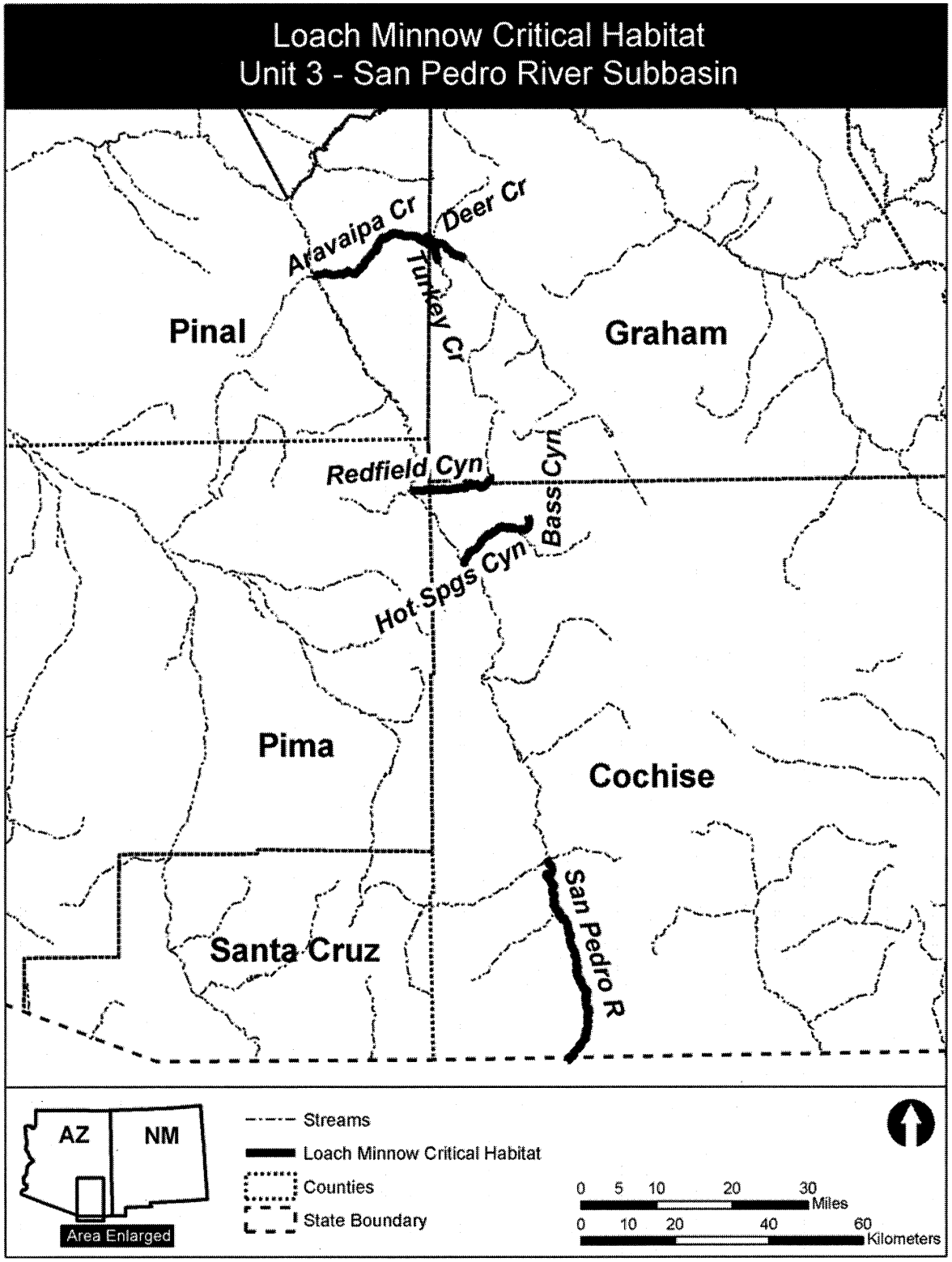
(iv) Turkey Creek—4.3 km (2.7 mi) of the creek extending from the confluence with Aravaipa Creek at Township 6 South, Range 19 East, section 19 upstream to the confluence with Oak Grove Canyon at Township 6 South, Range 19 east, section 32.

(v) Hot Springs Canyon for approximately 19.0 km (11.8 mi) extending from the confluence with the San Pedro River in Township 13 South, Range 19 East, center of section 23 upstream to the confluence with Bass Canyon in Township 12 South, Range 20 East, northeast quarter of section 36.

(vi) Redfield Canyon for approximately 22.5 km (14.0 mi) extending from the confluence with the San Pedro River in Township 11 South, Range 18 East, southwest quarter of section 34 upstream to the confluence with Sycamore Canyon in Township 11 South, Range 20 East, northwest quarter of section 28.

(vii) Bass Canyon for approximately 5.5 km (3.4 mi) from the confluence with Hot Springs Canyon in Township 12 South, Range 20 East, northeast quarter of section 36 upstream to the confluence with Pine Canyon in Township 12 South, Range 21 East, center of section 20.

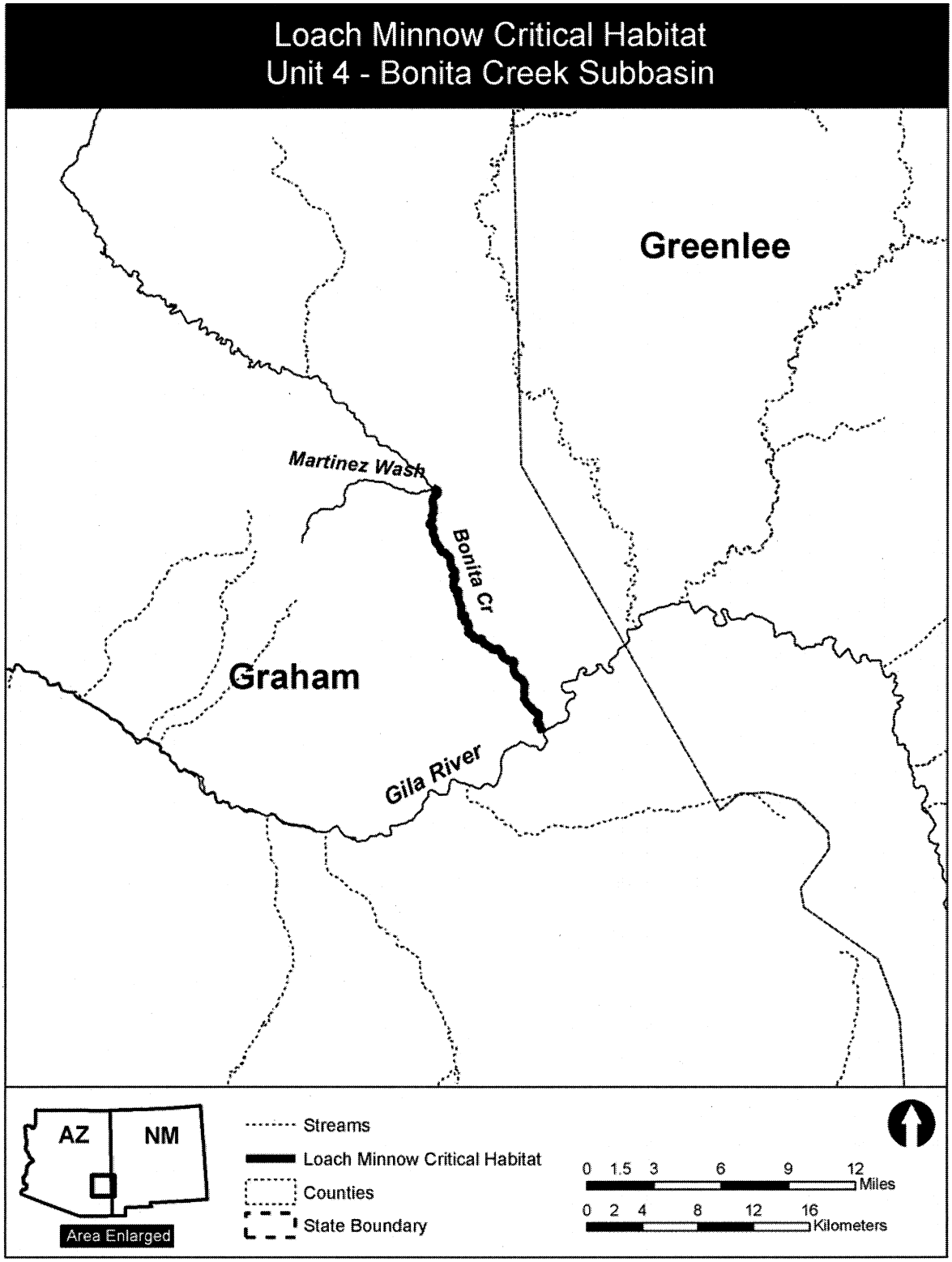
(viii) **Note:** Map of Unit 3, San Pedro River Subbasin (Map 4), follows.



(10) Unit 4: Bonita Creek Subbasin, Graham County, Arizona.

(i) Bonita Creek for approximately 23.8 km (14.8 mi) from the confluence with the Gila River in Township 6 South, Range 28 East, southeast quarter of section 21 upstream to the confluence with Martinez Wash in Township 4 South, Range 27 East, southeast quarter of section 27.

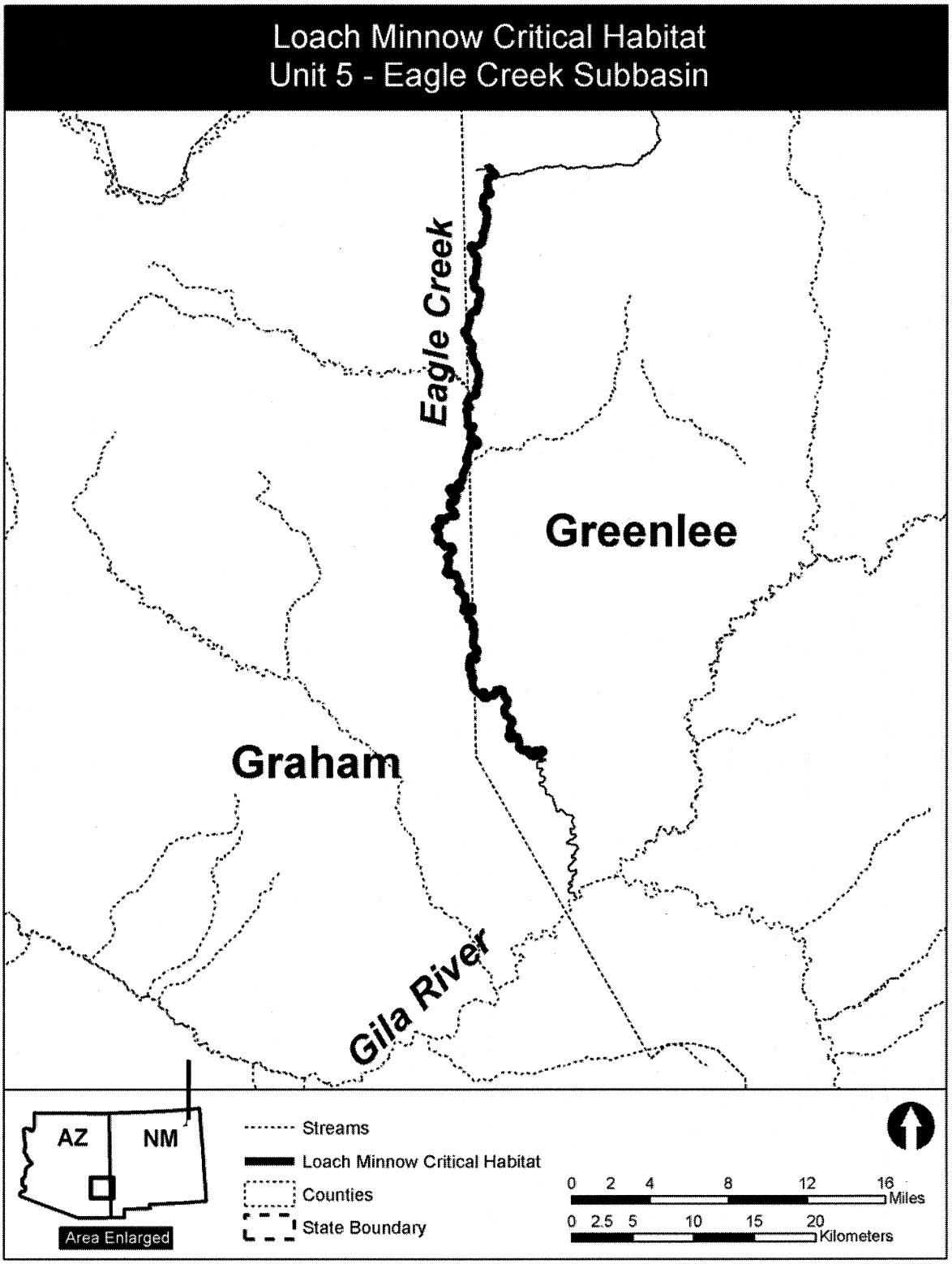
(ii) **Note:** Map of Unit 4, Bonita Creek Subbasin (Map 5), follows.



(11) Unit 5: Eagle Creek Subbasin, Graham and Greenlee Counties, Arizona.

(i) Eagle Creek for approximately 75.5 km (46.9 mi) from the Freeport McMoRan diversion dam at Township 4 South, Range 28 East, southwest quarter of the northwest quarter of section 23 upstream to the confluence of East Eagle Creek in Township 2 North, Range 28 East, southwest quarter of section 20.

(ii) **Note:** Map of Unit 5, Eagle Creek Subbasin (Map 6), follows.



(12) Unit 6: San Francisco River Subbasin, Greenlee County, Arizona, and Catron County, New Mexico.

(i) San Francisco River for approximately 181.0 km (112.3 mi) of the San Francisco River extending from the confluence with the Gila River in Township 5 South, Range 29 East, southeast quarter of section 21 upstream to the confluence with the Tularosa River in Township 7 South, Range 19 West, southwest quarter of Section 23.

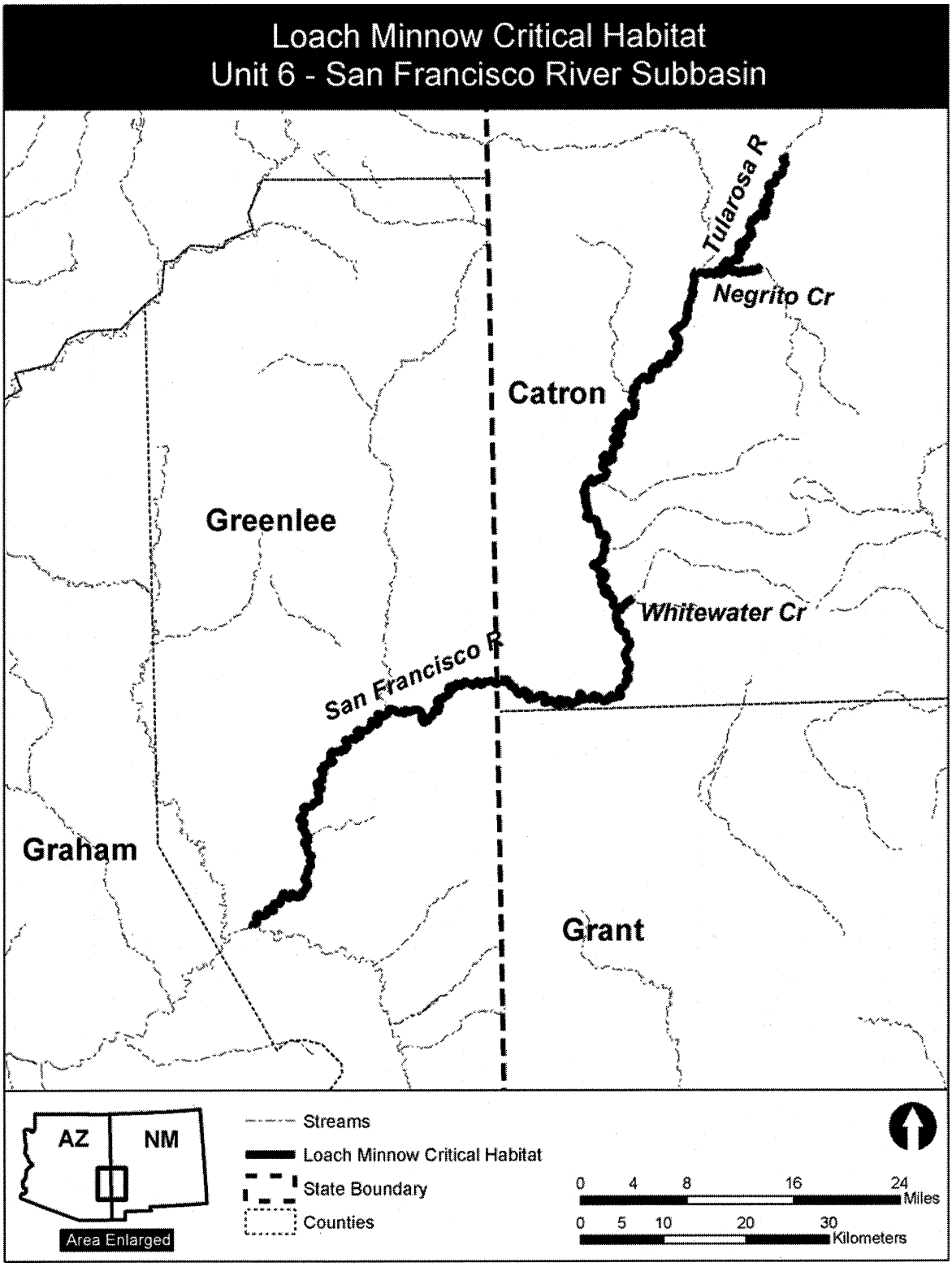
(ii) Tularosa River for approximately 30.0 km (18.6 mi) from the confluence with the San Francisco River at Township 7 South, Range 19 West, southwest quarter of section 23 upstream to the town of Cruzville at Township 6 South, Range 18 West, southern boundary of section 1.

(iii) Negrito Creek for approximately 6.8 km (4.2 mi) extending from the confluence with the Tularosa River at Township 7 South, Range 18 West,

southwest quarter of the northwest quarter of section 19 upstream to the confluence with Cerco Canyon at Township 7 South, Range 18 West, west boundary of section 22.

(iv) Whitewater Creek for approximately 1.9 km (1.2 mi) from the confluence with the San Francisco River at Township 11 South, Range 20 West, Section 27 upstream to the confluence with Little Whitewater Creek at Township 11 South, Range 20 West, southeast quarter of section 23.

(v) **Note:** Map of Unit 6, San Francisco Subbasin (Map 7), follows.



(13) Unit 7: Blue River Subbasin, Greenlee County, Arizona, and Catron County, New Mexico.

(i) Blue River for approximately 81.4 km (50.6 mi) from the confluence with the San Francisco River at Township 2 South, Range 31 East, southeast quarter of section 31 upstream to the confluence of Campbell Blue and Dry Blue creeks at Township 7 South, Range 21 West, southeast quarter of section 6.

(ii) Campbell Blue Creek for approximately 12.4 km (7.7 mi) from the confluence of Dry Blue and Campbell Blue Creeks at Township 7 South, Range 21 West, southeast quarter of section 6 to the confluence with Coleman Canyon in Township 4.5 North, Range 31 East, southwest quarter of the northeast quarter of section 32.

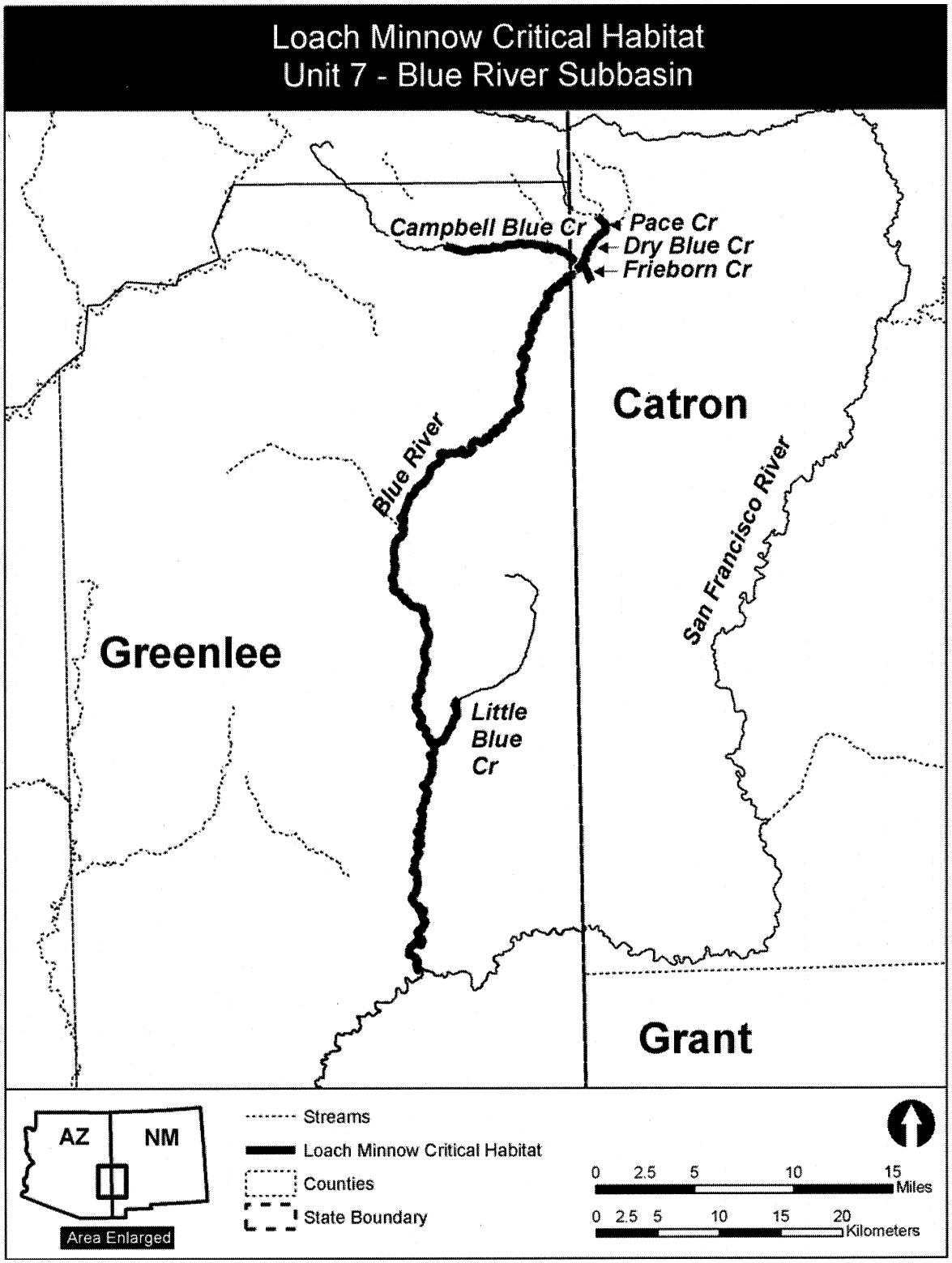
(iii) Little Blue Creek for approximately 5.1 km (3.1 mi) from the confluence with the Blue River at Township 1 South, Range 31 East, center of section 5 upstream to the mouth of a canyon at Township 1 North, Range 31 East, northeast quarter of section 29.

(iv) Pace Creek for approximately 1.2 km (0.8 mi) from the confluence with Dry Blue Creek at Township 6 South, Range 21 West, southwest quarter of section 28 upstream to a barrier falls at Township 6 South, Range 21 West, northeast quarter of section 29.

(v) Frieborn Creek for approximately 1.8 km (1.1 mi) from the confluence with Dry Blue Creek at Township 7 South, Range 21 West, southwest quarter of the northwest quarter of section 5 upstream to an unnamed tributary flowing from the south in Township 7 South, Range 21 West, northeast quarter of the southwest quarter of section 8.

(vi) Dry Blue Creek for approximately 4.7 km (3.0 mi) from the confluence with Campbell Blue Creek at Township 7 South, Range 21 West, southeast quarter of Section 6 upstream to the confluence with Pace Creek in Township 6 South, Range 21 West, southwest quarter of section 28.

(vii) **Note:** Map of Unit 7, Blue River Subbasin (Map 8), follows.



(14) Unit 8: Gila River Subbasin, Catron, Grant, and Hidalgo Counties, New Mexico.

(i) Gila River for approximately 165.1 km (102.6 mi) from the confluence with Moore Canyon at Township 18 South, Range 21 West, southeast quarter of the southwest quarter of section 32 upstream to the confluence of the East and West Forks of the Gila River at Township 13 South, Range 13 West, center of section 8.

(ii) West Fork Gila River for approximately 13.0 km (8.1mi) from the confluence with the East Fork Gila River at Township 13 South, Range 13 West, center of Section 8 upstream to the confluence with EE Canyon at Township 12 South, Range 14 West, east boundary of Section 21.

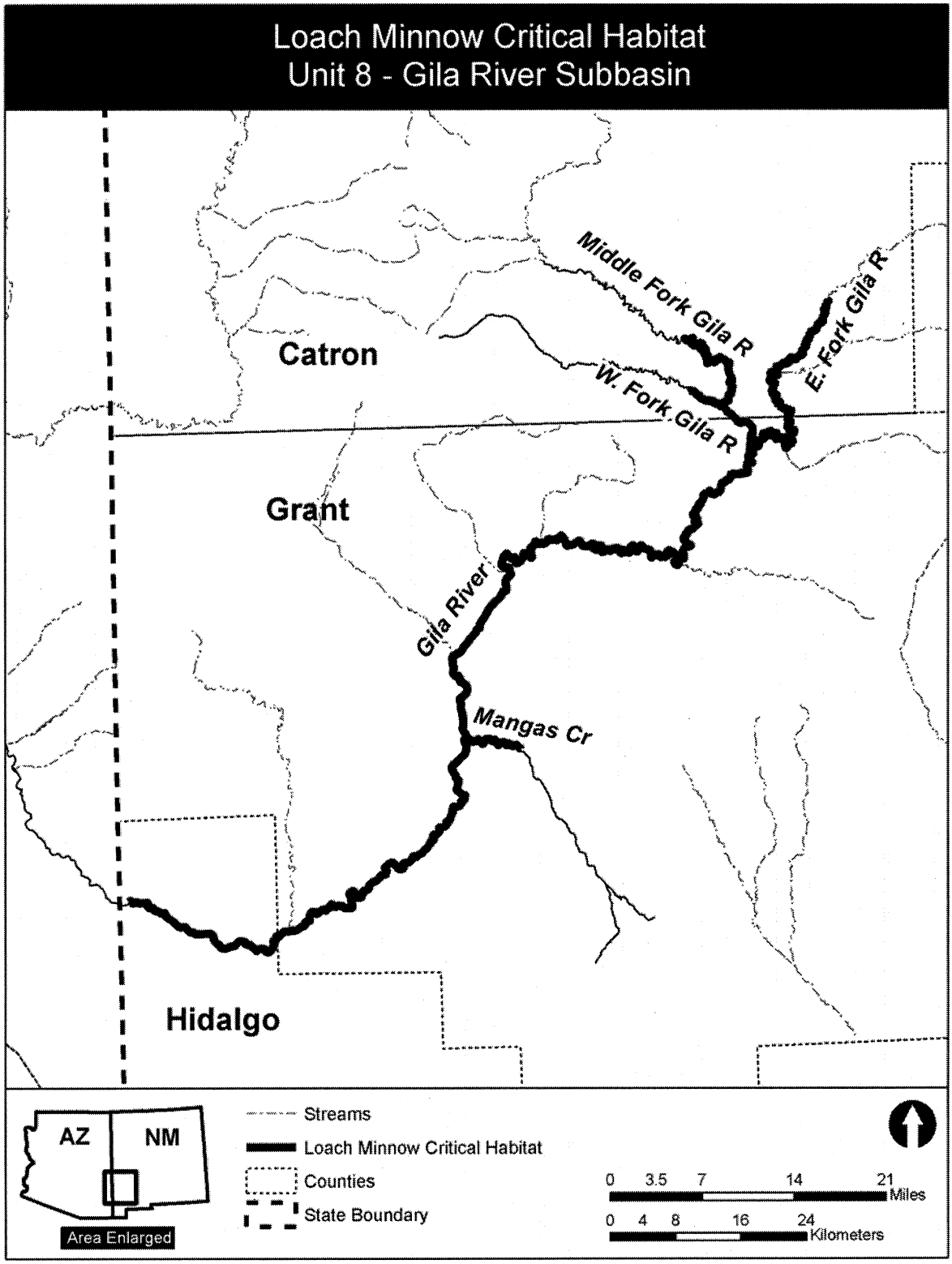
(iii) Middle Fork Gila River for approximately 19.1 km (11.9 mi) of the Middle Fork Gila River extending from the confluence with West Fork Gila

River at Township 12 South, Range 14 West, southwest quarter of section 25 upstream to the confluence of Brothers West Canyon in Township 11 South, Range 14 West, northeast quarter of section 33.

(iv) East Fork Gila River for approximately 42.1 km (26.2 mi) extending from the confluence with West Fork Gila River at Township 13 South, Range 13 West, center of section 8 upstream to the confluence of Beaver and Taylor Creeks in Township 11 South, Range 12 West, northeast quarter of section 17.

(v) Mangas Creek for approximately 9.1 km (5.7 mi) extending from the confluence with the Gila River at Township 17 South, Range 16 West, southwest quarter of Section 5 upstream to the confluence with Blacksmith Canyon at Township 17 South, Range 17 West, northwest quarter of section 3.

(vi) **Note:** Map of Unit 8, Gila River Subbasin (Map 9), follows.



* * * * *

Spikedace (*Meda fulgida*)

(1) Critical habitat units are depicted for Cochise, Gila, Graham, Greenlee, Pinal, and Yavapai Counties, Arizona, and for Catron, Grant, and Hidalgo Counties, New Mexico, on the maps below.

(2) The physical and biological features of critical habitat for the spikedace are:

(i) Habitat to support all egg, larval, juvenile, and adult spikedace. This habitat includes streams with perennial flows with a stream depth generally less than 1 m (3.3 ft), and with slow to swift flow velocities between 5 and 80 cm per second (1.9 and 31.5 in. per second). Appropriate stream microhabitat types include glides, runs, riffles, the margins of pools, and eddies, and backwater components over sand, gravel, and

cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness. Appropriate habitat will have a low gradient of less than approximately 1.0 percent, at elevations below 2,100 m (6,890 ft). Water temperatures should be in the general range of 8.0 to 28.0 °C (46.4 to 82.4 °F).

(ii) An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddisflies, stoneflies, and dragonflies.

(iii) Streams with no or no more than low levels of pollutants.

(iv) Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.

(v) No nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low as to allow persistence of spikedace.

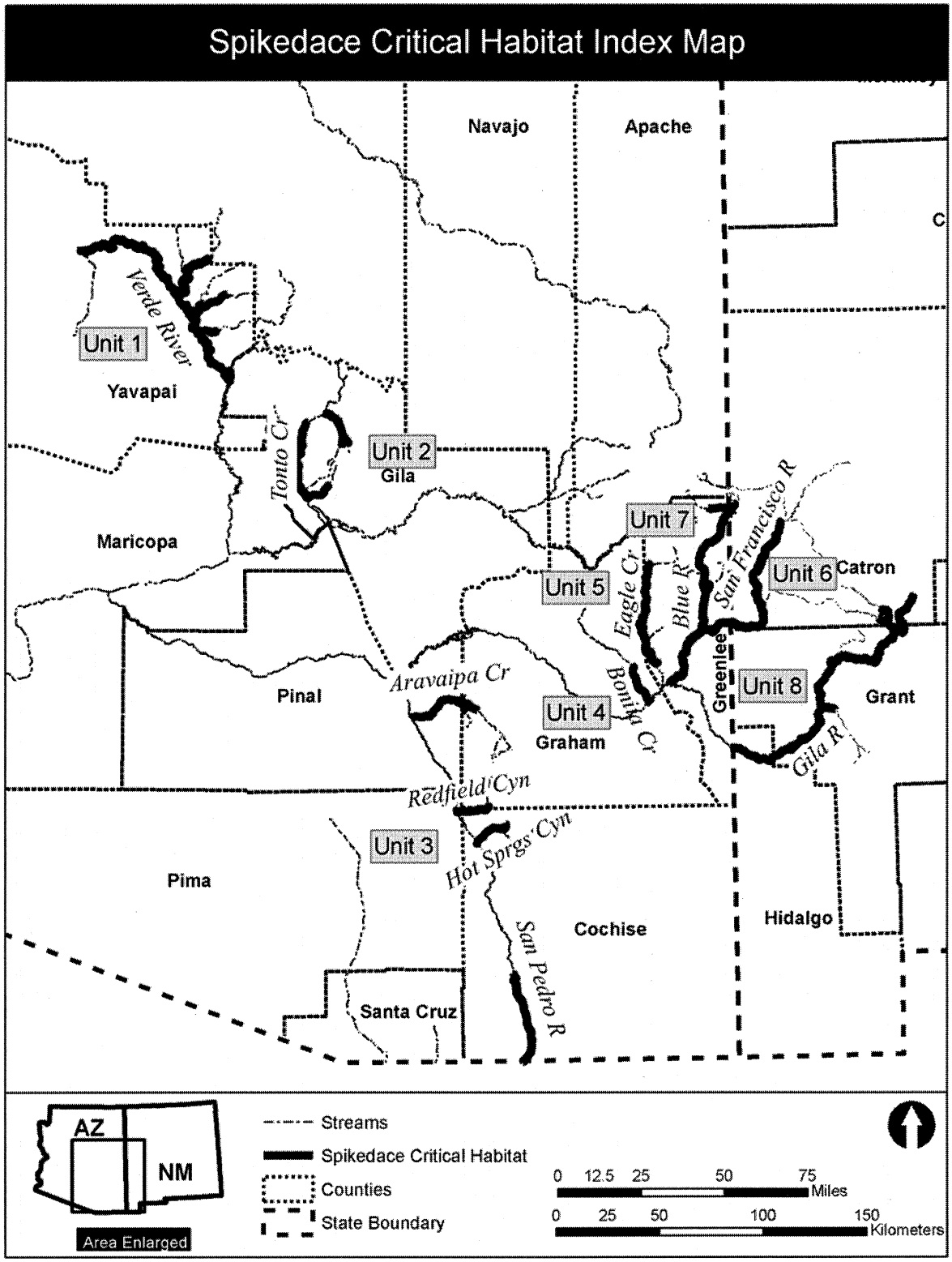
(vi) Streams with a natural, unregulated flow regime that allow for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

(3) We have determined that all designated areas contain at least one PBF for spikedace. There are no developed areas within the designation except for manmade barriers constructed on streams, low water road crossings of streams, and areas beneath bridges, all of which do not remove the suitability of these areas for this species. Where a manmade structure is within the proposed critical habitat designation, the structure would be considered to be proposed critical habitat if it continues to contain one or more of the PBFs. If the structure does not contain one or more of the PBFs, the structure is excluded by text in this proposed rule. For excluded structures, a Federal action involving these lands (if and when designated) would not trigger section 7 consultation with respect to critical habitat and the prohibition of destruction or adverse modification, unless the specific action may affect adjacent critical habitat.

(4) Each stream segment includes a lateral component that consists of 300 feet (91.4 meters) on either side of the stream channel measured from the stream edge at bank full discharge. This lateral component of critical habitat contains and contributes to the physical and biological features essential to the spikedace and is intended as a surrogate for the 100-year floodplain.

(5) Critical habitat map units. Data layers defining map units were created on a base of USGS 7.5′ quadrangles along with shapefiles generated by the Arizona Land Resource Information Service for land ownership, streams, counties, and the Public Land Survey System. Information on species locations was derived from databases developed by the Arizona Game and Fish Department, the New Mexico Department of Game and Fish, and Arizona State University.

(6) **Note:** Index map for spikedace critical habitat units follows.



(7) Unit 1: Verde River Subbasin, Yavapai County, Arizona.

(i) Verde River for approximately 171.8 km (106.7 mi), extending from the confluence with Fossil Creek in Township 11 North, Range 6 East, northeast quarter of section 25 upstream to Sullivan Dam in Township 17 North, Range 2 West, northwest quarter of section 15.

(ii) Granite Creek for approximately 3.2 km (2.0 mi), extending from the confluence with the Verde River in Township 17 North, Range 2 West, northeast quarter section 14 upstream to a spring in Township 17 North, Range 2 West, southwest quarter of the southwest quarter of section 13.

(iii) Oak Creek for approximately 54.3 km (33.7 mi), extending from the confluence with the Verde River in Township 15 North, Range 4 East, southeast quarter section 20 upstream to the confluence with an unnamed

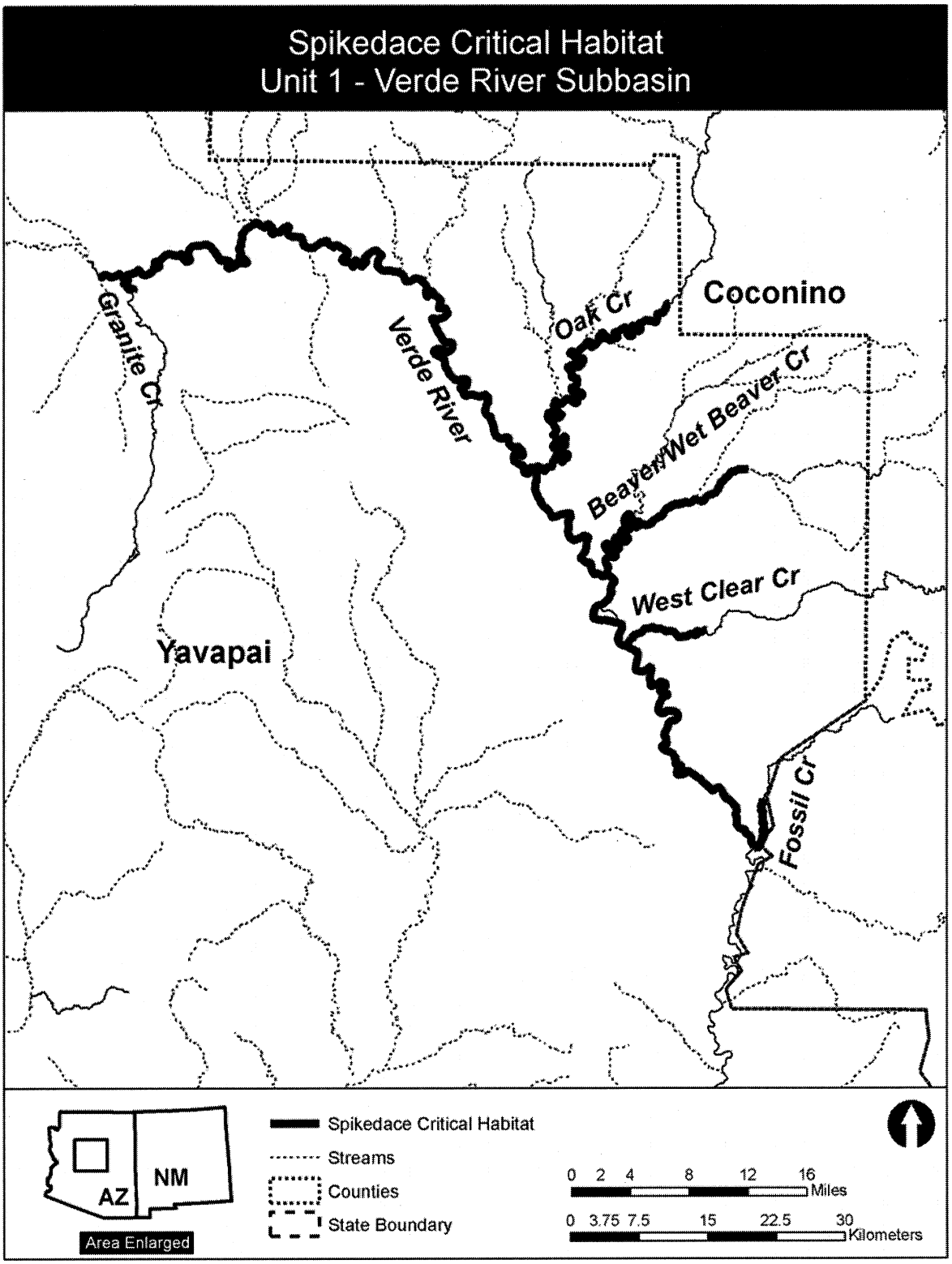
tributary from the south in Township 17 North, Range 5 East, southeast quarter of the northeast quarter of section 24.

(iv) Beaver Creek/Wet Beaver Creek for approximately 33.5 km (20.8 mi), extending from the confluence with the Verde River in Township 14 North, Range 5 East, southeast quarter of section 30 upstream to the confluence with Casner Canyon in Township 15 North, Range 6 East, northwest quarter of section 23.

(v) West Clear Creek for approximately 10.9 km (6.8. mi), extending from the confluence with the Verde River in Township 13 North, Range 5 East, center section 21, upstream to the confluence with Black Mountain Canyon in Township 13 North, Range 6 East, southeast quarter of section 17.

(vi) Fossil Creek for approximately 7.5 km (4.7 mi) extending from the confluence with the Verde River in Township 11 North, Range 5 East, northeast quarter of section 25 upstream to the confluence with an unnamed tributary from the northwest in Township 11.5 North, Range 7 East, center of section 29.

(vii) **Note:** Map of Unit 1, Verde River Subbasin (Map 2), follows.



(8) Unit 2: Salt River Subbasin, Gila County, Arizona.

(i) Tonto Creek for approximately 47.8 km (29.7 mi) extending from the confluence with Greenback Creek in Township 5 North, Range 11 East, northwest quarter of section 8 upstream to the confluence with Houston Creek in Township 9 North, Range 11 East, northeast quarter of section 18.

(ii) Greenback Creek for approximately 15.1 km (9.4 mi) from the confluence with Tonto Creek in Township 5 North, Range 11 East, northwest quarter of section 8 upstream to Lime Springs in Township 6 North, Range 12 East, southwest quarter of section 20.

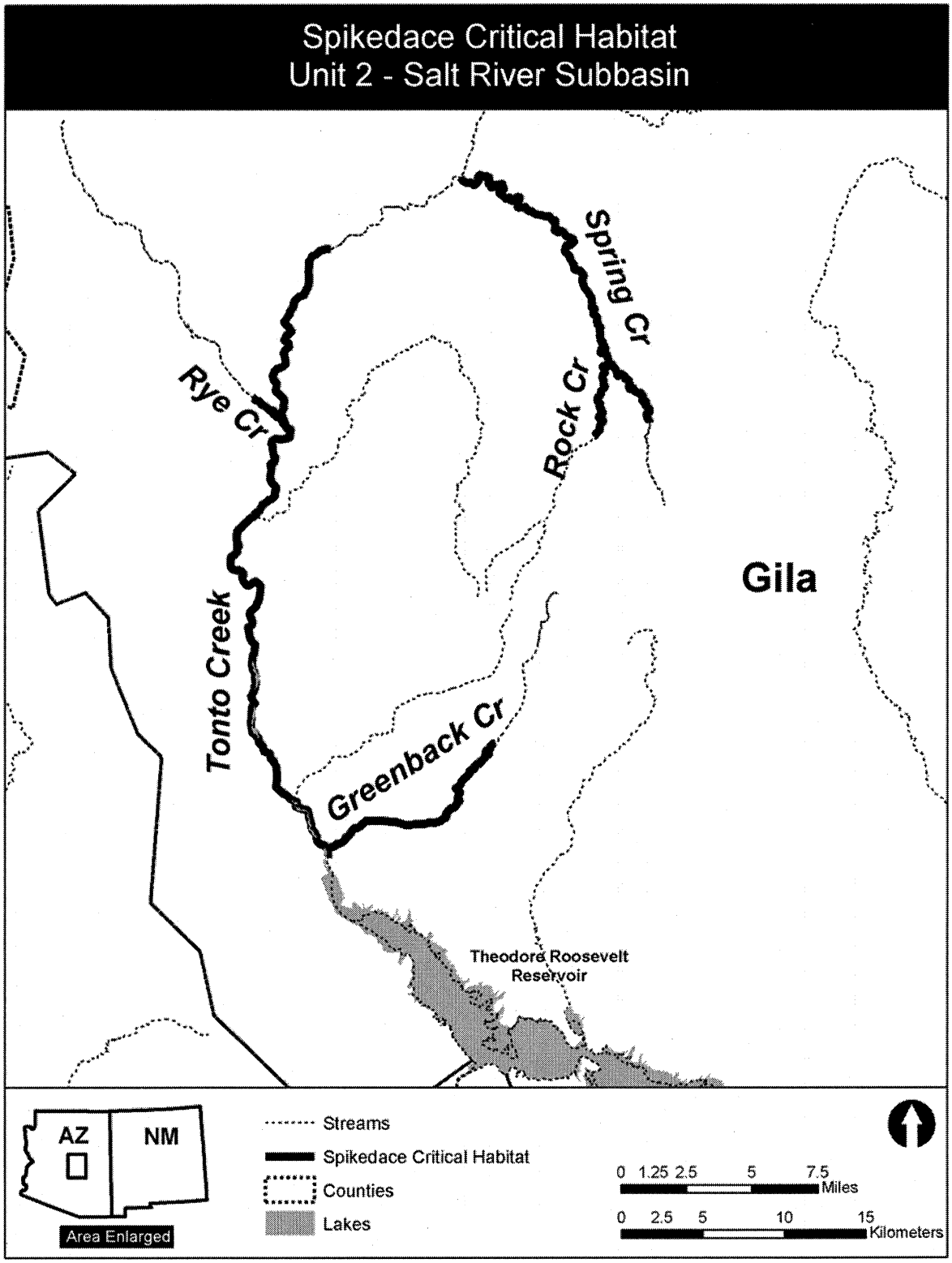
(iii) Rye Creek for approximately 2.8 km (1.8 mi) extending from the confluence with Tonto Creek in Township 8 North, Range 10 East, northeast quarter of section 24 upstream to the confluence with Brady Canyon in

Township 8 North, Range 10 East, northwest quarter of section 14.

(iv) Spring Creek for approximately 27.2 km (16.9 mi) extending from the confluence with the Tonto River at Township 10 North, Range 11 East, southeast quarter of section 36 upstream to the confluence with Sevenmile Canyon at Township 8 North, Range 13 East, northern boundary of section 20.

(v) Rock Creek for approximately 5.8 km (3.6 mi) extending from the confluence with Spring Creek at Township 8 North, Range 12 East, southeast quarter of section 1 upstream to the confluence with Buzzard Roost Canyon at Township 8 North, 12 East, center of section 24.

(vi) **Note:** Map of Unit 2, Salt River Subbasin (Map 3), follows.



(9) Unit 3: San Pedro River Subbasin, Cochise, Graham, Pima and Pinal Counties, Arizona.

(i) San Pedro River for approximately 60.0 km (37.2 mi) extending from the International Boundary with Mexico in Township 24 South, Range 22 East, Section 19 downstream to the confluence with the Babocomari River in the San Juan de las Boquillas y Nogales land grant.

(ii) Aravaipa Creek for approximately 44.9 km (27.9 mi) extending from the confluence with the San Pedro River in Township 7 South, Range 16 East, center of section 9 upstream to the confluence with Stowe Gulch in Township 6 South, Range 19 East, southeast quarter of the northeast quarter of section 35.

(iii) Deer Creek—3.7 km (2.3 mi) of the creek extending from the confluence with Aravaipa Creek at Township 6 South, Range 18 East, section 14 upstream to the boundary of the Aravaipa Wilderness at Township 6 South, Range 19 East, section 18.

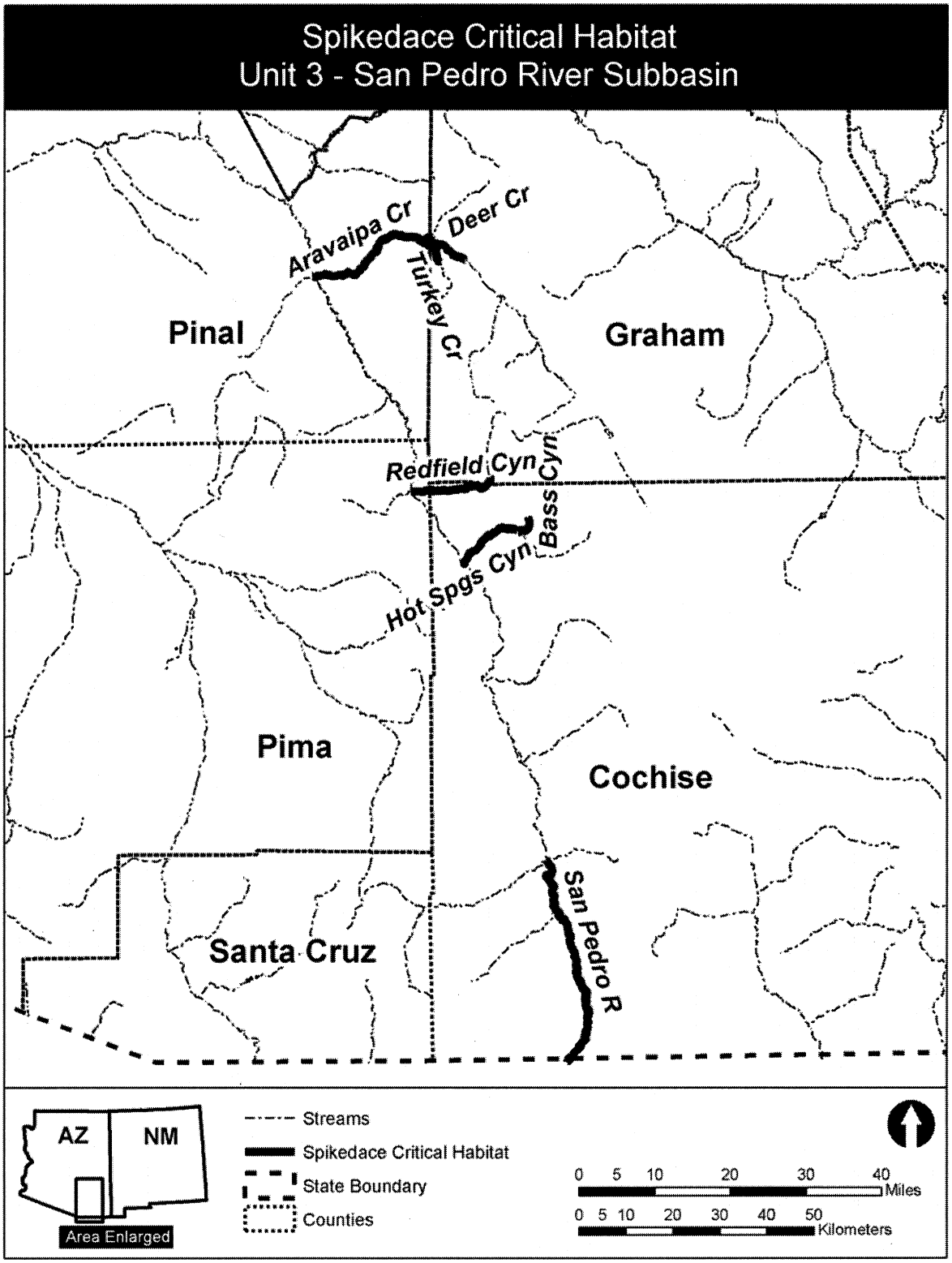
(iv) Turkey Creek—4.3 km (2.7 mi) of the creek extending from the confluence with Aravaipa Creek at Township 6 South, Range 19 East, section 19 upstream to the confluence with Oak Grove Canyon at Township 6 South, Range 19 east, section 32.

(v) Hot Springs Canyon for approximately 19.0 km (11.8 mi) extending from the confluence with the San Pedro River in Township 13 South, Range 19 East, center of section 23 upstream to the confluence with Bass Canyon in Township 12 South, Range 20 East, northeast quarter of section 36.

(vi) Redfield Canyon for approximately 22.5 km (14.0 mi) extending from the confluence with the San Pedro River in Township 11 South, Range 18 East, southwest quarter of section 34 upstream to the confluence with Sycamore Canyon in Township 11 South, Range 20 East, northwest quarter of section 28.

(vii) Bass Canyon for approximately 5.5 km (3.4 mi) from the confluence with Hot Springs Canyon in Township 12 South, Range 20 East, northeast quarter of section 36 upstream to the confluence with Pine Canyon in Township 12 South, Range 21 East, center of section 20.

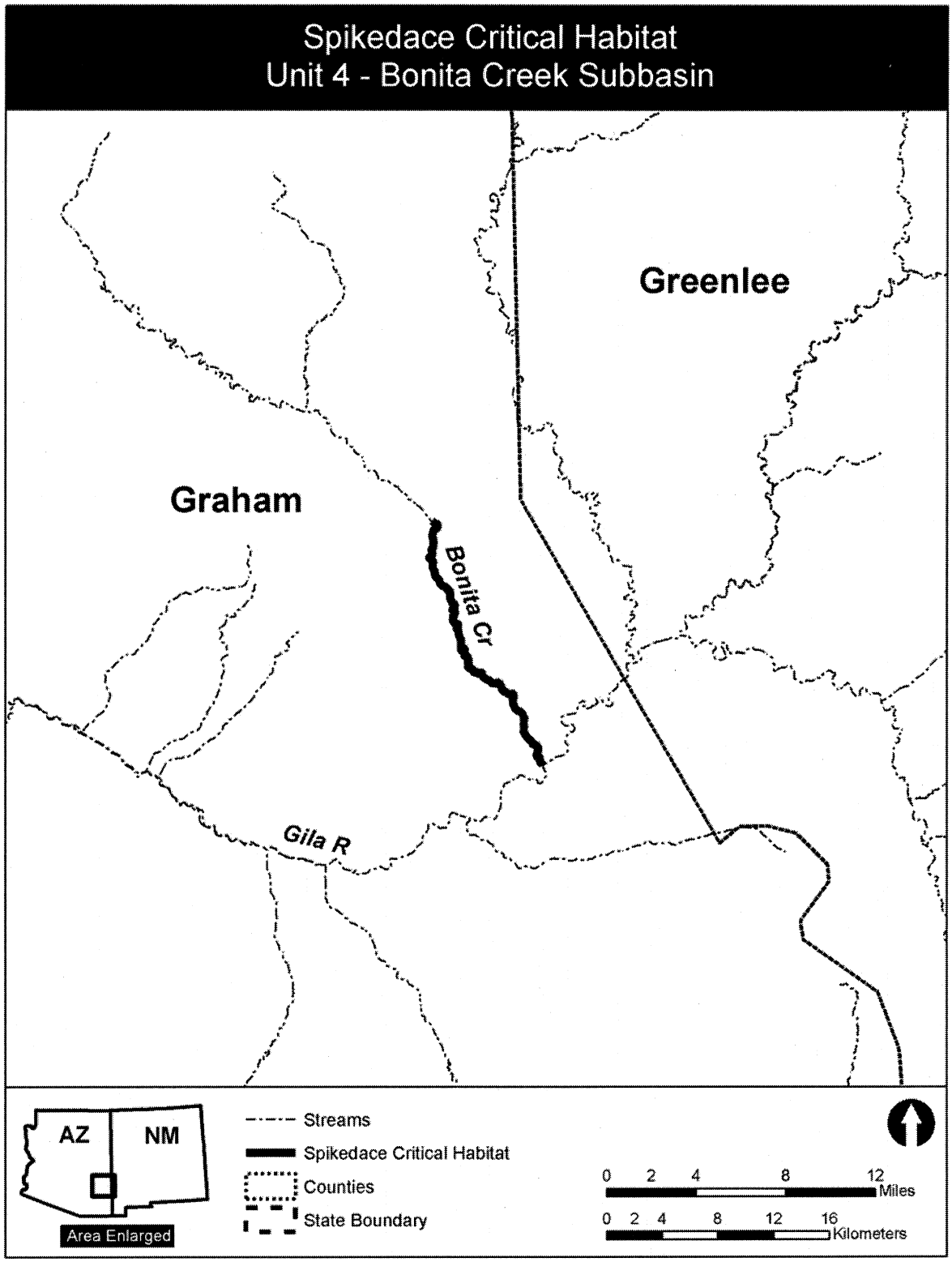
(viii) **Note:** Map of Unit 3, San Pedro River Subbasin (Map 4), follows.



(10) Unit 4: Bonita Creek Subbasin, Graham County, Arizona.

(i) Bonita Creek for approximately 23.8 km (14.8 mi) from the confluence with the Gila River in Township 6 South, Range 28 East, southeast quarter of section 21 upstream to the confluence with Martinez Wash in Township 4 South, Range 27 East, southeast quarter of Section 27.

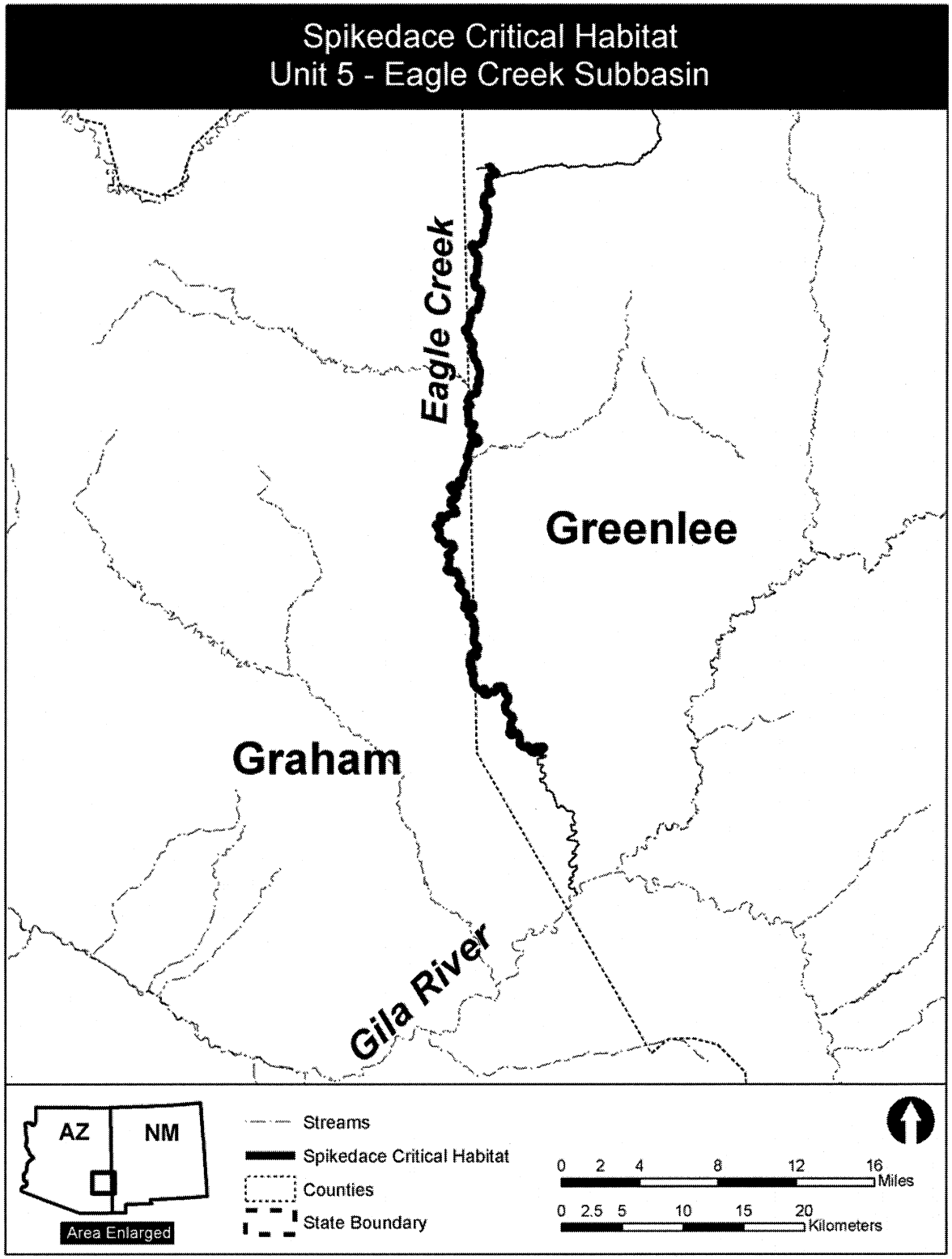
(ii) **Note:** Map of Unit 4, Bonita Creek Subbasin (Map 5), follows.



(11) Unit 5: Eagle Creek Subbasin, Graham and Greenlee Counties, Arizona.

(i) Eagle Creek for approximately 75 km (46.9 mi) from the Freeport McMoRan diversion dam at Township 4 South, Range 28 East, southwest quarter of section 23 upstream to the confluence of East Eagle Creek in Township 2 North, Range 28 East, southwest quarter of section 20.

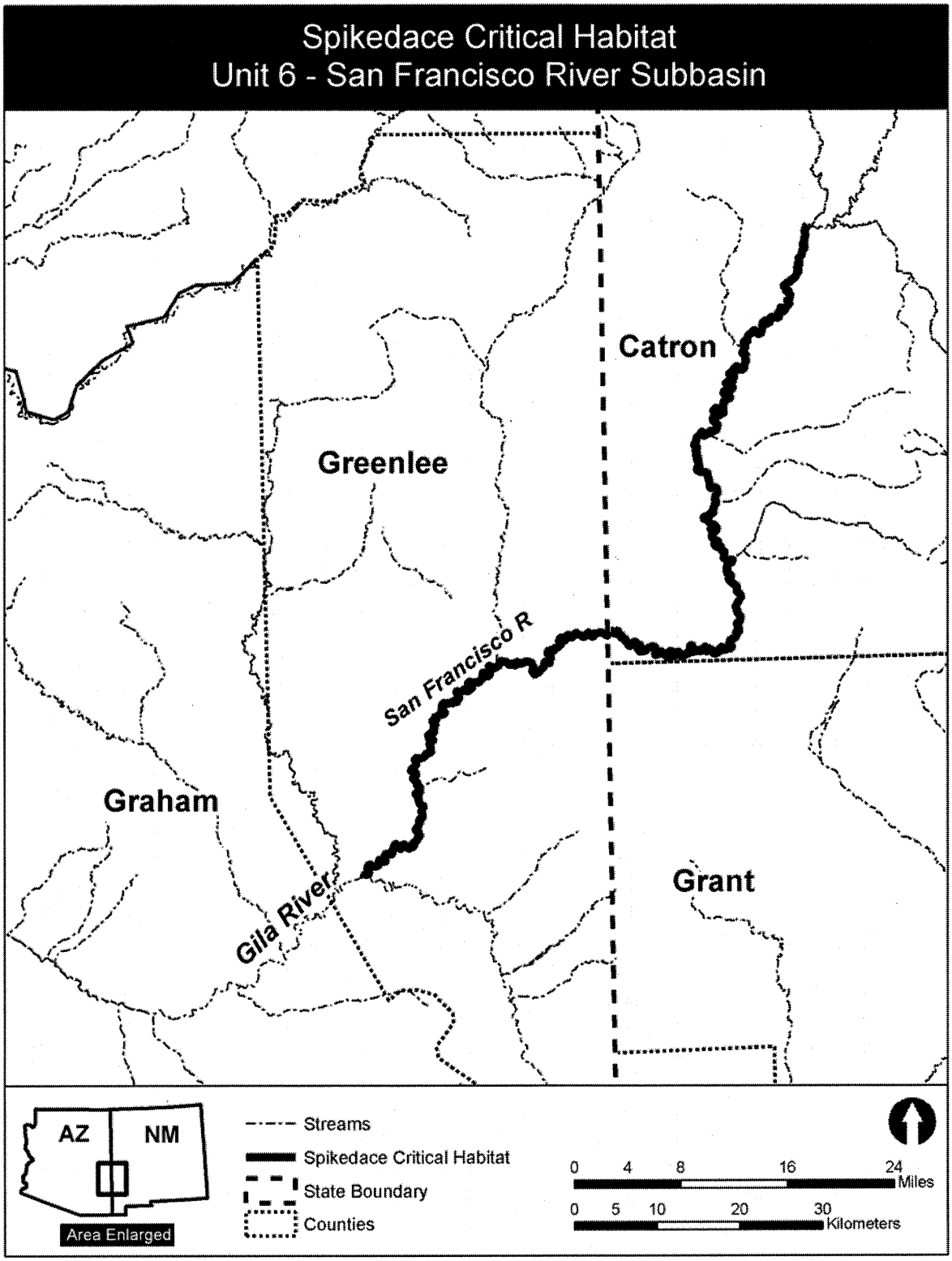
(ii) **Note:** Map of Unit 5, Eagle Creek Subbasin (Map 6), follows.



(12) Unit 6: San Francisco River Subbasin, Greenlee County, Arizona, and Catron County, New Mexico.

(i) San Francisco River for approximately 181.0 km (112.3 mi) of the San Francisco River extending from the confluence with the Gila River in Township 5 South, Range 29 East, southeast quarter of section 21 upstream to the confluence with the Tularosa River in Township 7 South, Range 19 West, southwest quarter of section 23.

(ii) **Note:** Map of Unit 6, San Francisco River Subbasin (Map 7), follows.



(13) Unit 7: Blue River Subbasin, Greenlee County, Arizona, and Catron County, New Mexico.

(i) Blue River for approximately 81.4 km (50.6 mi) from the confluence with the San Francisco River at Township 2S., Range 31 East, southeast quarter of section 31 upstream to the confluence of Campbell Blue and Dry Blue Creeks at Township 7 South, Range 21 West, southeast quarter of section 6.

(ii) Campbell Blue Creek for approximately 12.4 km (7.7 mi) from the confluence of Dry Blue and Campbell Blue Creeks at Township 7 South, Range 21 West, southeast quarter of section 6 to the confluence with Coleman Canyon in Township 4.5 North, Range 31 East, southwest quarter of the northeast quarter of section 32.

(iii) Little Blue Creek for approximately 5.1 km (3.1 mi) from the confluence with the Blue River at Township 1 South, Range 31 East,

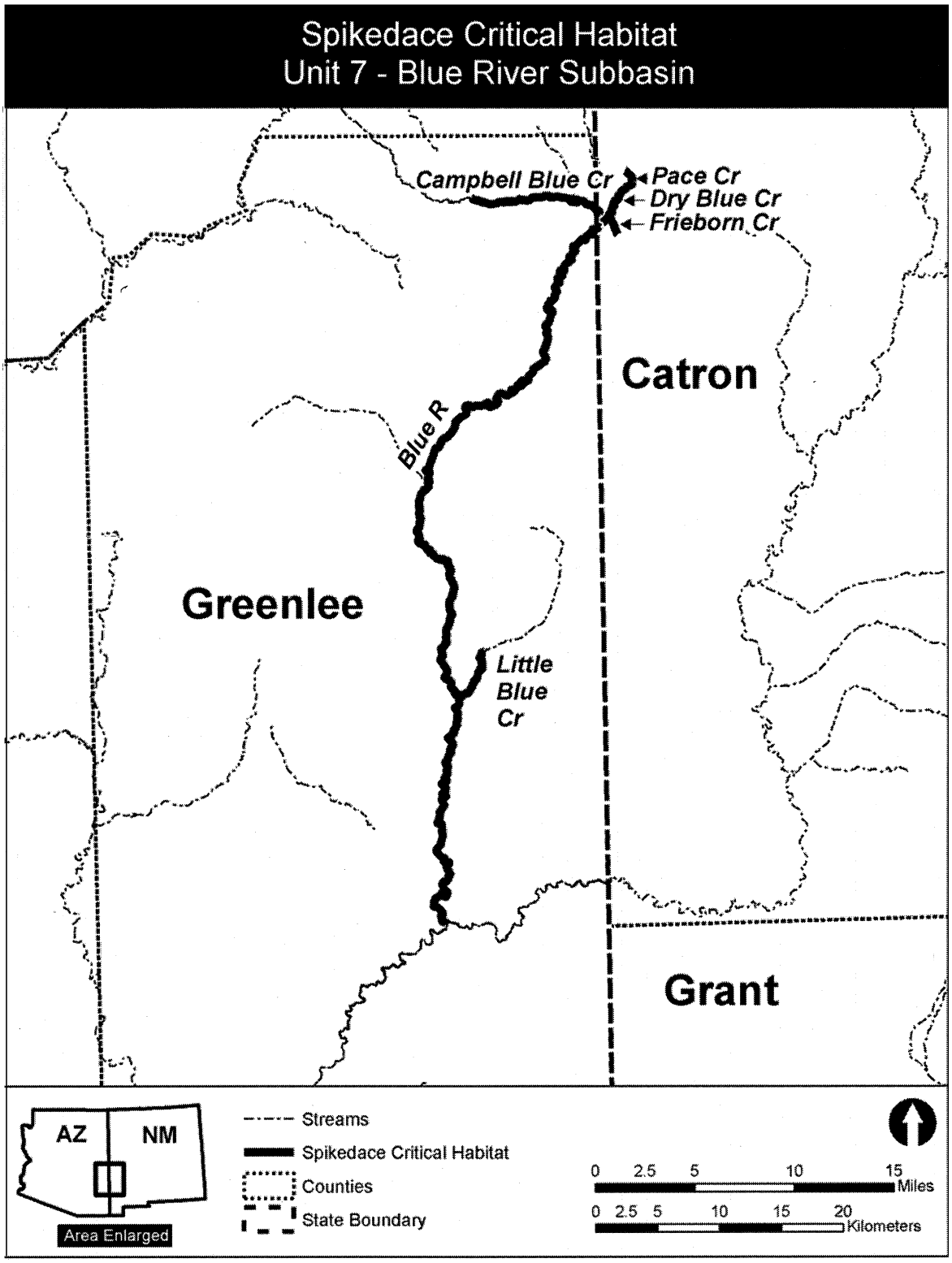
center Section 5 upstream to the mouth of a canyon at Township 1 North, Range 31 East, northeast quarter of section 29.

(iv) Pace Creek for approximately 1.2 km (0.8 mi) from the confluence with Dry Blue Creek at Township 6 South, Range 21 West, southwest quarter of Section 28 upstream to a barrier falls at Township 6 South, Range 21 West, northeast quarter of section 29.

(v) Frieborn Creek for approximately 1.8 km (1.1 mi) from the confluence with Dry Blue Creek at Township 7 South, Range 21 West, southwest quarter of the northwest quarter of section 5 upstream to an unnamed tributary flowing from the south in Township 7 South, Range 21 West, northeast quarter of southwest quarter of section 8.

(vi) Dry Blue Creek for approximately 4.7 km (3.0 mi) from the confluence with Campbell Blue Creek at Township 7 South, Range 21 West, southeast quarter of Section 6 upstream to the confluence with Pace Creek in Township 6 South, Range 21 West, southwest quarter of section 28.

(vii) **Note:** Map of Unit 7, Blue River Subbasin (Map 8), follows.



(14) Unit 8: Gila River Subbasin, Catron, Grant, and Hidalgo Counties, New Mexico.

(i) Gila River for approximately 165.1 km (102.6 mi) from the confluence with Moore Canyon at Township 18 South, Range 21 West, southeast quarter of the southwest quarter of Section 32 upstream to the confluence of the East and West Forks of the Gila River at Township 13 South, Range 13 West, center of Section 8.

(ii) West Fork Gila River for approximately 13.0 km (8.1 mi) from the confluence with the East Fork Gila River at Township 13 South, Range 13 West, center of section 8 upstream to the confluence with EE Canyon at Township 12 South, Range 14 West, east boundary of Section 21.

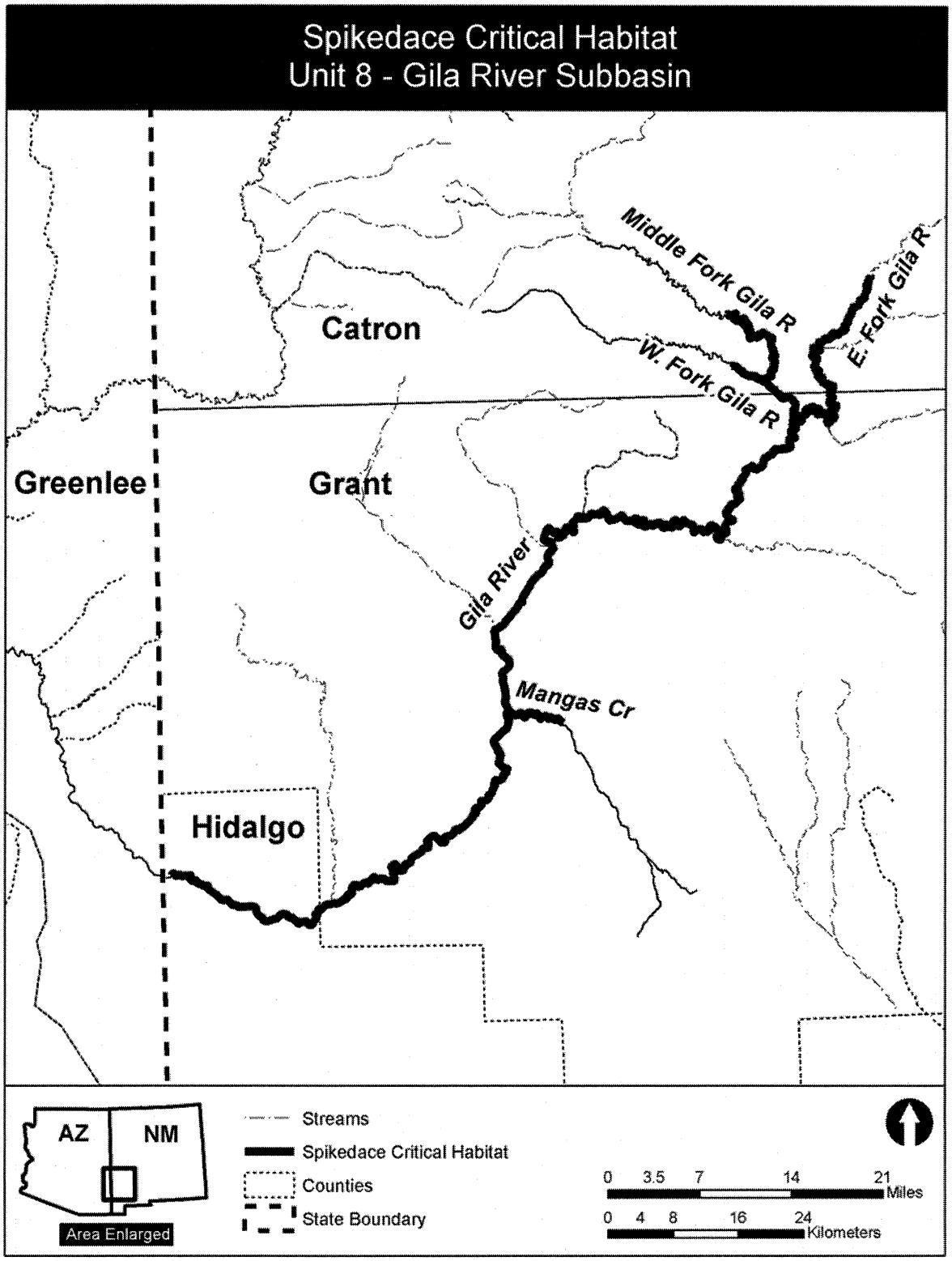
(iii) Middle Fork Gila River for approximately 12.5 km (7.7 mi) of the Middle Fork Gila River extending from the confluence with West Fork Gila

River at Township 12 South, Range 14 West, southwest quarter of section 25 upstream to the confluence of Big Bear Canyon in Township 12 South, Range 14 West, southwest quarter of section 2.

(iv) East Fork Gila River for approximately 42.1 km (26.2 mi) extending from the confluence with West Fork Gila River at Township 13 South, Range 13 West, center of Section 8 upstream to the confluence of Beaver and Taylor Creeks in Township 11 South, Range 12 West, northeast quarter of section 17.

(v) Mangas Creek for approximately 9.1 km (5.7 mi) extending from the confluence with the Gila River at Township 17 South, Range 16 West, southwest quarter of section 5 upstream to the confluence with Blacksmith Canyon at Township 17 South, Range 17 West, northwest quarter of section 3.

(vi) **Note:** Map of Unit 8, Gila River Subbasin (Map 9), follows.



Authority

The authority for this section is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: October 13, 2010.

Thomas L. Strickland,

Assistant Secretary for Fish and Wildlife and Parks.

[FR Doc. 2010–26477 Filed 10–27–10; 8:45 am]

BILLING CODE 4310–55–C