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Endangered and Threatened Wildlife and Plants; Endangered Status and Designations of Critical Habitat for Spikedace and Loach Minnow; Final Rule

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R2–ES–2010–0072; 4500030114]

RIN 1018–AX17

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

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), 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 (Act). With this rule we are also revising the designated critical habitats for both species. These changes fulfill our obligations under a settlement agreement.

DATES: This rule becomes effective on March 26, 2012.

ADDRESSES: This final rule and the associated final economic analysis and environmental assessment are available on the Internet at *http://www.regulations.gov*. Comments and materials received, as well as supporting documentation used in preparing this final rule, are available for public inspection, by appointment, during normal business hours, at the 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.

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:

Executive Summary

In this final rule, we are changing the status of spikedace and loach minnow from threatened to endangered under the Act. We also are revising our designations of critical habitat for both species. We are under undertaking these actions pursuant to a settlement agreement and publication of this action will fulfill our obligations under that agreement. With the change in status for the species, the special rules for each species will be removed from the Code of Federal Regulations. In total, approximately 1,013 kilometers (630 miles) are designated as critical habitat for spikedace and 983 kilometers (610 miles) are designated as critical habitat for loach minnow in Apache, Cochise, Gila, Graham, Greenlee, Pinal, and Yavapai Counties, Arizona, and Catron, Grant, and Hidalgo Counties in New Mexico. Of this area, approximately 853 kilometers (529 miles) are designated for both species, with an additional 162 kilometers (100 miles) for spikedace only and an additional 130 kilometers (81 miles) for loach minnow only. We have excluded from this designation of critical habitat: portions of the upper San Pedro River in Arizona based on potential impacts to national security at Fort Huachuca; Tribal lands of the White Mountain Apache Tribe, San Carlos Apache Tribe, and the Yavapai-Apache Nation in Arizona; and private lands owned by Freeport-McMoRan in Arizona and New Mexico.

Background

It is our intent to discuss in this final rule only those topics directly relevant to the development and designations of critical habitat for the spikedace and the loach minnow under the Act (16 U.S.C. 1531 *et seq.*). For more information on the biology and ecology of the spikedace and the loach minnow, refer to the final listing rule published in the **Federal Register** on July 1, 1986, for spikedace (51 FR 23769), and October 28, 1986, for loach minnow (51 FR 39468); the previous critical habitat designations (72 FR 13356, March 21, 2007); and our 1991 final recovery plans, which are available from the Arizona Ecological Services Office (see **ADDRESSES** section). For information on spikedace and loach minnow critical habitat, refer to the proposed rule to designate critical habitat for the two species published in the **Federal Register** on October 28, 2010 (75 FR 66482). A notice of availability regarding changes to the proposed rule and information on the associated draft economic analysis and draft environmental assessment for the proposed rule to designate revised critical habitat was published in the **Federal Register** on October 4, 2011 (76 FR 61330).

Previous Federal Actions

Previous Federal actions prior to October 28, 2010, are outlined in our proposed rule (75 FR 66482), which was published on that date. Publication of the proposed rule opened a 60-day comment period which closed on December 27, 2010. On October 4, 2011 (76 FR 61330), we published a revised proposed rule, announced the availability of a draft economic analysis and environmental assessment of the proposed designations, and announced the scheduling of a public information session and public hearing. Our October 4, 2011, notice also reopened the comment period on the revised proposed rule and uplisting for an additional 30 days, until November 3, 2011.

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 midchannel 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; Brouder, 2002, pers. comm.; Stefferud and Reinthal 2005, pp. 16–21; Paroz *et al.* 2006, pp. 62–67; Propst 2007, pp. 7–9, 11–14; Reinthal 2011, pp. 1–2).

In 2007, spikedace were translocated into Hot Springs and Redfield Canyons, in Cochise County, Arizona, and these streams were subsequently augmented (Robinson 2008a, pp. 2, 6; Robinson, 2008b, pers. comm.; Orabutt, 2009 pers. comm.; 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 and 2011 (Carter 2007b, p. 1; Carter 2008a, p. 1; Robinson 2009b, p. 9; Boyarski *et al.* 2010, p. 3, Robinson 2011a, p. 1). In 2008, spikedace were translocated into Bonita Creek, a tributary to the Gila River in Graham County, Arizona (Blasius, 2008, pers. comm.; Orabutt, 2009,, pers. comm.; Robinson *et al.* 2009a, p. 209; Blasius and Conn 2011, p. 3), and were repatriated to the upper San Francisco River in Catron County, New Mexico (Propst, 2010, pers. comm.). (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; Reinthal 2011, 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 (Brouder 2002, p. 1; 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 present range for spikedace 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.

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 1856 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; Carter 2005, pp. 1–5; Carter, 2008b, pers. comm.; 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);
- The North Fork East Fork Black River (Apache and Greenlee Counties, Arizona) (Leon 1989, pp. 1–2; Lopez, 2000, pers. comm.; Gurtin, 2004, pers. comm.; 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).

As described for spikedace above, population estimates for loach minnow 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. However, based on the available maps and survey information, we estimate the present range for loach minnow to be approximately 15 to 20 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.

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, is 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.

Throughout the document, we discuss areas in which spikedace or loach minnow have been reintroduced, translocated, or augmented. For purposes of this document, we consider the species to have been reintroduced when they have been placed back into an area in which they were formerly present, but no longer are. We consider the fish to have been translocated when they are placed into a location for which we have no previous records of occurrence. Augmentation occurs when we add additional individuals to a former reintroduction or translocation project, in an attempt to establish a stable population.

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

Water Withdrawals

Water resources are limited in the Southwestern United States and diversions and withdrawals 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 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.

Spikedace and loach minnow are stream-dwelling fish, and are associated only with flowing water. Spikedace are found in moderate to large perennial streams, and occur where the stream has flowing, rougher, choppy water (Barber and Minckley 1966, p. 31; Propst *et al.* 1986, p. 12; Rinne and Kroeger 1988, p. 1; Rinne 1991, pp. 8–10). Loach minnow occur in shallow, turbulent riffles where there are 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). Water withdrawals that either dewater channels or reduce flows to low levels or pools within an active channel therefore eliminate the habitat used by the two species.

Many streams currently or formerly occupied by spikedace and loach minnow have been affected by water withdrawals. The Gila River downstream of the town of Cliff, New Mexico, flows through a broad valley where irrigated agriculture and livestock grazing are the predominant uses. Human settlement has increased since 1988 (Propst *et al.* 2008 (pp. 1237–1238). Agricultural practices have led to dewatering of the river in the Cliff-Gila valley at times during the dry season (Soles 2003, p. 71). For those portions of the Gila River downstream of the Arizona-New Mexico border, 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).

The San Francisco River has undergone sedimentation, riparian habitat degradation, and extensive water diversion and at present has an undependable water supply throughout portions of its length. The San Francisco River is seasonally dry in the Alma Valley, and two diversion structures fragment habitat in the upper Alma Valley and at Pleasanton (NMDGF 2006, p. 302). The San Francisco River in Arizona was classified as impaired due to excessive sediment from its headwaters downstream to the Arizona—New Mexico border (Arizona Department of Water Resources 2011a, p. 1).

Additional withdrawals of water from the Gila and San Francisco rivers may occur in the future. Implementation of Title II of the Arizona Water Settlements Act (AWSA) (Pub. L. 108–451) would facilitate the exchange of Central Arizona Project water within and between southwestern river basins in Arizona and New Mexico, and may result in the construction of new water development projects. For example, Section 212 of the AWSA pertains to the New Mexico Unit of the Central Arizona Project.

The AWSA provides for New Mexico water users to deplete 140,000 acre-feet of additional water from the Gila Basin in any ten-year period. The settlement also provides the ability to divert that water without complaint from downstream pre-1968 water rights in Arizona. New Mexico will receive $66 million to $128 million in non-reimbursable federal funding. The Interstate Stream Commission (ISC) funds may be used to cover costs of an actual water supply project, planning, environmental mitigation, or restoration activities associated with or necessary for the project, and may be used on one or more of 21 alternative projects ranging from Gila National Forest San Francisco River Diversion/Ditch improvements to a regional water supply project (the Deming Diversion Project). At this time, it is not known how the funds will be spent, or which potential alternative(s) may be chosen.

While multiple potential project proposals have been accepted by the New Mexico Office of the State Engineer (NMOSE) (NMOSE 2011a, p. 1), implementation of the AWSA is still in the planning stages on these streams. The AWSA mandates that the ISC make the final determination of contracts for water and allocation of funding and provide notice to the Secretary of the Interior by December 31, 2014. New Mexico ISC must make any final determination during an open, public meeting, and only after consultation with the Gila San Francisco Water Commission, the citizens of Southwest New Mexico, and other affected interests. Due to the timeline associated with this project, as well as the uncertainties in how funding will be spent, and which potential alternative or alternatives will be chosen, the Service is unable to determine the outcome of this process at this time. However, should water be diverted from the Gila or San Francisco rivers, flows would be diminished and direct and indirect losses and degradation of

habitat for aquatic and riparian species would result. The San Francisco River is currently occupied by loach minnow, and is the site of a 2008 reintroduction for spikedace. The Gila River is a stronghold for both species, currently supporting the largest remaining populations of each. For these reasons, impacts to either river is of particular concern for the persistence of these species.

Groundwater withdrawal in Eagle Creek, primarily for water supply for a large open-pit copper mine at Morenci, Arizona 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 approximately 24,281 hectares (ha) (60,000 acres (ac)). 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 instream habitat loss due to water withdrawals because it is partially within a Bureau of Land Management (BLM) Wilderness area and partially within 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 (JE Fuller 2000, pp. 4–8).

On the mainstem Salt River, impoundments have permanently limited the flow regime and suitability for spikedace or loach minnow. Spikedace are extirpated from portions of the Salt and Gila Rivers that were once perennial and are now classified as regulated (ASU 2002, The Nature Conservancy 2006).

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 2010, 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 4,933,927 cubic meters (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 km (26 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; however, an agreement in principle was signed between various factions associated with water rights and interests on the Verde River (Citizens Water Advocacy Group 2010; Verde Independent 2010, p. 1).

This upper portion of the Verde River is considered currently occupied by spikedace, and barrier construction and stream renovation plans are under way 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.

Portions of the San Pedro River are now classified as formerly perennial, including areas from which spikedace and loach minnow are now extirpated (The Nature Conservancy 2006). Water withdrawals are also a concern for the San Pedro River. The Cananea Mine in Sonora, Mexico, owns the land surrounding the headwaters of the San Pedro. There is disagreement on the exact amount of water withdrawn by the mine, Mexicana de Cananea, which is one of the largest open-pit copper mines in the world. However, there is agreement that it is the largest water user in the basin (Harris *et al.* 2001; Varady *et al.* 2000, p. 232).

Another primary groundwater user in the San Pedro watershed is Fort Huachuca. Fort Huachuca is a U.S. Army installation located near Sierra Vista, Arizona. Initially established in 1877 as a camp for the military, the water rights of the Fort are predated only by those of local Indian tribes (Varady *et al.* 2000, p. 230). Fort Huachuca has pursued a rigorous water use reduction plan, working over the past decade to reduce groundwater consumption in the Sierra Vista Subwatershed. Their efforts have focused primarily on reductions in groundwater demand both on-post and off-post and increased artificial and enhanced recharge of the groundwater system. Annual pumping from Fort Huachuca production wells has decreased from a high of approximately 3,200 AF in 1989 to a low of approximately 1,400 AF in 2005. In addition, Fort Huachuca and the City of Sierra Vista have increased the amount of water recharged to the regional aquifer through construction of effluent recharge facilities and detention basins that not only increase stormwater recharge but mitigate the negative effects of increased runoff from urbanization. The amount of effluent that was recharged by Fort Huachuca and the City of Sierra Vista in 2005 was 426 AF and 1,868 AF, respectively. During this same year, enhanced stormwater recharge at detention basins was estimated to be 129 AF. The total net effect of all the combined efforts initiated by Fort Huachuca has been to reduce the net groundwater

consumption by approximately 2,272 AF (71 percent) since 1989 (Service 2007, pp. 41–42).

In addition to impacts on water availability within streams, diversion structures can create barriers for fish movement. 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 reconstruction, resulting in potential habitat damages and inputs of sediment into the active stream.

In summary, 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 withdrawals on Aravaipa Creek.

Stream Channel Alteration

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). Historical and ongoing channelization will continue to contribute to riparian and aquatic habitat decline most notably eliminating cover and reducing nutrient input.

Stream channel alteration 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). Loach minnow occupy interstitial spaces between cobble (Propst and Bestgen 1991, p. 34), and increases in sedimentation can fill these spaces in, removing shelter for loach minnow, and reducing available breeding habitat. Spikedace are typically found over 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). Changes in sediment transport and alteration of substrate size can make an area unsuitable for spikedace. Both species occur in streams with specific water velocities, and increasing flow velocities as a result of channelization may also make an area unsuitable.

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 from large mining operations (Eberhardt 1981, pp. 2, 16). 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 (EPA) 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 are: 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; Arizona Department of Water Resources 2011b, p. 1). 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 (Reinthal, 2010, pers. comm.). We do not know with certainty whether these levels of lead would affect spikedace or loach minnow, but we assume similar impacts would occur as they are collocated with Sonora sucker and roundtail chub in Aravaipa Creek.

The Service completed contaminant studies on the San Francisco River and Gila River in the 1990s. Two sites on the San Francisco River exceeded the International Joint Commission (IJC) background level standards for arsenic, cadmium, copper, mercury, and zinc. Cadmium levels at site 2 were approximately 16.5 times the background level, while copper was nearly 25 times greater than the background level. The two San Francisco River sites did not exceed domestic water source water quality standards for trace element concentrations, where those standards are provided for Arizona. The study site closest to, but downstream of, the portion of the Gila River included in the designation exceeded IJC background level standards for trace element concentrations for arsenic, cadmium, and copper. DDE was recovered in all whole body and edible fish samples, as were aluminum, arsenic, barium, chromium, selenium, and strontium. Cadmium, mercury, and selenium concentrations were determined to potentially pose a threat to fish-eating birds in the Gila River basin (Baker and King 1994, pp. 6–14, 17, 19, 22).

Organochlorine contaminants detected included heptachlor, chlordane, and DDE. The concentrations of these pesticides were below concentrations known to affect survival and reproduction of most fish species.

The study recommended continued monitoring, due to the high cadmium and mercury concentrations that approach the critical reproductive effect threshold level in more than one-half of the samples. In addition, the study recommended monitoring for selenium as selenium levels exceeded dietary levels for protection of avian predators. Such monitoring has not occurred.

The Arizona Department of Water Resources notes that 67 sites on the San Pedro River have parameter

concentrations that have equaled or exceeded their drinking water standards. The most frequently equaled or exceeded parameters included arsenic and fluoride, but other parameters equaled or exceeded in the sites measured in the San Pedro Basin were cadmium, lead, nitrates, beryllium, mercury, and total dissolved solids (Arizona Department of Water Resources 2011c, p. 1). The Verde River has three different reaches that exceed standards for turbidity, totaling 37.5 miles between Oak Creek and West Clear Creek. Additionally, Oak Creek exceeds the standards for *E. coli* (Arizona Department of Water Resources 2011d, p. 1).

There are few studies, with the exception of the study at Aravaipa Creek, which discuss contaminants on spikedace and loach minnow. Generally, contaminants can have both sublethal and lethal effects. Sublethal effects are those, such as the lead contamination at Aravaipa Creek, which may reduce a species' ability to reproduce. Lethal are those effects that result in death for the species. Large fish kills are more rare now than in the past.

Pollution is increasingly more widespread and more often from nonpoint sources. Urban and suburban development is one source of nonpoint-source pollution. Increasing the amount of 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 ecosystems during some periods of the year. Sewage effluent can contain lead, especially where the treatment plant receives industrial discharges or highway runoff (Hoffman *et al.* 1995, p. 361). The number of bridges and roads increases with expanding 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 Frissell 2000, pp. 22–24). Some metals, like lead and cadmium, are associated with fuel combustion. Lead can be found in vehicle emissions (Hoffman *et al.* 1995, pp. 369, 405).

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 nonpoint-source pollution.

Exposure to pesticides can result in a variety of behaviors. Sublethal behaviors are those that do not result in death. Sublethal responses of fish to pesticide exposure can include central nervous system disorders, increased ventilation rates, loss of equilibrium, rapid, jerky movements, dark discoloration or hemorrhaging in muscles and beneath the dorsal fin, erratic, uncoordinated swimming movements with spasms and convulsions, and spinal abnormalities (Meyer and Barclay 1990, p. 21).

Exposure to metals at toxic levels can have varying effects. Low levels of some metals, such as selenium, are essential for good health. However, excess levels of selenium can be toxic, and selenium is considered one of the most toxic elements to fish (Sorensen 1991, pp. 17–22). For other metals such as lead, all known effects on biological systems are negative (Hoffman *et al.* 1995, p. 356).

Exposure to metals causes a variety of impacts, including disruption to feeding behaviors, altered respiratory rates, growth inhibition, and delayed sexual maturation; damage to body structure including skin, nervous system, and musculature, gills, fins, and spines; damage to organs including the liver, kidneys, intestines, heart, and chemoreceptors (used in migration); alterations to blood and blood chemistry, including red blood cells, hemoglobin levels, protein concentrations, glucose concentrations, and antibody titers; and damage to the nervous system leading to muscle spasms, paralysis, hyperactivity, and a loss of equilibrium (Sorensen 1991, pp. 17–22, 34–48 (selenium), 74–78 (arsenic); 104–107 (lead); 153–164 (zinc); 199–219 (cadmium); 253–275 (copper); and 312–323 (mercury)).

The impacts of a toxin in a system vary by species, as well as by age level of the organism. For some metals, such as copper or mercury, fish are more severely affected at the embryonic and reproductive stages of the life cycle (Sorensen 1991, p. 269; Hoffman *et al.* 1995, p. 398). It is also important to note that, for some metals, such as cadmium, copper, lead, and mercury, increased temperatures or changes in water chemistry, such as pH or organic matter, can affect the toxicity of the metal (Sorensen 1991, p. 184; Hoffman *et al.* 1995, pp. 395–396). Therefore, there can be an increased threat from exposure to toxins in streams that have also undergone alterations such as vegetation removal due to fire or construction and maintenance activities, or improper livestock grazing.

An additional, increasing source of contamination for streams is caused by wildfires and their suppression. 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 Service to the U.S. Forest Service (USFS) on the nationwide use of fire retardants, the 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). This consultation was recently reinitiated and completed in October 2011. The revised biological opinion included additional buffers and protective measures and concluded that the revised protocol for fire retardant use was not likely to jeopardize the continued existence of either spikedace or loach minnow (Service 2011).

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 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 wildfires, 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 (sediments) and ash may be continuing to affect the populations on the West Fork Gila, near the Gila Cliff Dwellings (Propst *et al.* 2008, p. 1247).

Since the proposed rule was published in October of 2011, the Wallow Fire burned portions of the critical habitat designations for spikedace and loach minnow, specifically the Black River Complex in Unit 2 (loach minnow only), and the Blue River Complex in Unit 7 (both species). The Wallow Fire encompassed just over 217,721 ha (538,000 ac) total in Arizona and New Mexico (InciWeb 2011), and was the largest wildfire in Arizona's history.

Portions of Units 2 and 7 of the critical habitat designation fall within the Wallow Fire perimeter. Within Unit 2, the North Fork East Fork Black River falls within an unburned area inside the perimeter of the fire, as does most of Boneyard Creek. The majority of East Fork Black River falls within an area that experienced low burn severity, but does cross a few areas that were either unburned or burned at moderate burn severity. Coyote Creek is in an area almost entirely burned at low severity. Within Unit 7, the majority of Campbell Blue Creek is within unburned or low burn severity areas; however, approximately 2.4 km (1.5 mi) of the upper end of Campbell Blue Creek is within moderate and high burn severity. The Wallow Fire stopped just west of the Blue River, but came within approximately 0.3 km (0.2 mi) of the River. However, the rainfall during the summer monsoon, which began before the fire was extinguished, contributed ash and sediment to both streams. In the Blue River, ash and sediment travelled as far downstream as the San Francisco River, resulting in fish kills (Blasius, 2011, pers. comm.). Fish surveys completed in the fall of 2011 indicated reduced numbers of loach minnow (Adelsberger *et al.* 2011, p. 1).

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, increased water temperatures), 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, some of which can last for several years to more than a decade after the fire (Amaranthus *et al.* 1989, pp. 75–77; Propst *et al.* 1992, pp. 119–120; Gresswell 1999, pp. 194–211; Burton 2005, pp. 145–146; Dunham *et al.* 2007, pp. 335, 340–342; Rinne and Carter 2008, pp. 169–171; Mahlum *et al.* 2011, pp. 243–246). 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 people or livestock, such as horses or mules, 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. We do not have information on the impacts of litter on spikedace and loach minnow; however, impacts from vegetation loss can include 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).

Recreation overuse can result in decreased riparian vegetation (USFS 2008, pp. 7–17) and subsequent increases in stream temperatures. Recreation is cited as one of the causes of impairment due to water temperature on the West Fork Gila River (EPA 2010, p. 1). We discuss temperature tolerances below in the microhabitat discussions for each species. Spikedace and loach minnow are known to have a range of temperatures in which they occur, and recent research by the University of Arizona has determined upper temperature tolerances for the two species. Spikedace did not survive exposure of 30 days at 34 or 36 °C (93.2 or 96.8 °F), and 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. Similarly, 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). For loach minnow, 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. The study concludes that temperature tolerance in the wild may be even lower due to the influence of additional stressors, including disease, predation, competition, or poor water quality.

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 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.

Generally, there are fewer new bridge construction projects within critical habitat; however, one proposed bridge will occur near the designation for spikedace in Unit 2 over Tonto Creek. Road and bridge maintenance and repairs occur frequently on the Blue River. There have been repeated road repairs near the Gila Cliff Dwellings on the West Fork Gila River 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, 2002a, 2005, 2008b, 2008c, 2009, 2010a).

The impacts of bridge and road construction, usage, and repairs can include increased sedimentation, either due to driving across low-water crossings in active stream channels, or due to excavation associated with maintenance and repair activities. Vehicles using low-water crossings as well as heavy equipment in active channels during construction or repairs can both harm eggs of spikedace and loach minnow, and compress substrates so that the interstitial spaces used by adult loach minnow are removed. Maintenance and construction work on banks around bridges and roads may also lead to increased sedimentation due to sediment disturbance or the removal of vegetation.

Livestock Grazing

Livestock grazing has been one of the most widespread and long-term causes of 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; Wyman *et al.* 2006, pp. 5–7). Medina *et al.* (2005, p. 99) note that the impacts of grazing vary within and among ecoregions, and that some riparian areas can sustain little to no ungulate grazing, while others can sustain very high use. They further note that threatened and endangered fish populations and their associated riparian habitat ''* * * may require some form of protection from grazing of all ungulates (e.g., elk, deer, cattle) * * *''. 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), that 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.

An indirect effect of grazing can include the development of water tanks for livestock. In some cases, stocktanks are used to stock nonnative fish for sportfishing, or they may support other nonnative aquatic species such as bullfrogs or crayfish. In cases where stocktanks are in close proximity to live streams, they may occasionally be breached or flooded, with nonnative fish escaping from the stocktank and entering stream habitats (Hedwall and Sponholtz 2005, pp. 1–2; Stone *et al.* 2007, p. 133).

Climate Conditions

Climate conditions have contributed to the status of the spikedace and loach minnow now and will likely continue into the 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.

Consideration of climate change is a component of our analyses under the Endangered Species Act. In general terms, ''climate change'' refers to a change in the state of the climate (whether due to natural variability, human activity, or both) that can be identified by changes in the mean or variability of its properties, and that persists for an extended period—typically decades or longer (Intergovernmental Panel on Climate Change (IPCC) 2007a, p. 78).

Changes in climate are occurring. Examples include warming of the global climate system over recent decades, and substantial increases in precipitation in some regions of the world and decreases in other regions (for these and other examples see IPCC 2007a, p. 30; Solomon *et al.* 2007, pp. 35–54, 82–85).

Most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate, and is very likely due to the observed increase in greenhouse gas concentrations in the atmosphere as a result of human

activities, particularly emissions of carbon dioxide from fossil fuel use (IPCC 2007a, p. 5 and Figure SPM.3; Solomon *et al.* 2007, pp. 21–35). Therefore, to project future changes in temperature and other climate conditions, scientists use a variety of climate models (which include consideration of natural processes and variability) in conjunction with various scenarios of potential levels and timing of greenhouse gas emissions (e.g., Meehl *et al.* 2007 entire; Ganguly *et al.* 2009, pp. 11555, 15558; Prinn *et al.* 2011, pp. 527, 529).

The projected magnitude of average global warming for this century is very similar under all combinations of models and emissions scenarios until about 2030. Thereafter, the projections show greater divergence across scenarios. Despite these differences in projected magnitude, however, the overall trajectory is one of increased warming throughout this century under all scenarios, including those which assume a reduction of greenhouse gas emissions (Meehl *et al.* 2007, pp. 760–764; Ganguly *et al.* 2009, pp. 15555–15558; Prinn *et al.* 2011, pp. 527, 529). (For examples of other global climate projections, see IPCC 2007b, p. 8.)

Various types of changes in climate can have direct or indirect effects on species and these may be positive or negative depending on the species and other relevant considerations, including interacting effects with existing habitat fragmentation or other nonclimate variables. There are three main components of vulnerability to climate change: Exposure to changes in climate, sensitivity to such changes, and adaptive capacity (IPCC 2007a, p. 89; Glick *et al.* 2011, pp. 19–22). Because aspects of these components can vary by species and situation, as can interactions among climate and nonclimate conditions, there is no single way to conduct our analyses. We use the best scientific and commercial data available to identify potential impacts and responses by species that may arise in association with different components of climate change, including interactions with nonclimate conditions.

As is the case with all potential threats, if a species is currently affected or is expected to be affected in a negative way by one or more climate-related impacts, this does not necessarily mean the species meets the definition of a threatened or endangered species as defined under the Act. The impacts of climate change and other conditions would need to be to the level that the species is in danger of extinction, or likely to become so, throughout all or a significant portion of its range. If a species is listed as threatened or endangered, knowledge regarding the species' vulnerability to, and impacts from, climate-associated changes in environmental conditions can be used to help devise appropriate strategies for its recovery.

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 2007b, p. 887). Most models project a widespread decrease in snow depth in the Rocky Mountains and earlier snowmelt (IPCC 2007b, 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.

On August 16, 2011, the U.S. Department of Agriculture granted a request from the Governor of Arizona to assign Apache, Cochise, Graham, Greenlee, and Santa Cruz counties as primary natural disaster areas due to losses caused by drought, wildfires, and high winds. The purpose of such a designation is to make farm operators in both primary and contiguous disaster areas eligible to be considered for assistance from the Farm Service Agency (FSA) (Vilsack 2011). However, this designation is a recognition of drought in counties inhabited by spikedace and loach minnow, including Apache, Graham, and Greenlee counties. For New Mexico, the NMOSE reported that, for the first 5 months of 2011, statewide precipitation was only 35 percent of normal in New Mexico (NMOSE 2011b). They include spikedace and loach minnow on a list of species likely to be affected by drought due to loss of habitat (NMOSE 2011c). Habitat losses occur when surface waters decrease, resulting in insufficient flows which may continue to fill low areas as pool habitat, but which do not continue to have sufficient depth or velocity to create the habitat types preferred by spikedace and loach minnow.

Summary of Factor A

Spikedace and loach minnow face a variety of threats throughout their range in Arizona and New Mexico, including groundwater pumping, surface water diversions, impoundments, dams, channelization, improperly managed livestock grazing, wildfire, agriculture, mining, road building, residential development, and recreation. These activities, alone and in combination, 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. Groundwater pumping, surface water diversions, and drought are reducing available surface flow in streams occupied by spikedace and loach minnow. These conditions are ongoing, but drought conditions are worsening and there are at least two large diversion projects in the planning stages which may result in further water withdrawals on the Verde and Gila rivers. For spikedace and loach minnow, reduced surface flow in streams can decrease the amount of available habitat by eliminating flowing portions of the stream used by the two species. In addition, stream channel alterations, such as diversion structures and channelization of streams, affect the flow regimes, substrate, and sedimentation levels that are needed for suitable spikedace and loach minnow habitat.

Impacts associated with roads and bridges, changes in water quality, improper livestock grazing, and recreation have altered or destroyed many of the rivers, streams, and watershed functions in the ranges of the spikedace and loach minnow. While fish kills are less common now than in the past, water quality issues exist in several streams, and can include contamination by cadmium, lead, nitrates, beryllium, mercury, and total dissolved solids. These contaminants can have adverse effects on the prey base of the species and can be either sublethal, affecting their overall health or ability to reproduce, or can be lethal. Construction and maintenance at bridges, improper livestock grazing, wildfire, and recreation may also remove or reduce vegetation, which can impact water temperatures. With

increased temperatures, spikedace and loach minnow may experience multiple behavioral and physiological changes at elevated temperatures, and extreme temperatures can result in death. Decreases in precipitation and increases in temperatures due to climate change and drought are likely to further limit the areas where spikedace or loach minnow can persist by causing further decreases in surface flows and potentially increases in temperature.

The combined impacts of decreased flows, increased sedimentation, increased temperatures, and impaired water quality diminish the amount of habitat available and the suitability of that habitat in some areas. These impacts are further exacerbated by predation by and competition with nonnative species and other factors, as outlined below.

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 (Arizona Game and Fish Department (AGFD) 2009, p. 5). The collection of these species is prohibited in the State of New Mexico except by special scientific permit (New Mexico Department of Game and Fish (NMDGF) 2010, p. 4). Because spikedace and loach minnow do not grow larger than 80 mm (3 in), we conclude 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 at this time.

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; Propst *et al.* 2008, pp. 1246–1251; Pilger *et al.* 2010, pp. 300, 311–312). 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, the majority of 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 1996, 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*), brown trout (*Salmo trutta),* 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 semiaquatic 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 is under Factor E below.

Altered Flow Regimes and Nonnative Predators

Alterations of stream channels through channelization, surface and groundwater withdrawals are discussed above under Factor A. Propst *et al.* (2008, p. 1236) completed a study on the interaction of physical modification of stream channels coupled with the widespread introduction and establishment of nonnative aquatic species. Following evaluation of six study sites in the upper Gila River drainage, they determined that the negative association between nonnatives and native fishes indicated a complex relationship between naturally variable flows and nonnative species, and varied at the study sites (Propst *et al.* 2008, p. 1236). For the West, Middle, and East Forks of the Gila River, they determined that natural flow alone would be insufficient to conserve native fish assemblages. The Tularosa and San Francisco River study sites were affected by human use (albeit at low levels), and neither site supported more than a few nonnative fishes, with none in most years. Declines of loach minnow in this area may be due to the natural variability of the system; however, the research concluded that resilience of native fish assemblages may be compromised by the presence of the nonnative species.

The Gila River study site, just downstream of the town of Cliff, was the most affected by human activity, and was exposed to the greatest number of nonnative fishes; however, over the course of the study, the native fish assemblage at the site did not change. Although not entirely explained, the researchers indicate that the lack of optimal (i.e., pool) habitat for nonnative predators and the comparative abundance of habitats (e.g., cobble riffles and shallow gravel runs) favored by native fishes partially explains the persistence of the native fish assemblage. They speculate that other factors, including thermal regime or turbidity, might also have buffered the interactions between native and nonnative fishes (Propst *et al.* 2008, pp.

1246–1249). The study concludes that, while native fish assemblages may persist through drought, their resistance and resilience are compromised if nonnative predators are present. They also conclude that, while retention of natural hydrologic regimes is crucial for the persistence of native fish assemblages in arid-land streams, removal and preclusion of nonnative predators and competitors are equally important (Propst *et al.* 2008, p. 1251).

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; Paroz *et al.* 2009, pp. 12, 18). When smallmouth bass densities increased on the East Fork Gila River, densities of native fishes decreased (Stefferud *et al.* 2011, pp. 11–12). 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. In 1949, for example, 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 6 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 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 2009b, 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 (Paroz *et al.* 2009, p. 12; Propst *et al.* 2009, pp. 7–13) 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 composed 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 are preying on native fishes, small-bodied nonnative fishes are also 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. Rinne and Miller (2006, pp. 91, 95) note that, in the upper Verde River, native fishes have declined precipitously since the mid-1990s. 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 digestive track. Emaciation and starvation of the host can occur when large enough numbers of worms feed off 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. Ich is known to be present in Aravaipa Creek (Mpoame 1982, pp. 45–47), which is currently occupied by both spikedace and loach minnow. 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.

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.

Yellow grub (*Clinostomum marginatum)* is a parasitic, larval flatworm that appears as yellow spots on the body and fins of a fish. These spots contain larvae of worms which are typically introduced by fish-eating birds who ingest fish infected with the parasite. Once ingested, the parasites mature and produce eggs in the intestines of the bird host. The eggs are then deposited into water bodies in the bird waste, where they infect the livers of aquatic snails. The snail hosts in turn allow the parasites to develop into a second and third larval form, which then migrates into a fish host. Because the intermediate host is a bird, and therefore highly mobile, yellow grub are easily spread. When yellow grub infect a fish they penetrate the skin and migrate into its tissues, causing damage and potentially hemorrhaging. Damage from one yellow grub may be minimal, but in greater numbers, yellow grub can kill fish (Maine Department of Inland Fisheries and Wildlife 2002a, p. 1). Yellow grub occur in many areas in Arizona and New Mexico, including Aravaipa Creek (Amin 1969, p. 436; U.S. Geological Survey (USGS) 2004, p. 71; Widmer *et al.* 2006, p. 756), Oak Creek (Mpoame and Rinne 1983, pp. 400–401), the Salt River (Amin 1969, p. 436; Bryan and Robinson 2000, p. 19), the Verde River (Bryan and Robinson 2000, p. 19), and Bonita Creek (Robinson, 2011b, pers. comm.).

Black grub, also called black spot, (*Neascus* spp.) is a parasitic larval fluke that appears as black spots on the skin, tail base, fins, and musculature of a fish. As with yellow grub, adult black grub trematodes live in a bird's mouth and produce eggs, which are swallowed unharmed and released into the water in the bird's feces. Each stage of their life cycle is named. Eggs mature in the water releasing miracidia, which infect mollusks as a first intermediate host, and continue to grow, becoming redia. They then migrate into the tissues of a second intermediate host, which is typically a fish. At this stage, they are termed ''cercaria.'' When the cercaria penetrates and migrates into the tissues of a fish, it causes damage and possibly hemorrhaging. It then becomes encapsulated by host tissue, and melanophores, or pigmented cells, surround the outer layers, resulting in the darker color, which appears as a black spot. The damage caused by one cercaria is negligible, but in greater numbers they may kill a fish (Lane and Morris 2000, pp. 2–3; Maine Department of Inland Fisheries and Wildlife 2002b, p. 1). Black grub are present in the Verde River (Robinson et al. 1998, p. 603; Bryan and Robinson 2000, p. 21), Silver Creek, Redfield Canyon, and Fossil Creek (Robinson, 2011b, pers. comm.), and are prevalent in the San Francisco River in New Mexico (Paroz, 2011 pers. comm.).

Summary of Factor C

Both spikedace and loach minnow have been severely impacted by the predation 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 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 disease and predation are significant threats to the spikedace and loach minnow.

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 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 them difficult to control through regulation.

State Regulations

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. Indirectly, Arizona State law also allows surface water depletion by groundwater pumping.

A limited amount of scientific collection occurs under State permitting, as authorized by the special rule for the two species, but does not pose a threat to these species because it is regulated by the States.

Federal Regulations

Many Federal statutes 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.*), National Environmental Policy Act (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. The USFS and the BLM have made significant progress on some stream enhancements (Fossil Creek, Blue River, Hot Springs Canyon, and Bonita Creek). However, despite the protection and enhancement mechanisms in these laws, competing multiple uses, limited funding and staffing have resulted in few measureable on-the-ground successes, 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 (HCP) prepared by Salt River Project (SRP) is expected to benefit spikedace and loach minnow in the Verde River.

Spikedace and loach minnow have been protected under the Act since their listing in 1986. While the Act provides prohibitions against take, and allows for the development of HCPs, the species have continued to decline. To date, section 7 consultation has not been an effective tool in addressing this decline. This is due in part to the fact that some causes of the decline, such as competition and predation with nonnative aquatic species, decreases in surface flows due to drought, and habitat losses caused by wildfires are not covered by the Act. In addition, water diversions are often ''grandfathered'' into existing law and are therefore not subject to section 7.

Summary of Factor D

Despite the prohibitions against take, which have been in place since the

species were listed in 1986, spikedace and loach minnow have continued to decline. While section 7 consultation may be effective in addressing impacts from Federal actions such as a road construction project or implementation of an allotment management plan, they are not effective at minimizing losses to the species from competition and predation with nonnative species, the impacts of drought or climate change, or the effects of wildfires. Review under the CWA is lacking, and the Federal Land Policy and Management Act and National Forest Management Act are not currently having a positive effect on the species. In summary, existing regulatory mechanisms that prohibit taking of the two species have been in place for decades, however, these regulations are not adequate to address the significant habitat effects, particularly water diversion and the distribution and abundance of nonnative fishes, affecting spikedace and loach minnow. Because existing regulatory mechanisms do not provide adequate protection for these species or their habitats throughout their ranges, we conclude the inadequacy of existing regulatory mechanisms is a significant threat to the spikedace and loach minnow.

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. See Factor C for the discussion of predation by nonnative fish species.

As with many fish in the West, spikedace and loach minnow lacked exposure to a wider range of species over evolutionary time, 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). 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).

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. In these areas, small, nonnative fish species pose a threat to spikedace and loach minnow (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). However, negative interactions also occur between small native and large nonnative individuals. On the East and Middle Forks of the Gila River, where large nonnative predators were comparatively common, small native species were uncommon or absent. Conversely, on the West Fork Gila River, when large nonnative predators were rare, most small-bodied and young of large-bodied native fishes persisted (Stefferud *et al.* 2011, pp. 1409–1411).

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 to nonnative fishes, parasites have been introduced incidentally with nonnative species and may be deleterious to spikedace and loach minnow populations. Nonnative crayfish (*Orconectes virilis*) have invaded occupied spikedace and loach minnow habitats (Taylor *et al.* 1996, p. 31; Robinson and Crowder 2009, p. 3; Robinson *et al.* 2009b, p. 4; USGS 2009, p. 1). Crayfish are known to eat fish 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.

Competition can be classified as either interference competition or exploitive competition. 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). Exploitive competition in the form of predation is discussed above under Factor C. 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 in areas where spikedace co-occurrs with

red shiner, red shiner remain in the preferred habitat, while spikedace move into currents swifter than typically occupied (Douglas *et al.* 1994, pp. 14–16). The areas with swifter currents are likely less suitable for spikedace, as evidenced by their nonuse until such competition occurs. 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 (Reinthal, 2011, 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 San Francisco 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 smallbodied 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 spikedace and loach minnow (Pilger *et al.* 2010, p. 311). Western mosquitofish represent an additional challenge for spikedace and loach minnow management, in that they are harder to effectively remove during stream renovation efforts. 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 National Integrated Drought Information System (2011) classifies drought in increasing severity categories from abnormally dry, to moderate, severe, extreme, and, most severe, exceptional. The southwestern United States is currently experiencing drought conditions classified as moderate to exceptional. Drought conditions are reported as abnormally dry to moderate for the Verde River, with the remainder of the critical habitat streams in severe to extreme in Arizona. Critical habitat areas in New Mexico fall within the severe to extreme drought categories (National Integrated Drought Information System 2011).

While spikedace and loach minnow have survived many droughts in their evolutionary histories, drought may have more of an impact on the species due to already reduced habitat suitability from other effects, as described above. 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 combined effects of drought with ongoing habitat loss and alteration; increased predation, competition, and disease from nonnative species; and the general loss of resiliency in highly altered aquatic ecosystems have had and continue to have 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 (Tibbets and Dowling 1996, (pp. 1285–1291); Anderson and Hendrickson 1994, pp. 148, 150–154). The center of the historical distribution for spikedace 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 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 4 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. As noted for spikedace, genetic variation is important to the species' fitness and adaptive capability, and losses of genetic variation represent a threat to the species (Meffe and Carroll 1997, pp. 162–172).

Flow Regime, Nonnative Fishes, and Connectivity

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

Recent work completed by Propst *et al.* (2008) indicates that individual factors, such as the presence of nonnative fishes or existing flow regimes may have impacts on native fish species, but it is likely that the interaction of these factors causes a decline in native fish species. In studies on the upper Gila River drainage in New Mexico, Propst *et al.* (2008) determined that flow regime was a primary factor in shaping fish assemblages, with the greatest densities of native fishes occurring in those years with higher stream discharges. However, they also found that pressure from competition and predation with nonnative fishes also affected fish assemblages. They concluded that there was a negative association between nonnatives and native fishes, which indicated that there is a complex relationship between naturally variable flows and nonnative species, and that natural flow alone was not enough to conserve native fish species (Propst *et al.* 2008, p. 1246). The way in which these factors interact varied from stream to stream in the study.

Propst *et al.* (2008) also note the importance of connectivity, stating that it is critical to ensuring the long-term persistence of native fishes. They note that loach minnow, while still present throughout much of its historical range, has been apparently extirpated from four of six sites in 10 years or less, and that loss of connectivity among populations has reduced the likelihood that many will recover naturally, even if causes for elimination are removed. They conclude that ''It is almost certain similar, but undocumented, losses have occurred throughout the species range, and its status is much more fragile than presumed'' (Propst *et al.* 2008, p. 1251). However, where flows remain suitable, and connectivity is maintained, there is the inherent risk of exposure to nonnative species traveling from one area to another. They conclude that retention of natural hydrologic regimes and preclusion of nonnative predators and competitors are equally important (Propst *et al.* 2008, p. 1251).

Summary of Factor E

The reduced distribution and decreasing numbers of spikedace and loach minnow make the two species susceptible to natural environmental variability, including climate conditions such as drought. However, research indicates that it is the interaction of individual factors such as nonnative fishes and altered flow regimes that is causing a decline of native fish species. 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. Increased water demands are likely to further limit the areas where spikedace or loach minnow can persist. We therefore conclude that the spikedace and loach minnow are threatened by other natural or manmade factors.

Reclassification 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. 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). In addition, recent research indicates that the combination of altered flow regimes and nonnative fishes together are causing declines in native fishes. Existing regulatory mechanisms (Factor D) have not proven adequate to halt the decline of spikedace or loach minnow or habitat losses 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 A) 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 experienced 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 leads us to conclude 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, in the Candidate Notice of Review published on November 9, 2009 (74 FR 57804). Spikedace and loach minnow were not addressed in the Candidate Notice of Review published in 2011, as this reclassification determination was funded in FY 2010. Candidate assessments are not reviewed on an annual basis once they are funded.

Both species have been reduced in range and numbers since the time of listing through either localized extirpations, reduced distribution within occupied drainages, or reductions in numbers within a given drainage. Spikedace and loach minnow are both extirpated from the Salt and San Pedro rivers. Spikedace are additionally extirpated from the San Francisco River, while loach minnow are extirpated from the Verde River.

In terms of reduced distribution since listing within occupied drainages, spikedace currently have a much reduced distribution in the Verde River, where the known locations at listing occurred over approximately 25 percent of the previously occupied area. Loach minnow are reduced in distribution in the San Francisco and Tularosa rivers, occurring in a portion up and downstream of the Whitewater Creek confluence and again farther upstream of the Tularosa River. Spikedace and loach minnow are both reduced in distribution in the East and Middle Forks of the Gila River, occurring closer to the confluence with the Gila River, but no longer extending as far upstream as in the past. The strongholds for both species are Aravaipa Creek in Arizona and the Gila River mainstem in New Mexico, but more recent records indicate at least small reductions in the up and downstream extent of their distributions in these systems.

In addition to extirpations and reductions in range, some spikedace and loach minnow populations persist, but are at reduced numbers. In the Verde River, spikedace numbers were frequently in the hundreds, with a high of 407 in 1986, but reduced to double and then single digits in the late 1980s and 1990s (ASU 2002). While spikedace likely still occur in the Verde River, they are at extremely low numbers and on the verge of extirpation. Survey records indicate a similar situation exists for both spikedace and loach minnow in Eagle Creek. Loach minnow are in extremely low numbers in the North Fork East Fork Black River as well (ASU 2002).

Two of the primary threats to spikedace and loach minnow are nonnative fishes and loss of water due to diversions, pumping, drought, or other causes, as detailed above. Recently, Propst *et al.* (2008) indicated that individual factors, such as the presence of nonnative fishes or existing flow regimes may have impacts on native fish species, but it is likely that the interaction of these factors may cause a decline in native fish species. Past events (both legal and alleged illegal) resulted in the establishment of at least 60 nonnative fish species, at least three nonnative amphibians (American bullfrog, Rio Grande leopard frog, American tiger salamander), at least four invertebrates (two species of crayfish, Asiatic clam, and New Zealand mud snail), and several diseases or parasites that affect native fish or amphibians in areas across Arizona (*See* Service 2002a for additional information). The impacts of nonnative fishes on spikedace and loach minnow are detailed above. Nonnative aquatic species are known to occur in varying levels in every stream occupied by spikedace or loach minnow, with the exception of streams in the early stages of renovation and/or reintroduction projects, such as Hot Springs Canyon. Nonnative species are considered a serious cause of the decline of the two species in all streams except for Aravaipa Creek and the mainstem Gila River in New Mexico; however, nonnatives are present in these streams as well.

Alteration or reductions of stream flow is a concern in many areas as well, including the Verde River, Salt River, San Pedro River, Gila River, Eagle Creek, and San Francisco River. In these areas, diversion structures may cause stream levels to drop or become dewatered, especially during drought and during the drier months. Future water needs in the arid southwest, coupled with the ongoing drought and climate change, are likely to increase the number of dewatered areas, the size of the dewatered areas, and the length of time for which dewatering occurs. Additional, pending water development projects have been identified above.

Recovery actions have occurred at Hot Springs Canyon, Redfield Canyon, Fossil Creek, Bonita Creek, and the San Francisco River in New Mexico, and have focused on building barriers to nonnative fishes or using existing structures as barriers. In some instances, chemical and/or mechanical removal of nonnative species has occurred. To date, these projects have been costly, requiring millions of dollars for barrier construction, and extensive time and costs for personnel involved in the renovation. Sufficient time has not yet elapsed to determine the success of these projects. Fossil Creek is showing early signs of success for spikedace (Robinson 2011a, p. 1), but the downstream barrier has been breached by nonnatives on one occasion since the project began in 2007. Bonita Creek was reinvaded, despite its barrier. Redfield Canyon currently has inadequate flows to support either species. Regardless of the success of these efforts, Hot Springs Canyon and Redfield Canyon flow into the dry portions of the San Pedro River so are not connected to any other populations of spikedace or loach minnow. Fossil Creek does flow into the active channel of the Verde River, but the Verde River at that confluence is currently dominated by nonnatives. Bonita Creek flows into the Gila River, which is also dominated by nonnatives and ultimately becomes dewatered as well. Therefore, the recovery actions completed to date, while allowing the species to persist, have limited ability to help recover the species at this time.

An additional complication in recovery of the species is the lack of available suitable habitat. The species are both currently found in isolated areas, with little opportunity for expansion or for genetic interchange. The Verde River feeds into two reservoirs, effectively isolating it from the Salt River. Those portions of the Salt River that were historically occupied by the species now have four dams and reservoirs. The San Pedro River is dewatered in some areas, especially downstream of known historical distribution. Aravaipa Creek, while supporting the largest population of the two species in Arizona, ends at a dry stretch of the San Pedro River. Those portions of Eagle Creek occupied by the two species occur above a diversion dam, downstream of which nonnative levels are high. Eagle Creek then joins the Gila River, which is also dominated by nonnative fishes. Downstream of the occupied area in the Gila River, which supports the largest known populations of the species, there are water diversions that ultimately result in a dry stream channel as the river travels into Arizona from New Mexico.

In summary, spikedace and loach minnow previously had a relatively widespread distribution covering portions of Arizona, New Mexico, and northern Mexico. Both species have suffered major reductions in numbers and range over time due to persistent threats such that spikedace are now estimated to occur in only 10 percent of

their former range, while loach minnow occur in 10 to 20 percent of their former range. Currently, only small, isolated populations of these species remain, with limited to no opportunities for interchange between populations or expansion of existing areas, making the species more vulnerable to threats including reproductive isolation. The two primary threats of nonnative aquatic species competition and predation and alteration or diminishment of stream flows are persistent, and research indicates that the combination of the two is leading to declines of native species such as spikedace and loach minnow (Propst *et al.* 2008). The ongoing drought and climate conditions aggravate the loss of water in some areas, and future water development projects have been identified. Finally, the opportunities for expansion of the two species' range are limited by dams, reservoirs, dewatering, and nonnative species distribution.

Based on this information, as well as the above review of the best scientific and commercial information available, we find that both species are currently in danger of extinction and therefore meet the definition of endangered species under the Act. Because we have determined that these species are currently on the brink of extinction and are not in danger of extinction in the foreseeable future, we have determined that the correct status for the species under the Act is endangered. As a result, we are reclassifying both spikedace and loach minnow from threatened species to endangered species. With this reclassification of spikedace and loach minnow to endangered status, we 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, as spikedace and loach minnow are now listed as endangered, these special rules no longer apply.

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 under way 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, spikedace were translocated into Hot Springs Canyon, Redfield Canyon, and Fossil Creek. In 2008, spikedace were translocated into Bonita Creek in Arizona and reintroduced to the San Francisco River in New Mexico. Monitoring has occurred at each of these sites annually, with annual augmentations at Hot Springs Canyon, Redfield Canyon, and Fossil Creek in subsequent years when fish are available, up to and including 2011. Spikedace were augmented in the San Francisco River in 2009, but monitoring and augmentations did not occur in 2010 or 2011 due to a lack of adequate staffing and resources. Due to a reinvasion by nonnative species, augmentations are temporarily on hold at Bonita Creek.

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 of loach minnow occurred at Hot Springs Canyon, Redfield Canyon, and Fossil Creek. Monitoring of these sites occurs annually, and the sites have been augmented annually when fish are available, up to and including 2011. In 2008, loach minnow were translocated into Bonita Creek, Arizona. Monitoring occurs annually at this site; however, due to a reinvasion by nonnative species, augmentations are temporarily on hold.

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 under way 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 the Eagle and 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.

In an effort to minimize impacts from nonnative fish interactions, the NMDGF initiated a nonnative removal effort in the Forks area in 2007, and at Little Creek (a tributary to West Fork Gila River) in 2010. These efforts are expected to continue.

Critical Habitat Designations for Spikedace and Loach Minnow

Summary of Changes From Proposed Rule

As noted in our October 4, 2011, notice of availability (NOA) (76 FR 61330), we used three criteria in the proposed rule to evaluate if unoccupied habitat was essential to the survival and recovery of the species. One of the criteria evaluated the potential of a stream segment to ''connect to other occupied areas, which will enhance genetic exchange between populations.'' After additional review of the stream segments proposed for critical habitat, we concluded there were no stream segments that met this criterion, and we removed it as an element of the ruleset. We continue to believe that both loach minnow and spikedace conservation will require genetic exchange between the remaining populations to allow for genetic variation, which is important for species' fitness and adaptive capability. We also acknowledge that areas equally important to the conservation of the species, outside of the critical habitat designations, will be necessary for long-term conservation, subject to future on-the-ground recovery actions and 7(a)(1) opportunities. Based on information we received during the comment periods on the proposed rule, several changes have been made to the areas designated as critical habitat in this final rule. These changes are summarized in Table 1 below.

TABLE 1—CHANGES IN STREAM SEGMENTS INCLUDED WITHIN THE CRITICAL HABITAT DESIGNATIONS FOR LOACH MINNOW AND SPIKEDACE

Stream	From km (mi)	To km (mi)	Change in km (mi)
San Francisco River*	180.7 (112.3)	203.6 (126.5)	Addition of 22.8 (14.2).

TABLE 1—CHANGES IN STREAM SEGMENTS INCLUDED WITHIN THE CRITICAL HABITAT DESIGNATIONS FOR LOACH MINNOW AND SPIKEDACE—Continued

Stream	From km (mi)	To km (mi)	Change in km (mi)
Bear Creek*	0.0 (0.0)	31.4 (19.5)	Addition of 31.4 (19.5).
Redfield Canyon	22.5 (14.0)	6.5 (4.0)	Reduction of 16.0 (10.0).
Hot Springs Canyon	19.0 (11.8)	9.3 (5.8)	Reduction of 9.7 (6.0).
Fossil Creek	7.5 (4.7)	22.2 km (13.8 mi)	Addition of 14.6 (9.1).

*This change made for loach minnow only.

San Francisco River. As noticed in the NOA (76 FR 61330; October 4, 2011), we are correcting an error made in the proposed rule by extending that portion of the San Francisco River designated for loach minnow by 22.8 km (14.2 mi). The mileage for spikedace remains the same as was in the proposed rule (75 FR 66482; October 28, 2010); however, we had intended to include the same mileage for loach minnow as was in the 2007 critical habitat designation as this area is currently occupied by loach minnow, as this area meets the definition of critical habitat for loach minnow. The total mileage included on the San Francisco River for loach minnow was changed from 180.7 km (112.3 mi) in the revised proposed rule to 203.6 km (126.5 mi) in this final rule. This change has been incorporated in this final rule. The mileage for spikedace remains the same as in the revised proposed rule.

Bear Creek. We noted in the NOA that we intended to add portions of Bear Creek to the designation for loach minnow, based on occupancy of this area by loach minnow. The NOA noted that we were adding 31.4 km (19.5 mi) of Bear Creek from its confluence with the Gila River upstream to the confluence with Sycamore and North Fork Walnut creeks. We consider those portions of Bear Creek included within the final designation to have been occupied at listing, as described in the NOA, although records were not known until 2005 and 2006. These areas meet the definition of critical habitat for loach minnow. As noted in our NOA, we recognize that portions of this stream are intermittent, but also acknowledge that streams with intermittent flows can function as connective corridors through which the species may move when the area is wetted. We have reviewed all of the information received, and conclude that inclusion of Bear Creek is appropriate at this time. We do not anticipate that loach minnow will occupy the lowermost portions of the Creek when they are dry, but we have determined that that area has value as a connective corridor to the mainstem Gila River during high-flow events.

It should be noted that the low number of fish does not, in all likelihood, represent the total number of fish present, as sampling rarely results in capture of all individuals present. Regardless, the number of fish present in Bear Creek is low. However, Bear Creek is a tributary to an occupied stream, and is within the historical range of the species. Loach minnow are currently much reduced in their overall distribution compared to historical conditions. The threats assessment above outlines current threats, which are numerous. While reintroduction projects are under way, the success of those efforts is currently limited. Streams are not abundant in the desert southwest. Because this area provides suitable habitat and is occupied by loach minnow, we conclude that it is essential to the conservation of the species.

Redfield and Hot Springs Canyons. In response to comments received during the second comment period, we have reevaluated the extent of each stream included within the designations, and concluded that they do not meet the definition of critical habitat for either spikedace or loach minnow. With further review, we have determined that, although connective habitat is important, the area previously retained as connective habitat (i.e., between the barrier location and the San Pedro River) currently connects to dewatered portions of the San Pedro River. We have therefore shortened the overall stretch of each stream to include just those sections currently supporting perennial flows. For Redfield Canyon, the designations changed from 22.5 km (14.0 mi) in the revised proposed rule to approximately 6.5 km (4.0 miles) in this final rule, and include that portion of the stream from the confluence with Sycamore Canyon downstream to the barrier constructed at Township 11 South, Range 19 East, section 36.

For Hot Springs Canyon, we are making similar changes. The barrier location and the downstream extent of perennial flows are approximately one mile apart. As with Redfield Canyon, Hot Springs Canyon ultimately connects with dewatered portions of the San Pedro River. In the proposed rule we included Hot Springs Canyon from its confluence with Bass Canyon downstream for 19.0 km (11.8 mi). In the final rule, we are reducing the portion of Hot Springs Canyon included within critical habitat to that area from its confluence with Bass Canyon downstream for approximately 9.3 km (5.8 mi).

Fossil Creek. We received several comments and new information indicating that the best habitat for the species in Fossil Creek occurs above the newly constructed barrier at Township 11½ North, Range 7 East, section 29. The portions of Fossil Creek above the barrier have been in use as a translocation site for spikedace beginning in 2008. Although there was limited success with the translocation initially, surveys in August 2011 (Crowder, 2011, pers. comm.) located numerous spikedace within Fossil Creek. While it would be premature to call the translocation a success, the persistence of spikedace indicates that it is suitable, and this area meets the definition of critical habitat for spikedace and loach minnow. For this reason, we are adjusting the area included within Fossil Creek to include the portions upstream of the barrier to the old Fossil Diversion Dam at Township 12 North, Range 7 East, section 14. The area incorporated in this stream segment will increase from 7.5 km (4.8 mi) to 22.2 km (13.8 mi).

In total, the areas designated as critical habitat for both species were reduced as compared to the revised proposed rule. For spikedace, the area included within the designation was reduced by 155 km (96 mi). For loach minnow, the area included within the designation was reduced by 160 km (99 mi). Portions of this are attributable to the changes noted above, and portions to changes made under the Exclusions section. The bulk of the reduced mileage can be attributed to exclusions on Eagle Creek and the San Pedro River and, to a lesser extent, on the Gila River.

Critical Habitat Background

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

(1) 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

(a) Essential to the conservation of the species and

(b) Which may require special management considerations or protection; and

(2) 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 pursuant to 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 requirement that Federal agencies insure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of 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 by non-Federal landowners. 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) of the Act would apply, but even in the event of a destruction or adverse modification finding, the obligation of the Federal action agency and the landowner is not to restore or recover the species, but to implement reasonable and prudent alternatives to avoid destruction or adverse modification of critical habitat.

Under the first prong of the Act's definition of critical habitat, areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features (1) which are essential to the conservation of the species and (2) which may require special management considerations or protection. For these areas, the critical habitat designations identify, to the extent known using the best scientific and commercial data available, those physical or biological features that are essential to the conservation of the species (such as space, food, cover, and protected habitat). In identifying those physical and biological features within an area, we focus on the principal biological or physical constituent elements (PCEs such as roost sites, nesting grounds, seasonal wetlands, water quality, tide, soil type) that are essential to the conservation of the species. PCEs are the elements of physical or biological features that, when laid out in the appropriate quantity and spatial arrangement to provide for a species' life-history processes, are essential to the conservation of the species.

Under the second prong of the Act's definition of critical habitat, we can designate critical habitat in 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. For example, an area currently occupied by the species but that was not occupied at the time of listing may be essential to the conservation of the species and may be included in the critical habitat designation. We designate critical habitat in areas outside the geographical area occupied by a species only when a designation limited to its range 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 we are determining which areas should be designated as critical habitat, our primary source of information is generally the information 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.

The location and suitability of habitat changes and species may move from one area to another over time. Climate change will be a particular challenge for biodiversity because the interaction of additional stressors associated with climate change and current stressors may push species beyond their ability to survive (Lovejoy 2005, pp. 325–326). The synergistic implications of climate change and habitat fragmentation are the most threatening facet of climate change for biodiversity (Hannah *et al.* 2005, p. 4). Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field *et al.* 1999, pp. 1–3; Hayhoe *et al.* 2004, p. 12422; Cayan *et al.* 2005, p. 6; IPCC 2007b, p. 1181). Climate change may lead to increased frequency and duration of severe storms and droughts (Golladay *et al.* 2004, p. 504; McLaughlin *et al.* 2002, p. 6074; Cook *et al.* 2004, p. 1015. Generally, the outlook presented for the Southwest predicts warmer, drier, drought-like conditions (Seager *et al.* 2007, p. 1181; Hoerling and Eischeid 2007, p. 19), and a decline in water resources with or without climate change will be a significant factor in the compromised watersheds of the desert southwest.

Habitat is dynamic, or frequently changing, and species may move from one area to another over time. 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, both inside and outside the critical habitat designations, will continue to be subject to: (1) Conservation actions

implemented under section 7(a)(1) of the Act, (2) regulatory protections afforded by the requirement in section 7(a)(2) of the Act for Federal agencies to insure their actions are not likely to jeopardize the continued existence of any endangered or threatened species, and (3) the prohibitions of section 9 of the Act if actions occurring in these areas may affect the species. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. These protections and conservation tools will continue to contribute to recovery of this species. 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.

Occupied Versus Unoccupied Areas

We include as occupied those areas that were identified as occupied for each species in the original listing documents, as well as any additional areas determined to be occupied after 1986. Our reasoning for including these additional areas (post-1986) is that they were likely occupied at the time of the original listings, but had not been detected in surveys. In summary, there are three reasons why a stream segment is considered occupied at the time of listing: (1) The stream segment was occupied in the 1986 listing document; or (2) the fish were found subsequently to 1986; and (3) the post-1986 stream segment is between two occupied, but separated, stream segments.

Several factors may influence whether or not spikedace or loach minnow were detected in a given survey, and at what level. In some instances, survey efforts may have been minimal or absent for a given area. Once a species is listed, awareness of the species is heightened for wildlife and land managers, and survey efforts are often increased or expanded to include areas where they might be present. Moreover, spikedace and loach minnow are small-bodied fish that can be difficult to detect when in low numbers. This may be partially responsible for the lack of determinations over a 44-year period on Eagle Creek for loach minnow, for example. Finally, capture efficiencies for seining of fish are low, with some research indicating that capture efficiency of a seine haul averages 49 percent (Dewey and Holland-Bartels 1997, p. 101). This means that 51 percent of the fish present may not be captured. It should be noted that various factors can affect seining efficiency, and that most surveys involve more than one seine haul. However, if a species is present in low numbers, as is common for spikedace and loach minnow, the likelihood of catching them at the low capture efficiencies associated with seining is low. Loach minnow are likely to be more difficult to detect due to their having a reduced gas bladder. They are typically restricted to bottom-dwelling habitat, swimming in only brief movements, which may further reduce the likelihood of its being collected in a seine. We believe a combination of these factors to be responsible for the lack of detections over a 44 year period on Eagle Creek for loach minnow, as described above.

In some instances, areas were known to have been occupied by one or both species prior to listing, but were not described as occupied in the listing document based on the limited data available. Subsequent detections after listing in 1986 have caused us to reconsider the occupancy status of some streams. For example, we were aware of one loach minnow record for Dry Blue Creek from 1948 up until listing, but did not include Dry Blue Creek as occupied at listing in 1986 based on this record. Subsequent positive survey records in the late 1990s have caused us to reconsider this area. As a result, in this designation, we consider Dry Blue Creek to be occupied by loach minnow at the time of listing. Similarly, Eagle Creek had one record of loach minnow from 1950, but was not included as occupied at listing in 1986. Loach minnow were subsequently detected again in the 1990s, and it is therefore considered occupied at the time of listing within this designation.

In every case, areas discovered to be occupied after 1986 are connected, or historically were connected, to occupied areas. For example, the Black River complex was not known to be occupied until 1996; however, it is connected, albeit over long distances, to the White River, which is currently occupied, and the Salt River, which was historically occupied. Dry Blue Creek, described above, is connected to the occupied Blue River. Eagle Creek is a tributary to the Gila River, and at one time perennial flows would have connected this population to those in the upper portions of the Gila River in New Mexico. It is therefore logical to conclude that these areas had been occupied since listing, although possibly at low numbers that were difficult to detect.

Because areas determined to be occupied after 1986 are or were connected to occupied areas, the survey efforts for the species have been less than thorough, and because both species are difficult to detect in low numbers, we anticipate that, although occupancy was not determined in some areas until post-1986, the species were likely present at listing in 1986 in these areas, but not discovered until after listing.

Given that spikedace and loach minnow are small-bodied fish that can be difficult to detect when in low numbers, we also consider those areas included in this designation to be essential to the conservation of the species.

Physical and Biological Features

Under the Act and its implementing regulations, we are required to identify the physical and biological features (PBFs) essential to the conservation of spikedace and loach minnow in areas occupied at the time of listing, focusing on the features' primary constituent elements (PCEs). We consider PCEs to be the elements of physical and biological features that, when laid out in the appropriate quantity and spatial arrangement to provide for a species' life-history processes, are essential to the conservation of the species. We outline the appropriate quantities and spatial arrangements of the elements in the Physical and Biological Features (PBFs) section of the October 28, 2010, proposed rule. For example, spawning substrate would be considered an essential feature, while the specific composition (sand, gravel, and cobble) and level of embeddedness are the elements (PCEs) of that feature.

In accordance with section 3(5)(A)(i) and 4(b)(1)(A) of the Act and regulations at 50 CFR 424.12, in determining which areas within the geographical area occupied by the species at the time of listing to designate as critical habitat, we consider the PBFs essential to the conservation of the species and 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 historical, geographical, and ecological distributions of a species.

We derive the specific PBFs required for spikedace and loach minnow from studies of their habitat, ecology, and life history as described in the Critical Habitat section of the proposed rule to designate critical habitat published in the **Federal Register** on October 28, 2010, and in the information presented below. Additional information can be found in the final listing rule published in the **Federal Register** on July 1, 1986 (spikedace; 51 FR 23769) and October 28, 1986 (loach minnow; 51 FR 39468), and the recovery plans for each of the species (Service 1991a, 1991b). Below, we provide a discussion of the physical and biological features that are essential to the conservation of the spikedace and loach minnows:

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 amounts of 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 recorded at Aravaipa Creek, and on the Gila River in the Forks area and at the Cliff-Gila Valley. Water temperatures of occupied spikedace habitat vary with time of year. 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).

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 (33.8 °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). 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 2 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 1999a, p. 6).

TABLE 2—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.

TABLE 2—HABITAT PARAMETERS FOR VARYING LIFE STAGES OF SPIKEDACE—Continued

	Larvae	Juveniles	Adults
Substrates	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. Natural dams formed by the deposition of this sediment 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:

- 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 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; Minckley and Marsh 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).

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 (33.8 °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 3 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 3—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 allows 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 (Baker, 2005, pers. comm.). 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 level, 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 (EPA 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 summary, based on the best scientific and commercial information available for spikedace, we conclude that an appropriate prey base and water quality parameters for spikedace will include:

- 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 (Baker, 2005, pers. comm.). 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 (EPA 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 summary, based on the best scientific and commercial information available for loach minnow, we have identified an appropriate prey base and water quality for loach minnow to include:

- 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 conditions 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; Minckley and Marsh 2009, p. 174). Loach minnow adults place their adhesive eggs on the undersides of rocks, with the rock serving as protective cover. Propst *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 these designations 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 appropriate sites for breeding, reproduction, or development of offspring for spikedace to include:

- 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 appropriate sites for breeding, reproduction, or development of offspring for loach minnow to include:

- 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.

Spikedace

Nonnative aquatic species. One of the primary reasons for the decline of native species is the presence of nonnative aquatic species, as described above

under Factors C and E above. Nonnative aquatic species can include fishes, crayfish, or parasites, among others. 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 the best scientific and commercial information currently available for spikedace, we conclude that suitable habitat with respect to nonnative aquatic species is 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 the best scientific and commercial information currently available for spikedace, we conclude that suitable habitat with respect to nonnative aquatic species should include:

- 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.

Primary Constituent Elements for Spikedace

As noted above, we are required to identify the PBFs essential to the conservation of spikedace and loach minnow in areas occupied at the time of listing, focusing on the features' PCEs. We consider PCEs to be the elements of PBFs that provide for a species' life-history processes, and that are essential to the conservation of the species. We outline the appropriate quantities and spatial arrangements of the elements in the *Physical or Biological Features (PBFs)* section of the October 28, 2010, proposed rule. For example, spawning substrate would be considered an essential feature, while the specific composition (sand, gravel, and cobble) and level of embeddedness are the elements (PCEs) of that feature. This section identifies the PCEs for both 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 PCEs for the spikedace are:

(1) Habitat to support all egg, larval, juvenile, and adult spikedace, which includes:

a. 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).

b. Appropriate stream microhabitat types including 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;

c. Appropriate stream habitat with a low gradient of less than approximately 1.0 percent, at elevations below 2,100 m (6,890 ft); and

d. Water temperatures 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.

(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.

Primary Constituent Elements for 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 PCEs for the loach minnow are:

(1) Habitat to support all egg, larval, juvenile, and adult loach minnow which includes:

(a) 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);

(b) Appropriate microhabitat types including pools, runs, riffles, and rapids over sand, gravel, cobble, and rubble substrates with low or moderate amounts of fine sediment and substrate embeddedness;

(c) Appropriate stream habitats with a low stream gradient of less than 2.5 percent and are at elevations below 2,500 m (8,202 ft); and

(d) Water temperatures 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.

(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 these designations 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. Certain livestock grazing practices 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 cause 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 to update information on species distribution, revisit conservation priorities, address any new information developed through monitoring and research, and bring the plans into conformance with current Service standards. At the time the plans were written, captive propagation and reintroduction projects had not yet begun. With these efforts now under way, prioritization is needed. We are in the process of convening a recovery team for this purpose. In the interim, we have developed an internal preliminary recovery 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 continued protection of existing populations and habitat, as well as establishing populations in additional streams within their historical ranges. Not all streams within their historical range have retained the necessary PBFs, and the critical habitat designation does not include all streams known to have been occupied by the species historically. The critical habitat designation instead focuses on streams within the historical range that have retained the necessary PBFs, and that will allow the species to reach recovery by ensuring that there are adequate numbers of fish in stable populations, and that these populations occur over a wide geographic area. This will help to minimize the likelihood that catastrophic events, such as wildfire or contaminant spills, would be able to simultaneously affect all known populations. We developed necessary steps for downlisting as well as delisting.

For spikedace, our preliminary recovery assessment recommends that, in order to downlist the species from endangered to threatened, one additional stable population be established in either the Salt or Verde subbasins, 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 recovery 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 recovery assessment recommends that, in order to downlist the species from endangered to threatened, 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 recovery 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 recovery 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 recovery 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, the broad goals used in our preliminary recovery 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 designated as critical habitat for spikedace and loach minnow contain the PCEs for each species. There are no developed areas within the designations for either species except for barriers constructed on streams or road crossings of streams, which do not remove the suitability of these areas for these species.

Using our preliminary recovery assessment for selection of critical habitat, we have developed a designation to expand the current distribution of the two species by including both specific areas known to be occupied by the species at listing, as well as including some areas that were not known to be occupied at listing, but which were once part of their historical ranges. These unoccupied areas are essential to the recovery of the species because their current distribution is reduced to 10 to 20 percent of historical range, and concentrates fish in a few remaining areas that could be more susceptible to catastrophic events.

We used the following ruleset for both spikedace and loach minnow, also summarized in Table 4, to determine which areas to designate as critical habitat:

(1) Evaluate the habitat suitability of stream segments known to have been occupied at listing:

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

(b) Eliminate those areas known to have been occupied at listing, but that no longer contain any PCEs for the species.

(2) Evaluate stream segments not known to have been occupied at listing but that are within the historical range of the species to determine if they are essential to the survival and conservation (*i.e.,* recovery) of the species. Essential areas are those that:

(a) Serve as an extension of habitat within the geographic area of an occupied unit; or

(b) Expand the geographic distribution within areas not occupied at the time of listing across the historical range of the species.

TABLE 4—SUMMARY OF CATEGORIZATION OF WATERWAYS DESIGNATED AS CRITICAL HABITAT FOR LOACH MINNOW AND SPIKEDACE

Stream category	Criterion	Categorized as
Occupied at listing	Segment contains sufficient PCEs* to support life-history functions essential to the conservation of the species.	1a
	Segment no longer supports any PCEs for the species, or segment has been permanently altered so that restoration is unlikely.	1b
Not known to be occupied at listing but within the species' historical range.	Segment serves as an extension of habitat in the unit	2a
	Segment expands the geographic distribution across the range of the species.	2b

* PCE = primary constituent element.

The critical habitat designation includes two different categories of habitat. The ''2a'' category includes currently unoccupied stream reaches within units that are tributaries to other, occupied stream reaches. For example, within Unit 1, we include West Clear Creek as a 2a stream for spikedace. West Clear Creek is not currently occupied, but it is a tributary to the Verde River, which is currently occupied. Increasing the amount of occupied habitat in units, like the Verde River, already occupied by the species is essential because it expands the available habitat within a given unit that can be occupied by the two species and provides for an increased population size within that stream system. Increased population sizes are essential to conserving the two species as higher numbers of individuals increases the likelihood of their persistence over time.

The ''2b'' category includes streams within units that are not currently occupied by the species but that are still within their historical range. The difference between ''2a'' and ''2b'' streams is that there is no occupancy within the entire unit for a ''2b'' stream. For example, while there are historical records of spikedace from within the Salt River Subbasin (Unit 2), this subbasin is unoccupied by the species. We have included Tonto Creek and some of its tributaries as ''2b'' streams within the designation. Inclusion of this area provides for expansion of the overall geographic distribution of spikedace. Expanding the geographic distribution of both species is essential for species that occur in only a fragment of their former range, as is the case for spikedace and loach minnow. Identifying additional streams for recovery of the two species ultimately allows for additional occupied units over a broader geographic range, which reduces the overall impacts of catastrophic events.

In summary, we have considered the known occupancy of the area in determining which areas are either in category 1 (occupied at listing) versus category 2 (not occupied at listing), as well as the suitability and level of adverse impacts to habitat within each unit. We believe the areas designated as critical habitat provide for the conservation of the spikedace and the loach minnow because they include habitat for all extant populations and provide habitat for all known genetic lineages.

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 PCEs. We selected upstream and downstream cutoff points not to include 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 within the designation. Critical habitat stream segments were then mapped using ArcMap (Environmental Systems Research Institute, Inc.), a Geographic Information Systems program.

With respect to length, the designations were designed to provide sufficient riverine area for breeding, nonbreeding, and dispersing adult spikedace and loach minnow, as well as for the habitat needs for juvenile and larval stages of these fishes. In addition, with respect to width, we evaluated the lateral extent necessary to support the PCEs for spikedace and loach minnow. The resulting designations take 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). Riparian areas filter runoff, absorb and gradually release floodwaters, recharge groundwater, maintain streamflow, protect stream banks from erosion, and provide 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 USFS 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 PCEs 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 (Natural 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, such as pollutants in adjacent areas. Consequently, while a riparian corridor 23 to 46 m (75 to 150 ft) in width may protect water quality and provide some level of riparian habitat protection, a wider area would provide full protection of riparian habitat because the stream itself can move within the floodplain in response to high flow events. A 91.4 m (300 ft) buffer would better protect water temperatures, as well as reduce the impacts of high flow events, thereby providing additional protection to critical habitat areas.

To address this issue, the lateral extent of streams included in these designations 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 these designations contain 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. Bankfull stage is not an ephemeral feature, meaning it does not disappear. Bankfull stage can always be determined and delineated for any stream we have designated as critical habitat. We acknowledge that the bankfull stage of any given stream may change depending on the magnitude of a flood event, but it is a definable and standard measurement for stream systems. Unlike trees or cliff facings used by terrestrial species, stream systems provide habitat that is in constant change. Following high flow events, stream channels can move from one side of a canyon to the opposite side, for example. If we were to designate critical habitat based on the location of the stream on a specific date, the area within the designation could be a dry channel in less than one year from the publication of the determination, should a high flow event occur.

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 the Federal Emergency Management Agency or from the U.S. Army Corps of Engineers for the areas we are designating. 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 four 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.

(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).

(4) A 91.4-m (300-ft) buffer contributes to the functioning of a river, thereby supporting the PCEs needed for suitable spikedace and loach minnow habitat.

When determining critical habitat boundaries within this final rule, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack PCEs for spikedace and loach minnow. The scale 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 lands inadvertently left inside critical habitat boundaries shown on the maps of this final rule have been excluded by text in the rule and are not designated as critical habitat. Therefore, a Federal action involving these lands will not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect the PCEs in the adjacent critical habitat.

Eight units were designated as critical habitat based on sufficient elements of physical and biological features being present to support spikedace and loach minnow life processes. Some units contained all of the identified elements of physical and biological features and supported multiple life processes. Some segments contained only some elements of the physical and biological features necessary to support spikedace and loach minnow use of that habitat.

Final Critical Habitat Designations

We are designating eight units as critical habitat for spikedace and loach minnow. Within this designation, we refer to the eight units by subbasin name, as they are all subbasins to the Colorado River Basin. The critical habitat areas described below constitute our best assessment at this time of areas that meet the definition of critical habitat. Those eight units are: (1) Verde River Subbasin, (2) Salt River Subbasin, (3) San Pedro River Subbasin, (4) Bonita Creek Subbasin, (5) Eagle Creek Subbasin, (6) San Francisco River Subbasin, (7) Blue River Subbasin, and (8) Gila River Subbasin. Table 5 (spikedace) and Table 6 (loach minnow) show the occupied units.

TABLE 5—OCCUPANCY OF DESIGNATED CRITICAL HABITAT UNITS BY SPIKEDACE

Unit	Occupied at time of listing or documented after listing	Currently occupied	Translocated population
Unit 1—Verde River Subbasin			
Verde River	Yes	Yes	No.
Granite Creek	No	No	No.
Oak Creek	No	No	No.
Beaver and Wet Beaver Creek	No	No	No.
West Clear Creek	No	No	No.
Fossil Creek	No	Uncertain	Yes.
Unit 2—Salt River Subbasin			
Salt River Mainstem	No	No	No.
Tonto Creek	No	No	No.
Greenback Creek	No	No	No.
Rye Creek	No	No	No.
Spring Creek	No	No	No.
Rock Creek	No	No	No.
Unit 3—San Pedro River Subbasin			
San Pedro River	No	No	No.
Hot Springs Canyon	No	Yes	Yes.
Bass Canyon	No	No	No.
Redfield Canyon	No	Uncertain	Yes.
Aravaipa Creek	Yes	Yes	No.
Deer Creek	No	No	No.
Turkey Creek	No	No	No.
Unit 4—Bonita Creek Subbasin			
Bonita Creek	No	Uncertain	Yes.
Unit 5—Eagle Creek Subbasin			
Eagle Creek	Yes	Yes	No.
Unit 6—San Francisco River Subbasin			
San Francisco River	No	Uncertain	Yes.

TABLE 5—OCCUPANCY OF DESIGNATED CRITICAL HABITAT UNITS BY SPIKEDACE—Continued

Unit	Occupied at time of listing or documented after listing	Currently occupied	Translocated population
Unit 7—Blue River Subbasin			
Blue River	No	No	No.
Campbell Blue Creek	No	No	No.
Little Blue Creek	No	No	No.
Pace Creek	No	No	No.
Frieborn Creek	No	No	No.
Dry Blue Creek	No	No	No.
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*	No	No.

* Spikedace documented after 1986 listing, including: Mangas Creek, first occupied in 1999.

TABLE 6—OCCUPANCY OF DESIGNATED CRITICAL HABITAT UNITS BY LOACH MINNOW

Stream segment	Occupied at time of listing	Currently occupied	Translocated population
Unit 1—Verde River Subbasin			
Verde River	No	No	No.
Granite Creek	No	No	No.
Oak Creek	No	No	No.
Beaver and Wet Beaver Creek	No	No	No.
Fossil Creek	No	Uncertain	Yes.
Unit 2—Salt River Subbasin			
White River Mainstem	Yes	Yes	No.
East Fork White River	Yes	Yes	No.
East Fork Black River	No	No	No.
North Fork East Fork Black River	Yes*	Yes	No.
Boneyard Creek	Yes*	No	No.
Coyote Creek	No	Yes	No.
Unit 3—San Pedro River Subbasin			
San Pedro River	No	No	No.
Hot Springs Canyon	No	Yes	Yes.
Bass Canyon	No	No	No.
Redfield Canyon	No	Uncertain	Yes.
Aravaipa Creek	Yes	Yes	No.
Deer Creek	Yes*	Yes	No.
Turkey Creek	Yes*	Yes	No.
Unit 4—Bonita Creek Subbasin			
Bonita Creek	No	Uncertain	Yes.
Unit 5—Eagle Creek Subbasin			
Eagle Creek	Yes*	Yes	No.
Unit 6—San Francisco River Subbasin			
San Francisco River	Yes	Yes	No.
Tularosa River	Yes	Yes	No.
Negrito River	Yes*	Yes	No.
Whitewater Creek	Yes	No	No.
Unit 7—Blue River Subbasin			
Blue River	Yes	Yes	No.
Campbell Blue Creek	Yes*	Yes	No.

TABLE 6—OCCUPANCY OF DESIGNATED CRITICAL HABITAT UNITS BY LOACH MINNOW—Continued

Stream segment	Occupied at time of listing	Currently occupied	Translocated population
Little Blue Creek	Yes*	No	No.
Pace Creek	Yes*	Yes	No.
Frieborn Creek	Yes*	Yes	No.
Dry Blue Creek	Yes*	Yes	No.
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.
Bear Creek	Yes*	Yes	No.

*Loach minnow documented after 1986 listing, including: North Fork East Fork Black River in 1996; Boneyard Creek in 1996; Deer Creek in 1996; Turkey Creek in 1996; Eagle Creek in 1994; Negrito Creek in 1998; Campbell Blue Creek in 1987; Little Blue Creek in 1994; Dry Blue Creek in 1998; Frieborn Creek in 1998; Pace Creek in 1998; Mangas Creek in 1999; and Bear Creek in 2005.

The approximate area of each critical habitat unit is shown in Table 7.

TABLE 7—LENGTH OF DESIGNATED CRITICAL HABITAT UNITS FOR SPIKEDACE AND LOACH MINNOW

[Length 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	155	96	4	2	3	2	133	82	295	182
2	117	72	0	0	0	0	14	9	131	81
3	37	23	4	2	2	2	31	19	74	46
4	16	10	0	0	0	0	8	5	24	15
5	19	12	0	0	0	0	8	5	27	17
6	155	96	3	2	0	0	70	44	228	142
7	93	58	0	0	0	0	15	9	108	67
8	161	100	10	6	0	0	88	55	259	161
Total	753	467	21	12	5	4	367	228	1146	711

Note: Area sizes may not sum due to rounding. Total figures vary from those in the text description. 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 8 at the end of this section summarizes the criteria from the ruleset (above) under which units were included.

Unit 1: Verde River Subbasin

Within the Verde River Subbasin, we are designating 294.5 km (183.0 mi) from Sullivan Lake downstream 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 designating 231.5 km (143.9 mi) from Sullivan Lake downstream on the Verde River and its tributaries Granite Creek, Oak Creek, Beaver and Wet Beaver Creek, and Fossil Creek. All of the area in the designation for loach minnow falls within the designation for spikedace. The Verde River and its tributaries included within these designations 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. This reach of the Verde River is unique in comparison to other desert streams such as the Salt or Gila Rivers in that it is free-flowing and perennial (Sullivan and Richardson 1993, pp. 19–21; The Nature Conservancy 2010).

Verde River Mainstem. The Verde River was considered occupied at listing for spikedace, but not for loach minnow. None of the tributaries within this unit were occupied at listing for either species. For spikedace, the Verde River meets criteria for a 1a stream as defined in the ruleset, indicating that it was occupied at listing and has the features essential to support life-history functions essential for the conservation of the species. All of the tributaries within this unit meet criteria for 2a streams as defined in the ruleset for spikedace, indicating that they were not occupied at listing and would serve as an extension of habitat in the unit. For loach minnow, the Verde River and its tributaries meet the criteria for 2b streams under the ruleset, indicating that they were not occupied at listing, but would expand the geographic distribution of the species. We determined that those areas classified as 2a or 2b are essential to the conservation of both species because they contain suitable habitat, and securing both species in this watershed will contribute significantly to their recovery by protecting occupied habitat for spikedace, extending protection to tributary streams which will serve as extensions of occupied habitat, and by protecting habitat for loach minnow which will allow for them to expand their current distribution. Additional

details on areas designated under Unit 1 are provided below.

Spikedace Only. For spikedace, we are designating as critical habitat 170.5 km (106.0 mi) of the Verde River from Sullivan Lake downstream to the confluence with Fossil Creek. The Verde River mainstem was considered occupied at the time of listing (ASU 2002, 51 FR 23679). 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 (PCE 1); has an appropriate food base (PCE 2); consists of perennial streams with no or low levels of pollutants (PCEs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 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 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. As noted above, spikedace are currently restricted to 10 percent of their historical range, so that every remaining population is important to their recovery. Critical habitat designation will ensure protection of the habitat in this occupied unit which in turn will contribute to conserving the species in this area. 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; abnormally dry drought conditions (University of Nebraska-Lincoln 2011, p. 1); and competition with or predation by nonnative aquatic species.

We are designating as critical habitat for spikedace 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. West Clear Creek is on private and Coconino National Forest lands. West Clear Creek was not considered occupied at listing; however, one record exists for spikedace from West Clear Creek (from 1937; ASU 2002). West Clear Creek does have suitable habitat for spikedace, and is under consideration as a translocation site for spikedace by a multi-agency team. We consider this tributary essential for the conservation of the species based on the presence of suitable habitat, its past records of occupancy, and its consideration for translocation of spikedace, which indicates the area will serve as an important extension of the area occupied by spikedace in the Verde River watershed.

Loach Minnow Only. We are designating as critical habitat 118.5 km (73.6 mi) of the Verde River from Sullivan Lake downstream to the confluence with Wet Beaver Creek. The Verde River was not considered occupied by loach minnow at listing; however, there are later records of loach minnow from the Verde River mainstem near its confluence with Granite Creek, at the mouth of Beaver Creek, and in portions of the Verde River near Beaver Creek (ASU 2002). Subsequent surveys have failed to detect loach minnow in the Verde River or its tributaries. However, 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. Therefore, because the Verde River contains suitable habitat and will allow for the species' range to be expanded; we conclude that the Verde River is essential to the conservation of the loach minnow.

Within the Verde River Subbasin, 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 have been excluded from the final critical habitat designations under section 4(b)(2) of the Act (see ''*Application of Section 4(b)(2) of the Act*'' section below for additional information).

Verde River Tributaries—Spikedace and Loach Minnow

For both spikedace and loach minnow, the designation of critical habitat for each species includes 3.2 km (2.0 mi) of Granite Creek from the confluence with the Verde River upstream to an unnamed spring. Above the unnamed spring, flows are insufficient to maintain these species. 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 AGFD parcel includes approximately 1.6 km (1.0 mi) of Granite Creek; the remaining landownership is private.

Both Species. There are no known records of spikedace or loach minnow from Granite Creek. However, because of its suitability, confluence with occupied portions of the Verde River, and the opportunities it provides for extension of occupied habitat for spikedace and recovery habitat for loach minnow, this designated portion of Granite Creek is essential to the conservation of both species. Granite Creek is a perennial tributary of the Verde River, and its confluence with the Verde River occurs in that portion of the river with the highest species density for spikedace. Granite Creek meets criteria for a 2a stream for spikedace, serving as an extension of occupied spikedace habitat in the Verde River. For loach minnow, Granite Creek meets criteria for a 2b stream, expanding the current distribution of the species within its historically occupied range.

We are designating as critical habitat 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, increasing gradient, and substrate size. Oak Creek occurs on a mix of private and Coconino National Forest lands.

Oak Creek was not considered occupied at listing for spikedace or loach minnow; however, we consider it to be essential for the conservation of both species. It contains suitable habitat for both species. A multi-agency team is currently evaluating Oak Creek as a translocation site for 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, Oak Creek contains the physical features that provide an important extension area for spikedace and would help to expand the current distribution of loach minnow within its historical range.

We are designating as critical habitat 33.3 km (20.7 mi) of Beaver and Wet Beaver Creek from the confluence with the Verde River upstream to the confluence with Casner Canyon. Beaver and Wet Beaver Creek occur on a mix of private, National Park, and Coconino National Forest lands. Neither Beaver

nor Wet Beaver Creek were considered occupied at listing by either spikedace or loach minnow. Beaver Creek and its upstream extension in Wet Beaver Creek historically supported spikedace (ASU 2002; AGFD 2004) and contains suitable, although degraded, habitat. There is one record for loach minnow from Beaver Creek but none from Wet Beaver Creek. There is an additional 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 creeks are essential to the conservation of both species, and meet criteria 2a under the ruleset for spikedace as a stream that would extend occupied habitat. They meet the criteria for a 2b stream under the ruleset for loach minnow, expanding the species range. As noted under Granite and Oak creeks, habitat within this portion of the species' ranges is limited to the Verde River Unit, and including the Verde and a few of its perennial tributaries like Beaver and Wet Beaver Creeks expands the overall unit size, adding to available habitat, as well as expanding recovery potential for both species in this portion of their historical ranges.

We are including within these designations 22.2 km (13.8 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. Historically, sufficient flows were lacking in this creek but, in 2005, following decommissioning of the Childs-Irving Hydroelectric Power Plant, formerly diverted flows were returned to Fossil Creek (Robinson 2009b, p. 3). Spikedace and loach minnow were translocated into this stream in 2007 (Carter 2007a, p. 1), and additional fish were added in 2008 (Carter 2008a, pp. 1–2) and 2010 (Crowder, 2010, pers. comm.). Fossil Creek occurs primarily on Federal lands, forming the boundary between the Coconino and Tonto National Forests.

We consider this area to be essential to the conservation of the species. With the severe reductions in the species' overall distribution, and a translocation effort under way, Fossil Creek is essential to the recovery of spikedace and loach minnow because, if successful, the translocation effort will extend the distribution of spikedace in the Verde River watershed, meeting criteria for a 2a stream, and expand the distribution of loach minnow within its historical range, meeting criteria for a 2b stream. 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.

Unit 2: Salt River Subbasin

We are not designating any portion of the mainstem Salt River as critical habitat for spikedace or loach minnow 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 (from 1950; ASU 2002). However, the majority of 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 rivers 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. Due to its limited available habitat, limited habitat suitability, and permanent alteration for reservoirs, we have concluded that the PCEs for spikedace are not present at this time in the Salt River, in part due to permanent habitat alteration.

While we are not designating any habitat on the mainstem Salt River, we are designating critical habitat for both spikedace and loach minnow on other streams within the Salt River Subbasin. Within the Salt River Subbasin, there is no overlap between the areas we are designating for spikedace and loach minnow. For spikedace, the designation includes a total of 98.6 km (61.3 mi) of Tonto Creek and its tributaries Rye, Greenback, and Spring Creeks, as well as Rock Creek, which is a tributary to Spring Creek. None of these streams were known to be occupied by spikedace at listing, and therefore are classified as 2b streams under the ruleset, meaning that their occupancy by spikedace would allow for an increased distribution of the species within its historical range.

For loach minnow, we are designating a total of 32.0 km (19.9 mi) of the East Fork Black River, its tributaries Coyote Creek and North Fork East Fork Black River, and Boneyard Creek, a tributary to the North Fork East Fork Black. While East Fork Black River and Coyote Creek were not considered occupied at listing, the remainder of the streams included in the Salt River Subbasin for loach minnow were either occupied at listing (White River, East Fork White River) or determined to be occupied after listing (North Fork East Fork Black River, Boneyard Creek). Therefore, the East Fork Black River and Coyote Creek meet criteria for 2a streams under the ruleset, indicating they would serve as an extension to occupied habitat on the North Fork East Fork Black River, while White River, East Fork White River, North Fork East Fork Black River, and Boneyard Creek meet criteria for 1a streams under the ruleset. The unit descriptions and their rationale for inclusion are described below.

Spikedace Only. The Salt River Subbasin is a significant portion of spikedace historical range but currently has no known extant populations of spikedace. None of the streams within the Salt River Subbasin were known to be occupied at listing and therefore meet the criteria for 2b streams under the ruleset and are considered essential to the conservation of the species. Large areas of the subbasin are unsuitable, either because of topography or because of reservoirs and other stream-channel alterations. However, the presence of substantial areas of USFS lands, and suitable habitat in some stream segments makes this a promising subbasin for the reestablishment of spikedace, and conservation efforts are under way (see Spring Creek below). All stream segments designated for spikedace in the Salt River Subbasin are in Gila County, Arizona.

While it was not considered occupied at listing, there are limited records for spikedace from Tonto Creek (from 1937 only; ASU 2002). We are including within the designation 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 is within the historical range of spikedace, and occupancy of the creek would serve to increase the distribution of the species, as well as add to available, suitable habitat. We therefore consider the designated streams in this subbasin to be essential to the conservation of the species.

We are designating 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. While there are no known records of spikedace from Greenback Creek, the Salt River Subbasin is a significant portion of spikedace historical range, and there are limited areas of suitable habitat. The suitable habitat in Greenback Creek, its connection with Tonto Creek, and the fact that it occurs almost entirely on Federal lands makes this area an important expansion area for spikedace recovery, and we therefore consider it essential to the conservation of spikedace.

We are including within the designation 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. The entire portion of the designation is perennial. As with Greenback Creek, Rye Creek serves as connected perennial stream habitat that expands the available suitable habitat associated with Tonto Creek and the Salt River Subbasin; therefore, we believe it is essential to the conservation of the species.

We are including within the designation 27.2 km (16.9 mi) of Spring Creek from the confluence with Tonto Creek upstream to its confluence with Sevenmile Canyon. Portions of Spring Creek are perennial, while the lower portions are intermittent. The perennial portions of Spring Creek provide suitable habitat, and likely connect to Tonto Creek during seasonal flows, thereby expanding the available suitable habitat for spikedace. In addition, for both Spring and Rock (see below) creeks, conservation efforts for spikedace are under way. 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.

Finally, we are including within the designation 5.7 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; however, Rock Creek will further expand the available habitat in the Salt River Subbasin. The suitable habitat, perennial flows, and location within the Salt River Subbasin make Rock Creek essential to the conservation of the spikedace.

Within the Salt River Subbasin, a single record exists for spikedace on the Agua Fria River, which is located on the extreme western edge of the species' range 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 on the Agua Fria River is therefore minimal, with perennial stretches mixed with predominantly intermittent stretches, and isolated from any mainstem system by a large reservoir. For these reasons, we have concluded that the Agua Fria River is not essential to the conservation of spikedace at this time.

Loach Minnow Only. Areas included for loach minnow within the Salt River Subbasin include portions of the East Fork Black River, North Fork East Fork Black River, and Coyote and Boneyard creeks. The East Fork Black River, North Fork East Fork Black River, Coyote, and Boneyard creeks are in Apache and Greenlee counties. All of these streams are perennial (The Nature Conservancy 2010).

The Salt River Subbasin encompasses a significant portion of loach minnow historical range, and the Salt River mainstem was known at listing to have historical records near the U.S. 60 (from 1950; ASU 2002). The Black and White rivers join to form the Salt River. The North Fork East Fork Black River, and Boneyard Creek were newly discovered as occupied after listing, and meet the criteria for 1a streams. We have no records of loach minnow from East Fork Black River or Coyote Creek, and have designated these areas as 2a streams.

Within the Salt River Subbasin, we are designating 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. The presence of suitable habitat, and the presence of a distinct genetic population in the adjoining North Fork East Fork River, makes these streams important expansion areas for loach minnow, and they are therefore essential to the conservation of the species. We are including within this designation 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 an unnamed tributary just downstream of Boneyard Creek and 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 connected to the North Fork East Fork Black River, which is occupied by loach minnow (Lopez, 2000, pers. comm.; ASU 2002; Gurtin, 2004, pers. comm., Robinson *et al.* 2009b, p. 1). East Fork Black River and Coyote Creek contain suitable habitat for loach minnow, and will allow for expansion of the existing population of loach minnow in North Fork East Fork Black River and Boneyard Creek.

The presence of multiple PCEs, its occupied status, and the presence of a distinct genetic population makes the North Fork East Fork Black River and Boneyard Creek essential to the conservation of loach minnow. We are including within the designation 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, and 2.3 km (1.4 mi) of Boneyard Creek extending from the confluence with the North Fork 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; Gurtin, 2004, pers. comm.; Robinson *et al.* 2009b, p. 1), and is presumed to have been occupied at listing. Boneyard Creek is also occupied, and is connected to the North Fork East Fork Black River, which is occupied (ASU 2002; Gurtin, 2004, pers. comm.; Robinson *et al.* 2009b, p. 1), and contains suitable habitat for loach minnow. North Fork East Fork Black River contains suitable habitat for all life stages of loach minnow (PCE 1); has an appropriate food base (PCE 2); consists of perennial streams with no or low levels of pollutants (PCEs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6).

The portions of the North Fork East Fork Black River and Boneyard Creek included within this designation are entirely on Apache-Sitgreaves National Forests lands. Essential features may require special management or protection from the 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, possibly resulting in increased competition for resources and predation by trout. The Wallow Fire burned through this stream complex in 2011, and there may be temporary increases in sediment carried into the stream from burned areas in the uplands.

White River and its tributary East Fork White River were considered occupied at listing, and meet criteria for 1a streams under the ruleset. We included within the designation 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, as well as approximately 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. These areas have been excluded from the final critical habitat designations under section 4(b)(2) of the Act (see ''*Application of Section 4(b)(2) of the Act''* section below for additional information).

In previous critical habitat 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. Because there are other suitable areas for loach minnow within this portion of the species' range, we believe the limited mileage and habitat features in Tonto Creek and its tributaries are less important to the overall conservation of loach minnow, and our current assessment is that they are therefore not essential to the conservation of the species.

Unit 3: San Pedro Subbasin

Within the San Pedro Subbasin, we are designating 74.1 km (46.1 mi) of habitat on Aravaipa Creek and its tributaries Deer and Turkey creeks, Redfield Canyon, and Hot Springs canyons and its tributary Bass Canyon. All areas within this subbasin were proposed for both species. Aravaipa Creek, Redfield and Hot Spring canyons and their tributaries included within these designations are in Cochise, Pinal, and Graham counties, Arizona. The majority of Redfield Canyon, Hot Springs Canyon, and Aravaipa Creek are perennial, with small downstream areas considered formerly perennial (The Nature Conservancy 2010) but still connected during high flow events. Streams included within this subbasin occur primarily on BLM, State, and private lands.

The San Pedro Subbasin contains streams that are known to have been occupied by both species at listing, some of which are currently occupied, and some with translocated populations of spikedace and loach minnow. Aravaipa Creek was occupied by both species at listing, and is classified as a 1a stream for both species. Deer and Turkey creeks are considered occupied by loach minnow due to the species being newly detected after listing in 1996 (ASU 2002), but were not considered occupied at listing by spikedace and therefore meet criteria for 1a streams for loach minnow, and for 2a streams for spikedace. Hot Springs, Redfield, and Bass canyons were not known to be occupied at listing by either species. Both Hot Springs and Redfield canyons currently support translocated populations of spikedace and loach minnow that were placed into the streams in 2007 (Robinson 2008a, pp. 1, 15–16). They, along with Bass Canyon, meet criteria for 2a streams for both species.

We proposed as critical habitat 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. However, due to concerns for national security, the San Pedro River in its entirety has been excluded from the final critical habitat designations under section 4(b)(2) of the Act (see ''*Application of Section 4(b)(2) of the Act''* section below for additional information). In addition, in response to comments received, we have reduced the overall mileage included for Hot Springs and Redfield canyons. Please see the ''Summary of Changes from Proposed Rule'' for more detail.

With the removal of the San Pedro and decreased mileage on Hot Springs and Redfield Canyon, we are including within these designations a total of 74.1 km (46.1 mi) for spikedace and loach minnow. This area includes 44.9 km (27.9 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, and 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 regularly since 1943 (ASU 2002; Stefferud and Reinthal 2005, pp. 15–21; AGFD 2004; Reinthal 2011, pp. 1–2).

The long-term presence and current occupancy by both species, makes this area essential to their conservation. Aravaipa Creek is unique in that it supports an intact native fish fauna comprising seven species (Stefferud and Reinthal 2005, p. 11). It contains suitable habitat for all life stages of spikedace and loach minnow (PCE 1); has an appropriate food base (PCE 2); consists of perennial flows (PCE 3); has no nonnative aquatic species, or levels of nonnative aquatic species are sufficiently low to allow for persistence of both species (PCE 5); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6).

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 2011, p. 1); and channelization in upstream portions (Stefferud and Reinthal 2005, pp. 36–38).

We are including within these designations 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.

Both Deer and Turkey creeks are considered occupied by loach minnow with the species first detected in 1996, and both creeks are currently occupied by loach minnow. Each of these tributary streams contains suitable habitat for all life stages of loach minnow (PCE 1); have appropriate food bases (PCE 2); consist of perennial streams with no or low levels of pollutants (PCEs 3 and 4); and have an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 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 ground water removal; limited recreation; severe drought (University of Nebraska-Lincoln 2011, 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). In addition, Turkey Creek experiences low flows through part of most years, limiting occupancy by loach minnow during those times. Occupancy by loach minnow, as well as the presence of perennial water and other key features indicate that Deer and Turkey creeks are likely suitable for spikedace as well. Because they are tributaries to Aravaipa Creek, they meet criteria for a 2a stream for spikedace. We have therefore determined they are essential to the conservation of spikedace.

We have included within these designations 9.3 km (5.8 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.) Hot Springs Canyon occurs on a mix of State, private, and BLM lands. 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, and meets criteria as a 2a stream for 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, 2009, 2010, and 2011 (Robinson 2008a, pp. 1, 15–16; Robinson *et al.* 2010a, pp. 4–5; Robinson *et al.* 2010b, pp. 5–6, 20–22; Robinson and Crowder 2011, *In Draft,* p. 9). Spikedace and loach minnow have been captured each year since the project began (Robinson *et al.* 2010b, p. 7) indicating that conditions in the stream allow the species to persist year to year; however, insufficient time has elapsed to allow for evaluation of the ultimate success of the translocation effort.

Hot Springs Canyon contains suitable habitat for both spikedace and loach minnow, is currently occupied by a translocated population, and serves as an extension of habitat in this subbasin. We have therefore determined this area essential to the conservation of the two species.

We are including within this designation 6.5 km (4.0 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, thus making it unsuitable for spikedace and loach minnow. The majority of Redfield Canyon occurs on State lands, with smaller areas of private and Federal (BLM) lands. 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, and meets criteria as a 2a stream for both species.

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). 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.* 2010a, pp. 4–5, Robinson *et al.* 2010b, pp. 5–6, 20–22). Redfield Canyon currently supports loach minnow that were translocated to the site (Robinson *et al.* 2010b, pp. 20–22), and contains suitable habitat for both spikedace and loach minnow. The most recent surveys of Redfield Canyon (Robinson *et al.* 2010b) did not detect spikedace; however, the reintroduction project is not yet complete. The current occupancy by loach minnow and the presence of suitable habitat, which extends the available habitat in this unit, make this area essential to the conservation of both species.

We are including within these designations 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 Bass Canyon). Bass Canyon occurs on private and BLM lands. 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. In addition, 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 spikedace and loach minnow, has been identified as a potential stream for restoration activities, and meets criteria for a 2a stream under the ruleset. Bass Canyon serves as an extension to Hot Springs Canyon fish populations. We therefore consider it to be essential to the conservation of both species.

Unit 4: Bonita Creek Subbasin

Within the Bonita Creek Subbasin, we are including 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. It meets criteria for a 2b stream for both species under our ruleset. Land ownership at Bonita Creek is almost entirely Federal (BLM), with a few small private parcels. The designations end at the San Carlos Indian Reservation boundary.

Cooperative conservation efforts for spikedace and loach minnow are ongoing in Bonita Creek. A Memorandum of Understanding is in place with the City of Safford regarding water management for Bonita Creek as part of this effort. 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. Spikedace and loach minnow were translocated into the lower portions of Bonita Creek in 2008 (Robinson, 2008c, pers. comm.). In 2009, an additional small population of spikedace was placed above the City of Safford's infiltration gallery, but below the southern boundary of the San Carlos Indian Reservation. However, due to a reinvasion by nonnative species, augmentations of spikedace and loach minnow are temporarily on hold at Bonita Creek.

As noted above for Fossil Creek, Hot Springs Canyon, and Redfield Canyon, there are limited opportunities for translocating or reintroducing populations of spikedace and loach minnow, and the current 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 both species, occurs within the historical range of both species, and allows for the expansion of the geographic distribution of the species' ranges.

Unit 5: Eagle Creek Subbasin

We are including within these designations 26.5 km (16.5 mi) of Eagle Creek from the Freeport-McMoRan (FMC) diversion dam upstream to the confluence with East Eagle Creek in Greenlee and Graham Counties, Arizona. Eagle Creek is a largely perennial system (The Nature Conservancy 2010). 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. Spikedace and loach minnow are both considered currently present, but likely in small numbers (Marsh 1996, p. 2; ASU 2002; Bahm and Robinson 2009a, p. 1).

Eagle Creek was known to be occupied at the time of listing by spikedace, and therefore meets criteria for a 1a stream under our ruleset. It was determined to be occupied by loach minnow after listing, in 1994 (ASU 2002), and therefore meets criteria for a 1a stream for loach minnow under our ruleset. Eagle Creek contains suitable habitat for all life stages of spikedace and loach minnow (PCE 1); has an appropriate food base (PCE 2); consists of perennial flows with no or low levels of pollutants (PCEs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6) above the barrier, which serves as the endpoint of this unit.

Approximately 27.5 km (17.1 mi) of Eagle Creek in Graham County are on

the San Carlos Apache Reservation. Additionally, 21.4 km (13.3 mi) of Eagle Creek also flow through private lands belonging to Freeport McMoRan. These areas have been excluded from the final critical habitat designations 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 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 to severe drought (University of Nebraska-Lincoln 2011, p. 1); road construction and maintenance within and adjacent to the stream channel, and the indirect effect of wildfires that have occurred in the watershed since 2007.

Unit 6: San Francisco River Subbasin

We are including within these designations 228.1 km (141.7 miles) of stream segments from the San Francisco River and its tributaries Tularosa River, Negrito Creek, and Whitewater Creek. All of this area is designated for loach minnow, while 166.6 km (103.5 miles) is also designated for spikedace. All of the area included for spikedace is within the area designated for loach minnow. The portions of the San Francisco, Tularosa River, Negrito Creek, and Whitewater Creek included within these designations are in Greenlee County, Arizona, and Catron County, New Mexico.

Portions of the San Francisco River in Greenlee County totaling 14.1 km (8.8 mi) are on lands owned by FMC. These areas have been excluded from the final critical habitat designations under section 4(b)(2) of the Act (see ''*Application of Section 4(b)(2) of the Act*'' section below for additional information).

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). It is considered perennial throughout this length, except for seasonal drying in the Alma Valley. Land ownership on the San Francisco River includes primarily BLM and Apache-Sitgreaves National Forest with small parcels of private and State lands in Arizona, and the Gila National Forest with small parcels of private lands in New Mexico.

Occupancy within this subbasin is mixed. The San Francisco River downstream of the Tularosa River confluence was not known to be occupied by spikedace at listing; however, a reintroduction of spikedace occurred in 2008 above the town of Alma, New Mexico (NMDGF 2009, p. 1). The success of this translocation effort remains to be determined, but the stream meets criteria for a 2b for spikedace. The San Francisco River was known to be occupied by loach minnow at listing (NMDGF 2008; Propst *et al.* 2009, pp. 5–6), and therefore meets the criteria for a 1a stream under the ruleset for loach minnow.

There are no known records of spikedace from the Tularosa River, Negrito Creek, or Whitewater Creek, and spikedace have not been known to occur any higher in the San Francisco River than Pleasanton (Paroz and Propst 2007, pp. 13–15). We are not including any of these tributary streams for spikedace in the designation at this time. In contrast, the Tularosa River and Whitewater Creek were known to have been occupied at listing by loach minnow, and meet the criteria for a 1a stream under the ruleset. Negrito Creek was not known to have been occupied at listing by loach minnow, but loach minnow have since been detected in Negrito Creek (Miller 1998, pp. 1–6). For this reason, we have included Negrito Creek as a 1a stream under the ruleset.

Both Species. This designation includes 166.6 km (103.5 mi) of the San Francisco River as critical habitat for spikedace from the confluence with the Gila River upstream to the confluence with the Tularosa River. We are including a total of 203.6 km (126.5 mi) of the San Francisco River for loach minnow, from its confluence with the Gila River upstream to the town of Cruzville. For loach minnow, the San Francisco River was known to be occupied at listing. The San Francisco River contains suitable habitat for all life stages of loach minnow (PCE 1); has an appropriate food base (PCE 2); consists of perennial flows with no or low levels of pollutants (PCEs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6). 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; severe drought (University of Nebraska-Lincoln 2011, p. 1) in those portions in Arizona; competition with and predation by nonnative aquatic species; water diversions; road construction and maintenance; and channelization.

The San Francisco River was not known to be occupied by spikedace at listing. The presence of loach minnow, suitable habitat characteristics, reintroduced population of spikedace, and location within the historical range of spikedace indicate that this area is suitable for spikedace. The reduced distribution of spikedace and the suitability of this large, intact river system in the upper San Francisco River indicates that it is essential to the conservation of the species.

Loach Minnow Only. We are designating 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 (PCE 1); has an appropriate food base (PCE 2); consists of perennial flows with no or low levels of pollutants (PCEs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6). Land ownership along the Tularosa River is predominantly Gila National Forest, with private inholdings. The essential features in this stream may require special management considerations or protection due to residual effects of livestock grazing, and impacts to uplands, and competition with and predation by nonnative aquatic species.

We include within this designation 6.8 km (4.2 mi) of Negrito Creek extending from the confluence with the Tularosa River upstream to the confluence with Cerco Canyon. Negrito Creek is perennial through this reach. Above this point, gradient and channel morphology make the creek unsuitable for loach minnow. Loach minnow in Negrito Creek were newly discovered after listing (Miller 1998, pp. 1–6). Negrito Creek contains suitable habitat for all life stages of loach minnow (PCE 1); has an appropriate food base (PCE 2); consists of perennial flows with no or low levels of pollutants (PCEs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6). 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 include within this 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 (PCE 1); has an appropriate food base (PCE 2); consists of perennial flows with no or low levels of pollutants (PCEs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 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; channelization, and moderate drought (University of Nebraska-Lincoln 2011, p. 1).

Unit 7: Blue River Subbasin

Within the Blue River Subbasin, we are including 106.6 km (66.3 mi) of the Blue River, Campbell Blue and Little Blue creeks in Greenlee County, Arizona, and portions of Campbell Blue, Pace, Frieborn, and Dry Blue creeks in Catron County, New Mexico, for both spikedace and loach minnow. The Blue River, Campbell Blue Creek, and Little Blue Creek occur predominantly on Federal lands of the Apache-Sitgreaves National Forest. The tributaries Pace, Frieborn, and Dry Blue creeks occur entirely on Federal lands on the Gila National Forest in New Mexico.

Within this subbasin, occupancy by spikedace and loach minnow is mixed. None of the streams designated as critical habitat in the Blue River Subbasin were known to have been occupied at listing by spikedace. Streams within this subbasin are included as 2b streams for spikedace under the ruleset. In contrast, the Blue River was known to have been occupied at listing, and all of the tributary streams of Campbell Blue, Little Blue, Pace, Dry Blue, and Frieborn Creeks were discovered to be occupied by loach minnow after listing, as follows: Campbell Blue Creek—1987; Pace Creek—1998; Dry Blue Creek—1998, and Frieborn Creek—1998 (ASU 2002). We are therefore including each of these streams as 1a streams under the ruleset for loach minnow. Additional detail on the suitability of each stream is provided below.

Both Species. We are including within these designations 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. As noted above, this river was not known to have been occupied by spikedace at listing. The Blue River is occupied by loach minnow, and contains suitable habitat for all life stages of loach minnow (PCE 1); has an appropriate food base (PCE 2); consists of perennial streams with no or low pollutant issues (PCEs 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 (PCE 5); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6). The Blue River occurs predominantly on Federal lands on the Apache-Sitgreaves National Forest, as well as on private parcels of land within the Forest. 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; moderate to severe drought (University of Nebraska-Lincoln 2011, p. 1); and competition with and predation by nonnative aquatic species.

The larger size of the Blue River, compared to smaller, tributary streams within the species' range, along with its perennial flows and conservation management activities, make this area important to spikedace. 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 and allow for translocation of spikedace. Barrier feasibility studies have been completed, as has a draft Memorandum of Understanding with land managers and residents in this area. Federal land ownership throughout the majority of this proposed critical habitat unit would facilitate management for the species. We therefore consider the Blue River to be essential to the conservation of spikedace.

We are including within these designations stream miles on multiple tributaries for both spikedace and loach minnow, as follows:

- Campbell Blue Creek—12.4 km (7.7 mi) 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.
- Pace Creek—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.
- Dry Blue Creek—4.7 km (3.0 mi) of Dry Blue Creek from the confluence with Campbell Blue Creek upstream to the confluence with Pace Creek.
- Frieborn Creek—1.8 km (1.1 mi) of Frieborn Creek from the confluence with Dry Blue Creek upstream to an unnamed tributary.
- Little Blue Creek—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 an unnamed canyon. Above the canyon, flows are not perennial.

Each of these streams were occupied at the time of listing by loach minnow, contain suitable habitat for all life stages (PCE 1); have an appropriate food base (PCE 2); consist of perennial flows with no or low levels of pollutants (PCEs 3 and 4); have no nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low to allow persistence of spikedace and loach minnow (PCE 5); and have an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6). 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 to severe drought (University of Nebraska-Lincoln 2011, p. 1); and competition with and predation by nonnative aquatic species. Campbell Blue Creek and portions of the Blue River were burned during the Wallow Fire in 2011, and increased ash and sedimentation within the active stream may be a temporary issue in these streams.

Because these streams are occupied by loach minnow, which often co-occur with spikedace, and because they occur within the historical range of the species, we believe these streams are suitable for spikedace. In addition, as discussed above, perennial flows, and occurrence predominantly on Federal lands make these areas especially suitable for spikedace recovery, and cooperative management plans for a native fishery in the Blue River enhance opportunities for spikedace conservation. We therefore believe the Blue River, Campbell Blue, Pace, Dry

Blue, Frieborn, and Little Blue creeks to be essential to the conservation of the species.

Unit 8. Gila River Subbasin

These designations include approximately 258.6 km (160.7 mi) of the upper Gila River and five tributaries including West Fork Gila River, Middle Fork Gila River, East Fork Gila River, Mangas Creek, and Bear Creek in Hidalgo, Grant, and Catron Counties, New Mexico. A slightly larger area was included for loach minnow on the Middle Fork Gila River. All mileage included for spikedace on the Middle Fork Gila River is included within this area. All streams included within this unit are considered occupied at listing by both species (Paroz *et al.* 2009, p. 12), and therefore meet the criteria for 1a streams under the ruleset. Spikedace and loach minnow were first detected in Mangas Creek after listing, which meets the criteria for a 1a stream under the ruleset (in 1999; NMGFD 2008). Similarly, loach minnow were first detected in Bear Creek after listing, which also meets the criteria for a 1a stream (in 2005; Schiffmiller 2005; NMGFD 2008).

Both Species. These designations include 153.5 km (95.4 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 are included within these designations. Below Moore Canyon, the river is substantially altered by agriculture, diversion, and urban development. In addition, there are no loach minnow and only one spikedace records known from the Gila River between its confluence with Moore Canyon and a spikedace record from Pinal County, Arizona, near the Ashurst-Hayden Dam. This portion of the Gila River supports the largest remaining populations of spikedace and loach minnow (NMDGF 2008; Propst *et al.* 2009, pp. 14–17). In addition, we are designating 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 and 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. Above EE Canyon, the river becomes unsuitable for spikedace and loach minnow due to gradient and channel morphology. All stream segments contain suitable habitat for all life stages of spikedace and loach minnow (PCE 1); have an appropriate food base (PCE 2); consist of perennial streams with no or low levels of pollutants (PCEs 3 and 4); and have an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6).

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 (NMDGF at Heart Bar Wildlife Area). The essential features in the Gila River 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; recreation; and moderate drought (University of Nebraska-Lincoln 2011, p. 1).

Approximately 11.5 km (7.2 mi) of streams on the Gila River mainstem within this unit are owned and managed by FMC. This area has been excluded from the final critical habitat designations under section 4(b)(2) of the Act (see ''*Application of Section 4(b)(2) of the Act*'' section below for additional information).

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, watershed impacts associated with past wildfires, and moderate drought (University of Nebraska-Lincoln 2011, p. 1).

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; watershed impacts associated with past wildfires (University of Nebraska-Lincoln 2011, p. 1).

We are including within these designations 1.2 km (0.8 mi) of Mangas Creek for both species from the confluence with the Gila River upstream to the confluence with Willow Creek. 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 (PCE 1); has an appropriate food base (PCE 2); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6).

Approximately 7.9 km (4.9 mi) on Mangas Creek within this unit are on lands owned and managed by FMC. These areas have been excluded from the final critical habitat designations 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 on Mangas Creek occur primarily on private lands, with small portions occurring on lands managed by the BLM. The essential features in Mangas Creek may require special management considerations or protection due to residual impacts of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; impaired water quality due to high organic matter and excessive algal growth likely caused by resource extraction (mining), loss of riparian habitat, wildlife use of the area, municipal discharges, recreation and tourism, agriculture (livestock grazing) (EPA 2002, pp. 4–12; EPA 2004; EPA 2010, p. 1) and moderate drought (University of Nebraska-Lincoln 2011, p. 1).

Spikedace Only. We are including within the designation 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 (PCE 1); has an appropriate food base (PCE 2); consists of perennial streams with no or low pollutant issues (PCEs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6). This area is considered essential to the survival and recovery of the species because of its historical and current occupancy and multiple PCEs. 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; watershed impacts associated with past wildfires; and

moderate drought (University of Nebraska-Lincoln 2011, p. 1).

Loach Minnow Only. In addition to the areas described above for this unit, we are including within the 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). 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 (PCE 1); has an appropriate food base (PCE 2); consists of perennial flows with no or low levels of pollutants (PCEs 3 and 4); and has an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6). This area is considered essential to the survival and recovery of loach minnow due to its historical and current occupancy, its multiple PCEs, and its connection to the West Fork of the Gila River, which is currently occupied by loach minnow. See the description above, describing the designation along the West and Middle Forks of the Gila River for spikedace for details on land ownership and special management needs.

We are including within this designation 31.4 km (19.5 mi) of Bear Creek from its confluence with the Gila River upstream to the confluence with Sycamore Creek and North Fork Walnut Creek. Loach minnow were first found in Bear Creek in 2005 and again in 2006 (Schiffmiller 2005, pp. 1–4; NMDGF 2008). Bear Creek is classified as perennial interrupted, with stream segments that may dry up seasonally, depending on weather events (USFS 2010). While it was initially 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, further discussions with biologists familiar with the stream, a review of the loach minnow records, and reconsideration of the species biology make this seem unlikely. The location of the loach minnow detections on Bear Creek was approximately 18 miles upstream of the Gila River confluence. We believe it is unlikely that loach minnow were able to swim upstream 18 miles during a high flow event to become established in this location. Nearby Dorsey Spring maintains perennial flows in the section of river in which the loach minnow are found, and we believe it is more likely that loach minnow persist in this area of perennial flows.

Portions of Bear Creek contain suitable habitat for all life stages of loach minnow (PCE 1); have an appropriate food base (PCE 2); consist of perennial flows with no or low levels of pollutants (PCEs 3 and 4); have no nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low to allow persistence of spikedace and loach minnow (PCE 5); and have an appropriate hydrologic regime to maintain suitable habitat characteristics (PCE 6). The essential features in this stream may require special management considerations or protection due to some residual impacts of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; and moderate drought (University of Nebraska-Lincoln 2011, p. 1).

Approximately .9 km (1.2 mi) on Bear Creek within this unit are on lands owned and managed by FMC. These areas have been excluded from the final critical habitat designations under section 4(b)(2) of the Act (see *''Application of Section 4(b)(2) of the Act''* section below for additional information).

TABLE 8—STREAM SEGMENTS CONSIDERED IN THESE CRITICAL HABITAT DESIGNATIONS AND THE CRITERIA UNDER WHICH THEY ARE IDENTIFIED

Stream	Occupied by spikedace at the time of listing or at any time thereafter/rule criteria met	Occupied by loach minnow at the time of listing or at any time thereafter/rule criteria met *
Unit 1—Verde River Subbasin		
Verde River	Yes/1a	No/2b.
Granite Creek	No/2a	No/2b.
Oak Creek	No/2a	No/2b.
Beaver and Wet Beaver Creek	No/2a	No/2b.
West Clear Creek	No/2a	Not applicable.
Fossil Creek	No/2a	No/2b.
Unit 2—Salt River Subbasin		
Salt River	No/	Not applicable.
Tonto Creek	No/2b	Not applicable.
Greenback Creek	No/2b	Not applicable.
Rye Creek	No/2b	Not applicable.
Spring Creek	No/2b	Not applicable.
Rock Creek	No/2b	Not applicable.
White River	Not Applicable	Yes/1a.
East Fork White River	Not Applicable	Yes/1a.
East Fork Black River	Not applicable	No/2a.
North Fork East Fork Black River	Not applicable	Yes/1a.
Boneyard Creek	Not applicable	Yes/1a.
Coyote Creek	Not applicable	No/2a.
Unit 3—San Pedro River Subbasin		
San Pedro River	No/2b	No/2b.
Hot Springs Canyon	No/2a	No/2a.
Bass Canyon	No/2a	No/2a.

TABLE 8—STREAM SEGMENTS CONSIDERED IN THESE CRITICAL HABITAT DESIGNATIONS AND THE CRITERIA UNDER WHICH THEY ARE IDENTIFIED—Continued

Stream	Occupied by spikedace at the time of listing or at any time thereafter/rule criteria met	Occupied by loach minnow at the time of listing or at any time thereafter/rule criteria met *
Redfield Canyon	No/2a	No/2a.
Aravaipa Creek	Yes/1a	Yes/1a.
Deer Creek	No/2a	Yes/1a.
Turkey Creek	No/2a	Yes/1a.
Unit 4—Bonita Creek Subbasin		
Bonita Creek	No/2b	No/2b.
Unit 5—Eagle Creek Subbasin		
Eagle Creek	Yes/1a	Yes1a.
Unit 6—San Francisco River Subbasin		
San Francisco River	No/2b	Yes/1a.
Tularosa River	Not applicable	Yes/1a.
Negrito Creek	Not applicable	Yes/1a.
Whitewater Creek	Not applicable	Yes/1a.
Unit 7—Blue River Subbasin		
Blue River	No/2b	Yes/1a.
Campbell Blue Creek	No/2b	Yes/1a
Little Blue Creek	No/2b	Yes/1a.
Pace Creek	No/2b	Yes/1a
Frieborn Creek	No/2b	Yes/1a.
Dry Blue Creek	No/2b	Yes/1a.
Unit 8—Gila River Subbasin		
Gila River	Yes/1a	Yes/1a.
West Fork Gila River	Yes/1a	Yes/1a.
Middle Fork Gila River	Yes/1a	Yes/1a.
East Fork Gila River	Yes/1a	Yes/1a.
Mangas Creek	Yes/1a	Yes/1a.
Bear Creek	Not Applicable	Yes/1a.

Effects of Critical Habitat Designations

Section 7 Consultation

Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. In addition, section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed under the Act or result in the destruction or adverse modification of proposed critical habitat.

Decisions by the 5th and 9th Circuit Courts of Appeals have invalidated our regulatory 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 continue to serve its intended conservation role for the species.

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. Examples of actions that are subject to the section 7 consultation process are actions on State, tribal, local, or private lands that require 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 the Service under section 10 of the Act) or that involve some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency). Federal actions not affecting listed species or critical habitat, and actions on State, tribal, local, or private lands that are not federally funded or authorized, do not require section 7 consultation.

As a result of section 7 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, or 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 and/or destroy or adversely modify critical habitat, we provide reasonable and prudent alternatives to the project, if any are identifiable, that would avoid the likelihood of jeopardy and/or destruction or adverse modification of critical habitat. We define ''reasonable and prudent alternatives'' (at 50 CFR 402.02) as alternative actions identified during consultation that:

(1) Can be implemented in a manner consistent with the intended purpose of the action,

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

(3) Are economically and technologically feasible, and

(4) Would, in the Director's opinion, avoid the likelihood of jeopardizing the continued existence of the listed species and/or avoid the likelihood of 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 sometimes may 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.

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. Activities that may destroy or adversely modify critical habitat are those that alter the PCEs 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 life-history needs of the species and provide for the conservation 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.

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

(1) Actions that would significantly 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 (nonpoint 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 improper livestock grazing; 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 could result in the introduction, spread, or augmentation of 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 (whether native or nonnative); stocking of nonnative amphibians or other nonnative taxa; 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 eliminate the spikedace or loach minnow, degrade 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 Amendment 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 resource 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:

(1) An assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species;

(2) A statement of goals and priorities;

(3) A detailed description of management actions to be implemented to provide for these ecological needs; and

(4) 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 with a completed INRMP within the critical habitat designations for either species. Therefore, we are not exempting lands from these final designations of critical habitat for spikedace or loach minnow pursuant to section 4(a)(3)(B)(i) of the Act.

Exclusions

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

Section 4(b)(2) of the Act states that the Secretary shall designate and make revisions to 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 statute on its face, as well as the legislative history are clear that the Secretary has broad discretion regarding which factor(s) to use and how much weight to give to any factor.

In considering whether to exclude a particular area from the designations, we identify the benefits of including the area in the designations, identify the benefits of excluding the area from the designations, and evaluate whether the benefits of exclusion outweigh the benefits of inclusion. If the analysis indicates that the benefits of exclusion outweigh the benefits of inclusion, the Secretary may exercise his discretion to exclude the area only if such exclusion would not result in the extinction of the species.

When identifying 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 identifying 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; or implementation of a management plan that provides equal to or more conservation than a critical habitat designation would provide, forego disproportionate economic impacts resulting from the designation of critical habitat, or avoid potential conflicts with national security issues.

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

Based on the information provided by entities seeking exclusion, as well as any additional public comments received, we evaluated whether certain lands in the critical habitat in Units 1, 2, 3, 5, and 8 were appropriate for exclusion from these final designations pursuant to section 4(b)(2) of the Act. As discussed in detail below, the Secretary is exercising his discretion to exclude the following areas from critical habitat designations for both spikedace and loach minnow:

(1) The San Pedro River in its entirety within Unit 3 of the designations;

(2) Those portions of the Verde River and Beaver and Wet Beaver Creeks in Unit 1 occurring within the boundaries of the Yavapai-Apache Nation and subject to the provisions of Tribal Resolution 46–2006;

(3) Those portions of the mainstem White River and East Fork White River within the boundaries of the White Mountain Apache Tribe and subject to the provisions of the Loach Minnow Management Plan;

(4) Those portions of Eagle Creek in Unit 5 that are within the boundaries of the San Carlos Apache Nation and subject to the provisions of their FMP;

(5) Those portions of the mainstem Eagle Creek and the San Francisco River that are owned by FMC or their subsidiaries; and

(6) Those portions of the Gila River, Mangas Creek, or Bear Creek that are owned by FMC or their subsidiaries.

The Secretary is also exercising his discretion to exclude the areas because we determined the following:

(1) Their value for conservation will be preserved for the foreseeable future by existing protective actions, or

(2) The benefit of excluding them under the ''other relevant factor'' provisions of section 4(b)(2) of the Act outweighs the benefit of including them in critical habitat.

Table 9 below provides approximate length of streams that meet the definition of critical habitat but are excluded under section 4(b)(2) of the Act from the final critical habitat rule. Table 9 also provides our reasons for the exemptions and exclusions.

TABLE 9—EXCLUSIONS AND AREAS CONSIDERED FOR EXCLUSION FROM DESIGNATION OF CRITICAL HABITAT FOR LOACH MINNOW AND SPIKEDACE BY CRITICAL HABITAT UNIT

Unit	Specific area	Basis for exclusion	Areas meeting the definition of critical habitat in kilometers (miles)	Areas excluded in kilometers (miles)
1	Verde River and Beaver and Wet Beaver Creeks on Yavapai-Apache Nation lands.	Yavapai-Apache Nation Tribal Resolution 46–2006; Tribal Sovereignty; Working Relationship with the Yavapai-Apache Nation.	1.2 km (0.8 mi) of the Verde River and 0.2 km (0.1 mi) of Beaver Creek and Wet Beaver Creek.	1.2 km (0.8 mi) of the Verde River and 0.2 km (0.1 mi) of Beaver Creek and Wet Beaver Creek.

TABLE 9—EXCLUSIONS AND AREAS CONSIDERED FOR EXCLUSION FROM DESIGNATION OF CRITICAL HABITAT FOR LOACH MINNOW AND SPIKEDACE BY CRITICAL HABITAT UNIT—Continued

Unit	Specific area	Basis for exclusion	Areas meeting the definition of critical habitat in kilometers (miles)	Areas excluded in kilometers (miles)
2	Mainstem White River and East Fork White River.	Loach Minnow Management Plan; Tribal Sovereignty; Working Relationship with the White Mountain Apache Tribe.	29.0 km (18.0 mi) of the White River and 17.2 km (10.7 mi) of the East Fork White River.	29.0 km (18.0 mi) of the White River and 17.2 km (10.7 mi) of the East Fork White River.
3	San Pedro River	National Security	59.8 km (37.2 mi) of the San Pedro River.	59.8 km (37.2 mi) of the San Pedro River.
5	Eagle Creek	San Carlos Apache Tribe Fisheries Management Plan; Tribal Sovereignty; Working Relationship with the San Carlos Apache Tribe.	75.5 km (46.9 mi) of Eagle Creek.	27.5 km (17.1 mi) of Eagle Creek on the San Carlos Apache Reservation.
5	Eagle Creek	FMC Spikedace and Loach Minnow Management Plan Eagle Creek and San Francisco River Greenlee and Graham County, Arizona.	75.5 km (46.9 mi) of Eagle Creek.	Approximately 21.4 km (13.3 mi) of Eagle Creek owned by FMC or its subsidiaries.
5	San Francisco River	FMC Spikedace and Loach Minnow Management Plan Eagle Creek and San Francisco River Greenlee and Graham County, Arizona.	203.6 km (126.5 mi of the San Francisco River for loach minnow; 180.7 km (112.3 mi) of the San Francisco River for spikedace.	14.1 km (8.8 mi) of the San Francisco River owned by FMC or its subsidiaries.
8	Gila River	FMC Spikedace and Loach Minnow Management Plan Upper Gila River, Including Bear Creek and Mangas Creek Grant County, New Mexico.	165.1 km (102.6 mi) of the Gila River.	12.9 km (7.2 mi) of the Gila River owned by FMC or its subsidiaries.
8	Bear Creek	FMC Spikedace and Loach Minnow Management Plan Upper Gila River, Including Bear Creek and Mangas Creek Grant County, New Mexico.	31.4 km (19.5 mi) of Bear Creek.	1.9 km (1.2 mi) of Bear Creek owned by FMC or its subsidiaries.
8	Mangas Creek	FMC Spikedace and Loach Minnow Management Plan Upper Gila River, Including Bear Creek and Mangas Creek Grant County, New Mexico.	9.1 km (5.7 mi) of Mangas Creek.	7.9 km (4.9 mi) of Mangas Creek owned by Freeport McMoRan or its subsidiaries.

Exclusions Based on Economic Impacts

Under section 4(b)(2) of the Act, we consider the economic impacts of specifying any particular area as critical habitat. In order to consider economic impacts, we prepared a draft economic analysis of the critical habitat designations and related factors (IEc. 2011). The draft analysis, dated July 6, 2011, was made available for public review from October 4, 2011, through November 3, 2011 (76 FR 61330). Following the close of the comment period, a final analysis (dated January 24, 2012) of the potential economic effects of the designations was developed taking into consideration the public comments and any new information (IEc 2012).

The intent of the final economic analysis (FEA) is to quantify the economic impacts of all potential conservation efforts for spikedace and loach minnow; some of these costs will likely be incurred regardless of whether we designate critical habitat (baseline). The economic impact of the final critical habitat designations is analyzed by comparing scenarios both ''with critical habitat'' and ''without critical habitat.'' The ''without critical habitat'' scenario represents the baseline for the analysis, considering protections already in place for the species (e.g., under the Federal listing and other Federal, State, and local regulations). The baseline, therefore, represents the costs incurred regardless of whether critical habitat is designated. The ''with critical habitat'' scenario describes the incremental impacts associated specifically with the designations of critical habitat for the species. The incremental conservation efforts and associated impacts are those not expected to occur absent the designations of critical habitat for the species. In other words, the incremental costs are those attributable solely to the designations of critical habitat above and beyond the baseline costs; these are the costs we consider in the final designations of critical habitat. The analysis looks retrospectively at baseline impacts incurred since the species was listed, and forecasts both baseline and incremental impacts likely to occur with the designations of critical habitat.

While we think that the incremental effects approach is appropriate and meets the intent of the Act, we have taken a conservative approach in this instance to ensure that we are fully evaluating the probable effects of this designation. Given that we do not have

a new definition of ''destruction or adverse modification,'' there may be certain circumstances where we may want to evaluate impacts beyond those that are solely incremental. Such is the case with spikedace and loach minnow, where we have extensive case law and determinations of effects that suggest we gather information concerning not only incremental effects, but also coextensive effects.

The FEA also addresses how potential economic impacts are likely to be distributed, including an assessment of any local or regional impacts of habitat conservation and the potential effects of conservation activities on government agencies, private businesses, and individuals. Decision-makers can use this information to assess whether the effects of the designations might unduly burden a particular group or economic sector. Finally, the FEA considers those costs that may occur in the 20 years following the designation of critical habitat, which was determined to be the appropriate period for analysis based on the data available during the analysis. The FEA quantifies economic impacts of spikedace and loach minnow conservation efforts associated with the following categories of activity: Water use and management; livestock grazing; recreation; species management; residential and commercial development; transportation, fire management; and Tribal lands.

The FEA estimates that no significant economic impacts are likely to result from the designation of critical habitat. Quantified incremental impacts are estimated to be $2.95 million to $6.7 million over 20 years ($261,000 to $592,000 annually) using a discount rate of seven percent. The San Pedro River Unit, is anticipated to bear the highest incremental costs in both the low and high end scenarios. Quantified incremental costs are related to an anticipated large and costly consultation at Fort Huachuca Military Reservation, as well as annual monitoring costs on the San Pedro River of $100,000 to $200,000 annually. It should be noted that the San Pedro River has been excluded under section 4(b)(2) of the Act and is not part of the final designation, due to national security impacts at Fort Huachuca. The next largest quantified incremental impacts are expected in the Gila River unit primarily related to anticipated costs related to riparian fencing construction.

In conclusion, there is not significant economic impact are likely to be a result from the designation of critical habitat for these two species. As a result, the Secretary is not exercising his discretion to exclude any particular area from the final designation based on a disproportionate economic impact to any entity or sector. A copy of the FEA with supporting documents may be obtained by contacting the Arizona Ecological Services Field Office (see **ADDRESSES**) or by downloading from the Internet at *http://www.regulations.gov* or at *http://www.fws.gov/southwest/es/arizona/*.

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 these designations, we determined that the lands within the designations of critical habitat for spikedace and loach minnow are not owned or managed by the DOD. A nexus exists, however, between critical habitat in the San Pedro River in Subunit 3 and groundwater pumping by the United States Army Garrison Fort Huachuca (Fort Huachuca) in Cochise County, Arizona. An additional nexus is created by the geographic areas not owned but designated for use by Fort Huachuca. Because of this, and in response to comments received from Fort Huachuca, we completed a balancing analysis of the benefits of inclusion and the benefits of exclusion of lands in the San Pedro River in Subunit 3.

Fort Huachuca

Fort Huachuca is located in Cochise County, Arizona, approximately 15 miles north of the international border with Mexico. While the area designated as Fort Huachuca itself does not occur along the San Pedro River, Fort Huachuca officials indicated in their comment letter that there are geographic areas designated for Department of Defense (DOD) use including the Buffalo Soldier Electronic Test Range (BSETR), R–2303 restricted airspace, and groundwater resources in a regional aquifer of the Sierra Vista Subwatershed of the San Pedro River that are all located within critical habitat in Unit 3. The BSETR covers approximately 10.5 square kilometers (4.1 square miles), with 10.1 square kilometers (3.9 square miles) off-post and encompassing the entire 60 km (30.7 mi) of the critical habitat proposed along the San Pedro. Their R–2303 restricted airspace covers 3.9 square kilometers (1.5 square miles), with 3.4 square kilometers (1.3 square miles) off-post and nearly totally encompassing the critical habitat along the San Pedro River.

Fort Huachuca notes that the Army and Joint Military testing community is co-located at Fort Huachuca because of the BSETR and the unique environmental setting in which it occurs, which allows for specialized electronic testing. According to Fort Huachuca, the BSETR and R–2303 restricted airspace are vital resources to national security that are not duplicated elsewhere within the United States. For the BSETR, Fort Huachuca notes that ''the metal-bearing mountain ranges on the Fort create conditions conducive to testing and that these conditions are not replicated anywhere else in the United States with the only other known location in the world in the outback of Australia (Fort Huachuca 2011).'' With respect to the R–2303 restricted airspace, Fort Huachuca notes that the special restricted airspace that extends downward to the ground surface is critical for the training of Unmanned Aerial Systems operators for the Army, Marines, National Guard, and Department of Homeland Security. Fort Huachuca notes that this type of restricted airspace, which extends to the ground surface, is not duplicated anywhere else in the United States, and that this is one of the only Military Restricted Airspace complexes in the country: (1) Whose activation has no impact on commercial air traffic corridors; and (2) allows for unmanned aircraft to have priority over manned aircraft for testing, training, and border security. Fort Huachuca cites several other examples of the importance of their activities to national security; however, the BSETR and the unique environmental settings in which it occurs, as well as the R–2303 restricted airspace, were of greatest concerns in this evaluation due to lack of duplicate conditions elsewhere in the United States.

To carry out these missions, Fort Huachuca pumps groundwater to serve its on-base military and civilian population. Fort Huachuca's pumping results in both removal of groundwater from storage in the regional aquifer and the capture of water from discharge. Groundwater in storage is that which resides in an aquifer. Such stored water may be discharging to a spring or waterway. Water withdrawn from the ground by wells initially derives exclusively from storage. As pumping continues, increasing proportions of water are derived from the capture of discharge, and decreasing proportions are derived from storage. In other words, ground water wells are withdrawing not only water residing in the aquifer, but also water that was otherwise destined to become the surface flow of a stream or be available to sustain riparian

vegetation. If water withdrawal continues unmitigated, it will eventually deplete storage, reverse the flow direction of groundwater, and capture (dewater) the stream itself. Deprivation of the base flow of the San Pedro River could eventually cause perennial reaches to become intermittent or ephemeral. While these portions of the San Pedro River are not currently occupied by either species, such a change in the hydrologic regime of the San Pedro River, depending upon the reach in which it occurred, may not allow the San Pedro River to facilitate the expansion of the geographic distribution of spikedace and loach minnow in areas not occupied at the time of listing. Expansion within the geographic historic range of the species is important to the conservation of the species, as identified in the ruleset for ''2b'' areas.

The potential impacts of groundwater pumping by Fort Huachuca on several threatened and endangered species are described in detail in a 2007 section 7 biological opinion (Service 2007; Service 2002b and Service 2002c). This opinion also details the actions taken by Fort Huachuca to minimize the effects of their groundwater pumping. These actions are numerous, and include fixture upgrades (i.e., replacement of high water use plumbing fixtures with low water use fixtures), facility infrastructure removal/consolidation (i.e., demolition of facilities), aggressive leak detection and repair, water conservation education, and implementation of a strict landscape watering policy in military family housing. Fort Huachuca has also undertaken groundwater recharge, acquisition of conservation easements to reduce future developments, mitigation for increases in personnel, participation in and providing funding to the Upper San Pedro Partnership (USPP), and development of a strategic plan for water mitigation.

According to the biological opinion, costs to Fort Huachuca for this work are considerable. As noted in the biological opinion, Fort Huachuca typically invests $3.3 to $5.5 million per year in environmental, natural resources, and cultural projects. From 1997 through 2006, Fort Huachuca spent over $42 million in those categories exclusive of the $12 million spent for large construction (effluent recharge and extension of an effluent distribution system) projects. The biological opinion notes that recently, funding emphasis has shifted toward management of threatened and endangered species, and Fort Huachuca spent an estimated $10 million in a 4-year period for conservation work.

The biological opinion addressed potential impacts of actions taken by Fort Huachuca on Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*) with critical habitat, southwestern willow flycatcher (*Empidonax traillii extimus*) with critical habitat, Mexican spotted owl (*Strix occidentalis lucida*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*), Huachuca springsnail (*Pyrgulopsis thompsoni*), Ramsey Canyon leopard frog (*Rana subaquavocalis*), Canelo Hills ladies' tresses (*Spiranthes delitescens*); bald eagle, (*Haliaeetus leucocephalus*); jaguar (*Panthera onca*); spikedace with critical habitat; Gila topminnow (*Poeciliopsis occidentalis occidentalis*), and desert pupfish (*Cyprinodon macularius*). With respect to the critical habitat designation, Fort Huachuca notes they already completely offset groundwater pumping associated with on-post groundwater use, and are required to mitigate an additional 1,000 acre feet of groundwater use due to off-post groundwater usage at an estimated cost of $20,000 to $40,000 per acre foot, or a total cost of $20 million to $40 million. Fort Huachuca further notes that the completed biological opinion allows for up to 16,000 employees, which limits their flexibility with respect to DOD's needs to ''* * * bring additional high priority, high visibility missions to the fort (Fort Huachuca 2011, p. 11)''. They conclude that any additional restrictions placed on them have a strong probability of impacting the missions currently present at Fort Huachuca as well as DOD's flexibility to respond to changing requirements in theater and to protect the lives of military personnel (Fort Huachuca 2011, p. 11).

In a 2011 court decision (*See Center for Biological Diversity et al.* v. *Salazar et al.* 4:07-cv-00484–AWT), United States District Court, District of Arizona), the completed biological opinion was deemed inadequate in addressing recovery of the Huachuca water umbel and the Southwestern willow flycatcher, among other factors, and Fort Huachuca will be required to reconsult with the Service.

Benefits of Inclusion—Fort Huachuca

The principal benefit of including an area in a critical habitat designation is the requirement for Federal agencies to ensure actions they fund, authorize, or carry out are not likely to result in the destruction or adverse modification of any designated critical habitat, the regulatory standard of section 7(a)(2) of the Act under which consultation is completed. Federal agencies must also consult with us on actions that may affect a listed species and refrain from undertaking actions that are likely to jeopardize the continued existence of such species. The analysis of effects of a proposed project on critical habitat is separate and different from that of the effects of a proposed project on the species itself. The jeopardy analysis evaluates the action's impact to survival and recovery of the species, while the destruction or adverse modification analysis evaluates the action's effects to the designated habitat's contribution to conservation. Therefore, the difference in outcomes of these two analyses represents the regulatory benefit of critical habitat. This will, in many instances, lead to different results and different regulatory requirements. Thus, critical habitat designations may provide greater benefits to the recovery of a species than would listing alone.

However, for some species, and in some locations, the outcome of these analyses will be similar, because effects to habitat will often also result in effects to the species. In the case of spikedace and loach minnow in the San Pedro River, consultation would occur strictly based on critical habitat as the species are absent from this stream. Therefore, this principal benefit of section 7 consultation under the Act would be a benefit of inclusion of the San Pedro within the designation. BLM manages 50.6 km (31.4 mi), or 84 percent, of the land along the portion of the San Pedro River included within the designation, so actions taken by them or on their lands would likely result in section 7 consultation for any potential effects to critical habitat for spikedace or loach minnow.

An additional benefit of including portions of the San Pedro River within the critical habitat designation for spikedace and loach minnow is that it provides an additional 59.8 km (37.2 mi) of critical habitat within the southeastern portion of their historical range. The San Pedro River has collection records for both species that begins in the 1840s and spans more than 120 years. We categorized the San Pedro River as a 2a stream in this rule, as it was not identified as occupied at listing by either species, but has the features essential to the conservation for spikedace and loach minnow and would serve as an extension of occupied habitat in Aravaipa Creek within Unit 3.

Public education is often cited as another possible benefit of including lands in critical habitat as it may help focus conservation efforts on areas of

high value for certain species. A critical habitat designation can inform the public about the Act, listed species, their habitat needs, and conservation. Only 9.2 km (5.7 mi), or 16 percent, of the portion of the San Pedro within the designation are on private lands; however, because this area is indirectly tied to Fort Huachuca, and Fort Huachuca can have a staff of up to 16,000 individuals and interacts with other management groups through the Upper San Pedro Partnership, the educational benefits may be expanded beyond private landowners immediately adjacent to the stream.

The designation of critical habitat may strengthen or reinforce some Federal laws, such as NEPA or the Clean Water Act. These laws analyze the potential for projects to significantly affect the environment. Critical habitat may signal the presence of sensitive habitat that could otherwise be missed in the review process for these other environmental law. Because multiple listed species are known to occur along the San Pedro River, the overall impact of the designation in strengthening or reinforcing other laws is somewhat diminished as there have been and would continue to be awareness for other species listed under the Act that would lead to conservation measures.

Benefits of Exclusion—Fort Huachuca

As noted above, there are benefits to spikedace and loach minnow from having this portion of the San Pedro River protected as critical habitat for the two species, particularly given that it is currently unoccupied by either species. However, the minimal conservation and regulatory benefits gained through inclusion of this area as critical habitat for spikedace and loach minnow are at least partially offset by the fact that this area is already managed for a number of other species under which protections would be in place, including those covered by the biological opinion, as discussed above.

According to Fort Huachuca's comment letter, inclusion of the San Pedro as critical habitat for spikedace and loach minnow has a high probability of negative impacts to missions that are essential to national security. While actions taken by Fort Huachuca are already analyzed for effects to other species, Fort Huachuca states that, should critical habitat be designated in the San Pedro River, additional restrictions may result for protection of spikedace and loach minnow critical habitat, particularly as both species require running streams for habitat. Fort Huachuca currently has a staff of approximately 13,100, but anticipates that number could rise to 16,000. They note that any additional restrictions to water usage could affect their ability to increase staffing when needed, or carry out missions critical to national security. Further, because of the unique conditions within the BSETR, these missions could not be moved to another location as no other areas within the United States currently have those conditions. With the recent litigation on the existing biological opinion, and the requirement that consultation be completed again, the Fort believes there is both uncertainty as to what measures may be required of them through section 7 consultation to resolve the court's concern, as well as strong evidence that third party litigation may influence actions required of them in the future.

Weighing Benefits of Exclusion Against Benefits of Inclusion—Fort Huachuca

We reviewed and evaluated the benefits of inclusion and the benefits of exclusion of the 59.8-km (37.2-mi) stretch of the San Pedro River for which Fort Huachuca has requested exclusion from these designations of critical habitat. Since this portion of the San Pedro River is unoccupied, a benefit of inclusion of this portion of the San Pedro River would be the requirement of section 7 consultation under the adverse modification standard. However, we believe there would be minimal additional regulatory and educational benefits from a designation of critical habitat for spikedace and loach minnow because multiple listed species are known to occur along the San Pedro River and are currently being managed.

Because of the unique conditions within the BSETR, the critical national security missions could not be moved to another location as no other areas within the United States currently have those conditions. Therefore, exclusion of these lands from critical habitat will allow Fort Huachuca to continue their critical national security missions. Therefore, in consideration of the potential impact to national security, we determined the significant benefits of exclusion outweigh the benefits of inclusion in the critical habitat designation.

In summary, we find that excluding this 59.8-km (37.2-mi) stretch of the San Pedro River from this final critical habitat will preserve Fort Huachuca's ability to continue with their missions critical to national security. This benefit of continuing critical national security missions are significant and outweigh the minimal additional regulatory and educational benefits of including these lands in final critical habitat for spikedace and loach minnow.

Exclusion Will Not Result in Extinction of the Species—Fort Huachuca

The San Pedro River is not currently occupied by either spikedace or loach minnow. Loach minnow were last detected in 1961, and spikedace in 1966 (ASU 2002). The San Pedro represents a portion of the streams included within Unit 3, which also includes Aravaipa Creek, Hot Springs Canyon, Redfield Canyon, and Bass Canyon. As a result, this portion of the species range would not be void of protected habitat. Finally, the Service has identified eight units for designation as critical habitat, and the San Pedro River represents a portion of the habitat within one of eight units. Because the San Pedro is unoccupied, represents approximately eight percent of the overall proposed critical habitat designation for either spikedace or loach minnow, does not represent the only critical habitat designated within Unit 3, and will receive some protection through section 7 consultation for other species, we conclude that excluding the San Pedro River will not result in extinction of the species. Therefore, the Secretary is exercising his discretion to exclude the 59.8-km (37.2-mi) stretch of the San Pedro River from the designations of critical habitat for spikedace and loach minnow.

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 on 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 designations.

Land and Resource Management Plans, Conservation Plans, or Agreements Based on Conservation Partnerships

We consider a current land management or conservation plan (HCPs as well as other types) to provide adequate management or protection if it meets the following criteria:

(1) The plan is complete and provides the same or better level of protection from adverse modification or destruction than that provided through

a consultation under section 7 of the Act;

(2) There is a reasonable expectation that the conservation management strategies and actions will be implemented for the foreseeable future, based on past practices, written guidance, or regulations; and

(3) The plan provides conservation strategies and measures consistent with currently accepted principles of conservation biology.

We received information and management plans from four different entities, including the Yavapai-Apache Nation, White Mountain Apache Tribe, the San Carlos Apache Tribe, and from FMC Corporation. We have identified the benefits of inclusion and the benefits of exclusion for each of these management plans, and we carefully weighed the two sides to evaluate whether the benefits of exclusion outweigh those of inclusion.

Tribal Exclusions

In accordance with the Secretarial Order 3206, ''American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act'' (June 5, 1997); the President's Memorandum of April 29, 1994, ''Government-to-Government Relations with Native American Tribal Governments'' (59 FR 22951); President's Memorandum of November 5, 2009, ''Tribal Consultation'' (74 FR 57881); Executive Order 13175; and the relevant provision of the Departmental Manual of the Department of the Interior (512 DM 2), we believe that fish, wildlife, and other natural resources on tribal lands are more appropriately managed under tribal authorities, policies, and programs than through Federal regulation wherever possible and practicable. In most cases, designation of tribal lands as critical habitat provides very little additional conservation benefit to endangered or threatened species. Conversely, such designation is often viewed by tribes as an unwarranted and unwanted intrusion into tribal self-governance, and may negatively impact a positive government-to-government relationship between the Service and tribal governments essential to achieving a mutual goal of successfully managing ecosystems upon which endangered and threatened species depend. When conducting our analysis under section 4(b)(2) of the Act, we consider our existing and future partnerships with tribes and existing conservation actions that tribes have implemented or are currently implementing. We also take into consideration conservation actions that are planned as a result of ongoing government-to-government consultations with tribes.

Yavapai-Apache Nation—The Yavapai-Apache Nation submitted a comment letter during the first comment period in 2010 in which they discuss measures in place to protect the Verde River and its surrounding habitat on the lands of the Yavapai-Apache Nation. According to these comments, the Yavapai-Apache Nation is implementing conservation measures designed to preserve the Verde River and its riparian corridor for the benefit of all species, and in order to protect the traditional and cultural practices of the Nation. The Yavapai-Apache Nation's continued efforts to work cooperatively with the Service to protect federally listed species have been demonstrated through adoption of a Southwestern Willow Flycatcher Management Plan, dated May 25, 2005, which details objectives for protection of the riparian community on Tribal lands. The Yavapai-Apache Nation notes that the habitat protected under the Southwestern Willow Flycatcher Management Plan overlaps those areas proposed as critical habitat for spikedace. Because the existing Management Plan requires that the habitat of the Verde River be protected and preserved for the flycatcher, its protections similarly extend to the spikedace.

More specifically to spikedace and loach minnow and their habitat, the Yavapai-Apache Nation adopted Tribal Resolution 46–2006. Resolution 46–2006, completed in June of 2006, details land use restrictions and management plan goals along the Verde River ''* * * in order to continue to protect the traditional and cultural practices of the Nation, and to preserve those PCEs found within the riparian corridor of the Verde River which are essential to native wildlife species, including species listed as endangered or threatened by the federal government under the Endangered Species Act, such as the federally listed spikedace and loach minnow (Yavapai-Apache Nation 2006).''

The Resolution provides for conservation of the PCEs for spikedace and loach minnow both through conservation of existing habitat, and through restriction of some activities. The resolution established a riparian conservation corridor along both sides of the Verde River that encompasses the critical habitat designations. Protection and conservation of the riparian corridor minimizes disturbance in the active channel, protects vegetation, which in turn can act as a buffer strip and filter out sediment and contaminants from overland flow, stabilizes banks and reduces erosion and siltation, and maintains temperatures by preserving vegetation that provides shading of the stream channel (PCEs 1 and 2). In addition, the Resolution resolved that there would be no stocking of nonnative fishes (PCE 5), and that livestock, grazing, construction, and other activities would be minimized to assure that no net loss of habitat for spikedace and loach minnow occurs and that no permanent modification of habitat essential to spikedace and loach minnow is allowed. The Resolution also details a commitment by the Yavapai-Apache Nation to continue to cooperate with the Service on a variety of issues, including habitat monitoring and surveys.

In their 2010 comment letter, the Yavapai-Apache Nation notes that, under the Resolution, they have taken additional steps to protect the Verde River and its habitat. Specifically, they note that the Yavapai-Apache Nation's Tribal Housing Department and Planning Committee do not allow development within the riparian conservation corridor. The Yavapai-Apache Nation has also taken steps to educate Tribal members on the importance of protecting and preserving the Verde River and its riparian habitat for future generations. The Yavapai-Apache Nation further notes that they have pursued and secured grants that will enable them to examine ways to protect Verde River water quality and remove invasive plant species from the riparian corridor. The Yavapai-Apache Nation is examining how possible restoration activities and instream flow regimes could improve the health of riparian habitat within the Verde River and Beaver Creek to provide for restoration of native plants. Finally, the Yavapai-Apache Nation notes in their comment letter that they are continuing to improve their working relationship with the Service through improved coordination. These comments demonstrate that the Yavapai-Apache Nation has begun and continues to implement the Resolution, and provides the Service with the assurance that implementation of the Resolution is likely to continue.

The Yavapai-Apache Nation notes that a critical habitat designation on their lands would have adverse impacts to the Yavapai-Apache Nation and its ability to exist within its permanent Tribal homeland. Specifically, they believe these impacts will include interfering with the sovereign right of the Yavapai-Apache Nation to protect and control its own resources; undermining the positive and effective

government-to-government relationship between the Yavapai-Apache Nation and the Service; hampering or confusing the Yavapai-Apache Nation's own long-standing protections for the Verde River and its habitat; imposing an additional and disproportionate impact on the Yavapai-Apache Nation's overall land base, and adding additional economic and administrative costs, and potentially personnel burdens to the Yavapai-Apache Nation in order to meet increased section 7 consultations and other requirements under the Act. A Federal nexus exists for land use decisions or other tribal actions which require approval by the Bureau of Indian Affairs due the fact that the United States holds the Yavapai Apache land in trust, A federal nexus could also exists if a tribal action utilizes other Federal funding, or requires a Federal permit for their actions. The Service respects these concerns.

Benefits of Inclusion—Yavapai-Apache Nation

Those portions of the Verde River on lands belonging to the Yavapai-Apache Nation within the critical habitat designations for spikedace and loach minnow constitute part of a continuous stream habitat for the two species. Spikedace records exist for both the Verde River and Beaver Creek, although they are few in number and only as recent as 1950. We categorized the Verde River as a 1a stream for spikedace in the rule, as it was identified as occupied at listing, and supports one or more of the PCEs for the two species. We categorized the Verde River as a 2b stream for loach minnow, as it was not known to be occupied at listing.

The principal benefit of including an area in a critical habitat designation is the requirement for Federal agencies to ensure actions they fund, authorize, or carry out are not likely to result in the destruction or adverse modification of any designated critical habitat, the regulatory standard of section 7(a)(2) of the Act under which consultation is completed. The analysis of effects of a proposed project on critical habitat is separate and different from that of the effects of a proposed project on the species itself. We do consider the Verde River occupied, albeit at low numbers. Section 7 consultation would therefore require both a jeopardy and an adverse modification analysis. The draft and final economic analyses identified a future housing project, as well as wastewater treatment facilities and water development projects, all with potential ties to Federal funding or permitting, that could potentially require section 7 consultation.

Public education is often another possible benefit of including lands in critical habitat as it may help focus conservation efforts on areas of high value for certain species. The Service will continue ongoing coordination with the Yavapai-Apache Nation. However, we note that the Yavapai-Apache Nation has already undertaken education of Tribal members, as noted in their comment letter in which they indicate that they have taken steps to educate Tribal members on the importance of protecting and preserving the Verde River and its riparian habitat for future generations.

Finally, the designation of critical habitat may strengthen or reinforce some Federal laws, such as NEPA or the Clean Water Act. These laws analyze the potential for projects to significantly affect the environment. Critical habitat may signal the presence of sensitive habitat that could otherwise be missed in the review process for these other environmental laws. However, the Yavapai-Apache Nation is fully aware of the sensitive habitat on their lands.

Benefits of Exclusion—Yavapai-Apache Nation

Under Secretarial Order 3206, American Indian Tribal Rights, Federal-Tribal Trust Responsibilities and the Endangered Species Act, we recognize that we must carry out our responsibilities under the Act in a manner that harmonizes the Federal trust responsibility to tribes and tribal sovereignty while striving to ensure that tribes do not bear a disproportionate burden for the conservation of listed species, so as to avoid or minimize the potential for conflict and confrontation. In accordance with the Presidential memorandums of April 29, 1994, and November 9, 2009, we believe that, to the maximum extent possible, tribes are the appropriate governmental entities to manage their lands and tribal trust resources, and that we are responsible for strengthening government-to-government relationships with tribes. Federal regulation through critical habitat designation will adversely affect the tribal working relationships we now have and which we are strengthening throughout the United States. Maintaining positive working relationships with tribes is the key to implementing natural resource programs of mutual interest, including habitat conservation planning efforts. In light of the above-mentioned Secretarial Order 3206, and because of their sovereignty status, critical habitat designation is typically viewed by tribes as an unwarranted and unwanted intrusion into tribal self-governance. In comments submitted during the public comment periods on this proposed rule, tribes have stated that designation of critical habitat would negatively impact government-to-government relations.

In the case of the critical habitat designations for spikedace and loach minnow, the Yavapai-Apache Nation has indicated that designation on the Yavapai-Apache Reservation is not necessary to protect the habitat as the Nation already protects the riparian areas under its jurisdiction. They further note that such a designation is not only unwarranted but would be disruptive of the Nation's exercise of its own sovereign authority over its Tribal resources and lands. In addition, they state that the designation of critical habitat on Yavapai-Apache Nation lands would interfere with their ability to preserve themselves in their Tribal homeland, and that designation of critical habitat on the Reservation is contrary to the United States' obligations under the Apache Treaty of 1852 and to the Constitution of the Yavapai-Apache Nation, which was approved by the Secretary of the Interior. Finally, they note that designation of critical habitat on their lands would lead to restrictions and/or other circumstances that would violate the trust responsibility of the United States to the Yavapai-Apache Nation, as well as the letter and spirit of numerous Secretarial Orders and Presidential memoranda, as well as the Department of the Interior's own manual. The Yavapai-Apache Nation notes in their comment letter that they will use their own regulatory structure, including Resolution 46–2006, in protecting the Verde River and its riparian corridor. They note they have an ongoing commitment to cooperate with the Service on a wide variety of matters, including habitat monitoring, surveys, and future activities within the riparian corridor that may have the potential to adversely impact habitat essential to the conservation and recovery of federally listed species such as the spikedace and loach minnow.

We believe there are significant benefits from exclusion of the portion of the Verde River on the Yavapai-Apache Nation's lands. These benefits include:

(1) Continuing and strengthening of our ongoing coordination with the Tribe to promote conservation of spikedace and loach minnow and their habitat, as well as other federally listed species; and

(2) Allowing continued meaningful collaboration and cooperation in working toward recovering these species, including conservation actions

developed by a partnership with the Tribe that might not otherwise occur.

Because the Yavapai-Apache Nation is the entity that carries out protective regulations on Tribal trust reservation land, and we have a working relationship with them, we believe exclusion of these lands will yield a significant partnership benefit. There has been a substantial amount of coordination with the Yavapai-Apache Nation on spikedace and loach minnow, other federally listed species, and water management issues on the Verde River. In their comment letter, the Yavapai-Apache Nation has noted that we have established a positive and effective government-to-government relationship with them which in and of itself serves to protect federally listed species and their habitat. We will continue to work cooperatively with the Yavapai-Apache Nation on efforts to conserve spikedace and loach minnow. Therefore, excluding these lands from critical habitat would provide the benefit of maintaining and strengthening our existing conservation partnership.

Weighing Benefits of Exclusion Against Benefits of Inclusion—Yavapai-Apache Nation

We reviewed and evaluated the benefits of inclusion and the benefits of exclusion of those portions of the Verde River on the Yavapai-Apache Nation. The Yavapai-Apache Nation is educating Tribal members on the importance of conservation of the riparian corridor along the Verde River. Further, they are applying restrictions for building within the 100-year floodplain. The Yavapai-Apache Nation has indicated they will continue to use their existing regulatory structure in regulating development in this area to protect spikedace and loach minnow and their habitat. Further, exclusion of these lands from critical habitat will help preserve and strengthen the conservation partnership we have developed with the Yavapai-Apache Nation.

We believe that the Verde River supports one or more of the PCEs for spikedace and loach minnow. However, we believe the benefits to be gained through the Yavapai-Apache Nation's Tribal Resolution exceed those that would be gained through a critical habitat designation. Based on the information provided by the Yavapai-Apache Nation in their comment letter and Tribal resolution, the concerns outlined by the Yavapai-Apache Nation, and the protective measures already in place, we conclude that the benefits of excluding the 1.2 km (0.8 mi) of the Verde River and 0.2 km (0.1 mi) of Beaver Creek/Wet Beaver Creek outweigh the benefits of including this area.

Exclusion Will Not Result in Extinction of the Species—Yavapai-Apache Nation

While we believe these stream segments are important to the conservation of the species and currently support one or more PCEs, any direct impacts to the fish themselves due to exclusion of these areas is unlikely due to the low numbers of fish remaining in the Verde River. The protective measures already established by the Yavapai-Apache Nation will ensure that habitat remains in these streams for spikedace and loach minnow and that conservation of the two species and their habitat will not be precluded in this area. We therefore believe that excluding those portions of the Verde River and Beaver/Wet Beaver Creek on Yavapai-Apache Nation lands will not result in extinction of the species. Therefore, the Secretary is exercising his discretion to exclude the 1.2 km (0.8 mi) of the Verde River and 0.2 km (0.1 mi) of Beaver Creek/Wet Beaver Creek on Yavapai-Apache Nation lands from the designations of critical habitat for spikedace and loach minnow.

White Mountain Apache Tribe—The White Mountain Apache Tribe provided comments during the first comment period in 2010, and incorporated their 2000 Loach Minnow Management Plan (White Mountain Apache Tribe 2000) as part of their comments. The Loach Minnow Management Plan identifies several Tribal regulation and management efforts they believe to be beneficial to loach minnow, including Resolution #89–149, which designates streams and riparian zones as Sensitive Fish and Wildlife areas, requiring that authorized programs ensure these zones remain productive for fish and wildlife. The White Mountain Apache Tribe additionally adopted a Water Quality Protection Ordinance in 1999 to ''promote the health of Tribal waters and the people, plants and wildlife that depend on them through holistic management and sustainable use.''

The White Mountain Apache Tribe has also adopted Livestock and Range Management Plans, which regulate their stocking, rotation, and management practices for their Cattle Associations. According to their comments, their plan is aimed at ''maintaining or improving a stable and desired vegetative community, improving water quality and quantity, and reducing soil erosion'' while providing for livestock. The White Mountain Apache Tribe has also established Recreation Regulations and Game and Fish Code which regulates fishing, camping, hunting, and other recreational activities. The White Mountain Apache Tribe notes that large portions of the Reservation continue to be closed to recreational use.

The White Mountain Apache Tribe notes that they also have a process to review and approve all development activities on the Reservation. The Tribal Plan and Project Review Panel, among other things, investigates impacts to sensitive habitats and species, and provides for the implementation of mitigation measures to avoid adverse impacts to those resources. Finally, the White Mountain Apache Tribe noted in their comment letter that Tribal fish biologists and the sensitive species coordinator monitor any land operations or proposed timber sales along the East Fork White River, and monitor river levels, so that if river flows fall below a certain level, irrigation ditch gates that serve Tribal member farmlands are closed until such time as stream levels are restored.

The White Mountain Apache Tribe has a full-time Sensitive Species Coordinator and Technician who coordinate and participate in protection, research, management, and administrative activities involving Federally listed sensitive species on the Reservation, and these individuals are responsible for overseeing the implementation and ongoing development of the Loach Minnow Management Plan. The goals of the Loach Minnow Management Plan are to determine and quantify the full extent of loach minnow distribution on the Reservation; continue to develop and strengthen management actions that effectively address species threats and that provide adequate protection for, and sustainability of, existing Reservation loach minnow populations and habitats; complete the development and ongoing maintenance of Tribal data, information, and mapping for this and other native fish species; and evaluate and refine the application of Plan management practices, over time, in a manner that promotes the practical and effective long-term conservation of all Reservation native fish populations and assemblages, including those of loach minnow (White Mountain Apache Tribe 2000).

The Loach Minnow Management Plan provides an action and strategy outline with eight steps that provide additional detail on how they will be carried out. The eight steps and corresponding PCEs that they may affect include:

- Determining the distribution of loach minnow within Reservation boundaries;

• Continuing routine surveys and expanding efforts to include habitat assessment; continuing to monitor and refine existing management treatments involving irrigation uses and activities to develop adequate mitigation against related threats;
• Continuing to apply and refine existing monitoring and mitigation protocols involving low water and/or drought conditions to provide sustainable protection of loach minnow populations (PCEs 1 and 4);
• Development of contingency plans with responses to potential catastrophic events; evaluating and refining existing nonnative fish management and mitigation practices to provide sustainable protection of loach minnow populations and habitat (PCE 1); and
• Organizing data collection, handling, storage, and maintenance among partners; and continuing to monitor and refine existing Tribal Plan and Project Review Process, management plans, and practices to meet loach minnow and native fish management goals.

The Tribe additionally notes that they have a long-standing history of conservation efforts involving listed species and cooperation with the Service and other entities. These efforts include development of management plans for Mexican spotted owls (*Strix occidentalis lucida*), Arizona willow (*Salix arizonica*), Apache trout (*Oncorhynchus gilae apache*), and Mexican gray wolf (*Canis lupus baileyi*). Their comment letter notes additional conservation efforts, incorporated herein by reference, and the recognition that they have received for their conservation ethic.

Benefits of Inclusion—White Mountain Apache Tribe

Those portions of the mainstem White River and the East Fork White River on lands belonging to the White Mountain Apache and within the critical habitat designations for loach minnow are part of a continuous stream habitat for the species. Loach minnow records exist for both streams. We categorized the mainstem White River and the East Fork White River as 1a streams for loach minnow in the proposed rule, as they were identified as occupied at listing, and supports one or more of the PCEs for the species. Neither stream is known to have been occupied by spikedace.

Those portions of the mainstem White River and East Fork White River on lands belonging to the White Mountain Apache Tribe that are within the critical habitat designation for loach minnow may support a genetically distinct population of loach minnow, and comments received from peer reviewers note that loach minnow in the White River are likely highly divergent and deserving of management as a distinct unit. The length of perennial flows with suitable habitat parameters, historical occupancy, and potential current occupancy make this area important to the conservation of the loach minnow. Both the White River and East Fork White River were classified as 1a streams in this designation, indicating they were known to be occupied at listing. Both are considered currently occupied by loach minnow.

The principal benefit of including an area in a critical habitat designation is the requirement for Federal agencies to ensure actions they fund, authorize, or carry out are not likely to result in the destruction or adverse modification of any designated critical habitat, the regulatory standard of section 7(a)(2) of the Act under which consultation is completed. The analysis of effects of a proposed project on critical habitat is separate and different from that of the effects of a proposed project on the species itself. The analysis of effects of a proposed project on critical habitat is separate and different from that of the effects of a proposed project on the species itself. The jeopardy analysis evaluates the action's impact to survival and recovery of the species, while the destruction or adverse modification analysis evaluates the action's effects to the designated habitat's contribution to conservation. Therefore, the difference in outcomes of these two analyses represents the regulatory benefit of critical habitat. This will, in many instances, lead to different results and different regulatory requirements. Thus, critical habitat designations may provide greater benefits to the recovery of a species than would listing alone. However, for some species, and in some locations, the outcome of these analyses will be similar, because effects to habitat will often also result in effects to the species. Lands being evaluated for exclusion in this unit are occupied by loach minnow and are subject to consultation requirements of the Act.

Public education is often another possible benefit of including lands in critical habitat as it may help focus conservation efforts on areas of high value for certain species. The Service will continue ongoing coordination with the White Mountain Apache Tribe for exchange of relevant information. However, we note that the White Mountain Apache Tribe has developed a management plan for loach minnow, and currently employs a Sensitive Species Coordinator through which education of Tribal members can occur without critical habitat designation. In addition, Tribal fisheries biologists participate in review of development projects and timber sales, and can work to educate project proponents of the species' needs.

Finally, the designation of critical habitat may strengthen or reinforce some Federal laws, such as NEPA or the Clean Water Act. These laws analyze the potential for projects to significantly affect the environment. Critical habitat may signal the presence of sensitive habitat that could otherwise be missed in the review process for these other environmental laws. However, because the White Mountain Apache Tribe is fully aware of the sensitive habitat on their lands, designation of critical habitat is not necessary to heighten awareness when applying these laws.

Benefits of Exclusion—White Mountain Apache Tribe

Please see the discussion on Secretarial Order 3206, American Indian Tribal Rights, and Federal-Tribal Trust Responsibilities and the Endangered Species Act under ''*Benefits of Exclusion—Yavapai Apache Nation''* above. As stated there, we seek to balance our responsibilities under the Act in a manner that harmonizes the Federal trust responsibility to tribes and tribal sovereignty while ensuring that tribes do not bear a disproportionate burden for the conservation of listed species. We also note that, to the maximum extent possible, tribes are the appropriate governmental entities to manage their lands and tribal trust resources, and we are responsible for strengthening government-to-government relationships with tribes. We further believe that Federal regulation through critical habitat designation can adversely affect the tribal working relationships we now have and which we are strengthening throughout the United States.

In the case of this critical habitat designation for loach minnow, the White Mountain Apache Tribe states in their comment letter that Federal common law embodied in the decisions of the U.S. Supreme Court, the Indian Reorganization Act (IRA), the Tribe's IRA Constitution, and Congressional policies and laws established for the protection of Indian natural resources and forests confirm their retained or residual inherent sovereign authority to promulgate regulations and management plans to protect and manage Tribal trust lands, wildlife, forests and other natural resources. They cite numerous authorities that confirm their authority over wildlife and other natural resources existing

within their ancestral lands and to govern both their members and their territory and retain sovereign interests in activities that occur on land that they own and control.

The White Mountain Apache Tribe states in their comment letter that the benefits of excluding White Mountain Apache Tribal lands from critical habitat will continue to: ''(1) Advance the Service's Federal Indian Trust obligations, deference for tribes to develop and implement tribal conservation and natural resources management plans for the lands and resources, which includes the Loach minnow and other federal trust species; (2) maintain the effective working relationship to promote the conservation of the Loach minnow and their habitats; (3) perpetuate a continued and meaningful collaboration and cooperation on the Loach minnow management and other resources of interest to the federal government; and (4) enhance the provision of conservation benefits to riparian ecosystems and a host of species, including the Loach minnow and their habitat, that might not otherwise occur.'' We agree with the White Mountain Apache Tribe's explanation regarding the benefits of exclusion.

Weighing Benefits of Exclusion Against Benefits of Inclusion—White Mountain Apache Tribe

The principal benefit of including an area in a critical habitat designation is the requirement for Federal agencies to ensure actions they fund, authorize, or carry out are not likely to result in the destruction or adverse modification of any designated critical habitat, the regulatory standard of section 7(a)(2) of the Act under which consultation is completed. The analysis of effects of a proposed project on critical habitat is separate and different from that of the effects of a proposed project on the species itself. The analysis of effects of a proposed project on critical habitat is separate and different from that of the effects of a proposed project on the species itself. The jeopardy analysis evaluates the action's impact to survival and recovery of the species, while the destruction or adverse modification analysis evaluates the action's effects to the designated habitat's contribution to conservation. Therefore, the difference in outcomes of these two analyses represents the regulatory benefit of critical habitat. This will, in many instances, lead to different results and different regulatory requirements. Thus, critical habitat designations may provide greater benefits to the recovery of a species than would listing alone. However, for some species, and in some locations, the outcome of these analyses will be similar, because effects to habitat will often also result in effects to the species. Lands being evaluated for exclusion in this unit are occupied by both species and are subject to consultation requirements of the Act.

The White Mountain Apache Tribe clearly explained their sovereign authority to promulgate regulations and management plans to protect and manage Tribal trust lands, wildlife, forests, and other natural resources, and cited numerous authorities that confirm their authority over wildlife and other natural resources existing within their ancestral lands. In addition, they have shown a commitment to other federally listed species, such as the Mexican spotted owl (*Strix occidentalis lucida*) and the Arizona willow (*Salix arizonica*).

Based on our working relationship with the Tribe, their demonstration of conservation through past efforts, and the protective provisions of the Loach Minnow Management Plan, we conclude that the benefits of excluding the 29.0 km (18.0 mi) of the mainstem White River and 17.2 km (10.7 mi) of East Fork White River outweigh the benefits of including this area.

Exclusion Will Not Result in Extinction of the Species—White Mountain Apache Tribe

The current occupancy of streams on the White Mountain Apache Tribe are unknown due to the proprietary nature of Tribal survey information. However, the information contained in the management plan, as well as commitments to management through ordinances, codes, and the hiring of a sensitive species coordinator indicate that the White Mountain Apache Tribe has committed to management of loach minnow on their Tribal lands. While we continue to believe these stream segments are important to the conservation of the species and currently support one or more PCEs, we believe that commitments made by the White Mountain Apache Tribe in their management plan and comment letter ensure that habitat remains in these streams for loach minnow. We therefore believe that excluding those portions of the mainstem White River and East Fork White River will not result in extinction of the species. Therefore, the Secretary is exercising his discretion to exclude the 29.0 km (18.0 mi) of the mainstem White River and 17.2 km (10.7 mi) of East Fork White River on White Mountain Apache Tribal lands from the designations of critical habitat for spikedace and loach minnow.

San Carlos Apache Tribe—The San Carlos Apache Tribe submitted comments during the second comment period. Within their comment letter the Tribe notes that Traditional Ecological Knowledge (TEK) is ''* * * a key and fundamental principle of species conservation and land management on the Reservation,'' and that TEK uses an ecosystem-based approach to land and species management and preservation. The Tribe notes that use of TEK by Tribal government, Tribal leaders, Tribal elders, and the Apache people results in incorporation of adaptive management practices for land and species management and preservation. The Tribe also notes that jeopardizing the existence of any species would be counter to their beliefs, and that TEK was critical in the development of the 2005 Fishery Management Plan (FMP).

In their comment letter, the Tribe notes that the FMP does not specifically address loach minnow, but that both loach minnow and spikedace benefit from management actions in the FMP. The FMP was adopted in 2005, and has been actively implemented since that time on Tribal lands. Under the FMP, one management step taken to benefit spikedace and loach minnow is that the Tribe no longer stocks nonnative fishes in the Bonita Creek or Eagle Creek drainages (PCE 5). In addition, the Tribe is working with both the Service and the AGFD to complete additional survey work on Eagle Creek. The Tribe is currently discussing captive propagation of any spikedace or loach minnow found in Eagle Creek for future recovery purposes.

The Tribe notes that various departments are taking actions that benefit the species. The Recreation and Wildlife Department consults with other Tribal departments interested in restoration activities and, using the FMP, evaluates impacts on spikedace and loach minnow and their habitats and determines how to prevent or mitigate any impacts (PCE 1). The Soil and Moisture Conservation Department is developing a project for the removal of nonnative and invasive salt cedar and planting of native species, and has worked with the Recreational and Wildlife Department in applying the FMP to the proposal. The Recreation and Wildlife Department also surveys all proposed home and construction projects, and consults with the Tribal attorneys, providing information from the FMP for use in negotiating water exchanges and in determining mitigation measures for projects that may impact listed species or their habitat. Consultation with the Recreation and Wildlife Department is

for prescribed burns or thinning, and wildfire management actions are measured to ensure no net loss or permanent modification to spikedace and loach minnow habitat. The Tribe has also built fencing to exclude livestock grazing in riparian areas containing native fish or their habitats (PCE 1).

The Tribe's comment letter incorporated information from their FMP. The FMP has several goals relevant to native fish management, including development and implementation of integrated, watershed-based approaches to fishery resource management; conserving, enhancing, and maintaining existing native fish populations and their habitats as part of the natural diversity of the Reservation and preventing, minimizing, or mitigating adverse impacts to all native fishes, especially threatened or endangered, and their habitats when consistent with the Reservation as a permanent home and abiding place for San Carlos Apache Tribal members; restoring extirpated native fishes and degraded natural habitats when appropriate and economically feasible; increasing Tribal awareness of native fish conservation and values; and aggressively pursuing funding adequate to support all Tribal conservation and management activities for all native fishes and their habitats. Each of the goals has identified objectives, actions, and evaluations, which are incorporated here by reference (San Carlos Apache Tribe 2005, pp. 63–71).

Benefits of Inclusion—San Carlos Apache Tribe

Evidence of occupancy for Eagle Creek was most recently found in 1989 for spikedace and in 1997 for loach minnow in 1997 (ASU 2002). This area continues to support one or more of the PCEs for the two species. The benefits of including this stream within the designations include protecting an area with a long record of occupancy, and with perennial flows, as well as other PCEs. The length of perennial flows with suitable habitat parameters, historical occupancy, and current occupancy by both spikedace and loach minnow make Eagle Creek an area important to the conservation of both species. Eagle Creek was classified as a 1a stream for both species for these designations, indicating it was known to be occupied at listing.

The principal benefit of including an area in a critical habitat designation is the requirement for Federal agencies to ensure actions they fund, authorize, or carry out are not likely to result in the destruction or adverse modification of any designated critical habitat, the regulatory standard of section 7(a)(2) of the Act under which consultation is completed. A Federal nexus may exist for tribal projects such as land leases or water development through either the Bureau of Indian Affairs or the U.S. Army Corps of Engineers. The analysis of effects of a proposed project on critical habitat is separate and different from that of the effects of a proposed project on the species itself. The analysis of effects of a proposed project on critical habitat is separate and different from that of the effects of a proposed project on the species itself. The jeopardy analysis evaluates the action's impact to survival and recovery of the species, while the destruction or adverse modification analysis evaluates the action's effects to the designated habitat's contribution to conservation. Therefore, the difference in outcomes of these two analyses represents the regulatory benefit of critical habitat. This will, in many instances, lead to different results and different regulatory requirements. Thus, critical habitat designations may provide greater benefits to the recovery of a species than would listing alone. However, for some species, and in some locations, the outcome of these analyses will be similar, because effects to habitat will often also result in effects to the species. Lands being evaluated for exclusion in this unit are occupied by both species and are subject to consultation requirements of the Act.

Public education is often another possible benefit of including lands in critical habitat as it may help focus conservation efforts on areas of high value for certain species. The Service will continue ongoing coordination with the San Carlos Apache Tribe for exchange of relevant information. However, we note that the San Carlos Apache Tribe, through their Recreation and Wildlife Department, surveys all proposed home and construction projects, and provides information from the FMP for use in negotiating water exchanges and in determining mitigation measures for projects that may impact listed species or their habitat. The Recreation and Wildlife Department therefore has an opportunity to provide information regarding the species and their habitat across the Reservation. In addition, per their comment letter, the San Carlos Apache Tribe has adopted an interdisciplinary team approach to all natural resources matters. The team works together to provide an ecosystem management approach in developing strategic plans and management plans. Through this team, Tribal members can be informed of steps necessary to conservation of spikedace and loach minnow and their habitat.

The designation of critical habitat may strengthen or reinforce some Federal laws, such as NEPA or the Clean Water Act. These laws analyze the potential for projects to significantly affect the environment. Critical habitat may signal the presence of sensitive habitat that could otherwise be missed in the review process for these other environmental law. However, because the San Carlos Apache Tribe is fully aware of the sensitive species and habitat on their lands, designation of critical habitat is not necessary to heighten awareness when applying these laws.

Benefits of Exclusion—San Carlos Apache Tribe

Please see the discussion on Secretarial Order 3206, American Indian Tribal Rights, and Federal-Tribal Trust Responsibilities and the Endangered Species Act under ''*Benefits of Exclusion—Yavapai Apache Nation''* above. As stated there, we seek to balance our responsibilities under the Act in a manner that harmonizes the Federal trust responsibility to tribes and tribal sovereignty while ensuring that tribes do not bear a disproportionate burden for the conservation of listed species. We also believe that, to the maximum extent possible, tribes are the appropriate governmental entities to manage their lands and tribal trust resources, we are responsible for strengthening government-to-government relationships with tribes. We also note that Federal regulation through critical habitat designation can adversely affect the tribal working relationships we now have and which we are strengthening throughout the United States.

In the case of these critical habitat designations for spikedace and loach minnow, the San Carlos Apache Tribe notes in their comment letter that there is a unique and distinctive relationship between the United States and Indian Tribes, as defined by the Constitution, treaties, statutes, executive orders, and judicial decisions that differentiate tribes from other entities that work with or are affected by the Federal government. They note that, in recognition of the responsibilities and the relationship between the United States and Indian tribes, the Secretaries of Commerce and the Interior issued Secretarial Order 3206, which strives to ensure that Indian Tribes do not bear a disproportionate burden for the

conservation of listed species. They conclude that, oftentimes, tribal lands provide some of the better quality for federally protected species because the lands have not been subjected to the same development philosophies and pressures as those on non-tribal lands, and that tribal conservation practices, such as those established by the FMP, should be embraced, if not rewarded.

We believe there are significant benefits from exclusion of the portion of those portions of Eagle Creek on the San Carlos Apache Reservation. These benefits include:

(1) Continuing and strengthening of our ongoing coordination with the Tribe to promote conservation of spikedace and loach minnow and their habitat, as well as other federally listed species; and

(2) Allowing continued meaningful collaboration and cooperation in working toward recovering these species, including conservation actions that might not otherwise occur.

Because the San Carlos Apache Tribe is the entity that enforces protective regulations on Tribal trust reservation land, and because we have a working relationship with them, we believe exclusion of these lands will yield a significant partnership benefit. As noted, the San Carlos Apache Tribe is coordinating with the AGFD and the Service on surveys and captive propagation plans. We will continue to work cooperatively with the San Carlos Apache Nation on efforts to conserve spikedace and loach minnow. Therefore, excluding these lands from critical habitat would provide the benefit of maintaining and strengthening our existing conservation partnership.

Weighing Benefits of Exclusion Against Benefits of Inclusion—San Carlos Apache Tribe

As noted above, the San Carlos Apache Tribe has indicated a commitment to TEK, which uses an ecosystem-based approach to land and species management and preservation. In addition, they have developed the FMP, which benefits spikedace and loach minnow by discontinuing nonnative fish stocking in the Bonita Creek or Eagle Creek drainages. Further, the Tribe is working with both the Service and the AGFD to complete additional survey work on Eagle Creek, and is discussing captive propagation for spikedace and loach minnow.

The Tribe has focused on known areas of concern for the species management, and has discontinued stocking of nonnative fishes in the Bonita and Eagle Creek watersheds. The FMP contains goals of conserving and enhancing native fishes on the Reservation; restoring native fishes and their habitats; and preventing, minimizing or mitigating impacts to native fishes, among others. In addition, the Tribe has indicated that, through TEK, they practice an ecosystem-based approach to land-and-species based management and preservation. We conclude that the benefits to be gained through the FMP, coordination with the Service and AGFD, discontinuance of sportfish stocking, and proactive measures such as captive propagation all indicate that the San Carlos has committed to conservation measures that exceed benefits to be gained through a critical habitat designation. We, therefore, conclude that the benefits of excluding the 27.5 km (16.1 mi) of Eagle Creek on Tribal lands of the San Carlos Apache Tribe outweigh the benefits of including this area.

Exclusion Will Not Result in Extinction of the Species—San Carlos Apache Tribe

The Service considers Eagle Creek to be an occupied stream for both spikedace and loach minnow. The information provided by the San Carlos Apache Tribe regarding TEK and the FMP, as well as their discontinuance of sportfish stocking in the Eagle Creek watershed and continued coordination with the Service, will help to ensure that habitat remains in Eagle Creek for spikedace and loach minnow, and will reduce the potential for harm to the fish. We, therefore, believe that excluding those portions of Eagle Creek on the San Carlos Apache Reservation will not result in extinction of the species. Therefore, the Secretary is exercising his discretion to exclude the 27.5 km (16.1 mi) of Eagle Creek on Tribal lands of the San Carlos Apache Tribe from the designations of critical habitat for spikedace and loach minnow.

Freeport-McMoRan—Freeport-McMoRan provided two separate management plans during the second comment period. The first plan focuses on Eagle Creek and the San Francisco River in Arizona, while the second focuses on the Gila River, Mangas Creek, and Bear Creek in New Mexico. These two plans are evaluated separately below.

Background—Freeport-McMoRan is a member of the International Council on Mining and Minerals (ICMM). In their management plan for Eagle Creek and the San Francisco River, FMC notes that, as a member of ICMM, their parent company, FMC Copper & Gold Inc. (FCX), adheres to ten sustainable development principles, including integration of sustainable development considerations within the corporate decision making process; seeking continual improvement of our environmental performance; and contributing to conservation of biodiversity and integrated approaches to land use planning. In addition, FCM adhere to the ICMM requirement to report its performance against the Global Reporting Initiative (GRI) G3 metrics and identify/manage and report against key sustainable development risks and opportunities. As part of this effort, FCX annually establishes corporate Sustainable Development Performance Targets and reports progress against those targets in its annual *Working Towards Sustainable Development Report* (*See www.fcx.com*). In support of the company's efforts in implementing the ICMM Sustainable Development principles, FCX established a corporatewide Biodiversity Task Force in 2010. In accordance with these principles and reporting obligations, FMC has prepared these management plans to guide actions associated with the management of its lands along portions of Eagle Creek, the lower San Francisco River in Arizona, and portions of the Gila River, Bear Creek, and Mangas Creek in New Mexico. According to their management plans, it is FMC's intention, through implementation of these plans, to provide for the long-term protection and multiple use benefits of these natural systems.

FMC recognizes that the conservation of the spikedace, the loach minnow, and other native aquatic species is an important goal. In the southwest, FMC has funded studies and granted access to company land along Eagle Creek for many years, allowing the development of detailed information on the creek's native and nonnative fish communities. In addition, FMC has implemented a management system on its U–Bar Ranch, which is located along the upper Gila River in the vicinity of Cliff in Grant County, New Mexico. The Pacific Western Land Company (PWLC), a subsidiary of FMC, owns the U–Bar Ranch. Under FMC's existing management system, the riparian zone adjacent to the Gila River has expanded in width, benefitting the endangered southwestern willow flycatcher and other riparian species. Currently, the U–Bar Ranch supports one of the largest flycatcher populations in the Southwest. Freeport-McMoRan has been conducting surveys for flycatchers since 1994.

The land management practices that have allowed the flycatcher to flourish are compatible with the maintenance of spikedace and loach minnow habitat,

and the Gila/Cliff Valley segment of the Gila River currently supports the largest number of spikedace and loach minnow of any area within the species' ranges. In addition, surveys show that there are low levels of nonnative fishes in this stream segment. Freeport-McMoRan also has funded surveys for spikedace, loach minnow, and other fishes. Monitoring supported by FMC along Mangas Creek determined that, at that time, Mangas Creek supported only native fish species. Most of the lower 9.3 km (5.8 mi) of Mangas Creek is located on private land belonging to an FMC subsidiary, and has been grazed at moderate levels for decades.

Freeport-McMoRan has previously developed and implemented management plans for the conservation of listed species. In 2005, FMC prepared and submitted a plan to the Service for the management of the U-Bar Ranch, which supported exclusion of the FMC's land from the 2006 southwestern willow flycatcher critical habitat designation. The following year, FMC prepared and submitted management plans for the spikedace and loach minnow in Eagle Creek and in the upper Gila River, in the Gila/Cliff Valley. Those management plans supported the exclusion of FMC's land along Eagle Creek and the upper Gila River from the 2007 spikedace and loach minnow critical habitat designations.

Freeport-McMoRan has supported biological surveys for spikedace and loach minnow, as well as other species, on Eagle Creek for several years by allowing access to private lands to researchers, and also contracted with BIOME, a consulting firm, who provided assistance in completing surveys on Eagle Creek. During the 2007 critical habitat designation process, FMC developed management plans for Eagle Creek that involved monitoring the distribution and abundance of the loach minnow and spikedace in Eagle Creek passing through the FMC reach; providing the Service with reasonable notice of any significant changes to the water supply management system outside of historical operating parameters; making reasonable efforts to attend regularly scheduled fisheries management working group meetings; and continuing historical land use practices and water supply practices that enhance water flows in the FMC reach; and consideration of loach minnow and spikedace habitat when deviating from such historic management practices. In implementing these management plans, FMC provided annual reports to the Service regarding changes in management, or anticipated changes in management for the coming year. No changes were made to management during the time period covered by these plans.

Spikedace and Loach Minnow Management Plan—Eagle Creek and San Francisco River, Greenlee and Graham County, Arizona

Freeport-McMoRan owns land and water rights in the watersheds of both Eagle Creek and the San Francisco River, which are used in connection with the operation of the Morenci Mine near Clifton, Arizona. Under the current management plan, FMC will spend up to $4,000,000 over the next 10 years to investigate, design, and implement conservation measures along Eagle Creek upstream of its diversion dam and on the lower San Francisco River near Clifton, Arizona.

As part of the overall management plan, FMC has established a coordination process for review of all conservation measures. In order to ensure that their proposed projects are consistent and compatible with the goals and actions of the Gila River Basin Native Fishes Conservation Program (Native Fishes Program), under which much of the management of spikedace and loach minnow occurs, FMC will develop individual work plans and submit the plans to the Native Fishes Program Technical Committee during their annual project review period. This Committee consists of personnel from the Service, Bureau of Reclamation, USFS, Bureau of Land Management, New Mexico Department of Game and Fish, and the AGFD, all of whom are actively involved in native fish management. The purposes of the Native Fishes Program are: (1) to undertake conservation actions (recovery and protection) for Federal and state-listed or candidate fish species native to the Gila River Basin by implementing existing and future recovery plans for those fishes; and (2) to implement nonnative control activities to manage nonnative aquatic organisms where they interfere with native fish conservation activities, or provide funding for research in support of nonnative control actions. Freeport-McMoRan may revise work plans to meet comments received from the Native Fishes Program, or may respond to their recommendations and submit a final work plan to the Native Fishes Program. If necessary, FMC will meet with the Native Fishes Program to present revised work plans at that time.

As part of their management plan, FMC would submit a Safe Harbor Agreement and application for a permit pursuant to 50 CFR 17.22(c) which may also include a request for a permit under 50 CFR 17.22(d) and 17.32(d). The permit would address all listed fish species currently found in Eagle Creek and the San Francisco River, as well as other species that might be listed as threatened or endangered in the future. The Safe Harbor Agreement would be based on the conservation measures set forth in the management plan.

Eagle Creek. Eagle Creek was occupied by both species at listing, and is classified as a 1a stream under this designation. The management plan consists of four conservation measures, the first of which is investigation and construction of a fish passage barrier. Within their management plan, FMC commits to completing a feasibility study to determine three possible sites for the construction of a fish barrier above the Willow Creek confluence. Freeport-McMoRan has indicated that the area above Willow Creek is most suitable for a barrier due to the fact that nonnative fishes still enter Eagle Creek from the San Carlos Apache Reservation. Following review of the proposed sites by the Service, FMC will prepare a preliminary work plan that describes barrier construction, which will be submitted for review to the Native Fishes Program by September 1, 2014, using the coordination process described above. If the Native Fish Program finds the work plan acceptable, and if the barrier will cost $1.5 million or less, FMC will prepare an engineering study and prepare related documents for the fish barrier. Upon approval by the Native Fishes Program, FMC will secure required permits and approvals and build the fish barrier. For those portions of Eagle Creek upstream of the barrier, this conservation measure would be effective in addressing PCE #5, regarding no nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low as to allow persistence of spikedace and loach minnow.

The second conservation measure involves alternatives to barrier construction. Should barrier construction exceed $1.5 million in cost to build or be determined to be infeasible, FMC and the Service will develop other projects that will provide conservation benefits to spikedace and loach minnow in Eagle Creek and its tributaries. Alternative conservation measures, such as crayfish removal, and chemical treatment of the stream, or others that will contribute to the recovery of the two species, be technically sound and be implemented in a reasonable timeframe, and will not be redundant in scope with other projects will be considered. All alternative measures will be submitted

for review to the Native Fishes Program, as described above. Freeport-McMoRan will fund alternative projects not to exceed $1.5 million.

The third conservation measure is an exotic species removal study. Freeport-McMoRan will develop and implement a 3-year monitoring program to detect the presence of other types of invasive aquatic species (e.g., bullfrogs and crayfish) within the upper reach of Eagle Creek, and will investigate the practicability and cost of removal actions to suppress the populations of these species in the upper reach of Eagle Creek. The results of the study would be used to inform future management actions to remove nonnative species within Eagle Creek. This conservation measure would inform management agencies on how to better achieve PCE 5 regarding no nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low as to allow persistence of spikedace and loach minnow.

The fourth conservation measure is ecological monitoring for spikedace, loach minnow, and other warm water fish species. The Recovery Plans for both the spikedace and the loach minnow emphasize the need to consistently monitor the status of existing populations, including the establishment of standard monitoring locations and techniques, as well as investigate and quantify through field research the habitat needs of the species and effects of physical habitat modification (Service 1991a, pp.12–27; Service 1991b, pp. 11–27). Freeport-McMoRan will use the existing permanent sample locations that have been used in previous survey efforts, and will undertake a more robust monitoring program on both Eagle Creek and the lower reach of the San Francisco River, from its confluence with the Gila River upstream to its confluence with the Blue River. Monitoring will be conducted annually, with reports on information gathered provided to the Service and the Native Fishes Program. As part of this management plan, FMC will study and analyze the ecology of the loach minnow, spikedace, other native fish, and their habitat in Eagle Creek, including the relationship between native fish preferences for selected habitats and various associated environmental factors (e.g., substrates, channel characteristics, vegetation, and channel morphology). A key component of this effort will be the regular monitoring of PCEs within targeted stream segments that can affect the suitability of these streams for native fish and inform adaptive management decisions.

As mentioned earlier, in conjunction with the submission of the preliminary studies of possible fish barrier sites on Eagle Creek and the San Francisco River, FMC will submit a Safe Harbor Agreement and application for a permit pursuant to 50 CFR 17.22(c).

Benefits of Inclusion—Freeport-McMoRan at Eagle Creek

The principal benefit of including an area in a critical habitat designation is the requirement for Federal agencies to ensure actions they fund, authorize, or carry out are not likely to result in the destruction or adverse modification of any designated critical habitat, the regulatory standard of section 7(a)(2) of the Act under which consultation is completed. Federal agencies must also consult with us on actions that may affect a listed species and refrain from undertaking actions that are likely to jeopardize the continued existence of such species. The analysis of effects of a proposed project on critical habitat is separate and different from that of the effects of a proposed project on the species itself. The jeopardy analysis evaluates the action's impact to survival and recovery of the species, while the destruction or adverse modification analysis evaluates the action's effects to the designated habitat's contribution to conservation. Therefore, the difference in outcomes of these two analyses represents the regulatory benefit of critical habitat. This will, in many instances, lead to different results and different regulatory requirements. Thus, critical habitat designations may provide greater benefits to the recovery of a species than would listing alone.

However, for some species, and in some locations, the outcome of these analyses will be similar, because effects to habitat will often also result in effects to the species. Lands being evaluated for exclusion in this unit are occupied by both species and are subject to consultation requirements of the Act. Approximately 20.5 km (12.7 mi) of Eagle Creek are on Federal lands, and projects with a Federal nexus through permitting or funding on non-Federally owned areas along Eagle Creek may also require section 7 consultation. As proposed, the designation included 75.5 km (46.9 mi) of contiguous habitat. However, it should be noted that those portions on the San Carlos Apache Indian Reservation have been excluded under a separate management plan, as noted above, and that not all of the remaining 75.5 km (46.9 mi) occur on Federal lands or would have a Federal nexus for purposes of section 7 consultation.

All lands considered for exclusion are currently considered occupied by spikedace and loach minnow and will be subject to the consultation requirements of the Act in the future. Although a jeopardy and adverse modification analysis must satisfy two different standards, because any modifications to proposed actions resulting from a section 7 consultation to minimize or avoid impacts to spikedace and loach minnow would be habitat-based, it is difficult to differentiate measures implemented solely to minimize impacts to the critical habitat from those implemented to minimize impacts to the species. Therefore, in the case of spikedace and loach minnow, we believe the incremental benefits of critical habitat designation are minimal as compared to the conservation and regulatory benefits derived from the species being listed.

The Service has completed one consultation on a water diversion structure modification on FMC mining operations in the past. Generally, the mining operations have not resulted in consultation, as the Morenci Mine (as well as the Tyrone Mine) are not located adjacent to the stream channel. As noted in the water quality section above, spills associated with mines have occurred in spikedace and loach minnow habitat in the past. However, even absent a section 7 connection, other safeguards are in place, including water quality parameters and monitoring by the Arizona Department of Environmental Quality and the EPA. The Service also has an Environmental Contaminants Program and staff involved in identification of environmental contaminant problems affecting threatened and endangered species and other resources. Through this program, the Service identifies contaminant problems and pursues appropriate actions to eliminate contaminant threats and restore affected resources.

Public education is often cited as another possible benefit of including lands in critical habitat as it may help focus conservation efforts on areas of high value for certain species. Eagle Creek occurs in an isolated area; however, there are ranchers in the area, and the area is used for sportfishing by the general public. Designation of critical habitat could inform those who either live locally or use the area for recreation about listed species and their habitat needs. Freeport-McMoRan has indicated that this area is heavily used by employees of the Morenci Mine, and it is possible that a public outreach campaign could be used to educate

those who fish in the area about native fish species. Partnership efforts with FMC to conserve spikedace and loach minnow have resulted in awareness about the species that occur within the Eagle Creek. However, we believe there is little, if any, educational benefit attributable to critical habitat beyond those achieved from listing the species under the Act, and FMC's continued work in conserving these species.

The designation of critical habitat for spikedace and loach minnow within Eagle Creek may strengthen or reinforce some Federal laws, such as NEPA or the Clean Water Act. These laws analyze the potential for projects to significantly affect the environment. Critical habitat may signal the presence of sensitive habitat that could otherwise be missed in the review process for these other environmental laws; however, the listing of these species, prior designations of critical habitat and consultations that have already occurred will provide this benefit. Therefore, in this case we view the regulatory benefit to be largely as redundant with the benefit the species will receive from listing under the Act and may only result in minimal additional benefits.

In summary, we do not believe that designating critical habitat within lands owned and managed by FMC along Eagle Creek will provide significant additional benefits for spikedace and loach minnow. Projects on these lands with a Federal nexus will require section 7 consultation with the Service (regardless of critical habitat designation) because the habitat is occupied and we believe the incremental benefit from critical habitat would be minimal. Furthermore, FMC continues to show a commitment to conservation of these species.

Benefits of Exclusion—Freeport-McMoRan at Eagle Creek

The significant benefit of exclusion of FMC owned lands which are subject to the management plan for the Eagle Creek is the maintenance and strengthening of the ongoing partnership with the Service. Freeport-McMoRan has demonstrated a partnership with the Service beginning with the management plan submitted to the Service in 2005 for the southwestern willow flycatcher, the 2007 management plans for spikedace and loach minnow, and they have indicated a willingness to continue as a partner to the Service in the conservation of spikedace and loach minnow on Eagle Creek. Evidence of this partnership can be shown through the assistance with past monitoring efforts for spikedace and loach minnow on Eagle Creek, carried out under their 2007 management plan, and the continued occupancy of Eagle Creek by spikedace and loach minnow. Additional evidence of the partnership between FMC and the Service is shown by FMC's past commitment in 2005 to develop and implement a management plan for southwestern willow flycatcher and their current commitment to pursue a safe harbor agreement for all native fish in Eagle Creek. In addition, the identified coordination procedures and funding indicate a commitment on the part of FMC to on-the-ground spikedace and loach minnow conservation. And, FMC has also identified monitoring and exotic species removal studies. Information gained by both studies would be useful in guiding future management of the species and in managing Eagle Creek. In summary, exclusion of this area from the designation would maintain, and strengthen the partnership between the Service and FMC. The exclusion of these lands may enhance opportunities to partner with other entities not yet identified.

Weighing Benefits of Exclusion Against Benefits of Inclusion—Freeport-McMoRan at Eagle Creek

We reviewed and evaluated the benefits of inclusion and the benefits of exclusion of FMC owned lands along Eagle Creek as critical habitat for spikedace and loach minnow. We believe past, present, and future coordination with FMC has provided and will continue to provide sufficient education regarding spikedace and loach minnow habitat conservation needs on these lands, such that there would be minimal additional educational benefit from designation of critical habitat. Further, because any potential impacts to spikedace and loach minnow habitat from future projects with a Federal nexus will be addressed through a section 7 consultation with the Service under the jeopardy standard, we believe that the incremental conservation and regulatory benefit of designated critical habitat on Freeport-McMoRan owned lands would largely be redundant with the combined benefits of listing and existing management. Therefore, the incremental conservation and regulatory benefits of designating critical habitat on FMC owned lands along Eagle Creek are minimal.

On the other hand, the benefits of excluding FMC owned lands along Eagle Creek from critical habitat are significant. Freeport-McMoRan's management plan establishes a framework for cooperation and coordination with the Service in connection with resource management activities based on adaptive management principles, including, if necessary, the development of alternative conservations measures, at a total cost of up to $1,500,000 to protect habitat for spikedace and loach minnow on Eagle Creek. Most importantly, the management plans indicate a continuing commitment to ongoing management that has resulted in habitat that supports spikedace and loach minnow.

Exclusion of these lands from critical habitat will help preserve and strengthen the conservation partnership we have developed with FMC, reinforce those we are building with other entities, and foster future partnerships and development of management plans; whereas inclusion will negatively impact our relationships with FMC and other existing or future partners. We are committed to working with FMC to further the conservation of spikedace and loach minnow and other endangered and threatened species. Freeport-McMoRan will continue to implement their management plans and play an active role to protect spikedace and loach minnow and their habitat. Therefore, in consideration of the relevant impact to our partnership with FMC, and the ongoing conservation management practices of FMC, we determined the significant benefits of exclusion outweigh the benefits of inclusion in the critical habitat designation.

In summary, we find that excluding FMC owned lands along Eagle Creek from this final critical habitat will preserve our partnership and may foster future habitat management and species conservation plans with FMC and with other entities now and in the future. These partnership benefits are significant and outweigh the minimal additional regulatory and educational benefits of including these lands in final critical habitat for spikedace and loach minnow.

Exclusion Will Not Result in Extinction of the Species—Eagle Creek

We have determined that the exclusion of 21.4 km (13.3 mi) of FMC owned lands along Eagle Creek from the designation of critical habitat for spikedace and loach minnow will not result in the extinction of either species. The jeopardy standard of section 7 of the Act and routine implementation of conservation measures through the section 7 process due to spikedace and loach minnow occupancy provide assurances that this species will not go extinct as a result of excluding these lands from the critical habitat designation. Therefore, based on the

above discussion, the Secretary is exercising his discretion to exclude approximately of 21.4 km (13.3 mi) of FMC owned lands along Eagle Creek from the designation of critical habitat for spikedace and loach minnow.

San Francisco River. The San Francisco River was not occupied by spikedace at listing, and is classified as a 2b stream for spikedace, indicating it would serve as an expansion of the species' range. Spikedace were reintroduced into the San Francisco River in 2007; however, insufficient time has elapsed to determine if the reintroduction program will be a success. The San Francisco River was occupied at listing by loach minnow and is currently occupied, and is therefore classified as a 1a stream under this designation.

Freeport-McMoRan notes that they are the primary private property owner along the lower reach of the San Francisco River in Arizona. Under the Eagle Creek and San Francisco River Management Plan, FMC proposes to spend $2,500,000 on the San Francisco River. The coordination process with the Native Fishes Program, as detailed above, would apply to conservation measures for the San Francisco River as well.

The management plan describes the lower reach of the San Francisco River as a well-known sport fishery, with channel catfish, carp, and red shiner. For the San Francisco River, FMC's management plan proposes completing a feasibility study to evaluate three potential barrier sites. Provided that a suitable barrier site is found, FMC will prepare a preliminary work plan following the coordination procedures outlined above, and will submit it to the Service for review and comment, and then to the Native Fishes Program by September 1, 2014.

If approved by the Native Fish Program, and provided the cost does not exceed $2,500,000, FMC will construct a barrier on the San Francisco River with the goal of completing construction in 5 years. Freeport-McMoRan will report progress on the report semi-annually until barrier construction is complete. For those portions of the San Francisco River upstream of the barrier, this conservation measure would be effective in addressing PCE #5, regarding no nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low as to allow persistence of spikedace and loach minnow.

As with Eagle Creek, should barrier construction costs be estimated to exceed $2,500,000, if barrier construction is deemed infeasible, or if the Native Fish Program determines that it is not advisable to construct a fish barrier, FMC commits in the management plan to conferring in good faith with the Service to identify other projects that will provide conservation benefits to spikedace and loach minnows in the San Francisco River and its tributaries. Any identified conservation measures would contribute to the recovery of the two species, would be technically sound and able to be implemented in a reasonable timeframe, and would not be redundant in scope. Any alternative proposals developed would be reviewed through the coordination process described above, and FMC commits to paying $2,500,000 for the development, review, and implementation of conservation measures, including any expenditures to investigate the feasibility of a fish barrier.

In addition, FMC commits in the management plan to implementing a detailed monitoring program along the lower reach of the San Francisco River to assist in the conservation of spikedace and loach minnow. As noted above, the Recovery Plans for both the spikedace and the loach minnow emphasize the need to consistently monitor the status of existing populations, including the establishment of standard monitoring locations and techniques, as well as investigating and quantifying through field research the habitat needs of the species and effects of physical habitat modification (Service 1991a, pp. 12–27; Service 1991b, pp. 11–27). There is no regular monitoring of the portions of the San Francisco River in Arizona at this time. The monitoring program would include a minimum of 15 permanent sample locations. As with Eagle Creek, standardized sampling techniques and protocols would be used, and the management plan contains additional detail on equipment and procedures.

Freeport-McMoRan commits to providing an annual report to the Service regarding its implementation of the management plan. The report will provide a description of implementation of plan elements over the course of the previous year and discuss anticipated implementation for the coming year. Each year's report would be provided to the Service by April of the following year.

Benefits of Inclusion—Freeport-McMoRan on the San Francisco River

The principal benefit of including an area in a critical habitat designation is the requirement for Federal agencies to ensure actions they fund, authorize, or carry out are not likely to result in the destruction or adverse modification of any designated critical habitat, the regulatory standard of section 7(a)(2) of the Act under which consultation is completed. Federal agencies must also consult with us on actions that may affect a listed species and refrain from undertaking actions that are likely to jeopardize the continued existence of such species. The analysis of effects of a proposed project on critical habitat is separate and different from that of the effects of a proposed project on the species itself. The jeopardy analysis evaluates the action's impact to survival and recovery of the species, while the destruction or adverse modification analysis evaluates the action's effects to the designated habitat's contribution to conservation. Therefore, the difference in outcomes of these two analyses represents the regulatory benefit of critical habitat. This will, in many instances, lead to different results and different regulatory requirements. Thus, critical habitat designations may provide greater benefits to the recovery of a species than would listing alone. However, for some species, and in some locations, the outcome of these analyses will be similar, because effects to habitat will often also result in effects to the species. Lands being evaluated for exclusion in this unit are occupied by loach minnow (and possibly by spikedace, if the translocation efforts are successful) and are subject to consultation requirements of the Act. Approximately 13.2 km (8.2 mi) of those portions of the San Francisco River covered by the management plan are on Federal lands, and projects impacting other non-Federally owned areas may require section 7 consultation for impacts to critical habitat if they require Federal permitting or use Federal funds.

It is possible that projects impacting other non-Federally owned areas may require section 7 consultation for impacts to critical habitat if they require Federal permitting or use Federal funds. However, we do not anticipate there being many consultations along FMC's lands on the San Francisco River due to the lack of a Federal nexus and due to the lack of a history of consultations. Due to the lack of consultations in these areas, we conclude the benefit of inclusion based on consultation requirements under the Act is reduced.

All lands considered for exclusion are currently considered occupied by loach minnow and will be subject to the consultation requirements of the Act in the future. Although a jeopardy and adverse modification analysis must satisfy two different standards, because any modifications to proposed actions resulting from a section 7 consultation

to minimize or avoid impacts to loach minnow would be habitat-based, it is difficult to differentiate measures implemented solely to minimize impacts to the critical habitat from those implemented to minimize impacts to the species. Therefore, in the case of spikedace and loach minnow, we believe the incremental benefits of critical habitat designation are minimal as compared to the conservation and regulatory benefits derived from the species being listed.

Public education is often cited as another possible benefit of including lands in critical habitat as it may help focus conservation efforts on areas of high value for certain species. The San Francisco River occurs near the towns of Clifton and Morenci. The area is currently heavily used for sportfishing by the general public, and designation of critical habitat could inform those who either live locally or use the area for recreation about listed species and their habitat needs. Partnership efforts with FMC to conserve spikedace and loach minnow have resulted in awareness about the species that occur within the San Francisco River. However, we believe there is little, if any, educational benefit attributable to critical habitat beyond those achieved from listing the species under the Act, and FMC's continued work in conserving these species.

The designation of critical habitat for spikedace and loach minnow within the San Francisco River may strengthen or reinforce some Federal laws, such as NEPA or the Clean Water Act. These laws analyze the potential for projects to significantly affect the environment. Critical habitat may signal the presence of sensitive habitat that could otherwise be missed in the review process for these other environmental laws; however, the listing of these species, prior designations of critical habitat, and consultations that have already occurred will provide this benefit. Therefore, in this case we view the regulatory benefit to be largely redundant with the benefit the species will receive from listing under the Act and may only result in minimal additional benefits.

In summary, we do not believe that designating critical habitat within lands owned and managed by FMC along the San Francisco River will provide significant additional benefits for spikedace and loach minnow. Projects on these lands with a Federal nexus will require section 7 consultation with the Service (regardless of critical habitat designation) because the habitat is occupied and we believe the incremental benefit from critical habitat would be minimal. However, due to the lack of a consultation history along the San Francisco River, the benefits of inclusion that stem from consultation requirements under the Act are reduced. Furthermore, FMC continues to show a commitment to conservation of these species through the development and implementation of the management plans which cover the San Francisco River for spikedace and loach minnow.

Benefits of Exclusion—Freeport-McMoRan on the San Francisco River

The significant benefit of exclusion of FMC owned lands which are subject to the management plan for the San Francisco River is the maintenance and strengthening of the ongoing partnership with the Service. Freeport-McMoRan has demonstrated a partnership with the Service beginning with the management plan submitted to the Service in 2005 for the southwestern willow flycatcher, the 2007 management plans for spikedace and loach minnow, and they have indicated a willingness to continue as a partner to the Service in the conservation of spikedace and loach minnow on San Francisco River. Evidence of this partnership can be shown through the past monitoring efforts for spikedace and loach minnow on Eagle Creek, carried out under their 2007 management plan. Additional evidence of the partnership between FMC and the Service is shown by FMC's past commitment in 2005 to develop and implement a management plan for southwestern willow flycatcher and their current commitment to pursue a safe harbor agreement for all native fish in the San Francisco River. In addition, the identified coordination procedures and funding indicate a commitment on the part of FMC to on-the-ground spikedace and loach minnow conservation. Finally, Freeport-McMoRan has demonstrated a commitment to the 2007 management plans, and indicated a willingness to continue as a partner to the Service in the conservation of spikedace and loach minnow in the San Francisco River. Excluding the San Francisco River would promote that partnership. The identified coordination procedures and funding indicate a commitment on the part of FMC to on-the-ground spikedace and loach minnow conservation. And, FMC has also identified increased monitoring on the San Francisco River. The lower portions of the San Francisco River have been surveyed with less frequency and regularity than most spikedace and loach minnow streams. The commitment to monitoring in the management plan would assist conservation management efforts for the species. In summary, exclusion of this area from the designation would maintain, and strengthen the partnership between the Service and FMC. The exclusion of these lands may enhance opportunities to partner with other entities not yet identified.

Weighing Benefits of Exclusion Against Benefits of Inclusion—Freeport-McMoRan on the San Francisco River

We reviewed and evaluated the benefits of inclusion and the benefits of exclusion of FMC owned lands along the San Francisco River as critical habitat for spikedace and loach minnow. We believe past, present, and future coordination with FMC has provided and will continue to provide sufficient education regarding spikedace and loach minnow habitat conservation needs on these lands, such that there would be no additional educational benefit from designation of critical habitat. Further, because any potential impacts to spikedace and loach minnow habitat from future projects with a Federal nexus will be addressed through a section 7 consultation with the Service under the jeopardy standard, we believe that the incremental conservation and regulatory benefit of designated critical habitat on FMC owned lands would largely be redundant with the combined benefits of listing and existing management. Therefore, the incremental conservation and regulatory benefits of designating critical habitat on FMC owned lands along the San Francisco River are minimal.

On the other hand, the benefits of excluding FMC owned lands along the San Francisco River from critical habitat are significant. Freeport-McMoRan's management plan establishes a framework for cooperation and coordination with the Service in connection with resource management activities based on adaptive management principles, including, if necessary, the development of alternative conservations measures, at a total cost of up to $2,500,000 to protect habitat for spikedace and loach minnow on the San Francisco River. Most importantly, the management plans indicate a continuing commitment to ongoing management that has resulted in habitat that supports spikedace and loach minnow.

Exclusion of these lands from critical habitat will help preserve and strengthen the conservation partnership we have developed with FMC, reinforce those we are building with other entities, and foster future partnerships and development of management plans; whereas inclusion will negatively impact our relationships with FMC and

other existing or future partners. We are committed to working with FMC to further the conservation of spikedace and loach minnow and other endangered and threatened species. Freeport-McMoRan will continue to implement their management plans and play an active role to protect spikedace and loach minnow and their habitat. Therefore, in consideration of the relevant impact to our partnership with FMC, and the ongoing conservation management practices of FMC, we determined the significant benefits of exclusion outweigh the benefits of inclusion in the critical habitat designation.

In summary, we find that excluding FMC owned lands along the San Francisco River from this final critical habitat will preserve our partnership and may foster future habitat management and species conservation plans with FMC and with other entities now and in the future. These partnership benefits are significant and outweigh the minimal additional regulatory and educational benefits of including these lands in final critical habitat for spikedace and loach minnow.

Exclusion Will Not Result in Extinction of the Species—San Francisco River

We have determined that the exclusion of 14.1 km (8.8 mi) FMC owned lands along the San Francisco River from the designation of critical habitat for spikedace and loach minnow will not result in the extinction of either species. The jeopardy standard of section 7 of the Act and routine implementation of conservation measures through the section 7 process due to loach minnow occupancy (and spikedace if the translocation efforts are successful) provide assurances that this species will not go extinct as a result of excluding these lands from the critical habitat designation. Therefore, based on the above discussion, the Secretary is exercising his discretion to exclude approximately 14.1 km (8.8 mi) of FMC owned lands along the San Francisco River from the designation of critical habitat for spikedace and loach minnow.

Spikedace and Loach Minnow Management Plan—Upper Gila River, Including Bear Creek and Mangas Creek, Grant County, New Mexico

Freeport-McMoRan provided this management plan during the second comment period. Freeport-McMoRan currently owns more than 11.5 km (7.2 mi) along the Gila River, approximately 7.9 km (4.9 mi) along Mangas Creek, and approximately 1.9 km (1.2 mi) along Bear Creek. Much of this area is owned by the Pacific Western Land Company (PWLC), a subsidiary of FMC, and is included in the U-Bar Ranch. Freeport-McMoRan's land and water rights in the Gila/Cliff Valley support operations at the Tyrone Mine in addition to its agricultural operations along the Gila River. Freeport-McMoRan diverts water from the Gila River for use at the Tyrone Mine located southwest of Silver City, New Mexico. Their water right includes a diversion structure on the Gila River above its confluence with Mangas Creek, which diverts water into a canal. A pump station moves water from the canal to the Bill Evans Reservoir, and water is pumped from the reservoir through a 35.4-km (22-mi) pipeline to the Tyrone Mine. The Bill Evans Reservoir is managed by the NMDGF as a recreational facility, and stocked with sportfish. The Reservoir is separated from the active stream channel.

Freeport-McMoRan's management plan provides background on steps taken by FMC for environmental management in this region in general, as well as conservation measures for spikedace and loach minnow. One such measure is FMC's participation in a voluntary water conservation program administered by the New Mexico Office of the State Engineer (OSE). Under this program, FMC has enrolled 2,876 acre feet of its annual average diversion rights through 2018. The program allows FMC to increase or decrease the amount of water rights that are restricted from diversion and consumptive use on an annual basis, depending on their current water needs.

As detailed in the plan, this portion of the Gila River maintains a healthy stream and riparian system, and supports the largest populations of spikedace and loach minnow in the two species' ranges. The river in this area is perennial, and has very low levels of nonnative fishes. Under the plan, FMC will continue participation in the water conservation program noted above, and commits to re-enrolling to continue their participation in the water conservation program should their enrollment lapse during the life of the management plan.

The management plan would also maintain minimum flow levels in the Gila River during periods of drought. Specifically, FMC will not divert water from the Gila River at the Bill Evans Reservoir diversion structure into the reservoir if both of the following conditions exist: (1) The Gila River is flowing at less than 25 cfs at the USGS Gage 09431500 near Redrock, New Mexico; and (2) the water level in Bill Evans Reservoir is at 1,424 meters (4,672 feet) above sea level. Should Gila River flows be less than 25 cfs, but the reservoir levels fall below 1,424 meters (4,672 feet), FMC will consult with the NMDGF regarding a temporary curtailment of water. Freeport-McMoRan concludes that the 25 cfs trigger will ensure that FMC diversions do not cause the river to dry up during low-flow conditions. Should FMC need to modify its water use and diversion activities due to unanticipated circumstances, they will confer with FWS regarding the impacts of such changes for the purpose of developing alternative conservation measures. Should such measures be needed, FMC commits to spending up to $500,000 for these measures. This measure would assist in maintaining perennial flows, as described under PCE 4.

Freeport-McMoRan has funded monitoring on Mangas Creek and the Gila River in the past, and commits to funding surveys on these two streams on a biennial basis, and furnishing the results of the surveys to the Service. The Recovery Plans for both the spikedace and the loach minnow emphasize the need to consistently monitor the status of existing populations, including the establishment of standard monitoring locations and techniques, as well as investigating and quantifying through field research the habitat needs of the species and effects of physical habitat modification (Service 1991a; Service 1991b). In addition, FMC will develop and implement a program to detect and remove crayfish from Mangas Creek. Removal of this nonnative aquatic species would help in improving habitat conditions for spikedace and loach minnow by reducing/minimizing the number of nonnative aquatic species as described in PCE 5.

Freeport-McMoRan commits to making a reasonable effort to coordinate with other landowners in the Gila/Cliff Valley regarding conservation-related issues and activities. They will ask that neighboring landowners assist in FMC's conservation efforts, and will provide assistance to neighboring landowners who wish to implement conservation measures. Freeport-McMoRan will also confer with the Service regarding activities that might be undertaken to increase public awareness of the habitat needs of spikedace and loach minnow.

The management plan contains provisions for reporting requirements, as well as for adaptive management. For reporting requirements, FMC notes that they will provide an annual report to the Service discussing implementation of the management plan, which will include information affirming plan implementation; note any changes from

historic operating parameters; and discuss anticipated implementation of the plan for upcoming years. Reports will be submitted each year by April 1 for the previous year.

With respect to adaptive management, FMC anticipates that operational requirements may require modification of its land and water use in the Gila/Cliff Valley, or that future surveys and monitoring activities could detect significant changes in the native and nonnative fish populations or key habitat parameters, indicating that an alternative conservation measure is needed to protect spikedace and low minnow. They commit to conferring in good faith in the development of alternative conservation measures and, as noted above, will spend up to $500,000 on these measures.

For Bear Creek, FMC indicates that they will continue to discourage trespass on their lands in the lower portions of Bear Creek, which can aid in maintaining or improving water quality by minimizing sedimentation. In addition, the management plan states that FMC will continue its existing land uses and management practices in the Gila/Cliff Valley. The lower portions of Bear Creek included in the management plan are part of the U-Bar Ranch and managed by an FMC subsidiary. Freeport-McMoRan notes that they will continue their existing land uses and management practices on this property, unless unanticipated circumstances arise that necessitate changes. In such an event, FMC would provide the Service with notice of any significant changes in land use and management practices that are outside the range of the historic operating parameters they provide in the management plan, and discuss potential impacts to loach minnow.

We conclude that the management plans provide benefits to spikedace and loach minnow that are equivalent to those that would be provided by critical habitat designation. Under FMC's past and current management, portions of the Gila River and Mangas Creek continue to support the largest numbers of spikedace and loach minnow in their range. Nonnative species currently appear to be at levels that have a minimal impact on native species in the Gila River, and are currently nonexistent in Mangas Creek, meeting PCE 5 for these streams. Freeport-McMoRan has made a commitment to maintaining perennial flows in the Gila River downstream of their diversion. Should the situation change, FMC has committed to meeting with the Service to develop additional conservation measures, and has dedicated funding in the amount of $500,000 to this task. The management plan details reporting requirements and effective dates for the initiation of the plan.

Benefits of Inclusion—Freeport-McMoRan on the Gila River, Mangas Creek, and Bear Creek

The principal benefit of including an area in a critical habitat designation is the requirement for Federal agencies to ensure actions they fund, authorize, or carry out are not likely to result in the destruction or adverse modification of any designated critical habitat, the regulatory standard of section 7(a)(2) of the Act under which consultation is completed. Federal agencies must also consult with us on actions that may affect a listed species and refrain from undertaking actions that are likely to jeopardize the continued existence of such species. The analysis of effects of a proposed project on critical habitat is separate and different from that of the effects of a proposed project on the species itself. The jeopardy analysis evaluates the action's impact to survival and recovery of the species, while the destruction or adverse modification analysis evaluates the action's effects to the designated habitat's contribution to conservation. Therefore, the difference in outcomes of these two analyses represents the regulatory benefit of critical habitat. This will, in many instances, lead to different results and different regulatory requirements. Thus, critical habitat designations may provide greater benefits to the recovery of a species than would listing alone.

However, for some species, and in some locations, the outcome of these analyses will be similar, because effects to habitat will often also result in effects to the species. Lands being evaluated for exclusion in this unit are occupied by both species and are subject to consultation requirements of the Act. Within the stream reach managed by FMC, only approximately 0.25 mile is managed by BLM, while the remainder of this reach is private or State owned. It is possible that projects impacting other non-Federally owned areas may require section 7 consultation for impacts to critical habitat if they require Federal permitting or use Federal funds. However, we do not anticipate there being many consultations along the Gila River, Mangas Creek, and Bear Creek due to the lack of a Federal nexus and due to the lack of a history of consultations. Due to the lack of consultations in these areas, we conclude the benefit of inclusion based on consultation requirements under the Act is reduced.

All lands considered for exclusion are currently considered occupied by either spikedace or loach minnow and will be subject to the consultation requirements of the Act in the future. Although a jeopardy and adverse modification analysis must satisfy two different standards, because any modifications to proposed actions resulting from a section 7 consultation to minimize or avoid impacts to spikedace and loach minnow would be habitat-based, it is not possible to differentiate any measures implemented solely to minimize impacts to the critical habitat from those implemented to minimize impacts to the species. Therefore, in the case of spikedace and loach minnow, we believe the incremental benefits of critical habitat designation are minimal as compared to the conservation and regulatory benefits derived from the species being listed.

Public education is often cited as another possible benefit of including lands in critical habitat as it may help focus conservation efforts on areas of high value for certain species. Partnership efforts with FMC to conserve spikedace and loach minnow have resulted in awareness about the species that occur within the Gila River, Mangas Creek, and Bear Creek. However, we believe there is little, if any, educational benefit attributable to critical habitat beyond those achieved from listing the species under the Act and FMC's continued work in conserving these species.

The designation of critical habitat for spikedace and loach minnow within the Gila River, Mangas Creek, and Bear Creek may strengthen or reinforce some Federal laws, such as NEPA or the Clean Water Act. These laws analyze the potential for projects to significantly affect the environment. Critical habitat may signal the presence of sensitive habitat that could otherwise be missed in the review process for these other environmental laws; however, the listing of these species, prior designations of critical habitat and consultations that have already occurred will provide this benefit. Therefore, in this case we view the regulatory benefit to be largely as redundant with the benefit the species will receive from listing under the Act and may only result in minimal additional benefits.

In summary, we do not believe that designating critical habitat within lands owned and managed by FMC along the Gila River, Mangas Creek, and Bear Creek will provide significant additional benefits for spikedace and loach minnow. Projects on these lands with a Federal nexus will require section 7 consultation with the Service

(regardless of critical habitat designation) because the habitat is occupied and we believe the incremental benefit from critical habitat would be minimal. However, due to the lack of a consultation history along the Gila River, Mangas Creek, and Bear Creek, the benefits of inclusion that stem from consultation requirements under the Act are reduced. Furthermore, FMC continues to show a commitment to conservation of these species through the development and implementation of the management plans which cover the Gila River, Mangas Creek, and Bear Creek for spikedace and loach minnow.

Benefits of Exclusion—Freeport-McMoRan on the Gila River, Mangas Creek, and Bear Creek

The significant benefits of exclusion of FMC owned lands that are subject to the management plan for the Gila River, Mangas Creek, and Bear Creek is the maintenance and strengthening of the ongoing partnership with the Service. Freeport-McMoRan has demonstrated a partnership with the Service beginning with the management plan submitted to the Service in 2005 for the southwestern willow flycatcher, and the 2007 management plans for spikedace and loach minnow, and they have indicated a willingness to continue as a partner to the Service in the conservation of spikedace and loach minnow on the Gila River, Mangas Creek, and Bear Creek. Freeport-McMoRan has demonstrated a commitment to this partnership through conservation in this area by voluntarily enrolling in a water conservation program with the OSE for which they have dedicated 2,876 af of water that may be used for nonconsumptive purposes.

Evidence of this partnership can be shown through the management of those portions of the Gila River, Mangas Creek, and Bear Creek on FMC lands, which has resulted in expansion of riparian areas that provide suitable habitat for spikedace and loach minnow. Additional evidence of the partnership between FMC and the Service is shown by FMC's commitment to provide for adaptive management, such that should FMC need to modify its water use and diversion activities due to unanticipated circumstances, they will confer with the Service regarding the impacts of such changes and will adopt alternative conservation measures not to exceed $500,000 in cost. Exclusion of this area from the designation would maintain, and strengthen the partnership between the Service and FMC. The exclusion of these lands may enhance opportunities to partner with other entities not yet identified.

Weighing Benefits of Exclusion Against Benefits of Inclusion—Freeport-McMoRan on the Gila River, Mangas Creek, and Bear Creek

We reviewed and evaluated the benefits of inclusion and the benefits of exclusion of FMC-owned lands along the Gila River, Mangas Creek, and Bear Creek as critical habitat for spikedace and loach minnow. We believe past, present, and future coordination with FMC has provided and will continue to provide sufficient education regarding spikedace and loach minnow habitat conservation needs on these lands, such that there would be minimal additional educational benefit from designation of critical habitat. Further, because any potential impacts to spikedace and loach minnow habitat from future projects with a Federal nexus will be addressed through a section 7 consultation with the Service under the jeopardy standard, we believe that the incremental conservation and regulatory benefit of designated critical habitat on FMC-owned lands would largely be redundant with the combined benefits of listing and existing management. Therefore, the incremental conservation and regulatory benefits of designating critical habitat on FMC owned lands along the San Francisco River are minimal.

On the other hand, the benefits of excluding FMC-owned lands along the Gila River, Mangas Creek, and Bear Creek from critical habitat are significant. Freeport-McMoRan's management plan establishes a framework for cooperation and coordination with the Service in connection with resource management activities based on adaptive management principles. Most importantly, the management plans indicate a continuing commitment to ongoing management that has resulted in habitat that supports spikedace and loach minnow. Exclusion of these lands from critical habitat will help preserve and strengthen the conservation partnership we have developed with FMC, reinforce those we are building with other entities, and foster future partnerships and development of management plans whereas inclusion will negatively impact our relationships with FMC and other existing or future partners. We are committed to working with FMC to further the conservation of spikedace and loach minnow and other endangered and threatened species. Freeport-McMoRan will continue to implement their management plans and play an active role to protect spikedace and loach minnow and their habitat. Therefore, in consideration of the relevant impact to our partnership with FMC, and the ongoing conservation management practices of FMC, we determined that the significant benefits of exclusion outweigh the benefits of inclusion in the critical habitat designation.

In summary, we find that excluding FMC-owned lands along the Gila River, Mangas Creek, and Bear Creek from this final critical habitat will preserve our partnership and may foster future habitat management and species conservation plans with FMC and with other entities now and in the future. These partnership benefits are significant and outweigh the minimal additional regulatory and educational benefits of including these lands in final critical habitat for spikedace and loach minnow.

Exclusion Will Not Result in Extinction of the Species—Gila River, Bear and Mangas Creek

We have determined that the exclusion of 20.3 km (13.3 mi) FMC owned lands along the Gila River, Mangas Creek, and Bear Creek from the designation of critical habitat for spikedace and loach minnow will not result in the extinction of either species. The jeopardy standard of section 7 of the Act and routine implementation of conservation measures through the section 7 process due to spikedace and loach minnow occupancy provide assurances that this species will not go extinct as a result of excluding these lands from the critical habitat designation. Therefore, based on the above discussion, the Secretary is exercising his discretion to exclude approximately 20.3 km (13.3 mi) of FMC-owned lands along the Gila River, Mangas Creek, and Bear Creek from the designation of critical habitat for spikedace and loach minnow.

Summary of Comments and Responses

We requested written comments from the public on the proposed designations of critical habitat for the spikedace and the loach minnow during two comment periods. The first comment period was associated with the publication of the proposed rule opened on October 28, 2010 (75 FR 66482) and closed on December 27, 2010. The second notice reopening the comment period opened on October 4, 2011, (76 FR 61330) and closed on November 3, 2011. We held a public hearing on October 17, 2011. We also contacted appropriate Federal, State, and local agencies; scientific organizations; peer reviewers, and other interested parties and invited them to

comment on the proposed rule and draft economic and environmental analyses during these comment periods.

During the first comment period we received 36 comment letters directly addressing the proposed critical habitat designations. During the second comment period we received 25 comment letters addressing the proposed critical habitat designations or the draft economic and environmental analyses. No individuals or organizations made comments on the proposed designations of critical habitat or the analyses for the spikedace and loach minnow during the October 17, 2011, public hearing, All substantive information provided during comment periods has either been incorporated directly into this final determination or addressed below. Comments received were grouped into four general issues specifically relating to reclassification for spikedace and loach minnow and the proposed critical habitat designations and are addressed in the following summary.

Peer Review

In accordance with our peer review policy published on July 1, 1994 (59 FR 34270), we solicited expert opinions from 13 knowledgeable individuals outside the Service with scientific expertise to review our technical assumptions, interpretations of biology, and use of ecological principles with respect to the spikedace and loach minnow, and our analysis of the primary constituent elements (PCEs) and areas essential to the conservation of these species. We also asked for review on our adherence to regulations related to species reclassification and the critical habitat designations, and on whether or not we had used the best available information. We received responses from 6 of the 13 peer reviewers.

We reviewed all comments received from the peer reviewers for substantive issues and new information regarding threats to critical habitat for the spikedace and loach minnow. The peer reviewers generally concurred with our methods and conclusions and provided additional information, clarifications, and suggestions to improve the final critical habitat and reclassification rule. One peer reviewer noted that the literature cited contained a thorough listing of relevant reports and other literature relating to species status reclassification and critical habitat designation, which represents the best available scientific information to the best of the reviewer's knowledge. Peer reviewer comments are addressed in the following summary and incorporated into the final rule as appropriate.

Peer Reviewer Comments

(1) *Comment:* The reviewer stated that the term ''reasonably occupied'' in the proposed rule is not clear; suggest using the term ''occupied by the species at the time of listing.''

Our Response: In the October 4, 2011, NOA (76 FR 61330), we stated that, in order to improve clarity, we were revising the definition of occupied to include those areas identified as occupied for each species in the original listing documents, as well as any additional areas determined to be occupied after 1986. Our reasoning for including these additional, post-1986 areas is that it is likely that those areas were occupied at the time of the original listings, but had not been detected in surveys due to minimal or no survey efforts in some areas; low capture efficiencies associated with seining, and their small size. This language from the NOA has been incorporated into the final rule.

(2) *Comment:* The water temperature discussion should address the effects of shading on water temperature, including how water temperature would be affected by reductions in streambank vegetation. Belsky *et al.* 1999, Larson and Larson 1996, LeBlank *et al.* 1997, and Rutherford *et al.* 2004 were provided as potential sources of information for this discussion.

Our Response: We reviewed and added literature to address the possible increase in water temperatures as a result of the loss of vegetation by wildfire and recreation. Specifically, we added information indicating that indirect effects of wildfire, such as increases in stream temperatures, can last for several years to more than a decade after the fire.

(3) *Comment:* The term ''essential feature'' is used in the document, but is not defined. The peer reviewer noted that they would assume this means physical and biological features ''essential to the conservation of the species.''

Our Response: We have changed the language at the first use of essential feature to read ''essential feature to the conservation of the species.''

(4) *Comment:* Although the criteria for designating critical habitat are well described in the proposed rule, they seem overly focused on historical and present occupancy standards and do not always take into account how the species could best be recovered. For example, failing to consider designation of critical habitat within the Agua Fria drainage simply due to rejection of its single historical collection locality seems imprudent without more thoughtful deliberation.

Our Response: Please see page 66518, column 1 of the proposed rule. The Agua Fria was not included in the designation for spikedace for several reasons as stated there, including its location on the western edge of the species' range, and its relatively short stretches of perennial flows that enter the Lake Pleasant reservoir. Even with those conditions, we may have designated the Agua Fria had it served as an extension to any other spikedace area; however, it does not connect to any other occupied area. We do note elsewhere in the proposed rule (see page 66496, column 2) and the NOA (see page 61330) that we recognize that we have not necessarily included all areas that may be needed for recovery, and that other areas may be considered important for the species conservation by species managers or the Spikedace and Loach Minnow Recovery Team in the future. Page 66493, column 3 of the proposed rule further notes that critical habitat designations made on the basis of the best available information at the time of designations will not control the direction and substance of future recovery plans.

(5) *Comment:* It would seem that future designations of critical habitat should first be drafted by recovery teams to ensure that the entire process of recovery planning is comprehensively integrated and will produce the best possible chance of overall success.

Our Response: We agree. In the 1994 designation of critical habitat, the recovery plans from 1991 were in place to guide the designation. We used a revised and updated recovery outline to guide the current designation. There is no requirement in the Act that recovery plans need to be in place before critical habitat is designated, but we agree that recovery plans can be useful for critical habitat designations.

(6) *Comment:* The proposed rule states (page 66504, column 3) that all areas proposed for designation contain the physical and biological features (PBFs) for spikedace and loach minnow. However, on prior pages one PBF is defined as ''habitat devoid of nonnative aquatic species, or habitat in which nonnative aquatic species are at levels that allow persistence of spikedace and loach minnow.'' This is probably not true for most of the designation reaches, and actions such as barrier construction, chemical renovations upstream, and species augmentation or repatriations to achieve this PCE will be exceedingly difficult to implement. The document

falls short in its discussion of the intricacies associated with this PCE and the critical importance it has toward recovery of both species.

Our Response: Both the proposed and final rules provide a lengthy discussion of the impacts on spikedace and loach minnow from nonnative fishes. In addition, the descriptions of the streams throughout the document note the presence of nonnatives. In the final rule, we have added a section discussing the interaction between altered flow regimes and nonnatives. We recognize that nonnative aquatic species are a persistent threat throughout much, if not all, of the two species' ranges. Two facts about the PBFs are important to note. First, as written, the PCE on nonnatives is ''No nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low as to allow persistence'' of spikedace or loach minnow. It is not required that nonnative aquatic species be absent. Second, we look for one or more PBFs within a given unit in order to include it within the designations. In other words, a stream segment does not need to have all the PCEs in order to be designated as critical habitat.

(7) *Comment:* The potential for establishment of spikedace and loach minnow in Fossil Creek is much higher above the barrier than below, in the area proposed as critical habitat.

Our Response: Following review of comments received during the two comment periods, as well as new information received on the presence of spikedace, we have amended the area included within the designations to include that portion of Fossil Creek from its confluence with the Verde River, past and upstream of the barrier up to the old Fossil Diversion Dam. Please see the discussion under the section on ''Summary of Changes from Proposed Rule'' above for more detail.

(8) *Comment:* For Spring and Rock creeks in the Tonto River basin there was not enough justification provided to explain why spikedace was included but loach minnow was not. The chances of reestablishing both species are equal. It is not possible to accurately predict the outcome of the Rock and Spring Creeks translocation effort, and an a priori exclusion seems illogical and ill-advised.

Our Response: Please refer to the ruleset described in both the proposed rule and this final rule. Because there are no loach minnow known from Tonto Creek, Rock Creek, Spring Creek, Rye Creek, or Greenback Creek, these areas do not meet the category 1a criterion under the ruleset for occupied at the time of listing. Because none of these streams are tributary to an occupied stream, they do not meet criterion for category 2a of the ruleset. Because other streams are designated for loach minnow within this Subbasin (North Fork East Fork Black River, Coyote Creek, Boneyard Creek, and East Fork Black River), these areas would not significantly expand the distribution of loach minnow within its historical range (category 2b).

(9) *Comment:* With respect to reclassification, there seems to be little evidence presented to justify that the situation for either species is different (i.e., worse) now than at the time of listing. More recent reports may not show population decrease. Many surveys showed a boom for both species following the winter 2007–2008 flooding.

Our Response: As noted under the Reclassification Determination section of this rule, the decision to reclassify the two species began in 1991 with a 5-year review during which we determined that the species' status was precarious and that a change in status from threatened to endangered was warranted. While some recovery actions have occurred in the intervening years, and while we occasionally see an increase in numbers in a given area in response to flooding, the majority of areas occupied by spikedace and loach minnow have seen an increase in nonnative species, with nonnatives dominating some streams. 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. While streams that were occupied at listing may continue to be occupied, the overall length of the occupied segment has shrunk in some areas (e.g., Verde River, East Fork Gila River), or the two species occur in extremely limited numbers (e.g., Eagle Creek). In other areas, the species are considered extirpated (e.g., San Pedro River).

(10) *Comment:* There are inconsistencies between the occupancy table (Tables 3 and 4) in the proposed rule and the tables in the draft Environmental Assessment (Tables 5 and 6).

Our Response: We agree and the tables have been modified for the final rule and final environmental assessment.

(11) *Comment:* Section A Threats need to include the need for flushing flows to provide loose/clean substrate.

Our Response: Please see the discussion under Stream Channel Alteration within the Factor A analysis, which discusses disruptions to natural channel dynamics. In the final rule, we have also added a section on the relationship between altered flow regimes and nonnative predators which also highlights the importance of stream flow.

(12) *Comment:* There is no mention of yellow grubs or black spot parasites under the disease discussion, and they are fairly prevalent in the San Francisco River.

Our Response: In response to this comment, we have added information regarding both yellow grub and black grub parasites to the discussion under Factor C.

(13) *Comment:* Loose substrate should be included as a PBF for the two species.

Our Response: We discuss substrate within PCE 1 for both species, which includes ''Appropriate stream microhabitat types include glides, runs, riffles, the margins of pools and eddies, and backwater components over loose sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness.''

(14) *Comment:* There are no records of spikedace for those portions of the Blue River in New Mexico, and it may not be good habitat for that species.

Our Response: We do not have any records of spikedace for those portions of the Blue River in New Mexico. Within the proposed rule, we classified this stream as a 2b stream for spikedace, indicating that it would serve to expand the geographic distribution of the species. The Blue River system provides the PCEs for suitable habitat for spikedace, and we note that loach minnow, which often co-occur with spikedace, are found throughout the system, including those portions in both Arizona and New Mexico.

(15) *Comment:* Spikedace in the Verde River are very distinct from those in the Gila River. Hendrickson's morphology paper emphasizes the significance of thoroughly sampling the Verde to see if spikedace can be found.

Our Response: Please see the discussion under the Summary of Factors Affecting the Species. We include information regarding genetic and morphological differences, and cited Anderson and Hendrickson (1994) under Factor A in the proposed rule, and have added Anderson and Hendrickson (1994) as a cite under Factor E in the final rule.

(16) *Comment:* Populations of loach minnow actually show higher levels of differentiation than those of spikedace. Each unit identified to date is very distinct and each of the geographic subdrainages needs to be managed

independently. White River is likely highly divergent and deserving of management as a distinct unit.

Our Response: While not a criteria in the critical habitat designations, this information is used in ongoing management for the two species, and genetics is an important consideration in all captive propagation and translocation efforts. Additionally, information regarding the genetic and morphological distinctness of the two species will be considered as a revised recovery plan is completed.

(17) *Comment:* Throughout the document, but especially under the Available Conservation Measures section, the terms reintroduction, translocation, and augmentation are used. I would suggest they be defined, and defined early. I assume that for these purposes, reintroduction and translocation, when referring to loach minnow and spikedace, are synonymous. If so, defining them as synonymous early on or selecting one term and using it throughout the document would be of great value

Our Response: We have added definitions of reintroduction, translocation, and augmentation to the text. Briefly, a reintroduction occurs where the species was known to be present previously, but is believed likely absent based on a lack of detections; translocation occurs where the species was not known to be present previously, and augmentations are additions of more fish to streams as follow-up to reintroduction or translocation efforts.

Comments From States

Section 4(i) of the Act states, ''the Secretary shall submit to the State agency a written justification for his failure to adopt regulations consistent with the agency's comments or petition.'' Comments received from the State regarding the proposal to designate critical habitat for the spikedace and loach minnow are addressed below.

(18) *Comment:* Some commenters questioned whether it is appropriate to include as critical habitat those areas used for reintroduction sites when no success has yet been shown. They note that, if the species do not become established then it is likely that the habitat is unsuitable and, therefore, should not be included in the critical habitat designations. If designated, the AGFD would like the rule to state these areas will be removed if it is determined they are unsuitable. This would apply to Rock and Spring Creek, Fossil Creek, Hot Springs Canyon, Redfield Canyon, and Bonita Creek for both species, and the Blue River for spikedace only.

Our Response: Our studies indicate that inclusion of these areas is appropriate at this time. The translocation sites were chosen carefully, after field and scientific review of their suitability for spikedace and loach minnow. In some instances (e.g., spikedace in the San Francisco River in New Mexico), the species have been eradicated from the area, but previously occurred there, so that suitability is more certain. In other instances, a translocation may ultimately prove successful, and designation of critical habitat in the area will further protect and conserve habitat for the species. In some areas, should the translocation prove unsuccessful, it would be necessary to determine which factors are responsible for the failure. For example, a reinvasion by nonnative aquatic species, health issues, or water quality issues may ultimately prove responsible. Additional translocation efforts may be appropriate if these factors are addressed. Should this be the case, but suitable habitat is otherwise present, these streams could ultimately prove beneficial in the conservation of the species.

(19) *Comment:* The lower 33.7 kilometers (20.9 miles) of Oak Creek should not be included within the designations because there are no known records of either species, and this area is degraded. The upstream portions are in an urban area. In addition, this area is not currently being considered for translocation.

Our Response: We agree that there are no known records from this stream for either species, that some degradation has occurred, and there are no translocation efforts currently planned for this stream. However, spikedace and loach minnow are known to have occurred in the mainstem Verde River both above and below Oak Creek. Oak Creek does have perennial flows, and none of the degradation is permanent in nature (i.e., a dam, reservoir, or other permanent alteration). Because of its lack of occupancy records, Oak Creek is classified as an essential area for the conservation of both species. For spikedace, it was classified as a 2a stream, indicating that it will serve as an extension of habitat in the unit. For loach minnow, it was classified as a 2b stream, indicating it can serve to expand the geographic distribution of the species across its historical range.

(20) *Comment:* The lower portions of Fossil Creek below the barrier should not be included in the designations because of the presence of nonnatives.

Our Response: We agree that nonnative species are present in the lower portions of Fossil Creek. Ultimately, this is a situation which may be resolved, although that is not likely in the short term. Because we are attempting to conserve the species, and attempting to develop connectivity between occupied stream systems wherever possible, inclusion of this portion of the stream could ultimately serve as a connective corridor between the Verde River and upstream portions of Fossil Creek.

(21) *Comment:* The lower 2.8 km (1.7 miles) of Sycamore Creek should be included within the designations.

Our Response: We developed a ruleset, as described in both the proposed and final rules, which we applied in making determinations about the appropriateness of including or excluding specific areas. In addition, we used the best available information in determining which stream segments to include. At this time, we have no information regarding the suitability of this area.

(22) *Comment:* Those portions of the Verde River downstream of Tapco should be removed from the designations, as this area is developed.

Our Response: Development, in and of itself, does not make an area unsuitable for spikedace or loach minnow. The Verde River through these areas is classified as perennial, and spikedace are known to have occurred throughout this portion of the Verde River, while loach minnow records occur both above and below Tapco. The area may ultimately prove to provide suitable habitat, or serve as an important connective corridor between upstream portions of the Verde River and downstream areas, including tributary streams.

(23) *Comment:* The Salt River within the Salt River Canyon Wilderness should be included as there are records of spikedace from the Salt River confluence with Cibecue Creek.

Our Response: There are records for spikedace at the confluence with Cibecue Creek, with the most recent in 1967. Under the ruleset, however, we categorized this stream as a 1b stream, indicating the stream has been permanently altered by Theodore Roosevelt Dam and Lake, so that restoration is unlikely.

(24) *Comment:* Bass Canyon dries up into pools and is therefore not suitable for either species and should be removed from the designations.

Our Response: We have reviewed the site and spoken with individuals familiar with the site's flow regime and habitat. While the stream is not considered perennial, it provides suitable expansion habitat when flowing, and is a tributary to Hot

Springs Canyon. As such, we have classified it as an essential area (see discussion at 75 FR 66504). Hot Springs Canyon is the site of translocated populations of spikedace and loach minnow. These species were placed in Hot Springs Canyon in 2007, with annual augmentations of fish. Monitoring efforts showed that both species were present in 2011 (Robinson, 2011, pers. comm.). We anticipate that this translocation effort will be a success, and that Bass Canyon will serve as an extension of habitat in Hot Springs Canyon.

(25) *Comment:* The designations should exclude areas that have an economic impact on recreational fishing.

Our Response: Potential changes to recreational activities are discussed in Section 6 of the draft economic analysis. Potential impacts on recreational fishing losses are specifically discussed and estimated in Sections 6.4.1 and 6.5.2. The draft economic analysis notes that the AGFD has no planned or ongoing sportfish stocking projects on occupied reaches, with the exception of native Apache trout stocking on Fossil Creek. In New Mexico, the NMDGF stocked the East Fork Gila River in 2008 and 2009 and plans to continue stocking in the future. However, the Service completed a biological opinion on sportfish stocking activity in August 2011 that suggests that future stocking activities will not be found to jeopardize spikedace or loach minnow.

(26) *Comment:* Those portions of the Verde River covered by the SRP HCP should be excluded from the designations.

Our Response: While implementation of the HCP will provide some conservation measures for spikedace and loach minnow on the Verde River, the HCP does not involve all landowners on this portion of the Verde River, and therefore does not allow for exclusion of the area under section 4(b)(2) of the Act.

(27) *Comment:* Inclusion of Mangas Creek is appropriate.

Our Response: We agree, however, we have opted to exclude portions of Mangas Creek due to protections afforded by the FMC management plan for this area. We are retaining 1.2 km (0.7 mi) of Mangas Creek that are not on lands owned by FMC. Please see the discussion under the Exclusions section for additional detail.

(28) *Comment:* The decision not to include the Agua Fria River and those portions of the Gila River within Arizona is appropriate.

Our Response: We agree with this comment.

(29) *Comment:* The lower 4.2 kilometers (2.6 miles) of Negrito Creek are proposed as critical habitat and stated as occupied. The NMDGF is unaware of any records for this area. The lower 2.0 kilometers (1.25 miles) of Negrito will likely provide suitable habitat.

Our Response: Dennis Miller (1998) identified loach minnow from Negrito Creek in 1998, approximately 2.0 km (1.25 mi) upstream of its confluence with the Tularosa River. While the known collection sites are at this point, biologists from the Service and NMDGF had determined that Negrito Creek provided suitable habitat upstream as far as the Cerco Canyon confluence, as reflected in the designation.

(30) *Comment:* One State commenter noted a lack of awareness of any records for Frieborn Creek and stated that Frieborn Creek is marginal habitat for either species.

Our Response: Two monitoring efforts in 1998 and 2000 located loach minnow in Frieborn Canyon, indicating the suitability of the stream for loach minnow (ASU 2002; NMDGF 2008). We anticipate translocating spikedace to the Blue River system within the next 2 to 3 years, and conclude that Frieborn Canyon may serve as expansion habitat for spikedace as well.

(31) *Comment:* We recommend that the portions of the Gila River mainstem that are owned by FMC not be excluded from the final designations unless they adopt comprehensive plans that protect and enhance habitat within their ownership.

Our Response: Under Section 4(b)(2) of the Act, we consider a number of factors, during the development of a critical habitat designation, including whether the landowners have developed any HCPs or other management plans for an area. As with the 2007 designation, FMC provided a management plan for the Gila River, Mangas Creek, and Bear Creek in New Mexico. We have determined that it is appropriate to exclude portions of these three streams on FMC lands based on their management plans, with additional conditions. See the Exclusions section for further detail.

(32) *Comment:* We recommend that original work, especially published, be the primary source of information rather than synthesis documents or reports (e.g., Sublette *et al.* 1990, Propst 1999, and Minckley and Marsh 2009) unless synthesis documents report original sources of information.

Our Response: We are charged with using the best scientific information and commercial information available in a rule. In many instances, especially with monitoring data, ''synthesis'' documents are the only source of information available. Wherever possible, we attempt to use the original information.

(33) *Comment:* Stock tanks are an attractive nuisance and potential sources of nonnative fishes, and the problem of nonnatives caught in stock tanks and being released in the river should be identified.

Our Response: We agree that stock tanks can be a concern in native fish management, and have added language to our threats assessment to address this issue.

(34) *Comment:* The proposed rule states (p. 66483) that population estimates have not been developed as a result of the difficulty in detecting the species. The NMDGF notes that they do not find them difficult to detect in appropriate habitats with appropriate gear, but rather that population estimates likely have not been attempted, or reported, because of broad confidence intervals associated with estimates, the considerable effort associated with making reliable population estimates, and the brief time any estimate is relevant.

Our Response: Spikedace and loach minnow can be difficult to detect when at low numbers, as is the case for Eagle Creek or the Verde River. We agree, however, that at least in part, population estimates have not been attempted for the reasons cited in this comment. In addition, we note that different methodologies are applied in different streams by different survey teams, which can also complicate discussions on population numbers across the species' ranges as a whole.

(35) *Comment:* Soles 2003 should be added as a citation to the statement ''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.''

Our Response: We have reviewed Soles 2003 and added the citation as recommended.

(36) *Comment:* Under the Water withdrawals section, the AWSA is discussed as a potential diversion on the Gila River. The AWSA also has the potential to facilitate diversions on the San Francisco River.

Our Response: This is correct, and we have made appropriate modifications to reflect this information.

(37) *Comment:* Additional or different citations should be used for portions of the document, including Propst *et al.* 2008, Paroz *et al.* 2009, and Pilger *et al.* 2010.

Our Response: We reviewed the citations and the text in the proposed

rule, and have made appropriate modifications in the final rule.

(38) *Comment:* The proposed rule states that the State of New Mexico lacks adequate regulatory mechanisms to address the issue of introduction and spread of nonnative aquatic species. It should be noted that New Mexico State regulations prohibit the use of nonnative baitfish, except for the use of fathead minnow (*Pimephales promelas*) as a baitfish in the Gila and San Francisco river drainages.

Our Response: This comment is, in part, correct. The remainder of the text on this point states that regulation of activities that can lead to the spread of nonnative species is inadequate, as many introductions are the result of incidental or unregulated actions.

(39) *Comment:* The NMDGF suggests adding language to the discussion on ''Available Conservation Measures'' regarding repatriation of spikedace to the San Francisco River, removal of nonnative fishes from the Forks area, beginning in 2007, and removal of nonnative fishes in Little Creek beginning in 2010; and efforts to acquire and hold separate stocks of spikedace and loach minnow in a refuge facility.

Our Response: Appropriate modifications were made to this section in the final rule.

(40) *Comment:* The rule should be updated to include Propst et al. 2008 as a reference regarding nonnative fishes, in place of Propst 1986.

Our Response: We have included Propst *et al.* 2008 in several places within the document in regards to nonnative fish.

(41) *Comment:* The final rule should include information about competition with and predation by smallmouth bass as a likely threat, and Pilger *et al.* 2010 should be added as a citation.

Our Response: Smallmouth bass are mentioned in several places within the rule. Pilger *et al.* 2010 is also cited in the text. Please see the Disease or Predation section. In addition, results of the study by Pilger *et al.* 2010 are discussed.

(42) *Comment:* Riffles are identified as a PBF for spikedace, but they prefer runs and glides, not riffles.

Our Response: While we agree that spikedace are primarily associated with runs and glides, they may be associated with other habitat types and many authors (Barber and Minckley 1966, p. 31; Propst *et al.* 1986, p. 12; Rinne and Kroeger 1988, p. 1; Rinne 1991, pp. 8–10) note use of riffles by spikedace.

(43) *Comment:* The San Francisco River dries annually through the Alma Valley and is not perennial throughout as stated on page 66515.

Our Response: This correction has been made within the text, with an appropriate citation.

General Comments Issue 1: Biological Concerns

(44) *Comment:* There were many comments submitted with technical corrections, additional literature citations, and specific biological information on stream segments.

Our Response: We have reviewed all of these comments and have incorporated the information in this final rule, as appropriate.

(45) *Comment:* We received comments that Bear Creek should be included within the designation for loach minnow, and conversely that Bear Creek should not be included within the designation.

Our Response: In reviewing the information on Bear Creek, including surveys and habitat, we have determined that inclusion of Bear Creek is appropriate. Please see the discussion on Bear Creek in the section on Summary of Changes from Proposed Rule.

(46) *Comment:* The lowermost mileage on the Gila River in New Mexico, as it travels through the Virden Valley, is predominantly dry, and has three diversion structures, rarely supports fish, and is not connected to any other suitable habitats at this time.

Our Response: We reviewed occupancy data for this area. Spikedace have been detected occasionally within the area downstream of the diversion structures during surveys conducted over a 50-year period, with the most recent detection in 1999 (Rinne *et al.* 1999, p. 22; NMDGF 2008). Spikedace and loach minnow have been detected immediately upstream of the diversion more recently, into 2003, and the area around the Sunset Diversion had sufficient potential for spikedace and loach minnow that it was added to regularly monitored sites in 2010 and 2011 (Propst, 2011, pers. comm.).

With respect to flow patterns, the nearest gage station is just downstream of the confluence with Blue Creek, so does not accurately portray the flow patterns below the diversion structures. The next nearest USGS gage downstream of the barriers is 09439000 on the Gila River at Duncan. The monthly statistical data for this gage, recorded since 2003, show that flows have been at 0 cfs on one occasion, and been below 5 cfs on five occasions in the months of May, June, or July. However, in the area immediately downstream of the Sunset Diversion, native suckers and channel catfish are frequently present, indicating that water remains in this area and may indicate that the area serves as a refuge. While the diversion structure may serve as an impediment to upstream movement, it is not necessarily a barrier to upstream movement of fish (Propst, 2011, pers. comm.). With water present below the diversion, and the presence of spikedace in this area, albeit not consistently, over the last 50 years, we conclude it is appropriate to retain this area within the critical habitat designations.

(47) *Comment:* Bass Canyon is unsuitable for spikedace and loach minnow due to lack of flows.

Our Response: We have visited the site and conclude that, while it may not be classified as perennial, it contains adequate flows and appropriate substrates during significant portions of the year to support the two species. In addition, it joins with Hot Springs Canyon, where a spikedace and loach minnow translocation effort has been under way since 2007. Bass Canyon can serve as an extension of habitat for that population, and we are therefore retaining Bass Canyon within the designations at this time.

(48) *Comment:* The Biological Opinion issued by the Service for Fort Huachuca on 14 June 2007 states that the ''most likely sites for such reestablishments appear to be springs within the tributaries to the mainstem San Pedro River rather than along the mainstem river where critical habitat would be designated. A scientific basis for changing the approach from reestablishing the spikedace at springs within the tributaries to the mainstem San Pedro River needs to be provided.

Our Response: This is an error in the biological opinion, and not in the proposed rule. The habitat use, as described in the proposed rule at pages 66483 and 66497 through 66498 is correct. All reestablishment efforts to date have occurred on flowing streams (Hot Springs Canyon, Redfield Canyon, Fossil Creek, Bonita Creek, and the San Francisco River) and not in springs.

(49) *Comment:* The proposed rule assumes that these species were present in the San Pedro River at the time of listing in 1986 but were undetected due to infrequent or inconsistent surveys.

Our Response: This statement is incorrect, and reflects a misunderstanding in the terminology used within the proposed rule. Our determination of ''occupied at listing'' was based on whether or not the species was present up to the date of listing in 1986, and not on the presumption that the species was present but undetected. It should be noted that in the NOA, we announced that we were modifying our definition of occupied to improve

clarity on our approach to the critical habitat designation. In the NOA, we defined areas occupied at the time of listing to be those areas where the fish were identified in the original listing documents, as well as any additional areas determined to be occupied after 1986. Our reasoning for the inclusion of these additional areas (post-1986) is that it is likely that those areas were occupied at the time of the original listings, but had not been detected in surveys. This change in definition does not result in a change to any of the areas included or excluded as critical habitat in the proposed rule.

(50) *Comment:* The statement that ''After leaving the Mogollon Mountains in New Mexico, the Gila River is affected by agricultural and industrial water diversions, impoundment, and channelization'' is incorrect. There have been no significant modifications to the river channel or further commercial activities along the river from Mogollon Creek to the New Mexico/Arizona State line since listing these species in 1986.

Our Response: This statement encompasses present uses of the area as well. Propst *et al.* 2008 (pp. 1237–1238) notes that irrigated agriculture and livestock grazing are the predominant uses, and that human settlement has increased since 1988. Soles (2003 p. 69) notes that diversions for agriculture in the Cliff-Gila Valley are modest, but that, during dry seasons, may remove the Gila's entire baseflow of about 40 cubic feet per second (cfs).

Part of the language in this statement pertains primarily to the Gila River below the Arizona border. We have separated these statements for accuracy and added the Propst *et al.* 2008 and Soles 2003 citations to the rule.

(51) *Comment:* Additional data should be supplied to support the conclusion that declines of native fish species appear linked to increases in nonnative fishes (p. 66491). FWS cites data with a 28-year gap, which is not good science because the periodicity cannot be used to establish a reasonable trend.

Our Response: We have added additional information from Propst *et al.* 2008. Propst *et al.* 2008 found that physical modification of streams, coupled with widespread introduction and establishment of nonnative aquatic species led to the decline of native fishes (Propst *et al.* 2008, p. 1236, 1246). This study took place just downstream of the town of Cliff. While this study does implicate both altered flow regimes and nonnative aquatic species, Propst *et al.* 2008 (p. 1246) conclude that managing for natural flow alone would not be sufficient to conserve native fish assemblages where nonnatives are present.

(52) *Comment:* The Service failed to establish that there is a need for uplisting spikedace and loach minnow, and does not give population estimates or know the status of the species. The Service should provide actual population counts.

Our Response: Please see our response at Comment 9 above, which addresses the status of the species.

(53) *Comment:* The Service is not using best scientific and commercial information available. Fifty percent of the citations are 10 or more years old. A number of links to Web sites cited were broken; at least nine of the citations referenced data about species other than the spikedace or loach minnow, or referenced different ecological environments than that of the spikedace or loach minnow.

Our Response: Critical habitat designations use the best available commercial and scientific data to identify lands that contain the physical and biological features essential to the conservation of the species. The Act requires that we use the best available scientific information regardless of the age of the information. In some cases, the best available information is derived from different species with similar habitat requirements. In designating critical habitat for spikedace and loach minnow, we have used the best available scientific and commercial information, including results of numerous surveys, peer-reviewed literature, unpublished reports by scientists and biological consultants, and expert opinion from biologists with extensive experience with these species. Further, information provided in comments on the proposed designations and the draft environmental and economic analysis were evaluated and taken into consideration in the development of these final designations, as appropriate.

(54) *Comment:* The Service has failed to specify what ''residual effects of past livestock grazing and impacts to uplands, riparian vegetation'' and streams actually entail.

Our Response: Please see the discussion on livestock grazing under ''The Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range'' section. This section outlines the types of impacts that can occur as a result of improper livestock grazing. We used the term ''residual effects'' to indicate that, in some areas, these impacts are due to past, and not ongoing, livestock grazing.

(55) *Comment:* The Service should state what is accomplished by uplisting.

Our Response: The Act provides definitions of threatened and endangered species. A threatened species is one which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. An endangered species is one which is in danger of extinction throughout all or a significant portion of its range. We provide justification for the reclassification within the proposed and final rule, and note that we determined that listing the species as endangered was warranted but precluded in 1994 (59 FR 35303). In part, reclassifying the two species to endangered status fulfills our obligation for finalizing the reclassification. In addition, appropriately classifying the species notifies Federal agencies of the correct status of the species so that they can manage for the species appropriately.

The Service treats endangered animal species similarly to threatened species with regard to prohibitions on take and requirements for consultation by Federal agencies. However, the Act provides management flexibility for threatened species that is not allowed for endangered species. The Service sometimes makes exceptions to the take rule for threatened species (for example, to allow some traditional land-use activities to continue), and is able to issue take permits to allow more activities that affect threatened species than would be permitted for endangered species.

(56) *Comment:* We received several comments indicating that the Service did not adequately show that an individual land use necessitated designation of critical habitat. Specifically, one comment noted that numbers of cows and elk are down and that the Service should justify designation of critical habitat in light of the reduced populations of grazing animals. Another comment noted that the Service failed to provide justification for the designations of critical habitat due to improperly managed wildfire and the use of chemicals for fire suppression.

Our Response: We note that grazing animals and fire management are only one of several concerns for spikedace and loach minnow. Please see the discussion under Summary of Factors Affecting the Species.

(57) *Comment:* The spikedace and loach minnow coexisted with the diversion dams that have been a part of the local agricultural culture and heritage for hundreds of years. The Service should demonstrate how water uses today could impact habitat

although these same uses have not done so in the past.

Our Response: Please see the discussion on water diversions under the subheading of Water Withdrawals, which details the potential impacts associated with diversions and water withdrawals. In addition, climate change and drought are compounding the impacts of water withdrawals on these species.

(58) *Comment:* The Service has failed to acknowledge the causes for portions of the rivers, streams, and tributaries indicated on the maps as critical habitat periodically drying up. Human population, human use, livestock and wildlife populations and water diversion do not account for this phenomenon. According to the Northern Arizona University Forestry Department, the reason for reduced water flow is due to in excess of 300 percent greater tree density today, compared to presettlement. The Service should examine the relationship between tree density and water reduction, and should specify amount of water flow reduction due to tree density vs. other potential causes. The Service should further specify how designation of critical habitat would address the reduction of tree density issue.

Our Response: No literature citations were provided with this comment, and we were unable to locate any literature relevant to this comment. Please note that a critical habitat designation is not the process through which we rule out habitat suitability due to threats, nor is it the process through which we conduct research as suggested in the comment.

(59) *Comment:* The Service has failed to provide justification for the critical habitat designations due to human use of resources, including agriculture, mining, road building, residential development, and recreation. The Service should specify how these uses contribute to habitat loss and stream degradation.

Our Response: Please see the section on Summary of Factors Affecting the Species. This section addresses these, as well as other natural and human use impacts to the species.

(60) *Comment:* We received several comments indicating that we failed to look at the benefits of grazing to fish or wrongfully assumed that livestock grazing is harmful to spikedace and loach minnow and their habitat. In some instances, commenters noted that the work of Rinne and Medina should be included within our review.

Our Response: Please see the response to comment 51 above regarding use of the best scientific and commercial information available. The discussion on livestock grazing cites many studies and authors on the topic of livestock grazing, and we have added a citation from Medina *et al.* (2005). We have reviewed additional work by Rinne (Rinne 1999b) and considered the information in this literature. We believe the discussion on livestock grazing and impacts to fish provides a thorough discussion on this topic.

(61) *Comment:* Nonnative fish are the biggest problem for spikedace and loach minnow, and this is a threat that requires removal of the nonnatives and construction of barriers to prevent their spread, neither of which is facilitated by designation of critical habitat.

Our Response: The purpose of designating critical habitat is not to remove threats for the species, but is instead to identify those areas that are essential to the conservation of the species. While designation of critical habitat does not remove the threat from nonnative species, it does identify those areas that are critical to the conservation of the species, which allows land managers and others to prevent further degradation in areas critical to the species' conservation

(62) *Comment:* The current threat to spikedace and loach minnow from nonnative fish in the Gila River and Mangas Creek where they pass through FMC lands is greatly overstated.

Our Response: The discussion of Mangas Creek and the Gila River encompasses landowners other than FMC, and there are additional management considerations for these areas. We have updated the information for Mangas Creek.

(63) *Comment:* Road impacts to the species would be dealt with through section 7, and, therefore, designating critical habitat would not address this issue.

Our Response: This comment is incorrect. First, critical habitat designation is not the process through which we rule out habitat suitability due to threats, but the process through which we identify habitat that provides for one or more of the life-history functions of the species. Second, should future road projects have impacts on critical habitat, section 7 would be the process used to identify and minimize those threats, as appropriate. In areas where the species are not currently present, but that are designated as critical habitat, it would be the nexus between the project and critical habitat which would lead to section 7 consultation under the Act, assuming the action was either Federally funded, permitted, or carried out.

(64) *Comment:* Recreation is listed as a threat for the Gila River. No recreation occurs in the Cliff-Gila Valley.

Our Response: Our list of potential impacts to spikedace and loach minnow for the Gila River encompassed more than the Cliff-Gila Valley, including lands managed by the USFS, and we conclude the original assessment is correct.

(65) *Comment:* Occupancy by spikedace and loach minnow in Eagle Creek for only brief periods of time indicates that they suggest fish may have been placed there via bait bucket transfer.

Our Response: We have no evidence of bait bucket transfer, or any reasons to believe that such a transfer occurred. Marsh *et al.* 1990 (p. 112) provide a discussion on the likely cause for the sporadic records of spikedace and loach minnow in Eagle Creek, concluding it likely that the species were missed in some survey efforts while detected in others due to their tendency to expand and contract spatially in response to natural variations in their habitat. We further note that portions of Eagle Creek are not readily accessible, and are not regularly surveyed, so that the species could have been missed, yet present, during some of the survey efforts. Finally, we note that there are other gaps in the survey record for other streams. These gaps may be due to a lack of survey efforts, or to lack of detection during survey effort. For example, on the Verde River, spikedace were not detected from 1950 to 1975 (ASU 2002).

(66) *Comment:* The lower San Francisco is not occupied, with nearest detections 20 miles upstream, in the vicinity of Apache-Sitgreaves National Forests boundary.

Our Response: The San Francisco River, as a system, was classified as occupied at listing, and the designation reflects this.

(67) *Comment:* Both Eagle Creek and the San Francisco River have nonnatives and are not occupied by either spikedace or loach minnow. Neither can therefore be considered essential to the conservation of the species.

Our Response: We agree that both Eagle Creek and the San Francisco River have nonnative aquatic species; however, this alone does not preclude them from being considered for critical habitat designation. Further, as noted in the proposed rule, we consider Eagle Creek to be occupied by both species, while the San Francisco River is occupied by loach minnow and the site of a reintroduction effort for spikedace.

(68) *Comment:* The presence of a large nonnative fish population and refugia

that allow nonnative fish to persist and repopulate portions of proposed critical habitat on Eagle Creek and the lower reach of the San Francisco River following significant flood events make these streams unsuitable for both spikedace and loach minnow. Absent a comprehensive management plan agreed to by affected parties, the complex land ownership patterns and current uses of lower Eagle Creek and the lower San Francisco River substantially compromise the logistics and practicability of achieving adequate control of nonnative fish required to make the segment of these rivers suitable for spikedace and loach minnow.

Our Response: Critical habitat designation is not the process through which we rule out habitat suitability due to threats, but the process through which we identify habitat that provides for one or more of the life-history functions of the species. As defined in section 3(5)(A) of the Act, critical habitat means (i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of 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. During the designation process, the Service identifies threats to the best of our ability where they exist. Identification of a threat within an area does not mean that that area is no longer suitable, rather that special management or protections may be required. The need to address a particular threat, such as nonnative fishes, in a portion of the critical habitat designation may or may not arise in the future. Further, describing both the areas that support PBFs and the threats to those areas assists resource managers in their conservation planning efforts for threatened and endangered species like spikedace and loach minnow.

(69) *Comment:* Eagle Creek is listed as perennial, and this is incorrect.

Our Response: We have modified the description of Eagle Creek to indicate that the stream is largely a perennial system.

(70) *Comment:* We received comments that additional studies were needed, including a study of the future impacts of increased vegetation near the San Pedro River on the ability of groundwater to reach the river, and on pebble counts or other substrate evaluations of spikedace and loach minnow critical habitat.

Our Response: The Service makes every attempt to use the best scientific and commercial information available when evaluating areas to be included within critical habitat; however, the critical habitat designation process does not undertake studies of the kind recommended.

(71) *Comment:* Fossil Creek is the only stream on the Tonto National Forest that is occupied by loach minnow. Translocations for spikedace appear to be unsuccessful. Inclusion of Fossil Creek as critical habitat for spikedace may be premature.

Our Response: We recognize that Fossil Creek is a translocation site for both spikedace and loach minnow. We are designating Fossil Creek as a 2a stream, indicating that it could serve as an extension of habitat in the unit, as existing habitat is insufficient to recover the species. Please note the updated language regarding the potential success of the spikedace reintroduction effort in the section below on Summary of Changes from Proposed Rule. In addition, please see our response at Comment 18 to a similar question.

(72) *Comment:* The statement ''the majority of historical native habitat'' is overbroad and unclear as it applies to the Gila River in New Mexico. Also, this statement is incorrect, as it pertains to the Gila River in New Mexico, and the activities described have not, nor do they threaten destruction, modification, or curtailment of the loach minnow or spikedace habitat or range in New Mexico. Within New Mexico, the Gila River has not been altered significantly since the time of listing in 1986. The middle, east, and west forks of the Gila all lay within the Gila National Forest and watershed conditions have improved in these areas.

Our Response: This statement is found at the beginning of the discussion at Factor A, the Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range, and applies to the species rangewide, not to the Gila River in New Mexico specifically. As noted elsewhere in the proposed rule, we estimate the present range of spikedace to be approximately 10 percent of its historical range, while that of loach minnow is estimated to be 15 to 20 percent of its historical range. While watershed conditions may have improved within the Gila National Forest, there are still threats in those areas, including wildfires, residual impacts of livestock grazing, and competition with and predation by nonnative species.

(73) *Comment:* Additional data should be supplied to support the conclusion that declines of native fish species appear linked to increases in nonnative fishes. The Service cites data with a 28-year gap, which is not good science because the periodicity cannot be used to establish a reasonable trend.

Our Response: This comment addresses the information found in the proposed rule under the discussion at Factor C for Predation. Please also see the information on competition under Factor E on Nonnative Fishes, which provides additional citations.

(74) *Comment:* Portions of the proposed critical habitat in Units 6, 7, and 8 overlap sections of river currently occupied by Gila trout. The designations appear to create a conflict in management objectives; for example, adult Gila trout potentially prey on juvenile spikedace and loach minnow. The dynamics of this potential fish community are not yet clearly understood.

Our Response: We would agree that the dynamics of the interactions between Gila trout and spikedace and loach minnow may not yet be fully understood. However, this does not eliminate the possibility of the three species occurring in the same stream. For example, both Gila trout and spikedace are known to occur in the Verde River.

(75) *Comment:* Spikedace were found in the Middle Fork Gila River in 2008 and 2010.

Our Response: In response to this question, we have updated our information on the Middle Fork Gila River to reflect that spikedace were found in the Middle Fork Gila River in these years (Propst *et al.* 2009, p. 10; Gilbert 2011 pers. comm.).

(76) *Comment:* Propst *et al.* (2008) determined that the primary driver affecting native fish in the Upper Gila River and San Francisco River catchments was long-term discharge, with nonnative fish exacerbating the effects of low discharges. In the water withdrawal section, it should be noted that both existing and potential water withdrawals are one of the primary threats to spikedace and loach minnow. Long-term reductions of instream flow have been shown to negatively affect both species.

Our Response: In response to this and other comments, we have incorporated information from Propst *et al.* (2008) within the Flow Regime, Nonnative Fishes, and Connectivity discussion under Factor E above.

(77) *Comment:* A settlement agreement regarding pumping wells in the Big Chino Valley was effected between the Salt River Project and the towns of Prescott and Prescott Valley in 2010. This agreement will allow the withdrawal of approximately 2.5 billion gallons of water/year from the Big Chino

Valley aquifer, and could seriously impact surface flow in the upper Verde River. Implementation of this proposal lends credence to the need for uplisting to endangered of spikedace.

Our Response: We have added information and citations regarding the Agreement in Principle signed between Salt River Project, Prescott, and Prescott Valley indicating that they have agreed to try to move forward without litigation in the development of the Big Chino project.

(78) *Comment:* Some of the language under the Nonnative Fishes subheading of Factor E appears to discount the detrimental effect of larger nonnative species, e.g., green sunfish, smallmouth bass, flathead catfish, and others, all of which are highly predacious on spikedace and loach minnow.

Our Response: This language has been modified to indicate the specific problems associated with small and large nonnative fish species.

(79) *Comment:* Many of the descriptions of PBFs essential for spikedace and loach minnow are vague and undefined. They provide little detail as to their exact meaning. While this may be a result of the relative lack of research and knowledge of the species, it should also encourage the Service to advocate more applied investigations on the species in order to better understand their requirements.

Our Response: We acknowledge that additional research would be valuable; however, the discussion under the subheading of PBFs presents the best information currently available for the species.

(80) *Comment:* In addition to fishes, nonnative species that also affect spikedace and loach minnow include parasites, crayfish, mollusks, and probably others.

Our Response: We have modified the language under the subheading of Nonnative Aquatic Species to reflect this. Information regarding other nonnative aquatic species is found under Factor C.

(81) *Comment:* Although the concern for livestock grazing as a threat has lessened, the threat still remains. Livestock permittees on the National Forest lands continually request livestock access to riparian areas that were closed for resource protection. Also many of the areas proposed for critical habitat are not currently protected from livestock, either by structures or in their allotment management plans. Additionally, disturbance of soil and vegetation in upper watersheds will continually increase sedimentation in drainages.

Our Response: We include a discussion of the impacts of livestock grazing within Factor A of the rule. We note that 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), largely due to discontinuing grazing in the riparian and stream corridors. However, we also note that livestock grazing within watersheds where spikedace and loach minnow and their habitats are located continues to cause adverse effects. Following finalization of the critical habitat designations, existing consultations on livestock allotment management plans may require additional consultation.

(82) *Comment:* The recovery objectives for spikedace and loach minnow in the current recovery plans is delisting through protection of existing populations and restoration of populations into historical habitats. The downlisting and delisting criteria expressed in the proposed rule make no mention of the existing natural populations or their habitats. Assuring recovery and long-term conservation of existing natural populations should be the primary emphasis in any down- or delisting proposal.

Our Response: In response to this comment, we have amended the language to indicate that, in addition to increasing the number of occupied streams, there will be a continued protection of existing populations and habitat. This was implied in the text of the proposed rule, but we have clarified the language to place more emphasis on protection of existing populations and habitats.

(83) *Comment:* The Service should include bridges, diversion structures, and other structures in the designations. Although they lack the PBFs, it is often these structures that cause the most degradation, and including them would provide impetus to management agencies to modify their detrimental features in order to reduce effects on the species during both normal and extraordinary maintenance.

Our Response: Generally, areas without PBFs cannot be considered essential to the conservation of the species. However, it should be noted that, should one of these features require maintenance, the Service would evaluate potential up and downstream effects from such an action, assuming it has a Federal nexus.

(84) *Comment:* Current occupation of Fossil Creek and San Francisco should be uncertain.

Our Response: We agree, and have modified the table to reflect this for all translocated or reintroduced populations.

(85) *Comment:* Critical habitat in Fossil Creek should be extended upstream to Fossil Springs. Both spikedace and loach minnow have been translocated into Fossil Creek between the springs and downstream to Irving. Fossil Creek is considered recovery habitat for loach minnow and spikedace, but the habitat is threatened by recreational development and degraded by excessive human use. Fossil Creek was designated a Wild and Scenic River in 2010.

Our Response: Please see the response to comment 7, as well as the discussion below on Summary of Changes from Proposed Rule.

(86) *Comment:* It is unclear why West Clear Creek was excluded from critical habitat. The lower 7.2 miles of West Clear Creek was included in the 2000 designation.

Our Response: We are including the lower 10.9 km (6.8 mi) of West Clear Creek for spikedace only, as there are no known records for loach minnow from this stream.

(87) *Comment:* We do not agree that Tonto Creek, Rye Creek, and Greenback Creek should be excluded from critical habitat. Loach minnow and spikedace typically co-occurred historically. The lack of records of loach minnow from Tonto Creek was more likely an artifact of incomplete sampling, rather than lack of occurrence. We believe that Tonto Creek does have suitable habitat for loach minnow and is worthy of inclusion.

Our Response: Please see the response to comment 8 above.

(88) *Comment:* We question why West Fork Black River was excluded from critical habitat. The lower 6.4 miles was included in the 2000 designation.

Our Response: We have included within the designation 19.1 km (11.9 mi) of the East Fork Black River, 7.1 km (4.4 mi) of the North Fork East Fork Black River, 3.4 km (2.1 mi) of Coyote Creek, and 2.3 km (1.4 mi) of Boneyard Creek. There are no known records from the West Fork Black River. East Fork Black River is directly connected to the North Fork East Fork Black River, where loach minnow have been detected, whereas the West Fork Black River is not directly connected, and therefore does not provide an extension of habitat (i.e., is not a 2a stream) for loach minnow in this complex.

(89) *Comment:* Threats along the Gila River include water withdrawal, stream channelization, water quality degradation, roads and bridges, and

livestock grazing, as well as the spread of nonnative species and climate variability and change, especially drought.

Our Response: This issue has been addressed within the rule. Please see the discussion under Unit 8 for special management considerations, as well as the information on climate change and nonnative species.

(90) *Comment:* The proposed rule notes that grazing may cause increased erosion and deposition and increased sediment loads from livestock, but nowhere in the proposed rule does the document acknowledge the Chitty flood of July 2007 from Chitty Creek that changed the entire area and affected East Eagle and Eagle Creek. The Chitty, Hot Air, and Eagle wildfires have occurred since 2007. The Clifton Range District under the Mogollon Rim is prone to large lightning strikes and has no prescribed burns scheduled; therefore, the potential of another wildfire is evident and large-scale erosion occurring, making East Eagle and Eagle Creek not suitable for spikedace and loach minnow as stable habitat.

Our Response: We have added information regarding wildfires to the discussion for Eagle Creek. Eagle Creek continues to support one or more of the PBFs for spikedace and loach minnow, and we therefore believe it is reasonable to include Eagle Creek within the designation. East Eagle Creek was not included at the proposed rule stage, and is not included in the final rule for either species.

(91) *Comment:* The proposed rule states that open stock tanks contain nonnative aquatic species, which is not documented on East Eagle or Mud Springs allotment, and in fact all stock tanks go dry a minimum of once each year.

Our Response: The discussion on nonnative species and stock tanks is under the general discussion for livestock grazing, and is not attributed to Eagle Creek, or the East Eagle or Mud Springs allotments.

(92) *Comment:* The crayfish population is the only increasing aquatic life on Eagle Creek. Numerous studies over the last 10 years show no increase in native fish. A proposed rule change is not the solution.

Our Response: We have included discussions on the presence of nonnative aquatic species and potential impacts to spikedace and loach minnow; however, critical habitat designation is not the process through which we rule out habitat suitability due to threats, but the process through which we identify habitat that provides for one or more of the life-history functions of the species. Please see additional discussion on this point at comment 66.

(93) *Comment:* Eagle Creek has two year-round stream crossings and a third seasonal crossing, and all are on private land. There are private land holdings from Honeymoon Campground south on Eagle Creek. In addition, there are Upper Eagle Creek Watershed Association Management plans. For these reasons, Eagle Creek should be exempt from critical habitat.

Our Response: Critical habitat designation does not impose restrictions on private lands unless Federal funds, permits, or activities are involved. Federal agencies that undertake, fund, or permit activities that may affect critical habitat are required to consult with the Service to ensure that such actions do not adversely modify or destroy designated critical habitat. There will likely be minimal, if any, impact to private land holdings along Eagle Creek from the critical habitat designation, unless a Federal nexus exists, as described above. Appropriate exclusions along Eagle Creek have been made for the San Carlos Apache Tribe and FMC. With respect to the Upper Eagle Creek Watershed Association Management Plans, no such management plan was submitted to the Service for consideration during this rulemaking.

(94) *Comment:* Eagle Creek should be excluded as neither species has been seen there in more than 10 years.

Our Response: We refer the reader back to the ruleset used in determining which areas would be included as critical habitat, and to the definitions of occupancy within the rule. Eagle Creek was occupied at listing by both species, and is classified as a 1a stream under the ruleset, as it continues to provide suitable habitat for the species.

(95) *Comment:* The Upper Eagle Creek Watershed Association is participating in the Ranch Heritage alliance and has worked for the last two years with the National Riparian Service Team to develop plans, methods, and monitoring protocols to develop habitat for numerous species. This new method should be encouraged and the Greenlee County Rivers and tributaries should be excluded from the critical habitat designations for loach minnow and spikedace to give the management plans an opportunity to succeed. The past plan of just fencing the riparian areas has not been a total success, and a more positive approach of collaboration is recommended.

Our Response: We agree that collaboration is a positive approach to recovering threatened and endangered species. At this time, however, we have not received a complete management plan from the Upper Eagle Creek Watershed Association and, therefore cannot exclude this area from the designations.

(96) *Comment:* There were several comments referring to the unsuitability of the San Pedro River as critical habitat, especially because of the nonnative fishes and problems with pollution in the upstream portions of the river, which is in Mexico.

Our Response: The Service is aware of the challenges posed by nonnative aquatic species in the San Pedro River, particularly given that a suitable barrier site has not been found at this time. However, we have determined that inclusion of the San Pedro River may impact operations at Fort Huachuca critical to national security. Therefore, we are excluding the San Pedro River as critical habitat for the two species. See the Exclusion discussion in the text.

(97) *Comment:* Does the Service have any information regarding possible causes of the spikedace decline in New Mexico and the magnitude of the decline?

Our Response: The proposed and final rules contain a complete five-factor analysis, which describes threats to the species and presents the best available scientific information.

(98) *Comment:* Proposed critical habitat creates a conflict in management objectives between spikedace and loach minnow and Gila trout.

Our Response: There is some overlap in the species' distribution; however, designation of critical habitat would lead to protection of the stream habitat in which all three species occur, and we do not believe there will be conflicts in management.

(99) *Comment:* The Fish and Wildlife Service has stated 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. The proposed designation of the Redfield Canyon stream segment as critical habitat (CH) is based upon inaccurate information and would have no beneficial effect on the survival of the spikedace or loach minnow. In representing all private landowners along this segment and having the most firsthand and long-term knowledge of the area, we request that this segment be removed from consideration.

Our Response: Redfield Canyon is currently the site of a species translocation effort and it provides suitable habitat for the species. However, in response to information

received during the comment period, we have revised the designation within Redfield Canyon, and reduced the area to be designated as critical habitat to 6.5 km (4.0 miles) from the confluence with Sycamore Canyon downstream to the barrier constructed at Township 11 South, Range 19 East, section 36.

(100) *Comment:* Within the DEA for the designation you state: ''Conservation actions that might be performed for a variety of fish species include, but are not limited to (7) application of chemicals to eradicate fishes, etc.'' The chemical rotenone is most often used for this purpose. The Bureau of Reclamation (BOR) has recently acquired state lands along Redfield Canyon where the fish were translocated in 2007. BOR intends to construct a fish barrier in the Canyon to prevent nonnative fish from threatening the translocated fish. Generally following such a construction project rotenone is used to ensure that the area above the dam is clean of nonnatives. It is likely that rotenone will be used in Redfield Canyon and this is not reviewed or even mentioned in the DEA, which is in error given that the Arizona Game and Fish heavily depend upon this tool for managing native fish populations especially for threatened and endangered species. Analysis of this action should be included in the DEA and the effects it will have on local drinking water.

Our Response: For Redfield Canyon, nonnative aquatic species are limited to green sunfish, which are being mechanically removed. There are no plans to use rotenone in Redfield Canyon.

(101) *Comment:* The proposed rule and the environmental assessment lack specific discussions for each segment regarding how the unoccupied segment is ''essential for the conservation of the species.'' Both documents describe conditions in each segment that may be favorable to the species but do not explain how the Service determined that the unoccupied segment was essential. In addition, there is no discussion regarding the conservation value of unoccupied segments.

Our Response: We refer the commenter to the ruleset, as well as Table 6 within the proposed rule. For each stream, we indicated which portion of the ruleset was met. For example, the San Pedro is listed in Table 6 as a ''1a'' stream, and from the ruleset, this indicates that this stream was occupied at listing, and has sufficient PBFs to support life-history functions essential for the conservation of the species. The PBFs present in any stream segment are listed in the unit descriptions for each stream.

The conservation value of unoccupied segments is in their ability to allow the species to expand from their current distribution until recovery is reached. As noted in the rule, both species currently occur in a small percentage of their historical range, and cannot be recovered in place.

(102) *Comment:* How the Service expects success when they are only going to try to manage ''a portion of the Blue River'' and ''a small portion of Bonita Creek'' for native fish is confusing. We don't know the location of the proposed fish barrier on the Blue River but we do know that the failed fish barrier that is being fixed on Bonita Creek is almost at the confluence with the Gila River. That means that all the fish above the fish barrier for over 14 miles will mix.

Our Response: At this time, the only portion of the Blue River that may be mechanically treated for nonnative fishes are a few larger pools near where the barrier construction will take place, in the lower portions of the Blue River. For Bonita Creek, chemical renovation occurred in an approximately 2-mile stretch of the river. Both of these areas are limited in scope.

(103) *Comment:* The Service has relied on ephemeral reference points to describe critical habitat areas and is in violation of 50 CFR 424.12(c).

Our Response: The ephemeral reference point referred to is the use of the bankfull stage in describing critical habitat. Bankfull stage is described in the section Criteria Used to Identify Critical Habitat. It is not an ephemeral feature, in other words, it does not disappear. It can always be determined and delineated for any stream we have designated as critical habitat. We acknowledge that the bankfull stage of any given stream may change depending on the magnitude of a flood event, but it is a definable and standard measurement for stream systems.

(104) *Comment:* The precise areas proposed as critical habitat are improperly described, and their location and impacts on land and water uses are uncertain. The proposed critical habitat includes developed areas and improperly relies on post-designation exclusion criteria.

Our Response: As noted within the proposed rule, the scale 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. However, any such lands inadvertently left inside critical habitat boundaries shown on the maps of this final rule are considered excluded by text in the rule and are not designated as critical habitat. Should Federal action occur involving these lands it will not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect the PBFs in the adjacent critical habitat.

(105) *Comment:* The PBFs must be present before land is eligible to be designated as critical habitat. The Service cannot designate land that does not contain the PBFs, and then rely on exclusion criteria and subsequent Section 7(a)(2) consultations to filter out land that should not have been included in the designation.

Our Response: Each of the areas within the critical habitat designation contain one or more of the PBFs, and do not use exclusions or a section 7 consultation to filter out land after the listing action is complete. In fact, exclusions are developed before the listing is completed, and are based on several factors, which can be found in the ''Exclusions'' section of the rule. Section 7 is used to analyze the impacts of actions on PBFs present within a given area.

(106) *Comments:* There were several comments regarding discrepancies in stream miles proposed for critical habitat, especially in the draft economic and environmental analyses.

Our Response: We have revisited all of the mileage to ensure that it is accurate in this final rule. The final environmental and economic analyses will reflect the correct mileages.

(107) *Comment:* One commenter noted that, with respect to translocation or reintroduction sites for the species, the Service indicated that monitoring will be conducted at each of these sites to determine if populations ultimately become established at these new locations. The fish were translocated in 2007, yet there is no information included within the DEA or the **Federal Register** notice that describes the monitoring that has been done in these locations or gives the results of this monitoring. It is stated that the areas of Hot Springs and Redfield Canyon have been augmented. It is unknown to the public whether this augmentation was because the fish are not surviving or if the action was to increase what has been established. The need for augmentation is questionable if the fish are established, and if they are not surviving, it needs to be analyzed in this document so as to better determine whether the PFBs at this location are accurately analyzed. This information is critical to making the designation of critical habitat.

Our Response: Information is provided in the rule regarding the translocation and reintroduction efforts, monitoring, and augmentation. Please see comment 18 regarding the appropriateness of including reintroduction and translocation sites within the critical habitat designation.

(108) *Comments:* We received several comments regarding the adequacy of the information cited in discussions on livestock grazing. Some commenters also indicated that we should be using Minckley (*In* Stromberg and Tellman 2009) regarding the discussion on livestock grazing, and that the citations used were either dated or focused on salmonid species.

Our Response: Minckley (*In* Stromberg and Tellman 2009) did not focus on grazing. Minckley does indicate that threats from nonnative fish are the primary concern for native fish, which the Service acknowledges. However, we complete a five-factor analysis, looking at all potential concerns. With respect to literature by Rinne, we have reviewed this information and are familiar with the position that Rinne has taken regarding grazing and its benefits to native fishes. Resource management agencies continue to cite Platts 1990, which focuses not on salmonids, but the effects of grazing on stream habitats (See Cowley 2002, Guidelines for Establishing Allowable Levels of Streambank Alteration, Howery et al. 2000, A Summary of Livestock Grazing Systems Used on Rangelands in the Western United States and Canada, or the USFS Web site at *www.fs.fed.us/r5/snfpa/final-seis/biological-documents*, which all continue to cite Platts 1990).

(109) *Comment:* Item Number 7 in the Service's October 27, 2010, Question and Answer document reads: ''What sort of actions would continue to be allowed within areas designated as critical habitat? The Service's response to the question was, in part, ''We believe, based on best available information, that the following actions will not result in a violation of the ESA: Release, diversion, or withdrawal of water from or near spikedace or loach minnow habitat in a manner that (1) DOES NOT displace or result in desiccation or death of eggs, larvae, or adults, (2) DOES NOT result in disruption of perennial flows, (3) DOES NOT disrupt spawning activities * * * and (4) DOES NOT alter vegetation (emphasis added).'' How does anyone divert or withdraw water from the Gila River where fish are or may be present, without violating one or more of the ''DOES NOTS'' listed?

Our Response: Throughout the range of spikedace and loach minnow, numerous diversion structures are present, including in systems such as the Gila River, Blue River, and Verde River. These areas continue to divert water, and fish continue to persist, indicating that such diversions can take place. We anticipate that, should any new diversions be constructed, they would operate in a similar fashion.

(110) *Comment:* One commenter suggested that we discuss the pending decisions associated with the New Mexico Interstate Stream Commission's (SC) approval of 21 projects on the Gila River that could qualify to become part of the New Mexico Unit of the CAP approved in the AWSA.

Our Response: The AWSA provides for New Mexico water users to deplete 140,000 acre-feet of additional water from the Gila Basin in any 10-year period. The settlement also provides the ability to divert that water without complaint from downstream pre-1968 water rights in Arizona. New Mexico will receive $66 million to $128 million in non reimbursable Federal funding. The ISC Funds may be used to cover costs of an actual water supply project, planning, environmental mitigation, or restoration activities associated with or necessary for the project, and may be used on 1 or more of 21 alternative projects ranging from Gila National Forest San Francisco River Diversion/Ditch improvements to a regional water supply project (the Deming Diversion Project). It is not known how the funds will be spent, or which potential alternative(s) may be chosen. In addition, the AWSA mandates that the ISC make the final determination of contracts for water and allocation of funding and provide notice to the Secretary of the Interior by December 31, 2014. New Mexico ISC must make any final determination during an open, public meeting, and only after consultation with the Gila San Francisco Water Commission, the citizens of southwestern New Mexico, and other affected interests. Due to the timeline associated with this project, as well as the uncertainties in how funding will be spent, and which potential alternative or alternatives will be chosen, The Service is unable to determine the outcome of this process at this time.

(111) *Comment:* The draft environmental assessment states that quality fish habitat is intrinsically linked to the quality of the existing adjacent upland habitat that provides key habitat components (e.g., large woody debris) crucial for fish species. Spikedace and loach minnows do not need large woody debris.

Our Response: We note that large wood is an important factor to analyze in assessing riparian ecosystem health; however, we are not aware of any data at this time that illustrates what amount of large woody debris within a system would constitute ideal conditions for spikedace and loach minnow. Should such information be developed in the future, it would be another useful factor in evaluating river system health and habitat suitability for spikedace and loach minnow. However, we are removing this language from the draft environmental assessment at this time.

(112) *Comment:* The proposed loach minnow critical habitat in Apache County is made up of reaches of the East Fork of the Black River. The entire East Fork of the Black River and the upland watershed was burnt in the recent Wallow Fire. The effects of the Wallow Fire will adversely impact any existing loach minnow populations and greatly alter the habitat for this fish as sediments are washed into the Black River following the fire. There is a high probability that the reaches of the Black River in Apache County, which are being proposed for loach minnow critical habitat, will no longer support the species and remain uninhabitable by loach minnow for a considerable length of time. The Apache County Board of Supervisors feels the Service should reconsider their decision to propose the reaches of the Black River in Apache County as loach minnow critical habitat until it can be determined that these reaches of stream contain any of the PBFs of the loach minnow. The management required in order to again support the loach minnow in the Black River may well be beyond what can be reasonably accomplished under a critical habitat designation.

Our Response: Portions of Units Two (Black River Complex) and Seven (Blue River Complex) of the critical habitat designation fall within the Wallow Fire perimeter. While all of Unit Two is within the Wallow Fire burn perimeter, most of the area designated as critical habitat falls within areas that experienced either no or low burn severity. The North Fork East Fork Black River falls within an unburned area inside the perimeter of the fire, as does most of Boneyard Creek. The majority of East Fork Black River falls within an area that experienced low burn severity, but does cross a few areas that were either unburned or burned at moderate burn severity. Coyote Creek is in an area almost entirely burned at low severity. Within Unit 7, the majority of Campbell Blue Creek is within unburned or low

burn severity areas; however, approximately 2.4 km (1.5 mi) of the upper end of Campbell Blue Creek is within moderate and high burn severity. The Wallow Fire stopped just west of the Blue River, but came within approximately 0.3 km (0.2 mi) of the River.

The impacts from fire on fish and their habitat are described in greater detail within the discussion of threats. While the fire itself may not have reached high severity in proximity to the areas designated as critical habitat, the following ash and sediment that can be displaced from within the watershed into the streams is of primary concern. During the monsoon, which began before the fire was extinguished, ash and sediment entered Campbell Blue Creek and the Blue River. In the Blue River, ash and sediment travelled as far downstream as the San Francisco River, resulting in fish kills (Blasius, 2011, pers. comm.). Fish surveys completed during the fall of 2011 found reduced numbers of loach minnow (Adelsberger *et al.* 2011, p. 1). It is important to note however, that these areas, while temporarily affected by the ash and sediment resulting from the fire, are not permanently altered. We anticipate that they will continue to support loach minnow, albeit at reduced levels, and that, given sufficient time, they will recover sufficiently to provide habitat for loach minnow in Unit 2 and both spikedace and loach minnow in Unit 7.

(113) *Comment:* More than a century of stream and riparian habitat abuses does not indicate some happy coexistence between the livestock industry and conserving and recovering these two imperiled cyprinids that are facing extinctions largely from habitat alterations and fragmentation. There are clear and serious conflicts between domestic livestock grazing and conserving and fully recovering endangered spikedace and loach minnows throughout their historic ranges in the Gila River Basin of Arizona, New Mexico, and Northern Mexico.

Our Response: As noted in the threats analysis within the document, the Service recognizes that there are impacts from livestock grazing on riparian and stream systems and the species that depend on them. As also noted in the threats analysis, we believe that progress has been made with grazing management, but that legacy effects of past improper livestock grazing persist. At this time, we believe that progress has been made within the range of spikedace and loach minnow. However, because not all conflicts between grazing and fish have been eliminated, there is still a discussion on the types of impacts that can occur.

(114) *Comment:* We strongly support additional mileage and acreage of designated critical habitat for proposed endangered spikedace and loach minnow, but oppose the omission of much of the historic, unoccupied habitats necessary for not only the conservation, but the successful full recovery at a natural rate, without retardation, of these imperiled Southwestern cyprinids, and the eventual delisting of these species from the Act. While the Service proposes occupied habitat of an additional 14.2 miles of the San Francisco River and 19.5 miles of Bear Creek in New Mexico for the proposed endangered loach minnow critical habitat designations, it freely admits in the **Federal Register** Notice (at page 61332) to the fatal omission of stream reaches that connect occupied habitat for both imperiled cyprinids. We strongly disagree with the Service proposed critical habitat designation rule for omitting connecting reaches that would allow genetic exchanges between dwindling populations and pockets of individual spikedace and loach minnows—which do not constitute viable, sustainable populations—as well as other historic unoccupied habitats that may be crucial for the survival and full recovery of the two fishes. This blatant oversight ignores the basic precepts of modern conservation biology and the accepted science of conservation genetics needed to sustain viable populations of rare and declining species like the spikedace and loach minnow.

Our Response: As noted in the NOA (76 FR 61330), we were unable to identify additional areas within the historical range of the species that currently have sufficient habitat parameters to serve as connective corridors between occupied and unoccupied habitat. As also stated in the NOA, we believe that both loach minnow and spikedace conservation will require genetic exchange between the remaining populations to allow for genetic variation, which is important for species' fitness and adaptive capability. Our inability to identify unoccupied streams that would provide connections between occupied areas is a result of the highly degraded condition of unoccupied habitat and the uncertainty of stream corridor restoration potential. We anticipate that we will further address the issue of restoration of genetic exchange in our revised Recovery Plan. A Spikedace and Loach Minnow Recovery Team has been formed, and will be meeting in early 2012.

(115) *Comment:* We urge the Service to reevaluate the proposed 300-foot riparian strips and to consider them only as a minimum with wider riparian buffers required for larger stream reaches like the mainstem San Francisco River and Gila River. A similar approach is incorporated in the PACFISH/INFISH extant consultations in the interior Pacific Northwest, like the Land and Resource Management Plans Biological Opinion, which the Service issued for bull trout and other native fishes and the National Marine Fisheries Service issued for ESA-listed anadromous salmonids. In these consultations and agreements, while the minimum standard for a Riparian Conservation Area or Riparian Habitat Conservation Area (RHCA) is set, there are additional science-based criteria for increasing the area or breadth of the designated critical habitat surrounding critical stream reaches based on the stream order or size of the reach, and how the riparian ecosystems actually function. For an example, you should examine the designated critical habitat rule for the threatened Snake River spring/summer Chinook salmon. In that Designated Critical Habitat Final Rule, smaller tributaries are protected with the minimum RHCA, while larger rivers like the Salmon River or Snake River, maintain much broader RHCAs to conserve ecological functionality of the designated critical habitats and help ensure to maintain sustainable, viable populations and Distinct Population Segments or Evolutionarily Significant Units (or ''species'' under the Act).

Our Response: As stated in the 2007 **Federal Register** notice designating critical habitat, we selected the 300-foot lateral extent, rather than some other delineation, for three 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 provide 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 concerning Issuance and Modification of Nationwide Permits, March 9, 2000, 65 FR 12818–12899).

(116) *Comment:* We urge the Service to expand the proposed critical habitat designation rules to encompass upstream stream reaches and riparian habitats, whether they are occupied, historic but currently unoccupied, or even historically unoccupied stream/riparian reaches that are upstream of designated critical habitats and/or spikedace and/or loach minnows. As a broadly accepted scientific principle that is at the heart of watershed science, hydrology, and stream ecology, what happens upstream in a watershed, including adverse effects like dewatering, accelerated bank and upland erosion, and subsequent increases in siltation and turbidity of streams like that associated with domestic livestock grazing, logging, road encroachment, and poorly regulated off-road vehicle use, has significant adverse effects downstream on listed fishes and/or their designated critical habitats.

Our Response: Some areas have been expanded as described in the notice of availability and in this document; other areas have been reduced. Federal actions that may affect critical habitat will be evaluated under section 7 of the Act, regardless of in which portion of the watershed those actions occur.

(117) *Comment:* While it is not as intuitive to consider upstream reaches and watersheds as part of the designated critical habitats and section 7 consultations, the Service also needs to include downstream reaches if the goal is conservation, and full recovery without retardation of the natural rates. As explained eloquently by Dave Rosgen in his 1996 book, *Applied River Morphology,* by other stream hydrologists and watershed scientists, and from our extensive experiences examining stream channel alterations across the West caused by domestic livestock grazing, restrictive culverts, and other habitat threats, what happens downstream can certainly affect upstream reaches in stream and riparian ecosystems, particularly in the Arid West. Fluvial morphological actions like downcutting, headcutting, stream widening, stream channel filling with increased sediment loads, and the simplification of stream channel morphology with the accompanying disconnection of impacted streams with their natural floodplains, not only adversely affects the impacted reaches and downstream riparian and stream habitats, but also can result in upstream bank sloughing, riparian vegetation collapse, alluvial water declines, stream channel straightening, steepening, and water velocity increase. These actions just feed the cycle and accelerate the habitat destabilization and degradation, to the detriment of the dependent fish populations like spikedace and loach minnows in the Gila River Basin of Arizona, New Mexico, and Northern Mexico.

Our Response: The Service is aware of the information provided in Rosgen's book titled *Applied River Morphology,* which is, in fact, cited within the rule. Under section 7 of the Act, the Service evaluates impacts to the species and their habitat and ecological needs based on the best information available, regardless of where those impacts originate.

(118) *Comment:* The Service should be conducting section 7 consultations with the USFS, BLM, Bureau of Indian Affairs, and others to conserve and recover endangered spikedace and loach minnow populations, prevent non exempted section 9 take of individual fishes, prevent the adverse modification of designated critical habitats, and closely examine if proposed Federal actions may retard the natural rates of recovery of these two Southwestern cyprinids. These consultations should occur in upland, riparian, and aquatic ecosystems in the Gila River Basin, whether the Federal actions are within occupied or unoccupied designated critical habitat or they are upstream of them. We remind the Service that it can expand the action areas presented to it in an action agency's biological assessment and as such, section 7 consultations are not restricted to the footprint of the proposed project or action or even to the property boundaries of lands managed by a Federal agency like the USFS, BLM, or the Service. Likewise, the Service, according to its own Section 7 Consultation Handbook, is not restrained by the action agency's effects determinations and in meeting the spirit and intent of the Act, should always err towards the conservation of listed species and their protected habitats, especially endangered species, which by their nature, are facing potential extinctions, by replacing the determinations with their own, stricter effects determinations for species, designated critical habitats, and recoveries.

Our Response: We agree that the ''action area'' of a project refers to all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action, as defined in 50 CFR 402.02.

(119) *Comment:* In the arid West, including in the Gila River of Arizona and New Mexico, as well as Northern Mexico, water diversions and artificial impoundments are prized for agricultural production, livestock watering, and domestic water supplies. Often, the diversion structures are not properly screened or designed to prevent impingement (i.e., fish get stuck on the screens or filters, if there are any, or entrainment such that fish get caught in water conveyance pipes and ditches and may end up stranded in dewatered structures), allow fish passage upstream and downstream, or completely dewater occupied reaches of stream or disconnect isolated populations. The Service must ensure that Federally funded, permitted, and/or designed water diversion works are not lethally or non lethally taking listed spikedace and loach minnow in the Gila River Basin. Additionally, we expect the Service to enforce the Act and fully prosecute water users taking spikedace and loach minnow without exemptions under a biologically sound and legal incidental take statement or habitat conservation plan under section 10 of the Act.

Our Response: Section 9 of the Act prohibits actions including, 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) for all listed species.

(120) *Comment:* While we recognize that the Service views western water law and individual water rights as a states issue, the Federal government does have some significant influence on modifying the diversion, conveyance, storage, and use of western waters diverted from watersheds like the Gila River Basin, including through section 7 consultations with Federal action agencies that are permitting, designing or funding such activities, whether they are on Federal public, military reservations, tribal lands, or state or private lands. For example, many diversions originate on Federal lands managed by the USFS or BLM and include conveyances and rights-of-way that cross public lands or are used, as in the case of livestock water, in troughs, tanks, and artificial ponds, actually on Federal lands. There is precedent for having Federal action agencies like the USFS condition how water is diverted and conveyed across Federal lands even if the water rights are held by private or corporate entities. For example, the Salmon-Challis National Forest and Sawtooth National Forest in Idaho have entered into a legal settlement agreement with Western

Watershed Project to condition diversions and conveyances in the Salmon River Basin to the benefit of listed anadromous salmonids and bull trout. The USFS has also executed a programmatic biological assessment for lockable head gates, measuring devices, and fish screens and has completed formal consultation with the Service and National Marine Fisheries Service. We strongly encourage the Service to lead the way with a similar effort in the water-limited Gila River Basin with its BLM, USFS, military and tribal consultation problems.

Our Response: A recovery team is being established to develop on-the-ground strategies to conserve these two species.

(121) *Comment:* It is alarming to note how the Service has carefully dissected the occupied and historic unoccupied reaches of the loach minnow and spikedace in their proposed critical habitat rule just to avoid existing water diversion structures. This ''gerrymandering'' of the proposed riparian and stream reaches goes well beyond the precepts of broadly accepted conservation biology and should be eliminated from the Final Rule.

Our Response: We acknowledge the absence of connective corridors in the proposed designation. We continue to believe that both loach minnow and spikedace conservation will require genetic exchange between the remaining populations. However, the designation was not developed with existing water diversion structures as a focal point. Instead, we developed a ruleset, which was applied across the historical ranges of the two species. Many of the stream segments included, such as the Verde River, Blue River, Eagle Creek, and Gila River, have existing diversion structures within the designated area.

(122) *Comment:* Endangered species should not be subject to section 4 permits with States like Arizona and New Mexico and the tribal governments for angling, fish stocking, and possibly stock assessments and research/experiments. The Service has expressed that endangered spikedace and loach minnow face real threats from predation, competition, and transmission of disease and parasites by nonnative species, some of which are managed by fish and game agencies as game or sport fishes. In most cases, through Dingell-Johnson Federal funds administered by the Service, states like Arizona and New Mexico operate sport fisheries including stocking of nonnative predators, lethal and nonlethal take associated with angling, fisheries inventories and research, and hatchery programs. These actions should be considered and, if continued, be subject to section 7 consultations to protect spikedace and loach minnow and their designated critical habitats.

Our Response: Federal funding of the Urban Stocking Program in Arizona was completed in 2011. The consultation resulted in a Statewide conservation program for native fishes while continuing sport fish stocking and management in designated streams.

(123) *Comment:* The Service should be carefully assessing the environmental risks to individuals and critical habitats of spikedace and loach minnow with the types, amounts, seasons, and methods of chemical control of pests and weeds. In the case of the USFS, BLM, Bureau of Indian Affairs, military, and the Service's wildlife refuges, environmental risk analyses scaled down for endangered fishes to the No Observed Effects Levels (''NOELs'') are necessary as are consultations and new labeling that restricts the uses of accepted chemicals and surfactants (and other carriers and adjutants) to protect spikedace and loach minnows. Special care is needed within the 300 ± ft riparian buffers, but effectiveness and implementation monitoring as well as water quality testing is needed to prevent unwanted extirpations or even extinctions.

Our Response: The Service has a long history of conducting section 7 consultations on a wide variety of pesticide and herbicide treatments, weed control, and related topics.

(124) *Comment:* Simply adding some 34 miles of streams to the designated critical habitats is insufficient when some 80 to 90 percent of the historical range is adversely modified and/or vacant. These meager actions on behalf of spikedace and loach minnow will not stem the slippery slope towards extinctions for these native desert stream fishes, especially with a significant portion of the two species' ranges altered or vacated.

Our Response: We are not certain where the figure of 34 additional miles came from in this comment. With this designation, we are increasing the overall mileage by 305 km (188 mi), compared to the 2007 designation.

General Comments Issue 2: Legal or Policy Concerns

(125) *Comment:* The Service needs to complete a regulatory flexibility analysis.

Our Response: Compliance with the Regulatory Flexibility Act is part of this final rule, and can be found under the subheading of ''*Regulatory Flexibility Act (5 U.S.C. 601* et seq.*)''.*

(126) *Comment:* The use of only one PBF in determining suitability is inadequate. If an area cannot support a viable population, then by definition it cannot be critical habitat.

Our Response: In accordance with section 3(5)(A)(i) and 4(b)(1)(A) of the Act and regulations at 50 CFR 453.12, in determining which areas within the geographical area occupied at the time of listing to designate as critical habitat, we consider the physical and biological features essential to the conservation of the species and which may require special management considerations or protection. In our final critical habitat designations, we did not include any occupied areas that contained only one PBF. All of the areas occupied at the time of listing for both species, or each individual species, contain more than one PBF, as described in the unit descriptions.

(127) *Comment:* Please explain why the word ''only'' is in the phrase ''* * * be included only if those features may require special management considerations or protection.'' The word ''only'' is not in section 3 of the Act (see page 66496, 1st column, item (II). It appears that this proposed rule is trying to narrow the scope of what can be included in critical habitat (i.e., make policy).

Our Response: We agree with the commenter that the language in the proposed rule was incorrect. We have inserted the following language in the final rule: ''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 physical and biological features which are essential to the conservation of the species and which may require special management considerations or protection.''

(128) *Comment:* The Service received several requests for an extension of the comment period.

Our Response: We believe the two comment periods allowed for adequate opportunity for public comment. A total of 90 days was provided for document review and the public to submit comments. In addition, a public hearing was scheduled on October 17, 2011, as another venue for comment submission.

(129) *Comment:* The Nation supports the Service's proposal to exclude those lands located within the exterior boundaries of the Yavapai-Apache Reservation from the final critical habitat designation under section 4(b)(2) of the Act, as the benefit of such exclusion outweighs the benefits of designating these lands as critical habitat, and such exclusion will not result in the extinction of the species.

Our Response: Within the proposed rule, we identified areas that we would consider for exclusion, including those of the Yavapai-Apache Reservation. Please see the Exclusions section for the analysis on the benefits of inclusion and exclusion for this area.

(130) *Comment:* There were several comments regarding the proposed exclusions in the proposed rule and that our rationale was not clear in determining which areas were proposed for exclusion. FWS should provide support for all exclusion determinations.

Our Response: We may exclude an area from designated critical habitat based on economic impacts, impacts on national security, or any other relevant impacts. In addition, we can consider exclusion of areas covered by other management plans or agreements such as habitat conservation plans which provide equal or better protection than would be gained from a critical habitat designation. In considering whether to exclude a particular area from the designation, we must identify the benefits of including the area in the designation, identify the benefits of excluding the area from the designation, and determine whether the benefits of exclusion outweigh the benefits of inclusion. See the discussion in the exclusions section of the final rule for further details.

(131) *Comment:* Fort Huachuca is requesting that a national security analysis in compliance with section 4(b)(2) be performed in consultation with the fort. In addition, the fort would like to continue dialogue beyond November 3, 2011, on the issues that have been raised in both letters regarding the national security impacts and the lack of justification for critical habitat designation in Unit 3.

Our Response: We conducted an exclusion analysis based on a comment in which national security issues were raised by Fort Huachuca following closure of the second comment period. In this final rule, the San Pedro River has been excluded from the designation because the benefits of exclusion outweigh the benefits of inclusion based on potential impacts to national security. Refer to the discussion in the Exclusions section for further details.

(132) *Comment:* The Service is not following their own regulations, policies and guidelines by allowing a long list of major Federal actions, such as fish recovery projects carried out under the Central Arizona Project (CAP) Biological Opinion, and the proposed spikedace and loach minnow critical habitat designation, to occur without NEPA analysis.

Our Response: While actions taken under the CAP Fund Transfer Program do benefit spikedace and loach minnow, these are projects that are largely derived from the section 7 process. While ideally, recovery actions and critical habitat designation support one another to achieve recovery and delisting of the species, critical habitat designation is independent of these types of management actions. Had the Bureau of Reclamation and the Service decided for example, not to complete recovery actions on Bonita Creek or Hot Springs Canyon with barrier construction and translocations of the two species, we would still be designating critical habitat. These actions are therefore independent of one another and require separate NEPA analysis.

(133) *Comment:* The way the Service implements consultations, the designation of critical habitat does impose universal rules and restrictions on land use. It does automatically trigger consultation with Service for modifications and results in prohibiting and altering certain land uses and water development activities. An example is the Upper San Pedro River where the habitat is unoccupied. With designated critical habitat there is a universal rule and restriction that any activity within 300 feet of the river cannot adversely modify critical habitat. This automatically prohibits a land owner from creating a tilapia farm, alfalfa farm, alpaca ranch, livestock corral or otherwise lawful activity within 300 feet of the river. This is a universal blanket rule in critical habitat. To state otherwise is disingenuous.

Our Response: It should be noted that adverse modification is rarely reached. Designation of critical habitat does not prohibit projects, but should an action be proposed, permitted, or funded by a Federal agency, section 7 consultation may be required. The purpose of section 7 consultation is to provide minimization measures that reduce the impacts to listed species or their critical habitat. There are no automatic prohibitions to activities under the ESA.

(134) *Comment:* The term ''sufficient conservation measures'' is used three times in the Environmental Assessment. The subsequent EIS needs to detail the measures deemed sufficient so that the costs and benefits of excluding areas due to economic, national security, and other needs can be assessed.

Our Response: Please see the Exclusions section of this document, which describes the process that the Service uses to determine if exclusions are warranted. Generally, the process weighs whether the benefits of exclusion outweigh the benefits of inclusion. In the case of a management plan that details conservation measures, the Service would consider conservation measures sufficient if they would lead to conservation that meets or exceeds what we would anticipate occurring through designation of critical habitat.

(135) *Comment:* An issue was raised regarding large floods in the streams proposed for critical habitat and if the designation would make it more difficult to complete repair work since some funding will be from Federal agencies.

Our Response: Flooding, along with other activities, often does involve a Federal nexus that might trigger a section 7 consultation. Should flooding occur, Federal assistance may be used through programs such as the Natural Resource Conservation Service's Emergency Watershed Protection Program, which has been used in the past to provide assistance to landowners in protecting their property from flood damage. The Service has established emergency consultation procedures that allow for this type of Federal action to move forward quickly, with emphasis on protection of human life and property.

(136) *Comment:* The designation of critical habitat for these species is an attempt by the Service to gain additional control over the use of public and private land and resources.

Our Response: Critical habitat identifies geographic areas that contain features essential for the conservation of a threatened or endangered species and that may require special management considerations. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Critical habitat designation does not impose restrictions on private lands unless Federal funds, permits or activities are involved. Federal agencies that undertake, fund, or permit activities that may affect critical habitat are required to consult with the Service to ensure that such actions do not adversely modify or destroy designated critical habitat. Requirements for consultation on critical habitat do not apply to entirely private actions on private lands. Critical habitat designations apply only to Federal lands, or federally funded or permitted activities on non federal lands. Activities on private or State lands that are funded, permitted, or carried out by a Federal agency, such as a permit from the U.S. Army Corps of Engineers under section 404 of the Clean Water Act, will be subject to the

section 7 consultation process with the Service if those actions may affect critical habitat or a listed species.

(137) *Comment:* One commenter noted that the development of conservation agreements with agencies and private landowners to gain similar protection to that afforded by designation of critical habitat would preclude the need to designate critical habitat but that, as no such efforts were under way across the species' range during the 2010 proposed rule development, the Service rejected an alternative to accept conservation agreements in lieu of critical habitat designation. The commenter noted that conservation agreements would allow the Service to save money by putting a large part of the conservation burden on agencies and landowners, and that it may have been premature for the Service to reject this alternative. There may be potential for better results than through designation. Specifically, the AWSA offers opportunity to easily improve habitat for the loach minnow and spikedace.

Our Response: We agree that the use of conservation agreements may, in some instances, provide a conservation benefit equal to or greater than the designation of critical habitat. However, at the time that the critical habitat designation was proposed and subsequently finalized, no such conservation agreements were under way or in place. The Service has a court-determined deadline for designation of critical habitat. While we considered those conservation agreements that are under way, we are not able to delay the designation of critical habitat until such agreements are developed, and we are not able to exclude areas from critical habitat based on conservation agreements that might be developed in the future.

(138) *Comment:* In the past the Service has published information which states that designation of critical habitat provides little additional protection to species (69 FR 53182). The information states that in 30 years of implementing the Act, the Service has found that the designation of statutory critical habitat provides little additional protection to most listed species, while consuming significant amounts of available conservation resources. Additionally, we have also found that comparable conservation can be achieved by implementation of laws and regulations obviating the need for critical habitat. This statement supports the preparation of an EIS.

Our Response: The Service has changed how it evaluates the value of critical habitat due to guidance provided by the Ninth Circuit Court. Formal consultation under section 7 of the Act concludes with a biological opinion issued by the Service on whether the proposed Federal action is likely to jeopardize the continued existence of a listed species or to destroy or adversely modify critical habitat (50 CFR 402.14[h]). In 2004, the Ninth Circuit Court determined through *Gifford Pinchot Task Force et al.* v. *United States Fish and Wildlife Service* (2004) that, while the jeopardy standard concerns the survival of a species or its risk of extinction, the adverse modification standard concerns the value of critical habitat for the recovery, or eventual delisting, of a species. As pointed out in the Ninth Circuit decision, survival of a species and recovery (or conservation) of a species are distinct concepts in the ESA. Implementation of the two standards, therefore, involves separate and distinct analyses based on these concepts.

In light of the *Gifford Pinchot* decision, the Service no longer relies on the regulatory definition of ''destruction or adverse modification'' of critical habitat at 50 CFR 402.02. Instead, the Service relies on the statutory provisions of the ESA to complete the analysis with respect to critical habitat. The potential for destruction or adverse modification of critical habitat by a Federal action is assessed under the statutory provisions of the ESA by determining whether the effects of the implementation of the proposed Federal action would allow the affected critical habitat to 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 (75 FR 66519). This analysis provides the basis for determining the significance of anticipated effects of the proposed federal action on critical habitat. The threshold for destruction or adverse modification is evaluated in the context of whether the critical habitat would remain functional to serve the intended conservation role for the species. The direction provided by the Ninth Circuit Decision in *Gifford Pinchot* has changed the way the Service is analyzing the value of critical habitat.

(139) *Comment:* Under Section 7 ESA consultations, FWS should urge the reinitiation of extant consultations, including programmatic consultations, with the uplisted statuses of spikedace and loach minnow in mind as well as the expanded designated critical habitats. This includes the 18 BLM domestic livestock grazing allotments in the mid-Gila River Basin.

Our Response: Reinitiation of consultation is required if a new species or critical habitat designation may be affected by an identified Federal action. Any consultations for projects that are within the proposed critical habitat designation may need to be reinitiated to evaluate impacts on the critical habitat. However, it should be noted that the 2007 critical habitat designation remains in place until the 2012 designation is published, and many projects went through consultation under the 2007 designation. For projects that have been developed in the interim, preliminary consultation is under way in many areas.

(140) *Comment:* It is our understanding that FMC has not submitted a draft management plan for spikedace and loach minnow conservation on reaches of the San Francisco and Gila Rivers and Eagle Creek. Without management plans, FMC's contention that these stream reaches and their spikedace and loach minnow populations do not require special management is invalid. If FMC does submit management plans in support of a request for exclusion of their lands from the critical habitat, please send us copies for our information and review.

Our Response: Freeport-McMoRan developed two management plans. One plan addressees Eagle Creek and the San Francisco River in Arizona, while the other addresses the Gila River, Bear Creek, and Mangas Creek in New Mexico. A description of the management plans and our decision regarding exclusions can be found in the ''Exclusions'' section of the final rule. The management plans themselves are available on *http://www.regulations.gov* for public viewing.

(141) *Comment:* An earlier management plan by Phelps-Dodge (acquired by FMC) used to support the exclusion of their lands along the upper Gila River in the 2007 final critical habitat rule was vague and completely inadequate. It was primarily a study plan for the USFS's Rocky Mountain Research Station. This study plan received strong criticism from within the USFS and those comments were made available to the Service. We submitted a critical review of the Phelps-Dodge/Rocky Mountain Research Station management/study plan in a letter of October 14, 2006, to the Service. In our letter we also commented on the inadequacy of a similarly vague and insubstantial Phelps-Dodge management plan for Eagle Creek. Neither of these two defective plans should be considered in

this revision of the critical habitat, both are inadequate and out-of-date.

Our Response: Freeport-McMoRan provided updated management plans during the second comment period. The revised plans provide for the commitment of significant additional resources for construction of barriers to limit movement of nonnative fish into spikedace and loach minnow habitat, monitoring, and other conservation actions.

(142) *Comment:* In April 2007 the Service informed us they do not believe the 2003 Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE) applies to critical habitat designations and so will not conform to it when assessing the quality and sustainability of management plans submitted in seeking critical habitat exclusions. The PECE is a strong and well constructed policy for assessing the value to species from proposed private conservation efforts, and regardless of whether or not it can be legally required, we urge the Service to use PECE in its analysis of management or conservation plans submitted in support of requested exclusions from critical habitat designation for spikedace and loach minnow. An analysis using PECE guidelines, and made available to the public, would be a worthwhile and informative method for documenting the Service's rationale and process for critical habitat exclusion decisions.

Our Response: The PECE Policy identifies criteria we use in determining whether formalized conservation efforts that have yet to be implemented or to show effectiveness contribute to making listing a species as threatened or endangered unnecessary. We believe that a recovery plan is the appropriate vehicle to provide guidance on actions necessary to delist a species.

(143) *Comment:* For the reasons set forth here and as explained in (a) prior filings with the Service by the Nation; and (b) in face-to-face meetings and other communications with the Service (all of which are incorporated in full here by reference), it remains the Nation's position that the Secretary of the Interior lacks legal authority to designate critical habitat on the Nation's lands. (See written comments of the Yavapai-Apache Nation, dated February 16, 2006, February 21, 2006, February 26, 2006, July 6, 2006, and December 27, 2010 specifically addressing prior and current proposals by the Service to designate critical habitat for the spikedace and loach minnow on the Yavapai-Apache Reservation.)

Our Response: We understand that it is the Tribe's position that a designation of critical habitat on its lands improperly infringes upon its Tribal sovereignty and the right to self-government. In recognition of the Nation's sovereignty, our working relationship with the Tribe, and the management efforts taken by the Yavapai-Apache Nation on their tribal lands that benefit spikedace and loach minnow, all proposed critical habitat has been removed from the final rule.

General Comments Issue 3: Economic Analysis Concerns

(144) *Comment:* There were several comments concerning the effects of the critical habitat designation on the operation of Ft. Huachuca, especially the economic costs and cumulative effects.

Our Response: The economic effects were analyzed in the draft economic analysis, however, the San Pedro River has been excluded based on national security issues related to the operation of Ft. Huachuca. See our discussion in the Exclusion section of this text.

(145) *Comment:* The cumulative impact of the endangered species program combined with critical habitat designations in Arizona and New Mexico over the last 9 years has been severe. More than a one-third reduction in the number of USFS permittees and a 33.8 percent reduction in the number of animal unit months occurred (AUMs) in the period 2000 to 2009. This information is from the USFS, Annual Grazing Statistical Reports.

Our Response: We agree with the commenter that the comparison of 2000 (USDA 2000, p. 31) to 2009 (USDA 2011, p. 33–34) data indicates an overall reduction in the number of permittees, head months (HMs), and animal unit months. However, these documents report the figures cited in the comment, without stating any conclusions as to the cause of the decline between 2000 to 2009, so it would be in error to conclude that the cumulative impact of the endangered species program and critical habitat designations in Arizona and New Mexico have led to this decline.

(146) *Comment:* We challenge the validity of the draft environmental assessment especially with its proposed exclusions of Federal lands managed by agencies like the USFS or BLM, just because they have paper plans in place that one would expect to protect designated critical habitat and promote the conservation and recovery of listed species like spikedace and loach minnow that are facing potential extinctions. Using the grazing allotment examples with which we are most familiar, paper Land and Resource Management Plans and Resource Management Plans do not guarantee the necessary protections and recovery under the Act for these two imperiled fish species. In fact, our field and legal work have proven how weak the paper promises are and how important enforcement of the Act and legal actions are for just conserving what remains of the 10 to 20 percent of the occupied habitats for the two cyprinids in the lands. By eliminating those from the final critical habitat rules, the Service will undermine the conservation and recovery without retardation of the natural rates of loach minnow and spikedace.

Our Response: At this time, we are not excluding Federal lands from the designation of spikedace and loach minnow critical habitat and are not including any Land and Resource Management Plans or Resource Management Plans as the means for any exclusions. Our rationale for excluding tribal and military lands are provided within the Exclusions section of this rule.

(147) *Comment:* The Communities have existing rights to groundwater and surface water within the Upper Verde River Watershed. Additionally, the Communities have invested in the development of additional water rights owned by the City of Prescott in the City's Big Chino Water Ranch in order to preserve and enhance the economic viability of the region.

Our Response: Section 4(b)(2) of the Act requires the Secretary to designate critical habitat based on the best scientific data available after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat.

(148) *Comment:* Participation in the National Resource Conservation Service (NRCS) program may be impacted by the critical habitat designation due to time delay impacts on NRCS activities, including those under the Environmental Quality Incentives Program (EQIP) that would require section 7 consultation. Also, NRCS programs might be affected because farmers could refuse federal funding to avoid a federal nexus that would require section 7 consultation.

Our Response: Exhibits ES–1 and ES–2 in the Economic Analysis recognize the potential for impacts to participation in NRCS funding and programs. However, considerable uncertainty exists surrounding the effect of critical habitat designation on the level of participation in the NRCS and other Federal programs. At this time, we are unaware of any instances where critical habitat designation has resulted in

delays to NRCS project implementation. Therefore, these impacts are not quantified. Section 3.6 of the final economic analysis does, however, discuss potential impacts of critical habitat on NRCS programs in more detail, including the potential for reduced farmer participation in these programs. Further, it should be noted that the Service and NRCS completed a programmatic consultation in 2011 which will facilitate the review of EQIP projects.

(149) *Comment:* The number of wells in the Virden Valley area of the Gila River is underestimated because the analysis only considers wells within critical habitat areas.

Our Response: The geographic scope of the final economic analysis was estimated using information provided in the proposed rule, in which the Service states that critical habitat designation extends 300 feet to either side of a stream's bank full width. While it is certainly possible that wells outside of this area draw water from critical habitat reaches, those particular wells were not easily identified. It should be noted that because groundwater withdrawals frequently do not involve a Federal nexus, groundwater issues have rarely been addressed through section 7 consultations in the past. The analysis therefore reports the number of groundwater wells in proposed critical habitat areas, but does not assign a cost associated with potential impacts to these wells.

(150) *Comment:* In the economic analysis for the critical habitat designation, the Service uses faulty logic by comparing projected dollar costs to the public weighed against projected biological benefits of protecting habitat for the endangered species. This is performed under the specious argument that conserving and recovering endangered and threatened species should not be reduced to dollars and cents. While this appears noble, it places portions of designated critical habitat at the great risk of being excluded for economic reasons, even when some of the economic costs can be countered with local or regional economic benefits. The Service totally ignores these benefits and weighs the full weight of the costs for their economic exclusion decisions.

Our Response: Section 2.3.3 of the final economic analysis recognizes that ''the published economics literature has documented that social welfare benefits can result from the conservation and recovery of endangered and threatened species. In its guidance for implementing Executive Order 12866, the OMB acknowledges that it may not be feasible to monetize, or even quantify, the benefits of environmental regulations due to either an absence of defensible, relevant studies or a lack of resources on the implementing agency's part to conduct new research. Rather than rely on economic measures, the Service believes that the direct benefits of the proposed rule are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking. Critical habitat designation may also generate ancillary benefits. Critical habitat aids in the conservation of species specifically by protecting the primary constituent elements on which the species depends. To this end, critical habitat designation can result in maintenance of particular environmental conditions that may generate other social benefits aside from the preservation of the species. That is, management actions undertaken to conserve a species or habitat may have coincident, positive social welfare implications, such as increased recreational opportunities in a region. While they are not the primary purpose of critical habitat, these ancillary benefits may result in gains in employment, output, or income that may offset the direct, negative impacts to a region's economy resulting from actions to conserve a species or its habitat.'' Section 11 qualitatively describes coincident benefits of the designation on water quality, stream flow levels, property values, and aesthetic and educational benefits. The Service considers these benefits while weighing the benefits of inclusion against the benefits of exclusion before excluding any area from the designation.

(151) *Comment:* Commenters recommend that the authors of the spikedace and loach minnow economic analysis and environmental analysis documents cite Dr. Rinne's publications that describe the increase in predatory nonnative fish and the disappearance of native fish on the Verde River after removal of livestock.

Our Response: Section 2.3.3 of the final economic analysis recognizes that ''the published economics literature has documented that social welfare benefits can result from the conservation and recovery of endangered and threatened species. In its guidance for implementing Executive Order 12866, the OMB acknowledges that it may not be feasible to monetize, or even quantify, the benefits of environmental regulations due to either an absence of defensible, relevant studies or a lack of resources on the implementing agency's part to conduct new research. Rather than rely on economic measures, the Service believes that the direct benefits of the proposed rule are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking. Critical habitat designation may also generate ancillary benefits. Critical habitat aids in the conservation of species specifically by protecting the primary constituent elements on which the species depends. To this end, critical habitat designation can result in maintenance of particular environmental conditions that may generate other social benefits aside from the preservation of the species. That is, management actions undertaken to conserve a species or habitat may have coincident, positive social welfare implications, such as increased recreational opportunities in a region. While they are not the primary purpose of critical habitat, these ancillary benefits may result in gains in employment, output, or income that may offset the direct, negative impacts to a region's economy resulting from actions to conserve a species or its habitat.'' Section 11 qualitatively describes coincident benefits of the designation on water quality, stream flow levels, property values, and aesthetic and educational benefits. The Service considers these benefits while weighing the benefits of inclusion against the benefits of exclusion before excluding any area from the designation.

(152) *Comment:* The commenter believes that economic benefits at the local, regional, and national levels exist, but are not included in the draft Economic Analysis.

Our Response: As stated in Section 2.3.3 of the final economic analysis, ''Critical habitat aids in the conservation of species specifically by protecting the primary constituent elements on which the species depends. To this end, critical habitat designation can result in maintenance of particular environmental conditions that may generate other social benefits aside from the preservation of the species. That is, management actions undertaken to conserve a species or habitat may have coincident, positive social welfare implications, such as increased recreational opportunities in a region. While they are not the primary purpose of critical habitat, these ancillary benefits may result in gains in employment, output, or income that may offset the direct, negative impacts to a region's economy resulting from actions to conserve a species or its habitat.''

(153) *Comment:* Rather than applying the 'but for' test for some of the projected costs, the costs attributed to

the designation of critical habitat for spikedace and loach minnow should be independent of other costs that would exist, whether there is designated critical habitat or not for spikedace and loach minnow. In other words, the coextensive framework used in the draft Economic Analysis is inappropriate.

Our Response: The estimation of incremental impacts is consistent with direction provided by the Office of Management and Budget to Federal agencies for the estimation of the costs and benefits of Federal regulations (see Office of Management and Budget, Circular A–4, 2003). It is also consistent with several recent court decisions, including *Cape Hatteras Access Preservation Alliance* v. *U.S. Department of the Interior,* 344 F. Supp. 2d 108 (D.D.C.) and *Center for Biological Diversity* v. *U.S. Bureau of Land Management,* 422 F. Supp. 2d 1115 (N.D. Cal. 2006). Those decisions found that estimation of incremental impacts stemming solely from the designation is proper. However, in order to address the divergent opinions of the courts and provide the most complete information to decision-makers, this economic analysis reports both the baseline impacts of protections afforded spikedace and loach minnow absent critical habitat designation; and the estimated incremental impacts precipitated specifically by the designation of critical habitat for the species. Summed, these two types of impacts comprise the fully co-extensive impacts of conservation in areas considered for critical habitat designation.

(154) *Comment:* The Economic Analysis and Environmental Assessment should cite Dr. Rinne's publications that describe the increase in predatory nonnative fish and the disappearance of native fish on the Verde River after removal of livestock.

Our Response: Section 4.1 of the final economic analysis now recognizes that studies by J. N. Rinne have suggested that current management has been successful at mitigating the negative effects of grazing on riparian habitat, that further limitation of grazing may create conditions conducive to non-native species, and that fencing could be detrimental to riparian species.

(155) *Comment:* Each addition of a species and/or critical habitat area takes its toll on the economic viability of ranching and this cumulative impact was not discussed in the critical habitat documents. A single additional restriction or requirement that decreases the profitability of an operation could be the one that causes the operator to go out of business.

Our Response: This concern is now reflected in Section 3 and Appendix A of the FEA.

(156) *Comment:* The NRCS agency is the best agency to provide current and accurate actual costs of conservation practices. The Economic Analysis states that the cost of fencing ranges from $1,690 to $16,900 per river mile of fence construction. NRCS costs, which are updated yearly to be as close to actual as possible, estimates the cost of fence construction at $3.05 per foot for level ground to $4.30 per foot for rough county and $5.75 per foot for rough county where materials must be packed in. This would make the cost of fence building to range from $16,104 to $30,360. The articles by Miller 1961, Platts 1990, Belsky 1999 referenced in the draft Economic Analysis are not the best commercially available information.

Our Response: In response to two public comments, the final economic analysis now incorporates updated fence construction and maintenance cost estimates, maintained and updated by NRCS for 2012. In Section 4.3.1 of the final economic analysis, fencing costs are estimated to range from $8,940 per mile fenced to $14,500 per mile fenced, with annual fence maintenance costs ranging from $179 to $725 per mile of fencing.

(157) *Comment:* The use of 2002 census data in the draft Economic Analysis and the draft Environmental Assessment is not compliant with requirements to use the best scientific and commercial data available. The Economic Analysis and Environmental Assessment need to be updated to use 2011 data.

Our Response: The final economic analysis and final environmental assessment now incorporate 2010 census data where possible throughout the report to more accurately estimate the magnitude and distribution of economic impacts.

(158) *Comment:* The draft Economic Analysis does not consider impacts to grazing related to the necessity for water in all livestock operations.

Our Response: As shown in Exhibit 4–3 of the final economic analysis, the Service has historically recommended that off-river water systems be used to supply water to cattle where possible, but has not disallowed watering areas.

(159) *Comment:* The designation of critical habitat for spikedace and loach minnow could possibly be the ''final straw'' for what Department of Defense is willing to spend on Fort Huachuca's support of the Act and it is significant as a cumulative impact. If one more element of critical habitat is added over and above the current cost of all the other management actions for endangered species the Fort is financing, it could be the factor that triggers the Fort to reduce its missions or close the Fort and move all the missions to other locations.

Our Response: The final economic analysis now recognizes the commenters concern in Section 3.5. In addition, please note that the San Pedro River has been removed from the designation. Additional detail is provided in the ''Exclusions'' section above.

(160) *Comment:* The commenter believes the draft Economic Analysis fails to consider three classes of small entities defined by the Small Business Administration as: businesses with an average income under $750,000, cities and towns with a population under 50,000 and local governments such as school districts.

Our Response: In the final economic analysis, Appendix A, Section A.1.2, details the types of small entities included in the analysis, and includes those categories of small entities identified in the comment. The analysis, as described in Exhibit A–1, considers small businesses on the basis of the Risk Management Association's Small Business Size Standards, including, for some industries, businesses with revenues under $750,000. In addition, Appendix A states, ''Section 601(5) of the Regulatory Flexibility Act defines small governmental jurisdictions as governments of cities, counties, towns, townships, villages, school districts, or special districts with a population of less than 50,000. Special districts may include those servicing irrigation, ports, parks and recreation, sanitation, drainage, soil and water conservation, road assessment, etc.''

(161) *Comment:* The Economic Analysis needs to consider impacts to operations falling into numerous NAICS codes: 111940 Hay Farming; 112111 Beef Cattle Ranching and Farming; 112112 Cattle Feedlots; 112120 Dairy Cattle and Milk Production; 112210 Hog and Pig Farming; 112410 Sheep Farming; 112920 Horses and Other Equine Production; 113110 Timber Tract Operations; 113210 Forest Nurseries and Gathering of Forest Products; 113310 Logging; 114210 Hunting and Trapping; 115112 Soil Preparation, Planting, and Cultivating; 115113 Crop Harvesting, Primarily by Machine; 115114 Postharvest Crop Activities (except Cotton Ginning); 115115 Farm Labor Contractors and Crew Leaders; 115116 Farm Management Services; 115210 Support Activities for Animal Production;

115310 Support Activities for Forestry; etc.

Our Response: Exhibit A–1 lists the NAICS codes used to identify potentially affected small entities in the industries most likely to incur impacts related to the critical habitat designation. The final economic analysis considers nine NAICS classifications in agricultural, ranching, and development sectors, including Hay Farming (111940) and Beef Cattle Ranching and Farming (112111). It is not clear why the commenter expects impacts to the remaining sectors listed.

(162) *Comment:* The commenter claims the economic analysis is flawed because it failed to coordinate development of the Proposed Rule changes with local government.

Our Response: As noted in Section 7.3, the analytic approach to the Economic Analysis is explained. Based on projected growth rates, the analysis identified counties that were likely to undergo high levels of development and were thus most likely to incur impacts to residential and commercial development activities. Based on this process, a subset of county and local government planning offices that were likely to incur costs to development was contacted. Due to time constraints, every county and local government could not be contacted.

(163) *Comment:* Appendix A recognizes that there will be economic impacts to small entities but underestimates the impacts due to the omission, throughout both the draft Environmental Assessment and the draft Economic Analysis, of not taking into account the potential restrictions to groundwater extraction and use in areas outside the actual critical habitat designation corridor. Similarly, the draft Economic Analysis and draft Environmental Assessment generally fail to address water and land uses outside the proposed critical habitat, focusing instead on impacts occurring within the proposed critical habitat—a corridor that extends 300 feet from each side of the stream edge at ''bank full discharge.'' As a consequence, the full range of impacts has not been considered.

Our Response: As noted in comment 149 above, the geographic scope of the final economic analysis was estimated using information provided in the Proposed Rule, in which the Service states that critical habitat designation extends 300 feet to either side of a stream's bank full width. However, the analysis is not limited to assessing impacts derived from activities occurring inside that area. For example, Section 5 of the final economic analysis focuses on mining activities which are not located in proposed critical habitat areas. The potential for impacts to groundwater users is discussed qualitatively.

(164) *Comment:* Because of differing court rulings in the Ninth and Tenth Circuit Courts, the Service must perform a full analysis of all of the economic impacts of the critical habitat designated in New Mexico, regardless of whether an impact is co-extensive with the species' listing, while for critical habitat proposed in Arizona, the Service may use the baseline approach. However, the different approaches adopted by the two circuits are relevant only where currently occupied areas are designated as critical habitat. In the absence of recent records of occupancy, the area should be treated as unoccupied and all impacts attributed to the designation.

Our Response: As stated in Section 2 of the final economic analysis, in order to address the divergent opinions of the courts and provide the most complete information to decision-makers, this economic analysis reports both the baseline impacts of protections afforded the two species absent critical habitat designation; and the estimated incremental impacts precipitated specifically by the designation of critical habitat for the species. When summed, these two types of impacts comprise the fully co-extensive impacts of conservation in areas considered for critical habitat designation.

(165) *Comment:* The draft economic analysis erroneously used an incremental impact approach for critical habitat proposed in New Mexico.

Our Response: Please see the comment above regarding use of the incremental versus baseline approaches for critical habitat designated in New Mexico.

(166) *Comment:* Smallmouth bass, along with channel catfish, are the primary sport fish in Eagle Creek, as well as other streams proposed as critical habitat, including the lower San Francisco River and the Verde River and its tributaries. The draft Economic Analysis fails to address the economic impacts of removing these warmwater sportfish, which in many locations are the primary sportfish.

Our Response: Section 6.3 of the final economic analysis states ''non-native fish species that could potentially impact spikedace and loach minnow include catfish, largemouth bass, smallmouth bass, green sunfish, brown trout, rainbow trout, and red shiner. Possible recovery actions include the installation of fish barriers, increased monitoring, and non-native fish removal.'' The AGFD identified planned or ongoing non-native fish removal activity on the Verde River, as noted in Exhibit 6–7, amounting to a one-time cost of $150,000 to $200,000 in undiscounted dollars between 2016 and 2031, with the possibility of an additional one-time cost of $50,000 (undiscounted) for follow-up activity over that period. However, neither the AGFD nor the NMDGF identified non-native fish removal activity as being planned on Eagle Creek or the lower San Francisco River.

(167) *Comment:* The volumes of water used at Morenci are so significant that sufficient quantities of substitute water sources may be impossible to obtain. The DEA should be revised to reflect the costs of restricting or preventing mining production and limiting expansion capabilities.

Our Response: Section 5 of the final economic analysis is focused exclusively on a discussion of potential impacts to the mining industry, and specifically focuses on facilities owned by FMC. The discussion includes data supplied by the commenters on the scope and scale of potential impacts to those operations. Information received as part of the comment above provided a value of potential lost water rights and associated replacement costs based. While we do not disagree that, should the water be lost to mining activities, such costs could occur, there remains considerable uncertainty as to the likelihood of such events. Nonetheless, the final economic analysis includes estimates of the cost of replacing water sources in Section 5 of the analysis, to provide additional context for understanding the potential magnitude of impacts, should they occur.

(168) *Comment:* The draft Economic Analysis does not address the impacts of critical habitat on water supplies for the communities of Morenci and Clifton.

Our Response: The final economic analysis now acknowledges this concern in Section 5.

(169) *Comment:* The critical habitat designation threatens rights of the Town of Sierra Vista, Cochise County, and the Coalition of New Mexico Counties to surface and groundwater.

Our Response: Impacts to municipal water use are discussed qualitatively in Section 3 of the final economic analysis. Considerable uncertainty surrounds the specific quantity of water, if any, that Service would request to be conserved for spikedace and loach minnow as part of a section 7 consultation. As such, this analysis does not quantify the probability or extent to which water use would need to be curtailed or modified

to remedy impacts on spikedace and loach minnow.

(170) *Comment:* The draft Economic Analysis states that 29 percent of the land in critical habitat is privately owned. This is a significant amount of private land, especially when you consider how little streamside acreage there is within the arid states of Arizona and New Mexico. For many purposes, land adjacent to flowing water is the most valuable land in the arid west. The draft Economic Analysis understates impacts to development on streamside land.

Our Response: As stated in Section 7 of the final economic analysis, potential modifications to development projects related to spikedace and loach minnow conservation activities depend on the scope of spikedace and loach minnow conservation activities, pre-existing land use and regulatory controls in the region, and the nature of regional land and real estate markets. In this case, consultations on development activities have been rare (one to date). In addition, riparian development buffers already exist in many areas, and some developments may not require any Federal permits. Further, the Service does not expect that conservation efforts related to future development activities in critical habitat areas are likely. The analysis nonetheless includes an estimate that assumes that all private parcels in the Verde unit are required to conduct conservation efforts for spikedace and loach minnow. Separate from that, Section 11 of the final economic analysis describes published studies that have examined increased property values associated with stream habitat. For example, Colby and Wishart estimated the value to property arising from proximity to open space provided by streambeds, arroyos, and dry washes in the city of Tucson, Arizona. The authors found that existence of permanent easements and other policies to protect these areas increased the property values of homes within one-half mile of the streambed by an average of five percent. However, compliance costs for development projects are not anticipated to be higher for streamside homes than in other areas.

(171) *Comment:* There are potential mathematical errors in the calculation of impacts. In the Executive Summary, it states that ''Incremental impacts are estimated to be $2.20 million to $8.79 million over twenty years ($194,000 to $776,000 annually) using a real rate of seven percent, or $2.77 million to $11.2 million over 20 years ($181,000 to $728,000 annually) using a real rate of three percent.'' However, $194,000 × 20 years = $3.88 million (not $2.2 million); 776,000 × 20 years = $15.52 million (not $8.79 million); $181,000 × 20 years = $3.62 million (not $2.77 million) and $728,000 × 20 = $14.56 million (not $11.2 million). Taking into account the 3 and 7 percent analysis does not fix this error.

Our Response: The Economic Analysis presents economic impacts that may be incurred in different time periods in present value terms and annualized terms. As described, annualized values are calculated to provide comparison of impacts across activities with varying forecast periods and distribution over time. For this analysis, activities employ a forecast period of 20 years. The discrepancies identified by the commenter appear to be related to the commenter's assumptions that reported costs are *annual* costs, rather than *annualized* costs.

(172) *Comment:* The draft Economic Analysis does not consider the costs of developing alternate water sources, reductions in the number of cattle the operator can run, or additional consultant and meeting costs for grazing activities.

Our Response: Based on a review of the consultation history, the economic analysis determined that the Service is not likely to request restrictions or reductions on water use for grazing activities during section 7 consultation. Therefore, water use impacts are not expected for grazing operations. It would be helpful if we can show that the consultation allowed watering areas too, since I think the issue is not having access to the water itself due to fencing.

(173) *Comment:* The cost of fish barrier installation used in the draft Economic Analysis is too low. The cost of building a fish barrier is between $800,000 and $1 million.

Our Response: Fish barrier costs are given in Exhibit 6–6 of the analysis. Undiscounted fish barrier costs range from $1 million on the low end to $10 million of the high end. These costs have been confirmed with Bureau of Reclamation officials responsible for fish barrier installation in Arizona and New Mexico.

(174) *Comment:* Transportation costs are too low and the economic analysts should consult with the affected entities.

Our Response: Section 9 of the final economic analysis reports costs associated with transportation projects that were estimated by the Arizona Department of Transportation related to a consultation for an endangered fish species.

(175) *Comment:* The fire management costs in the draft Economic Analysis are too low.

Our Response: Based on information received during the comment period, we have adjusted estimated impacts to fire management activities to include costs related to the 2011 Coronado Fire. The analysis estimates three total fire management activities throughout all of the critical habitat designation, one in Unit 3. Impacts to fire management are presented in Section 10.3. Impacts are estimated at $14,200 over the next 20 years ($1,250 on an annualized basis).

(176) *Comment:* The draft economic analysis should use more up-to-date administrative cost figures than the 2002 dollar figures from across the country. The cost figures used should be based on a review of consulting records from Arizona and New Mexico from 2010 through 2011.

Our Response: The draft Economic Analysis provided an incorrect citation in Exhibit 2–3. Data from the ''Federal Government Schedule Rates, Office of Personnel Management'' is from 2011, not 2008. The draft Economic Analysis and underlying cost models incorporated the most recent estimates of administrative effort during section 7 consultation, based on data from the Federal Government Schedule Rates, Office of Personnel Management, 2011, and a review of consultation records from several Service field offices across the country conducted in 2002. This citation error has been corrected in the final economic analysis.

(177) *Comment:* The commenter believes the administrative costs are too low.

Our Response: The commenter did not provide a basis for assuming the administrative costs estimated in this report are too low.

(178) *Comment:* The statement that the Service ''anticipates requesting few additional changes'' is nebulous.

Our Response: The commenter did not provide a basis for questioning the Service's statements.

(179) *Comment:* The **Federal Register** and the draft Economic Analysis give different total impacts estimates for incremental and coextensive costs.

Our Response: The information printed in the revised Proposed Rule and Notice of Availability released by the **Federal Register** on October 4, 2011 represents an error. The costs reported in the draft Economic Analysis posted to *www.regulations.gov* are correct.

(180) *Comment:* In Exhibit ES–1, the draft Economic Analysis underestimates or avoids stating the true impacts due to designation of the San Pedro River. Cochise County and the City of Sierra

Vista cannot withstand an impact of $3,240,000. An EIS is necessary to analyze the economic impacts of the proposed designation.

Our Response: Exhibits ES–1 and ES–2 summarize the expected administrative costs and project modification impacts developed in the analysis. These costs are detailed in Chapter 3 of the final economic analysis.

(181) *Comment:* The Service has failed to provide the requisite analysis required by law prior to designating critical habitat. This is evidenced by the fact that the spikedace and loach minnow economic analysis was done by IEc, the same firm that performed the cactus ferruginous pygmy-owl economic analysis.

Our Response: As described in detail in Section 2.1 of the final economic analysis, the analysis adheres to OMB Circular A–4 guidelines for providing assessments of the social costs and benefits of proposed regulatory actions. Also, in response to relevant rulings in both the U.S. Ninth and Tenth District Court of Appeals, in order to address the divergent opinions of the courts with respect to NEPA, and in order to provide the most complete information to decision-makers, this economic analysis reports both the baseline impacts of protections afforded the four invertebrates absent critical habitat designation and the estimated incremental impacts precipitated specifically by the designation of critical habitat for the species. Summed, these two types of impacts comprise the fully co-extensive impacts of conservation in areas considered for critical habitat designation.

(182) *Comments:* One section 7 consultation for a development project occurred in Yavapai County and considered potential impacts to the spikedace, loach minnow and the southwestern willow flycatcher on the lower Verde River. The Homestead Project consultation recommended the following conservation measures: Fencing; producing educational materials for homeowners; conducting scientific studies over 20 years; surveying and monitoring over 20 years; and off-setting mitigation (habitat set-asides). To ensure that the action would not adversely affect the spikedace and loach minnow, the following measures were added: developing a recreation and habitat monitoring plan; monitoring effects of recreation on habitat; implementing measures to ensure that habitat and streambanks are not degraded; reducing risk of exotic species reintroduction through educational programs, prohibiting backyard ponds, and prohibiting fishing and in-stream recreation in the 25-acre Conservation Area on the property; improving human barriers to entrance to the river area and preventing trespass; and increasing fence maintenance. The developer for this project stated that 95 percent of costs to accommodate threatened and endangered species stemmed from southwestern willow flycatcher needs, and that total costs to implement conservation measures would have been $4.4 million to $4.8 million. However, the Service states that this project did not go forward, and that the property has since been sold. Many developments do not go forward due to these types of onerous government restrictions that often add enormous costs, yet provide little benefit to the species. The true economic costs of the proposed critical habitat designation include the cost of foregone development opportunities because the developers and their consultants do not even have to ask the Service what the development restrictions will be. Instead, they choose to avoid the entire costly process of consultation with the Service.

Our Response: Section 7 of the final economic analysis addresses impacts to development activities. As discussed in that section, the analysis utilizes a range of assumptions to estimate the potential impact of critical habitat on development activities in these areas. Individual single-family home development has rarely been subject to consultation or habitat conservation planning requirements in Arizona. As noted in the comment, only one development has undergone a formal section 7 consultation related to development activities and impacts to multiple species, including spikedace and loach minnow, in the past, and this development was never, so no actual cost information is available.

A number of existing baseline requirements prohibit development in floodplain areas, which limits the likelihood of developments within the critical habitat designation. In addition to the rarity of consultations in the past, potential for baseline protections, as well as the potential lack of a Federal permit requirement for some development projects, the Service does not expect that conservation efforts related to future development activities in critical habitat areas are likely to occur. As a result, the low end scenario assumes that no future consultations or conservation efforts on development will occur related to spikedace and loach minnow over the next 20 years. However, because it is not certain that no consultations or conservation efforts for spikedace and loach minnow will occur related to development activities, the analysis also considers a high end scenario, where proposed critical habitat areas will be built out at a rate that is proportional to the county-wide housing unit growth rate within the next 20 years. To the extent that developers avoid critical habitat areas, this effect would be considered a stigma effect and is recognized in the analysis.

(183) *Comment:* Census data is compromised in areas of low population density due to Privacy Act considerations. In these areas the disclosure of economic activities by individuals and businesses would entail disclosing identifiable personal information. Such data needs to be determined by on-the-ground surveying to produce reliable information on potential impacts. To do anything less will result in failure to disclose impacts on the most vulnerable segments of the economy.

Our Response: The final economic analysis includes, to the extent possible, data sources that represent the most accurate population and demographic data publicly available. Performing an on-the-ground survey of undisclosed personal business is outside the scope of the final economic analysis.

(184) *Comment:* There is a total omission of the affected counties and other local government road and bridge maintenance and construction impacts. Had the Service properly contacted the affected counties and other local governments, they could have obtained numerous impacts that are not catalogued by the state departments of transportation. The failure to obtain and analyze these impacts renders this section deficient.

Our Response: As stated in the final economic analysis, county road and bridge construction and maintenance projects often require state Department of Transportation involvement on some level. Due to Federal funds accepted by most state Departments of Transportation, county road and bridge construction activity can be subject to a Federal nexus. The Arizona Department of Transportation and the New Mexico Department of Transportation were contacted and responded with information on all county and state road and bridge construction projects that required state Department of Transportation involvement. All county and state road construction projects that may potentially require section 7 consultation were captured in these communications and are presented in Section 9 of the final economic analysis. Those projects that do not require Department of Transportation

involvement lack a Federal nexus and would not be subject to section 7 consultation, and thus are not anticipated to incur costs associated with this rule.

(185) *Comments:* The draft Economic Analysis at Section 8–4 makes note of the fact that the Bureau of Indian Affairs provides technical assistance to the Tribes on forest-management planning and oversees a variety of programs on tribal lands. While the purpose of this statement is not made clear by the Service, any suggestion that the BIA presently has or will in the future have sufficient funding and/or programs to ''offset'' the increased administrative and other costs resulting from the designation of critical habitat on tribal lands such as the Yavapai-Apache Reservation is misplaced. In truth, federal funding for tribal programs and programs for technical assistance within the BIA are increasingly threatened in today's tough economic and budget climate. The Service simply cannot rely on the BIA as a means to potentially ''mitigate'' for the increased costs that the Nation will suffer if critical habitat is designated on the Nations lands.

Our Response: The draft Economic Analysis did not intend to imply that BIA involvement would mitigate costs to the Tribes, only that BIA involvement could potentially provide a Federal nexus for projects associated with BIA programs. This has been clarified in Section 8 of the final economic analysis.

(186) *Comment:* The draft environmental assessment states that ''As a result the Fort has reduced its water usage from 3,300 acre–feet per year (20 years ago) to 1,142 acre–feet currently.'' There is a difference between water usage and groundwater pumping volume. The values used in this sentence are groundwater pumping rather than water usage. This statement is inaccurate and needs to be revised.

Our Response: The language in the final economic analysis has been revised to reflect this comment.

(187) *Comment:* The **Federal Register** and DEA give different total impacts estimates for incremental and coextensive costs.

Our Response: The information printed in the proposed rule and NOA released by the **Federal Register** on October 4, 2011, represents an error. The costs reported in the draft economic analysis posted to *http://www.regulations.gov* are correct. Total incremental impacts for all of the above activities are estimated to be $2.29 to $47.2 million over 20 years ($202,000 to $4.16 million annually) using a real rate of seven percent. The final draft economic analysis values were $2.20 million to $8.79 million over twenty years ($194,000 to $776,000 annually) using a real rate of seven percent.

General Comments Issue 4: National Environmental Policy Act Concerns

(188) *Comment:* The mission of the Service is to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people. This mission will work much better when done with full disclosure of agency analysis processes as is called for by NEPA. FWS should consider the impacts of their actions on the local citizens and should give due weight to feedback from those who will bear the direct burden of FWS actions.

Our Response: The Service has made available a draft economic analysis and a draft environmental assessment which considered the impacts of the critical habitat designation on local citizens. In addition, we completed two comment periods totaling 90 days, which included an open house and public hearing, during which comments were submitted by the public. The comment and response section of this document provides the feedback requested.

(189) *Comment:* There were several comments on the inadequacy of the draft environmental assessment, especially in respect to making a determination of negligible to minor impacts on the environment.

Our Response: We determined through the NEPA process that the overall effects of this action are insignificant. An EIS is required only if we find that the proposed action is expected to have a significant impact on the human environment. The completed studies, evaluations, and public outreach conducted by the Service have not identified impacts resulting from the proposed designation of critical habitat that are clearly significant. The Service has afforded substantial public input and involvement, with two comment periods and a public hearing. Based on our analysis and comments received from the public, we prepared a final EA and made a Finding of No Significant Impact (FONSI), negating the need for a preparation of an EIS. We have determined that our EA is consistent with the spirit and intent of NEPA. The final EA, FONSI, and final economic analysis provide our rationale for determining that critical habitat designation would not have a significant effect on the human environment. Those documents are available for public review (see **ADDRESSES**)

(190) *Comment:* A commenter requested that the actual size or distance of stream proposed as critical habitat be clarified. The information in the October 4, 2011, **Federal Register** notice, draft environmental assessment and draft economic analysis caused some confusion.

Our Response: Because fishes occupy stream habitat, we have determined that it is more appropriate to quantify the delineation in terms of stream miles rather than total acres. All mileage figures throughout the rule and in the tables have been checked for consistency and adjusted where necessary. In addition, see the discussion on lateral extent of the stream in the Criteria Used to Identify Critical Habitat section.

(191) *Comment:* Several comments asked why different alternatives were not evaluated in the environmental and economic analyses, including the 1994 critical habitat designation (with and without appropriate exclusions), evaluating only river and streams that are currently occupied, and, an alternative that evaluates the designation of critical habitat in light of the Service's policy of supporting and enhancing recreational fishing opportunities with the designation of critical habitat.

Our Response: Critical habitat is defined in section 3 of the Act as:
(1) 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

(a) Essential to the conservation of the species and

(b) Which may require special management considerations or protection; and

(2) 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.

We do not believe the area encompassed by the 1994 designation would include areas essential for the conservation of the species. In addition, if we were to limit critical habitat to the 257 km (159 mi) in the 1994 designation, any impacts to that limited amount of area would be much more difficult to minimize or offset, and the likelihood of reaching the adverse modification threshold would be substantially increased. Also, the goal for management of spikedace and loach minnow is to recover the two species so that they may be removed from the endangered species list, and recovery would not be possible within the confines of the limited area included in 1994. Finally, the Service is charged with using the best scientific and

commercial information available. New information has been gained about the species, their habitat requirements, and distribution, and the use of the 1994 rule would not reflect this information.

In addition, for a species that is currently limited to 10 to 20 percent of its range, recovery in the remaining occupied areas is impractical. Areas outside of the currently occupied areas will be needed to recover both species, and we have included these areas as essential to the conservation of the species.

Finally, with respect to conflicts with sportfishing opportunities, the Service is currently completing a sportfish stocking consultation that addresses management for native fish and sportfish. In addition, the Service coordinates closely with the Arizona Game and Fish Department on management of native fishes and sportfish.

(192) *Comment:* Hidalgo County officials and residents were not aware of the status of the critical habitat proposal until March of this year. We need to point out that the only published newspaper in Hidalgo County, the *Hidalgo County Herald,* was not included in the Service's contacts for publishing the notices.

Our Response: The *Hidalgo County Herald* was included in our notification list, and Hidalgo County officials are included in our interested parties mailing list. We believe the two comment periods allowed for adequate opportunity for public comment. A total of 90 days was provided for document review and for the public to submit comments. In addition, a public hearing was scheduled on October 17, 2001, as another venue for comment submission.

(193) *Comment:* The first paragraph of the discussion of Alternative A in the draft environmental assessment indicates that the current critical habitat designation includes an increase of up to 239 miles of designated critical habitat over the 2007 designation of 522 miles, and then states that addition would result in a small but unknown number of new or reinstated consultations and that the economic analysis projects at a similar rate and in similar units as the past. Considering the addition of 239 miles is approximately a 45 percent increase in habitat designation, the impacts are being understated. In addition, unoccupied habitat does not currently require consultation.

Our Response: The overall designation does include an increase in total mileage over that designated in 2007. The Service cannot predict the number of consultations that will occur as that number is dictated by as-yet-undefined projects that will occur within critical habitat and that have a Federal nexus. Therefore, we have made the best predictions possible based on existing information, which is the level of section 7 consultation that has occurred in the past.

(194) *Comment:* The use of introduction of nonnative predators and prolonged periods of low or no stream flow as catastrophic events in the draft environmental assessments ensures 100 percent chance of a ''catastrophic event'' as there is continued stocking of nonnative fish by State fish and wildlife agencies and because every year there are widespread and common ''prolonged periods of low or no stream flow'' along large portions of the Upper San Pedro River and a number of other stream and river segments proposed for critical habitat.

Our Response: The language in this comment comes from the ''Need for the Action'' section of the draft environmental assessment. Taken in context, the information in this section highlights the fact that habitat loss or alteration has occurred in the past, and that additional losses or further restrictions in the species' distributions increases their vulnerability to a variety of threats. The intent of this section was not to highlight any one threat or management concern, but to provide background information on the need for the critical habitat designation.

(195) *Comment:* To state that the impact of excluding an area due to economic, national security, or other needs would depend on issues not addressed in the environmental assessment is an admission that the environmental assessment is inadequate. The EA never analyzes conservation measures at Fort Huachuca or anywhere else except Ttribal and FMC lands. These facts continue to support the argument that all the major decisions were made before the environmental assessment was written. The EA is a post-decision document, in violation of NEPA.

Our Response: The draft environmental assessment was completed following the publication of the proposed rule, but prior to the development of a final rule for critical habitat. Comment letters, including management plans, can be accepted up through the closing of the second comment period, which follows the publication of the draft environmental assessment. Therefore, there is no possible way for the draft environmental assessment to address conservation measures, as its publication preceded receipt of comments and management plans detailing those conservation measures. The final rule describes several exclusion decisions that were made, including one for Fort Huachuca, following closure of the second comment period and review of all materials received.

(196) *Comment:* The word ''unknown'' was used at least 26 times in relation to impacts, which triggers an EIS. The primary purpose of preparing an environmental assessment under NEPA is to determine whether a proposed action would have significant impacts on the human environment. If significant impacts may result from a proposed action, then an EIS is required (40 CFR 1502.3). Whether a proposed action exceeds a threshold of significance is determined by analyzing the context and the intensity of the proposed action (40 CFR 1508.27). Under Council of Environmental Quality (CEQ) regulations, which are responsible for ensuring compliance with NEPA, intensity is determined by considering 10 criteria (CFR 40 1508.27[b]) including ''the degree to which the proposed action would impose unique, unknown, or uncertain risks (emphasis added).'' The proposed alternatives in the EA would impose at least 26 ''unknown'' risks including the risk of compromising national security by taking money away from the War on Global Terrorism. An EIS is required under 40 CFR 1508.27.

Our Response: If some of the impacts will occur in the future, the Federal agency still has an obligation to consider reasonably foreseeable future impacts. 40 CFR 1508.7 defines ''cumulative impact'' as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (*Custer County Action Ass'n* v. *Garvey,* 256 F.3d 1024 (10th Cir. 2001)). The record of decision must contain a ''useful analysis of the cumulative impacts of past, present, and future projects,'' which requires ''discussion of how [future] projects together with the proposed project will affect [the environment] (*Muckleshoot Indian Tribe* v. *U.S. Forest Serv., 177 F.3d 800, 810 (9th Cir. 1999)).''

Nevertheless, NEPA does not require the government to do the impractical (*Kleppe* v. *Sierra Club,* 427 U.S. 390, 1976). Determining the environmental impacts of reasonably foreseeable actions does not mean that the Federal agency has to wait to make its decision on the current project until the details of other foreseeable actions are known

(*Kleppe* v. *Sierra Club, id.; Inland Empire Public Lands Council* v. *U.S. Forest Service,* 88 F.3d 754 (9th Cir. 1996). If a future action is foreseeable but not imminent and its details are not yet known, the Federal agency is not required to wait until the details of the other action are known before proceeding (*Kleppe* v. *Sierra Club, supra).* When further investigation would provide no definitive information to resolve the issues during the time frame for the decision on the project, further investigation in an EIS is not required (*Kleppe* v. *Sierra Club,* 427 U.S. 390 (1976); *Neighbors of Cuddy Mountain* v. *United States Forest Serv.,* 137 F.3d 1372, 1380 (9th Cir. 1998)).

(197) *Comment:* We strongly challenge the adequacy of the draft environmental assessment, especially in how it glosses over the serious and significant adverse effects to loach minnow and spikedace populations and adverse modifications to critical habitats that the livestock industry has imposed after a century of devastation and stream and riparian ecosystem destruction in the Gila River Basin.

Our Response: The proposed rule and final rule acknowledge the significant impact grazing has had on many watersheds in the West. We also acknowledge significant improvements on Federal lands due to restrictions in riparian and stream corridors and other management practices.

(198) *Comment:* The draft environmental assessment (and where relevant, draft economic analysis) fails, among other things, to accurately characterize (and therefore consider) (a) the substantive protections that already exist on the Yavapai-Apache Reservation for the spikedace and loach minnow; (b) the nature of surface water rights within the Verde River Subbasin, including the Federal reserved water rights that are held by the United States of America in trust for the Nation; and (c) the adverse impacts that the designation will have on the Nation's ability to preserve itself in its permanent tribal homeland as outlined by the Nation in prior comments and discussions with the Service on this matter.

Our Response: We appreciate the concerns of the Tribe and have excluded all lands of the Yavapai-Apache Nation in consideration of impacts to the Tribe, their sovereign nation status, existing management practices, and ongoing relationship with the Service. The Exclusions section of the final rule details our rationale for the exclusion.

(199) *Comment:* Furthermore, the draft environmental assessment fails to discuss (or even reference) those portions of the Nation's recent written comments submitted to the Service on December 27, 2010, which summarize the steps that the Nation has taken since enactment of Tribal Resolution No. 46–2006, to provide continuing protection for the habitat within the Verde River Conservation Corridor. See Draft EA at 141 (referencing only the Nation's comments from 2006 relative to the Verde River Conservation Corridor and ignoring recent comments updating the Service on this matter).

Our Response: The purpose of the draft environmental assessment is to reflect the impacts of the decision, as made by the Service, of the critical habitat designation. The Service does not make decisions on exclusions until both comment periods have been closed, in order to ensure that all parties have an opportunity to provide relevant information. Therefore, at the time the draft environmental assessment was published, the Service had not yet decided that the Yavapai-Apache Nation lands would be excluded from the designation. The comments regarding the steps the Nation has taken are most relevant to the Service's decision, which is then ultimately reflected in the draft environmental assessment.

(200) *Comment:* In reviewing the existing conditions of water resources of the Verde River, the draft environmental assessment discusses the ''water rights'' of the Salt River Project and other non-Indian users along the River, but fails to mention the important fact that the Yavapai-Apache Nation, and the United States as the trustee for the Nation, also hold present and perfected, high-priority water rights to the surface flows of the Verde River and its tributaries under principles of Federal law. See, e.g., *Arizona* v. *California,* 373 U.S. 546, 600 (1963); see also, *In Re The General Adjudication of All Rights to Use Water In the Gila River System and Source,* 201 Ariz. 307, 35 P.3d 68, 71–72 (2001) (''Gila V''). In addition, other tribes, including the Fort McDowell Yavapai Nation and the Salt River Pima-Maricopa Indian Community, hold high-priority water rights to the Verde River, yet the draft environmental assessment fails to mention this fact as well.

Our Response: The purpose of the draft environmental assessment is to reflect the impacts of the decision, as made by the Service on the critical habitat designation. The final environmental assessment will be updated where needed, in response to the two comment periods.

(201) *Comment:* In the ''Environmental Consequences'' section of the draft environmental assessment (3.9.2), the Service concludes, with almost no substantive analysis or discussion, that the impacts of designating critical habitat on the Nation's lands for the spikedace and loach minnow under Alternative B ''would be minor.'' Draft EA at pp. 145–146. The Nation disagrees.

Our Response: In the final rule, Yavapai-Apache lands have been excluded from the designation. Both the economic analysis and environmental assessment have been updated in response to these comments.

(202) *Comment:* The Service is requested to once again review the Nation's prior written and oral comments (2006 through 2010) regarding the potential designation of critical habitat on the Yavapai-Apache Reservation and to meaningfully discuss these concerns in the final environmental analysis (Alternative B) and in the final economic analysis.

Our Response: In the final rule, Yavapai-Apache lands have been excluded as we determined that the Yavapai-Apache Nation's resolution specifically addresses conservation of these species, and the benefits of exclusion outweighed the benefits of inclusion.

(203) *Comment:* It must also be noted that the draft environmental assessment wrongly states that the Tribal lands considered for critical habitat designation ''are primarily used for livestock grazing, fuelwood cutting, roads, and recreation.'' By lumping all Tribal lands together in its analysis, the draft environmental assessment misrepresents how the Yavapai-Apache Nation utilizes the lands within the Verde River Subbasin that are proposed for designation in this instance. These lands are used to satisfy the permanent tribal homeland needs of the Yavapai-Apache Nation. It should also be pointed out that contrary to the Draft EA, these lands are not utilized for livestock grazing and they remain protected pursuant to tribal law under tribal Resolution No. 46–2006. In addition, the Nation generally does not permit fuelwood cutting within this area and the Nation has only one minor access road across the River. Although the Nation does utilize the Verde River to satisfy the recreational needs of its tribal members, this does not involve large-scale recreational activities. In addition, it is important to understand the fundamental role that the Verde River and its habitat continues to play in the traditional, cultural, and religious practices of the Nation. Indeed, as the Nation has repeatedly explained to the Service, the Verde River is intertwined with the identity of the Yavapai and Apache people, including with regard to

certain ceremonial and religious practices that are deliberately conducted within the Verde River Corridor. None of these important points have been meaningfully considered in the Draft EA. The Nation respectfully requests that the Service address as part of the final environmental assessment and final economic analysis the Nation's previously stated concerns pertaining to the myriad of very real and specific impacts that are likely to stem from the proposed designation on the Nation's lands, which includes impacts on the Nations ability to preserve itself in its permanent tribal homeland.

Our Response: Thank you for the response. We note that the lands are used to satisfy the permanent tribal homeland needs of the Yavapai-Apache Nation. We further note that the Nation does not permit fuelwood cutting within certain areas, and that some portion of the land is used for certain ceremonial and religious practices.

(204) *Comment:* The summary for the August 26, 2011, draft environmental assessment indicates that two additional proposed stream segments were added for critical habitat designation in some places, and that three additional stream segments were added in other places within the document. The location and description of these two or three added stream segments are not described in the description of the alternatives found in Chapter 2 of the DEA.

Our Response: The Service has made changes to five stream segments proposed for critical habitat designation subsequent to publication of the proposed rule. These include: (1) Increasing the length of the San Francisco River critical habit segment for loach minnow only from 112.3 miles to 126.5 miles; (2) adding a 19.5-mile critical habitat segment of Bear Creek for loach minnow only; (3) reducing the Redfield Canyon critical habitat segment for spikedace and loach minnow from 14.0 miles to 4.0 miles; (4) reducing the Hot Springs Canyon critical habitat segment for spikedace and loach minnow from 11.8 miles to 5.8 miles; and (5) increasing the Fossil Creek critical habitat segment for spikedace and loach minnow from 4.7 miles to 13.8 miles. These changes are reflected in the final environmental assessment.

(205) *Comment:* The Service has failed to provide adequate information regarding the actual environmental impacts of critical habitat designation for spikedace and loach minnow. Statements in the draft environmental assessment explaining the requirements of the Act and the rationale for the Service to propose and then designate critical habitat for the spikedace and loach minnow may help the public understand the mindset of the Service, however they do little to provide information concerning the actual environmental effects of designating critical habitat for the species. The Service should revise the draft environmental assessment to remove much of the explanation language for the Act and replace it with analysis of the environment effects of designating SD/LM critical habitat. As stated in 40 CFR, Part 1500.1(b), ''Most important, NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail.''

Our Response: The 2011 draft and 2012 final environmental assessment largely follow the format and methodology used to prepare the 2006 final environmental assessment. Additional information has been provided to the more recent environmental assessments, where needed, to refine habitat requirements (physical and biological features) essential to the conservation of the species, changes to stream segments proposed for critical habitat designation. Additional information has also been provided, where necessary, with respect to the affected environment and environmental consequences. The conclusions of the environmental consequence analysis have not substantially changed from the 2006 final environmental assessment to the 2012 final environmental assessment.

(206) *Comment:* In comparison to Alternatives A and B, the No Action Alternative includes three stream segments not in the 2010 proposed rule. These stream segments are now considered by the Service to be highly degraded and likely not occupied by spikedace or loach minnow. The ISC would like to know where those segments are located, what degradation supports removal from listing.

Our Response: The no action alternative is the 2007 final rule. When compared to the 2010 proposed rule, the no action alternative includes three stream segments not included in the 2010 proposed rule: (1) For spikedace only, the middle Gila River from Ashurst-Hayden Dam upstream to the confluence of the San Pedro River; (2) for spikedace only, the lower San Pedro River from the confluence with the Gila River to the confluence with Aravaipa Creek; and (3) for loach minnow only, the San Francisco River upstream of the confluence with the Tularosa River. The Service has re-evaluated the suitability of these three stream segments for critical habitat designation and now considers the middle Gila segment and the lower San Pedro segment to no longer meet the rule set for spikedace or loach minnow critical habitat. For loach minnow only, the 22.9 km (14.2 mi) segment of the San Francisco River segment upstream of the Tularosa River confluence is included in the final rule for critical habitat designation for loach minnow.

(207) *Comment:* The Statement in Chapter 4 of the draft environmental assessment states that the potential impacts on the quality of the environment are not likely to be highly controversial, which is not true, especially for the upper San Pedro River area.

Our Response: The Service has reviewed the comments submitted by Fort Huachuca regarding the potential impacts of the designation on national security activities conducted (in some cases exclusively) at Fort Huachuca and determined that the San Pedro River should be excluded based on potential impacts to national security.

(208) *Comment:* Under topics dismissed from detailed analysis in the draft environmental assessment, the last bullet at the bottom of the page on Urban quality and design of the built environment (1502.16) states that the proposed critical habitat segments are not located in urban or other built environments and would not affect the quality of such environments. While this is a true with respect to the actual critical habitat location, it is misleading when considering the location of the critical habitat with regard to the City of Sierra Vista and Fort Huachuca. Surface water flow in the San Pedro River includes a component referred to as base flow from the regional aquifer outside of the potential critical habitat designation. This is acknowledged at other points in the documents (see the top of page 85). Considering the possibility of future limitations on groundwater uses in these built-up areas, the effect on the quality of such environments needs to be analyzed as part of this environmental assessment.

Our Response: The Service has reviewed the comments submitted by Fort Huachuca regarding the potential impacts of the designation on national security activities conducted (in some cases exclusively) at Fort Huachuca and determined that the San Pedro River should be excluded based on potential impacts to national security. There is therefore no potential for the potential impacts discussed in this comment to occur as a result of the final critical habitat designation.

(209) *Comment:* The draft environmental assessment indicates that ''the stream channel at bank full width,

plus 300 feet on either side of bank full width * * *'' This would result in a designation of 600 feet lateral distance plus the stream channel. Throughout this draft environmental assessment the critical habitat designation is referred to as a 300-foot corridor and not a 600-foot corridor. Considering this discrepancy, if the analysis was actually done on a 300-foot width rather than a 600-foot width, it would seem that this draft environmental assessment would be significantly flawed and will need to be redone.

Our Response: The critical habitat designation includes the width of the stream (which will vary), and 300 feet on either side of bankfull width. This has been corrected in the final environmental assessment.

(210) *Comment:* Under alternative B, the draft environmental assessment states that there is a potential increase of 313 miles of designated critical habitat from the existing designation of 522 miles and again states there would be a small but unknown increase in section 7 consultations. When considering this is approximately a 65 percent increase in the critical habitat designation, the impacts are being understated.

Our Response: The increase in consultations is anticipated to be small based on historical information about past consultations. There is potential for new consultations not already covered by the Act in stream segments currently unoccupied by either spikedace or loach minnow.

(211) *Comment:* The Cumulative Impacts section should be revised to emphasis on the significance of the socioeconomics and water management impacts of the listings.

Our Response: The Service has evaluated the potential environmental consequences of the proposed critical habitat designation for spikedace and loach minnow and determined that the incremental impact of designating additional critical habitat for the spikedace and loach minnow when added to other past, present, and reasonably foreseeable future actions in the analysis area would be minor on water resources, wetlands and floodplains, natural resources, land use and management (including livestock grazing), wildlife fire management, and recreation. Tribal socioeconomics, tribal Trust resources, and tribal environmental justice may incur additional impacts if alternative B is selected. Fort Huachuca could also incur additional impacts on national security activities if alternative B is selected.

(212) *Comment:* Portions of the discussion on the San Pedro River center on adversely affecting livestock grazing but there is no discussion on the impacts associated with Fort Huachuca.

Our Response: The Service has reviewed the comments submitted by Fort Huachuca regarding the potential impacts of the designation on national security activities conducted (in some cases exclusively) at Fort Huachuca and determined that the San Pedro River should be excluded based on potential impacts to national security.

(213) *Comment:* While the draft environmental assessment discusses impacts such as drought, current and future market trends and fluctuations, and supplemental forage availability contribute to the cumulative impacts on livestock grazing. While the impacts from critical habitat designation are expected to have generally minor adverse effects on current livestock grazing conditions, an acknowledgment must be given to other factors that contribute to the cumulative impacts on grazing. Though the draft environmental assessment document acknowledges cumulative impacts in the above statement, it does not analyze them and it does not take into consideration that it is the incremental addition of species after species and critical habitat restriction upon critical habitat restriction that is killing the livestock industry. The cumulative impacts need to be identified and quantified.

Our Response: The 2011 draft and 2012 final environmental assessment largely follow the format and methodology used to prepare the 2006 final environmental assessment. Additional information has been provided to the more recent environmental assessments, where needed, to refine habitat requirements (physical and biological features) essential to the conservation of the species, changes to stream segments proposed for critical habitat designation. Additional information has also been provided, where necessary, with respect to the affected environment and environmental consequences. The conclusions of the environmental consequence analysis have not substantially changed from the 2006 final environmental assessment to the 2012 final environmental assessment, including the section of text that is referred to in the comment.

(214) *Comment:* Several commenters noted that, in order to be in compliance with various case law, policies, or regulations including Chapter 1 of NEPA, *Bennett* v. *Spear* 550 FW 1, the Citizens Guide to NEPA (2007); and page 16 of the 550 FW 1 and NEPA regulations in 40 CFR 1501.6, it is the continuing responsibility of the Federal government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources. The City of Sierra Vista, Cochise County, and affected counties within the Coalition respectfully request agency coordination.

Our Response: Local governments have been provided with adequate opportunity to comment on the proposed rule, draft environmental assessment, and draft economic analysis. As noted at comment 128, we believe the two comment periods allowed for adequate opportunity for public comment. A total of 90 days was provided for document review and the public to submit comments. In addition, an open house and public hearing were held on October 17, 2011, providing another opportunity for comment submission. Per our Regional Solicitor, there is no designation for ''Coordinator Status.'' However, in addition to the comment period we personally visited with these commenters on several occasions to ensure that their concerns were heard and considered. The Service met with representatives of Hidalgo County, Grant County, and Catron County in March of 2011; Apache County, Grant County, Hidalgo County, and Catron County in Springerville in July 2011; and with the City of Sierra Vista, Cochise County, the Hereford Natural Resource Conservation District, Hidalgo County, and Fort Huachuca in November of 2011. We held an additional conference call with Fort Huachuca in August of 2011. We concluded that cooperator status would be limited to New Mexico and Arizona Game and Fish Departments. Per our Regional Solicitor, there is no designation for ''Coordinator Status.'' However, in addition to the comment period we personally visited with these commenters on several occasions to ensure that their concerns were heard and considered.

(215) *Comment:* The Service must use the best scientific and commercial information available as required by the Act and the Data Quality Act of 2000 (Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*), here forth referred to as Data Quality Act) standards. Had Service employees followed the requirements in the laws and regulations and used the best scientific and commercial information available and their internal agency guidelines contained in Chapter 1 of NEPA—Policy and Responsibilities—550 FW 1, the agency would have had the necessary

information to properly prepare the NEPA document and economic impact analysis.

Our Response: Under the Act, the Service must make decisions to designate critical habitat on the basis of the best available scientific and commercial data. When making critical habitat decisions, the Service consults with experts within and external to the Federal government and considers studies or data from Federal and state agencies, other stakeholders, and the general public. Proposed and final rules are reviewed by the Service at the field, regional, and national level to help ensure that the analysis is sound and conforms to the ''best available science'' requirement. Additionally, the Service also has a policy to ask at least three independent scientific experts in a relevant field to provide a ''peer review'' of the proposed decisions to ensure that best available science is considered. When considering a critical habitat proposal, the Service is also required to consider economic impacts through completion of an economic analysis.

(216) *Comment:* Impacts to surface flows in streams may also result from pumping of groundwater wells located outside of the proposed 300-foot critical habitat corridor. The groundwater–surface water interactions of each hydrologic system are unique and require site-specific analysis to fully understand potential interactions and impacts. The NEPA process requires decisionmakers be informed of impacts. It is unclear from the draft environmental assessment whether groundwater wells outside the 300 foot critical habitat boundary will be shut down if they are determined to impact surface flows. This impact needs to be made very clear. Significant economic impacts to well owners outside the 300 foot critical habitat boundary could occur if their wells are shut down. An Environmental Impact Statement is necessary to address this issue.

Our Response: While potential administrative costs and impacts to existing infrastructure are relatively predictable, potential impacts on water use that could result from spikedace and loach minnow conservation, particularly in areas that are currently unoccupied by the species are, in large part, uncertain. The majority of past consultations on water issues have not focused on water availability or water quantity issues. Instead, they have focused on nonnative species reintroduction issues for multiple native fish species, diversion repair and bank stabilization projects, and occasionally proposed water exchanges. To date there has been only one known example of a Section 7 consultation affecting water use and this affected a Federal entity (Fort Huachuca).

(217) *Comment:* The draft environmental assessment indicates that channelization of streams for purposes of flood control may increase the risk of flooding. This statement is confusing to the reader and it should be explained better or removed from the next version of the NEPA document.

Our Response: We refer the reader to page the October 28, 2010, proposed rule (page 66487). Language in the proposed rule states that 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. Various changes to stream channels occur through channelization, including increases in water velocity in the channelized section, subsequent increases in rates of erosion, and in some instances deposits of sediment in downstream reaches that may increase the risk of flooding. The final environmental assessment has been modified to provide clarification on this topic.

(218) *Comment:* The draft environmental assessment indicates that the effects on future water management activities and water resources from critical habitat designation are expected to be minor and are not anticipated to constrain any proposed water management activities because most all of the proposed segments are occupied by the spikedace and loach minnow. The impact of critical habitat designation on future water management activities was not addressed for unoccupied habitat, and this is a fatal flaw in the draft environmental assessment. The impacts to the Upper San Pedro River were not addressed because the draft environmental assessment is too general and fails to take a ''hard look'' at the impacts of designating critical habitat. No attempt has been made to analyze the full range of impacts resulting from the critical habitat designation, including water development and use outside the critical habitat boundary. Instead, impacts on agricultural, municipal and industrial water development projects are ''unknowable at this time,'' ''cannot be predicted with precision'' and are ''mostly uncertain.'' Similar statements appear throughout the document, indicating that the Service has failed to take the required ''hard look'' at the environmental consequences of the proposed alternatives.

Our Response: While potential administrative costs and impacts to existing infrastructure are relatively predictable, potential impacts on water use that could result from spikedace and loach minnow conservation, particularly in areas that are currently unoccupied by the species are, in large part, uncertain. The majority of past consultations on water issues have not focused on water availability or water quantity issues. Instead, they have focused on nonnative species reintroduction issues for multiple native fish species, diversion repair and bank-stabilization-type projects, and occasionally proposed water exchanges. To date there has been only one known example of a Section 7 consultation affecting water use and this affected a Federal entity (Fort Huachuca). The Service has reviewed the comments submitted by Fort Huachuca regarding the potential impacts of the designation on national security activities conducted (in some cases exclusively) at Fort Huachuca and determined that the San Pedro River should be excluded based on potential impacts to national security.

(219) *Comment:* The draft environmental assessment notes that some required Section 7 conservation measures could have minor to moderate adverse impacts on water management activities (e.g., groundwater pumping, surface water diversion, channelization). The term ''minor to moderate adverse impacts'' should be defined, as water is not a small matter. Every impact to water should be addressed in an EIS to the extent required by law.

Our Response: The NEPA and related supporting regulations require that an Environmental Impact Statement be prepared and approved when a proposed Federal action would cause significant impacts. The Service has determined through its completion of a NEPA environmental assessment that the proposed designation of critical habitat for spikedace and loach minnow would not result in significant impacts. This is not to say that there would be no impacts to water or other resources, but that the impacts are not anticipated to be significant based on the Service's analysis. At this time, the Service does not believe there is a legitimate basis for preparing an environmental impact statement.

(220) *Comment:* The draft environmental assessment states that adverse impacts of critical habitat designation on livestock grazing, however, are expected to be generally minor in part because livestock grazing operations typically occur on a large

scale, and designated critical habitat within any one allotment is likely to be small; and therefore, few grazing allotments are likely to be subject to consultation requirements based solely on the presence of the spikedace and loach minnow designated critical habitat. As required by *Bennett* v. *Spear* (1997), each agency must ensure that the Act not be implemented haphazardly, or on the basis of speculation or surmise. This statement in the draft environmental assessment shows a complete lack of understanding of western livestock grazing operations. There is a very limited amount of water in the arid west, and the portion of an allotment that is most valuable is the water source because without water you cannot graze livestock. To state that the impacts are expected to be generally minor because designated critical habitat (the water) is likely to be a small part of the allotment, is haphazard implementation of the Act.

Our Response: The 2011 draft environmental assessment and 2012 final environmental assessment are generally aligned in format and methodology with the 2006 final environmental assessment. The environmental consequence analysis has not substantially changed. This same text pertaining to livestock grazing appeared in the 2006 final environmental assessment (see p.72).

(221) *Comment:* The draft environmental assessment fails to distinguish the impact of critical habitat in areas that are presently unoccupied by spikedace and loach minnows. By erroneously assuming that ''most all'' of the proposed critical habitat is currently occupied, and will remain occupied over the next 20 years, the draft environmental assessment overlooks significant impacts on land and water users.

Our Response: This text is in error and has been updated in the draft environmental assessment. However, the analysis completed in the draft economic analyses and in the draft environmental assessment correctly reflects occupancy status for the river segments within this critical habitat designation.

(222) *Comment:* There are several additional alternatives that are consistent with the purpose and need of the proposed action and are not too remote, speculative or impractical for critical review as part of the NEPA process.

Our Response: The scope of reasonable alternatives to be considered is a function of the purpose and need of the proposed action. This environmental assessment generally follows the format and methodology of the 2006 final environmental assessment used to prepare the 2007 final rule, including the structure of alternatives. In the 2011 draft environmental assessment, alternative A included a number of stream segments being considered by the Service for exclusion. Additional stream segments have been considered by the Service for exclusion under this Alternative based on comments received subsequent to publication of the 2010 proposed rule, 2011 draft environmental assessment, and 2011 draft economic analysis.

(223) *Comment:* To ''occupy'' to us implies perennial, year-round and year after year occurrence, and we conclude that the Service, in the draft environmental assessment, was implying the same thing. To use occupy for any status other than permanent residence is misleading. If occupation is intermittent, such should be stated.

Our Response: Please see the discussion under the subheading ''Occupied Versus Unoccupied Areas in the final rule for our definition of occupied habitat and a discussion of the rationale for that definition.

(224) *Comment:* The environmental consequence determinations for each of the various resource categories that are presented throughout the draft environmental assessment are not environmental consequence determinations, but a listing of the changes in the Act's procedural requirements that would take place if the proposed critical habitat is implemented. In each of the ''Environmental Consequence'' section of the various resource categories there is a detailed description of how the section 7 consultation processes would change if the proposed spikedace and loach minnow critical habitat is implemented. The various ''Environmental Consequence'' sections also contain a listing of potential new management requirements for each resource category. These procedural changes and potential new management requirements do not give the public any idea of what changes will occur to ecosystem health or spikedace and loach minnow habitat if the proposed critical habitat is implemented. At best the current environmental consequences determinations infer that by implementing Service control over the management of the federal spikedace and loach minnow critical habitat units (or lands with a Federal nexus), the physical and biological features for the spikedace and loach minnow will improve to the point that the designated critical habitat areas will again somehow sustain a population of the two species. All of the vague environmental consequence language only serves to put local citizens on notice that the designation of the proposed critical habitat could impact their use of federal land and the future management of their private land, where their land is included in a proposed critical habitat unit.

Our Response: The 2011 draft and 2012 final environmental assessment largely follow the format and methodology used to prepare the 2006 final environmental assessment. Additional information has been provided to the more recent environmental assessment, where needed, to refine habitat requirements (physical and biological features) essential to the conservation of the species, changes to stream segments proposed for critical habitat designation. Additional information has also been provided, where necessary, with respect to the affected environment and environmental consequences. The conclusions of the environmental consequence analysis have not substantially changed from the 2006 final environmental assessment to the 2012 final environmental assessment.

(225) *Comment:* The draft environmental assessment contains the statement; ''It is not expected, based on past consultations in the Southwest that designation of critical habitat would result in the infringement of any existing water rights.'' This statement does not meet the standard of utility and objectivity required by the Data Quality Act.

Our Response: We believe the statement is accurate based on our past experience and section 7 consultation history in the southwest. However, if the commenter feels that the statement is not accurate, there is a defined process under the Data Quality Act for requesting a correction. The commenter can follow the process outlined on our Web site: *http://www.fws.gov/southwest/science/informationquality.html?region=5* under the U.S. Fish and Wildlife Service Information Quality Guidelines.

Required Determinations

Regulatory Planning and Review—Executive Order 12866

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

(1) 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.

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

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

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

Regulatory Flexibility Act (5 U.S.C. 601 et seq.)

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 (5 U.S.C. 801 *et seq.*), 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 an agency certifies the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended the 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. In this final rule, we are certifying that the critical habitat designations for spikedace and loach minnow will not have a significant economic impact on a substantial number of small entities. The following discussion explains our rationale.

According to the Small Business Administration, small entities include small organizations, such as independent nonprofit organizations; small governmental jurisdictions, including school boards and city and town governments that serve fewer than 50,000 residents; as well as small businesses. Small businesses include manufacturing and mining concerns with fewer than 500 employees, wholesale trade entities with fewer than 100 employees, retail and service businesses with less than $5 million in annual sales, general and heavy construction businesses with less than $27.5 million in annual business, special trade contractors doing less than $11.5 million in annual business, and agricultural businesses with annual sales less than $750,000. To determine if potential economic impacts on these small entities are significant, we consider the types of activities that might trigger regulatory impacts under this rule, as well as the types of project modifications that may result. In general, the term ''significant economic impact'' is meant to apply to a typical small business firm's business operations.

To determine if the rule could significantly affect a substantial number of small entities, we consider the number of small entities affected within particular types of economic activities (e.g., water use and management, grazing, mining, species management and recreational fishing, development, transportation, fire management, and tribal activities). We apply the ''substantial number'' test individually to each industry to determine if certification is appropriate. However, the SBREFA does not explicitly define ''substantial number'' or ''significant economic impact.'' Consequently, to assess whether a ''substantial number'' of small entities is affected by these designations, this analysis considers the relative number of small entities likely to be impacted in an area. In some circumstances, especially with critical habitat designations of limited extent, we may aggregate across all industries and consider whether the total number of small entities affected is substantial. In estimating the number of small entities potentially affected, we also consider whether their activities have any Federal involvement.

Designation of critical habitat only affects activities authorized, funded, or carried out by Federal agencies. Some kinds of activities are unlikely to have any Federal involvement and so will not be affected by critical habitat designation. In areas where the species is present, Federal agencies already are required to consult with us under section 7 of the Act on activities they authorize, fund, or carry out that may affect the spikedace or loach minnow. Federal agencies also must consult with us if their activities may affect critical habitat. Designation of critical habitat, therefore, could result in an additional economic impact on small entities due to the requirement to reinitiate consultation for ongoing Federal activities (see *Application of the ''Adverse Modification Standard''* section).

In our final economic analysis of the critical habitat designations, we evaluated the potential economic effects on small business entities resulting from conservation actions related to the designations of critical habitat for spikedace and loach minnow. The analysis is based on the estimated impacts associated with the rulemaking as described in Chapters 3 through 10 and Appendix A of the analysis and evaluates the potential for economic impacts related to: (1) Mining; (2) Species Management; (3) Tribes; (4) Transportation; (5) Fire Management; (6) Water Management; and (7) Grazing. The final economic analysis indicates that incremental impacts are not expected to impact small entities for mining, species management, tribal, transportation, or fire management activities.

The final economic analysis indicates that incremental impacts associated with water management, grazing, and development may potentially be borne by small entities. The entities potentially affected under water management include cotton farming, hay farming, cotton ginning, and food manufacturing. The potential incremental costs to water management activities that may be borne by small entities are estimated at $125,000 to $252,000 on an annualized basis (discounted at seven percent) over the next 20 years. The final economic analysis indicates of the 312 entities in this sector, 47 (or 15 percent) that may be small entities may be affected. If each of them are small and each undergoes section 7 consultation, annualized impacts per small entity would be expected to range from 0.16 to 0.32 percent of annual revenues. Based on our analysis, we have determined that there will not be a significant impact to small businesses in this sector.

Grazing entities potentially affected by the critical habitat rule include beef cattle ranching and farming. The final economic analysis indicates of the 147 entities in this sector, 33 (or 22 percent) small entities may be affected. Incremental costs to small grazing entities are estimated at $20,300 to $295,000 on an annualized basis. Assuming that all 33 entities were to undergo section 7 consultation, and all of the entities are small, annualized impacts per small entity are expected to range from 0.08 to 1.18 percent of annual revenues. Based on our analysis, we have determined that there will not be a significant impact to small businesses in this sector.

Development entities potentially affected by the critical habitat designations could include new single-family housing, new multifamily housing construction, new housing operative builders, and land subdivision. The final economic analysis indicates of the 4,673 entities in this sector, that four (or 0.9 percent) entities could be affected. Incremental costs to small development firms are

estimated to range from $0 to $77,000 on an annualized basis. Assuming that impacts are borne by four small entities that undergo section 7 consultation, annualized impacts are anticipated to range from 0 to 0.30 percent of annual revenues. Based on our analysis, we have determined that there will not be a significant impact to small businesses in this sector.

In summary, we have considered whether the proposed designation would result in a significant economic impact on a substantial number of small entities. Information for this analysis was gathered from the Small Business Administration, stakeholders, and the Service. For the above reasons and based on currently available information, we certify that, if promulgated, the designations of critical habitat for spikedace and loach minnow would not have a significant economic impact on a substantial number of small business entities. Therefore, regulatory flexibility analysis is not required.

Energy Supply, Distribution, or Use—Executive Order 13211

Executive Order 13211 (Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use) requires agencies to prepare Statements of Energy Effects when undertaking certain actions. OMB has provided guidance for implementing this Executive Order that outlines nine outcomes that may constitute ''a significant adverse effect'' when compared to not taking the regulatory action under consideration. The economic analysis finds that none of these criteria are relevant to this analysis. Thus, based on information in the economic analysis, there are no expected energy-related impacts associated with designations of critical habitat for spikedace and loach minnow. As such, the designation of critical habitat is not expected to significantly affect energy supplies, distribution, or use. Therefore, this action is not a significant energy action, and no Statement of Energy Effects is required.

Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.)

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

(1) 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.

(2) We do not believe that this rule will significantly or uniquely affect small governments because it will not produce a Federal mandate of $100 million or greater in any year; that is, it is not a ''significant regulatory action'' under the Unfunded Mandates Reform Act. The designation of critical habitat imposes no obligations on State or local governments. By definition, Federal agencies are not considered small entities, although the activities they fund or permit may be proposed or carried out by small entities.

In the past, local county governments have indicated a concern in the perceived regulatory burden imposed by critical habitat designation on management issues within the county, and particularly in relation to public safety issues such as bridge and road repair or flood management. These counties have indicated that State agencies might opt not to complete necessary repairs or management activities, or would not pursue Federal funding to address these issues if such actions could trigger a section 7 consultation. We note that not all actions would necessarily trigger section 7 consultation unless a Federal nexus exists. Where a Federal nexus does exist, the county or state have options to facilitate the section 7 process. Programmatic consultations can provide the planning agency with a long-term ability to affect repairs as needed over a specified length of time, without repeating the section 7 process. In addition, the Service has emergency consultation procedures so that any management entity can carry out necessary actions in which lives or property are in danger without first completing section 7 consultation. Once the emergency is handled, section 7 consultation can be completed. As such, a Small Government Agency Plan is not required.

Takings—Executive Order 12630

In accordance with Executive Order 12630 (Government Actions and Interference with Constitutionally Protected Private Property Rights), we have analyzed the potential takings implications of designating critical habitat for spikedace and loach minnow in a takings implications assessment. Critical habitat designation does not affect landowner actions that do not require Federal funding or permits, nor does it preclude development of habitat conservation programs or issuance of incidental take permits to permit actions that do require Federal funding or permits to go forward. The takings implications assessment concludes that these designations of critical habitat for spikedace and loach minnow do not pose significant takings implications for

lands within or affected by the designations.

Federalism—Executive Order 13132

In accordance with Executive Order 13132 (Federalism), this 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 critical habitat designation with appropriate State resource agencies in Arizona and New Mexico. We received comments from both States and have addressed them in the Summary of Comments and Recommendations section of the rule. The designations of critical habitat in areas currently occupied by spikedace and loach minnow may impose few additional regulatory restrictions to those currently in place and, therefore, may have little incremental impact on State and local governments and their activities. The designations may have some benefit to these governments in that the areas that contain the physical and biological features essential to the conservation of the species are more clearly defined, and the elements of the features of the habitat necessary to 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 designations 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—Executive Order 12988

In accordance with Executive Order 12988 (Civil Justice Reform), the regulation meets the applicable standards set forth in sections 3(a) and 3(b)(2) of the Order. We are designating critical habitat in accordance with the provisions of the Act. This final rule uses standard property descriptions and identifies the physical and biological features essential to the conservation of spikedace and loach minnow within the designated areas to assist the public in understanding the habitat needs of the species.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

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 (42 U.S.C. 4321 et seq.)

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 pursuant to the 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 49534). 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 spikedace and 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 the critical habitat designations and notify the public of the availability of the draft environmental assessment for the critical habitat designations when it is finished.

We performed the NEPA analysis, and drafts of the environmental assessment were available for public comment on October 4, 2011 (76 FR 61330). The final environmental assessment has been completed and is available for review with the publication of this final rule. You may obtain a copy of the final environmental assessment online at *http://www.regulations.gov*, by mail from the Arizona Ecological Services Field Office (see **ADDRESSES**), or by visiting our Web site at *http://www.fws.gov/southwest/es/Arizona/*.

The final environmental assessment included a detailed analysis of the potential effects of the critical habitat designations on resource categories, including: Water resources; wetlands and floodplains, natural resources (fish, wildlife and plants), land use and management, Wildland fire management, recreation, socioeconomics, tribal trust resources, and environmental justice. The scope of the effects were primarily limited to those activities involving Federal actions, because critical habitat designation does not have any impact on the environment other than through the section 7 consultation process under the Act which is conducted for Federal actions. Private actions that have no Federal involvement are not affected by critical habitat designation.

Based on the review and evaluation of the information contained in the environmental assessment, we determined that the designations of critical habitat for spikedace and loach minnow do not constitute a major Federal action having a significant impact on the human environment under the meaning of section 102(2)(c) of NEPA.

Pursuant to the Council on Environmental Quality regulations for implementing NEPA, preparation of an environmental impact statement is required if an action is determined to significantly affect the quality of the human environment (40 CFR 1502.3). Significance is determined by analyzing the context and intensity of a proposed action (40 CFR 1508.27). Context refers to the setting of the proposed action and includes consideration of the affected region, affected interests, and locality (40 CFR 1508.27[a]). The context of both short- and long-term effects of critical habitat designations are the critical habitat units in Apache, Cochise, Gila, Graham, Greenlee, Pinal, and Yavapai Counties, Arizona, and Catron, Grant, and Hidalgo Counties, New Mexico, totaling about 1,168 km (726 mi) for spikedace, and (742 mi) for loach minnow. The effects of critical habitat designation at this scale, although long-term, would be small. Intensity refers to the severity of an impact and is evaluated by considering ten factors (40 CFR 1508.27[b]).

The intensity of potential impacts that may result from designations of critical habitat for the spikedace and loach minnow under the proposed action is not anticipated to be significant. This conclusion is reached based on the following findings in the environmental assessment:

(1) The potential impacts on environmental resources may be both beneficial and adverse, but would generally be minor.

(2) There would be negligible to minor impacts on public health or safety from designations of critical habitat.

(3) The increased risks of wildland fire or flooding was analyzed and determined to be minor.

(4) Potential impacts from critical habitat designations on the quality of the environment are unlikely to be highly controversial.

(5) Designation of critical habitat for spikedace and loach minnow is not a precedent-setting action with significant effects.

(6) Designation of critical habitat would not result in significant cumulative impacts.

(7) Designation of critical habitat is not likely to affect sites, objects, or structures of historical, scientific, or cultural significance because Federal and State laws enacted to protect and preserve those resources would address any such potential impacts.

(8) The critical habitat designations would have long-term, beneficial impacts for spikedace and loach minnow.

(9) Critical habitat designations would not violate any Federal, State, or local laws or requirements imposed for the protection of the environment.

The effects of critical habitat designations at this scale would be insignificant. Therefore, we found that the designations will not significantly affect the quality of the human environment and an environmental impact statement is not required.

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), Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), 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 spikedace and loach minnow, tribal lands associated with three tribes occur within the designations. The coordination efforts with the tribes are described below, and additional detail on the exclusions of each are provided above in the Exclusions section.

Yavapai-Apache Nation—We coordinated early with the Yavapai-Apache Nation on the proposed rule for spikedace and loach minnow critical habitat. A coordination meeting was held in October 2010 to gain a better understanding of Tribal positions and concerns regarding the designations. We have maintained contact with the Tribe through letters, phone calls, and emails, and have provided the Tribe with notice of publication dates of various documents. We received comments from the Tribe during the first open comment period. Their comment letter provided a copy of Tribal Resolution 46–2006, which details the development exclusion zone they have created for the 100-year floodplain of the Verde River, where it crosses their lands. In addition, in their comment letter, the Tribe detailed the actions they have taken in the past several years under the resolution for protection of the Verde River, as noted above in the Exclusions section. We have determined that the benefits of excluding lands on the Yavapai-Apache Nation outweigh the benefits of including these areas.

San Carlos Apache Tribe—The San Carlos Apache Tribe submitted comments during the second comment period. Within their comment letter the Tribe notes their adherence to TEK, which is an ecosystem-based approach to land and species management; their 2005 Fishery Management Plan; development of various codes and regulations that benefit the species and/or their habitat; and a commitment to no longer stocking nonnative sportfish in the Eagle Creek watershed.

As noted in the Exclusions section above, we find that the Tribe's lands should be excluded on the basis of our relationship with the Tribe, the goals of the FMP, and the information provided during the second comment period. The Tribe has focused on known areas of concern for the species management, and has discontinued stocking of nonnative fishes in the Bonita and Eagle Creek watersheds. The FMP contains goals of conserving and enhancing native fishes on the Reservation; restoring native fishes and their habitats; and preventing, minimizing or mitigating impacts to native fishes, among others. In addition, the Tribe has indicated that, through TEK, they practice an ecosystem-based approach to land and species based management and preservation.

White Mountain Apache Tribe—We coordinated early with the White Mountain Apache Tribe regarding the critical habitat designations. A coordination meeting was held in October 2010 to gain a better understanding of any concerns White Mountain Apache Tribe might have regarding the upcoming proposed rule for spikedace and loach minnow critical habitat. Representatives of the White Mountain Apache Tribe attended the public hearing in October of 2011. We subsequently received comments from White Mountain Apache Tribe on the proposed rule, including the request for a 4(b)(2) exclusion and a copy of their Loach Minnow Management Plan. Their comment letter and management plan detail various conservation measures that will benefit loach minnow, including adoption of various ordinances, hiring of key personnel, and contingency plans for disaster management.

After reviewing their comment letter and management plan, and in recognition of our special Tribal relationship with White Mountain Apache Tribe, we determined that benefits of exclusion of the mainstem White River and East Fork White River outweighed the benefits of including it in the designations of critical habitat for the species.

References Cited

A complete list of all 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**).

Author(s)

The primary authors of this rulemaking 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.

Regulation Promulgation

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

PART 17—[AMENDED]

■ 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. Amend § 17.11(h) by revising the entries for ''Minnow, loach'' and ''Spikedace'' 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	247	17.95(e)	NA
*	*	*	*	*	*	*	
Spikedace	*Meda fulgida*	U.S.A. (AZ, NM), Mexico.	Entire	E	236	17.95(e)	NA
*	*	*	*	*	*	*	

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

■ 4. In § 17.95, amend paragraph (e) by revising the entries for ''Loach Minnow (Tiaroga cobitis)'' and ''Spikedace (Meda fulgida),'' 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, Pinal, and Yavapai Counties, Arizona, and for Catron, Grant, and Hidalgo Counties, New Mexico, on the maps below.

(2) Within these areas, the primary constituent elements (PCE) of the physical or biological features essential to the conservation of loach minnow consist of six components:

(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 stream 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, caddis flies, 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.

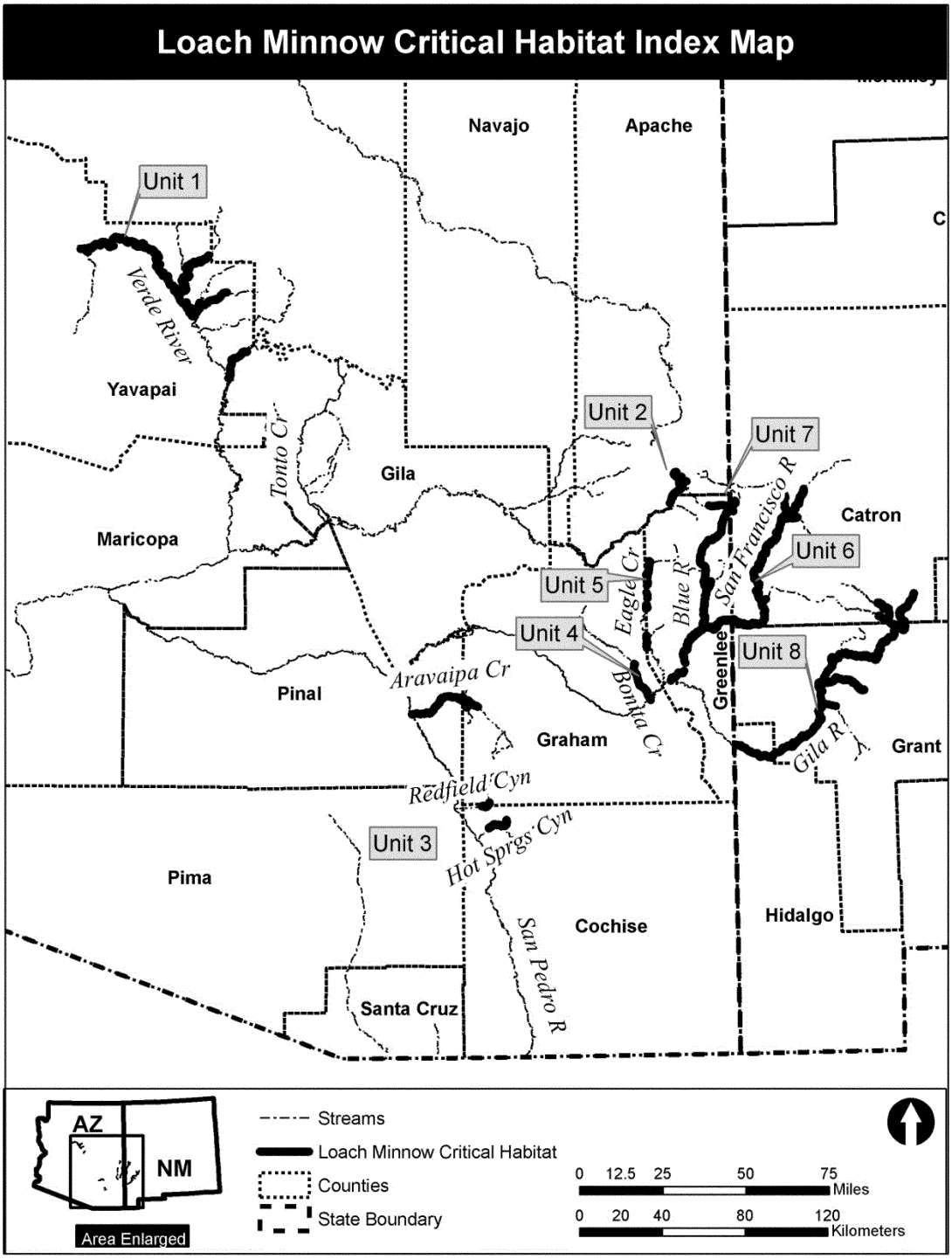
(vi) Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on the effective date of this rule. We have determined that all designated areas contain at least one PCE for loach minnow.

(4) *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.

(5) **Note:** Index map follows:

BILLING CODE 4310–55–P



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

(i) Verde River for approximately 118.5 km (73.6 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. This mileage does not include the 1.2 km (0.8 mi) belonging to the Yavapai-Apache Nation, which is excluded from this designation.

(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.

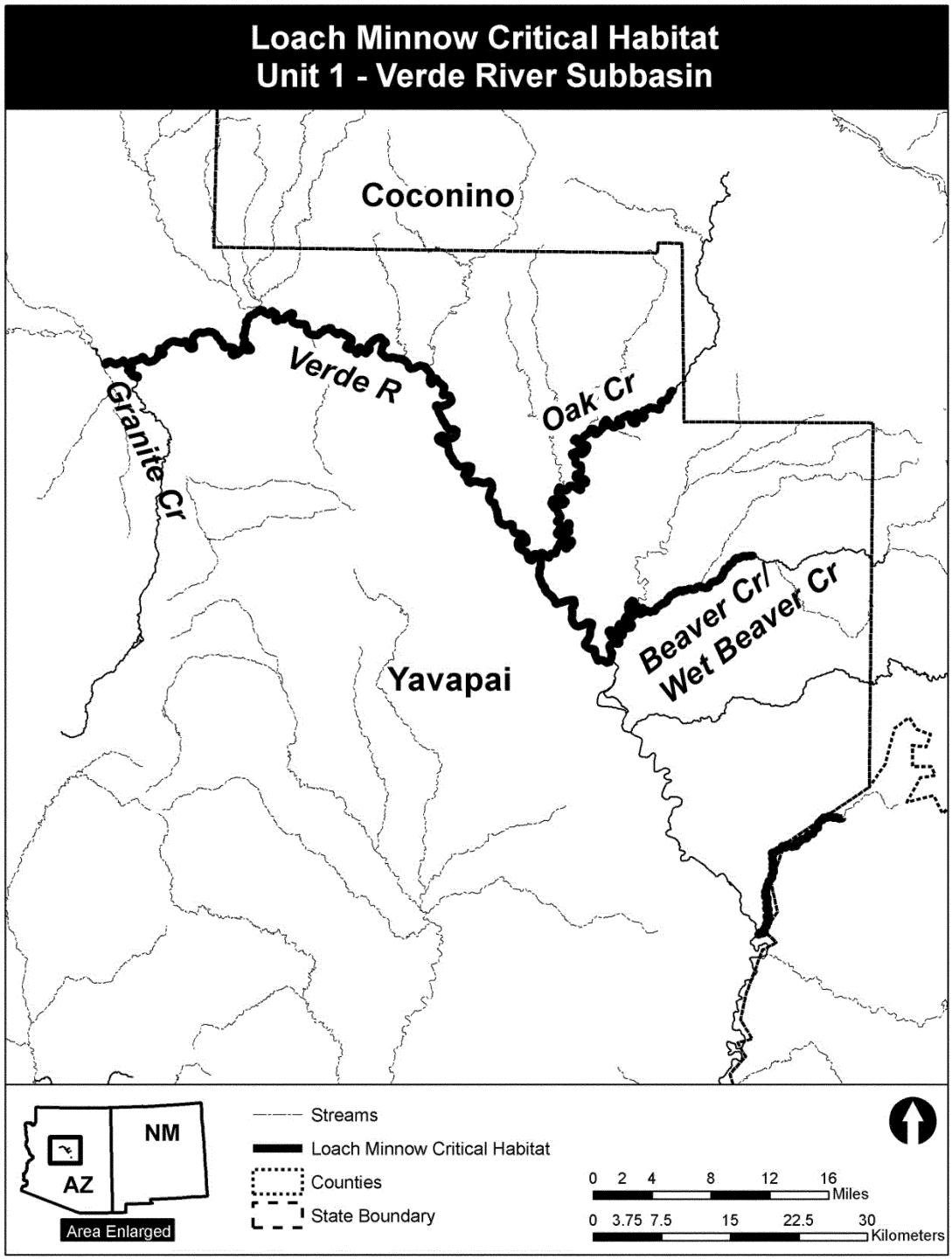
(iii) Oak Creek for approximately 54.3 km (33.7 mi), extending from the confluence with the Verde River in Township 15 North, Range 4 East, southeast quarter of section 20 upstream to the confluence with an unnamed tributary from the south in Township 17 North, Range 5 East, southeast quarter of the northeast quarter of section 24.

(iv) Beaver Creek and Wet Beaver Creek for approximately 33.3 km (20.7 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. This mileage does not include the 0.2 km (0.1 mi) belonging to the Yavapai-Apache Nation, which is excluded from this designation.

(v) Fossil Creek for approximately 22.2 km (13.8 mi) from its confluence with the Verde River at Township 11 North, Range 6 East, northeast quarter of section 25 upstream to the old Fossil Diversion Dam site at Township 12 North, Range 7 East, southeast quarter of section 14.

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



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

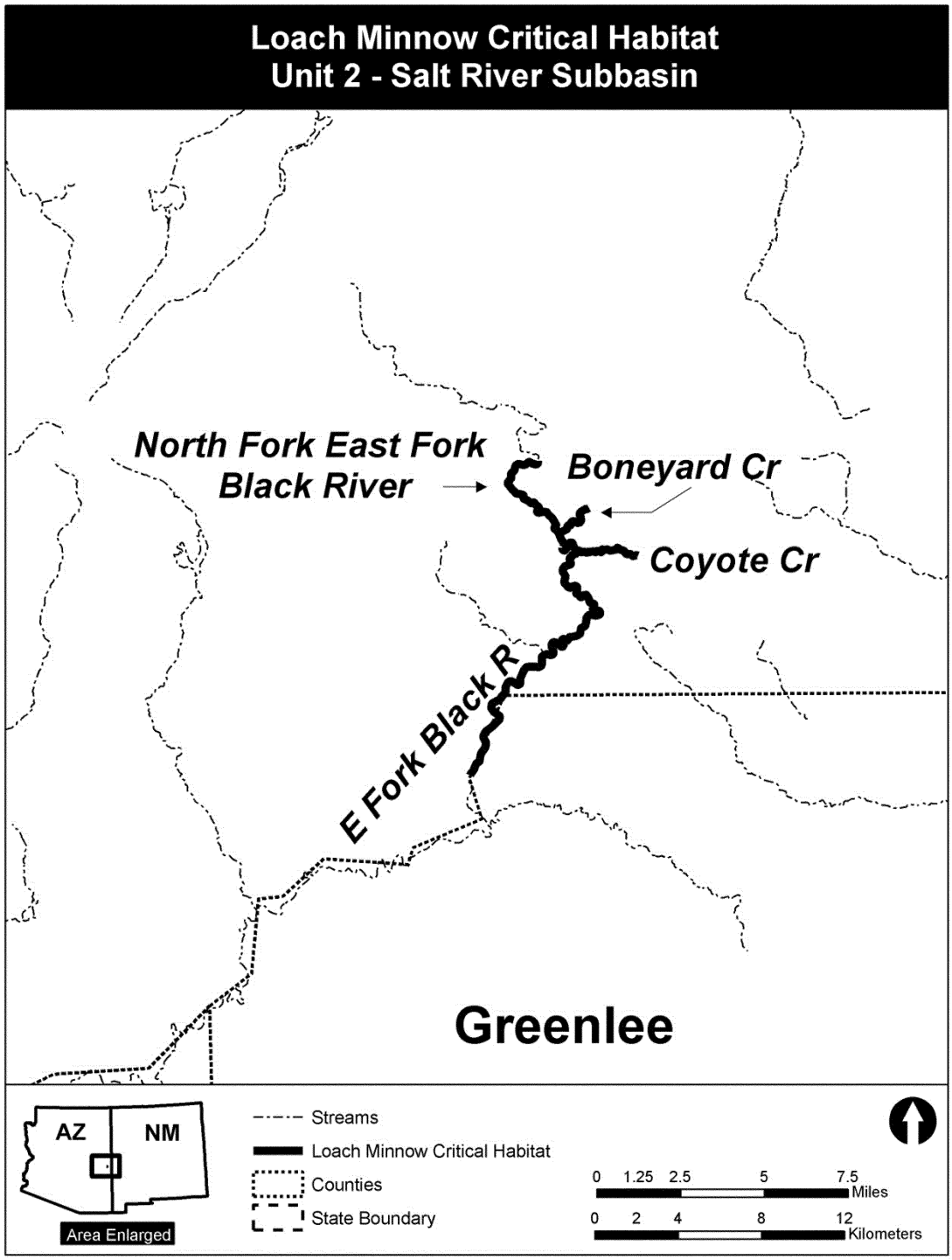
(i) East Fork Black River for approximately 19.1 km (11.9 mi) from the confluence with the West Fork Black River at Township 4 North, Range 28 East, southeast quarter of section 11 upstream to the confluence with an unnamed tributary approximately 0.82 km (0.51 mi) downstream of the Boneyard Creek confluence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

(ii) 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.

(iii) 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.

(iv) 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.

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



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

(i) 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.

(ii) 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.

(iii) 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.

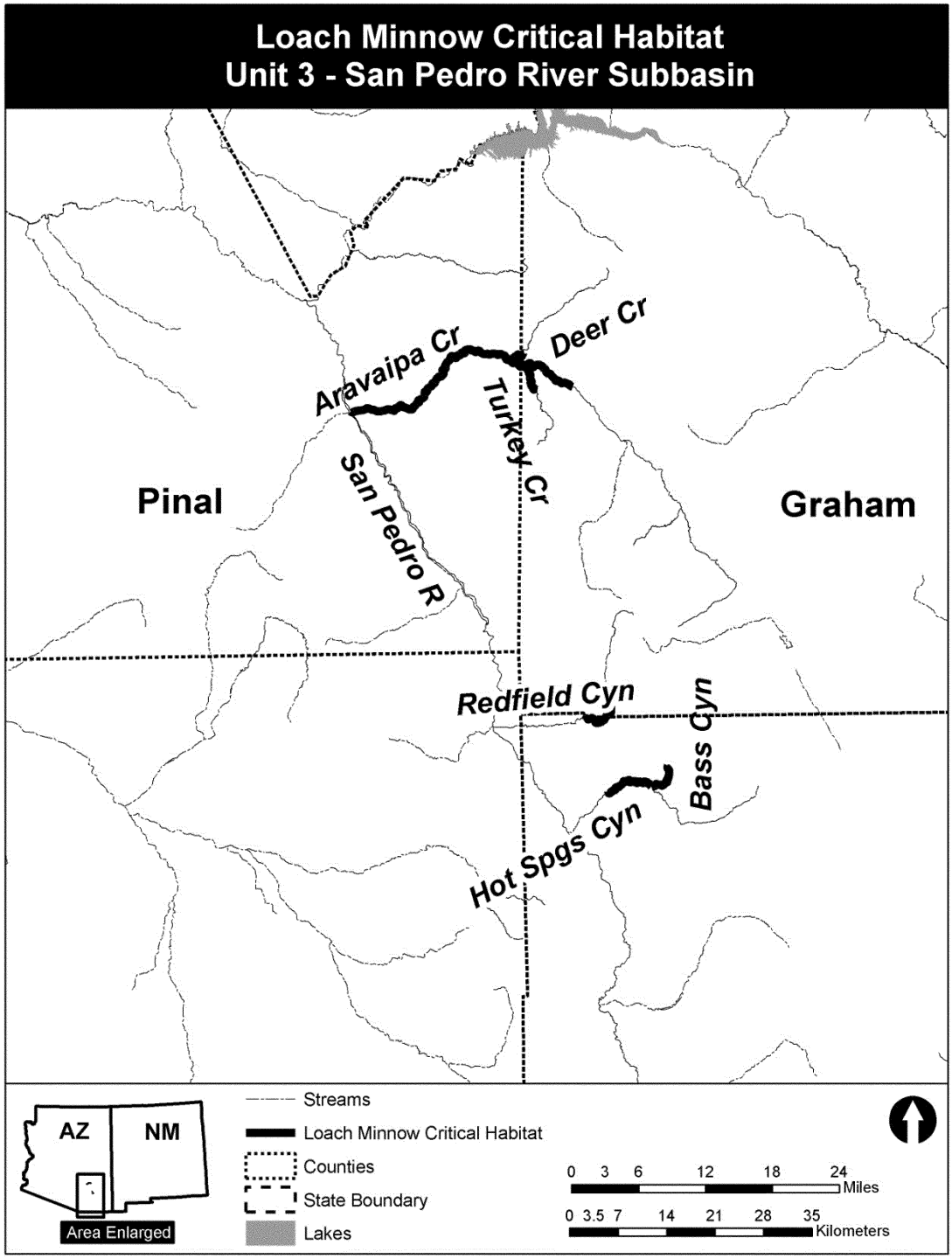
(iv) Hot Springs Canyon for approximately 9.3 km (5.8 mi) extending from the confluence with Bass Canyon in Township 12 South, Range 20 East, northeast quarter of section 36 downstream to Township 12

South, Range 20 East, southeast quarter of section 32.

(v) Redfield Canyon for approximately 6.5 km (4.0 mi) extending from Township 11 South, Range 19 East, northeast quarter of section 36 upstream to the confluence with Sycamore Canyon in Township 11 South, Range 20 East, northwest quarter of section 28.

(vi) 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.

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

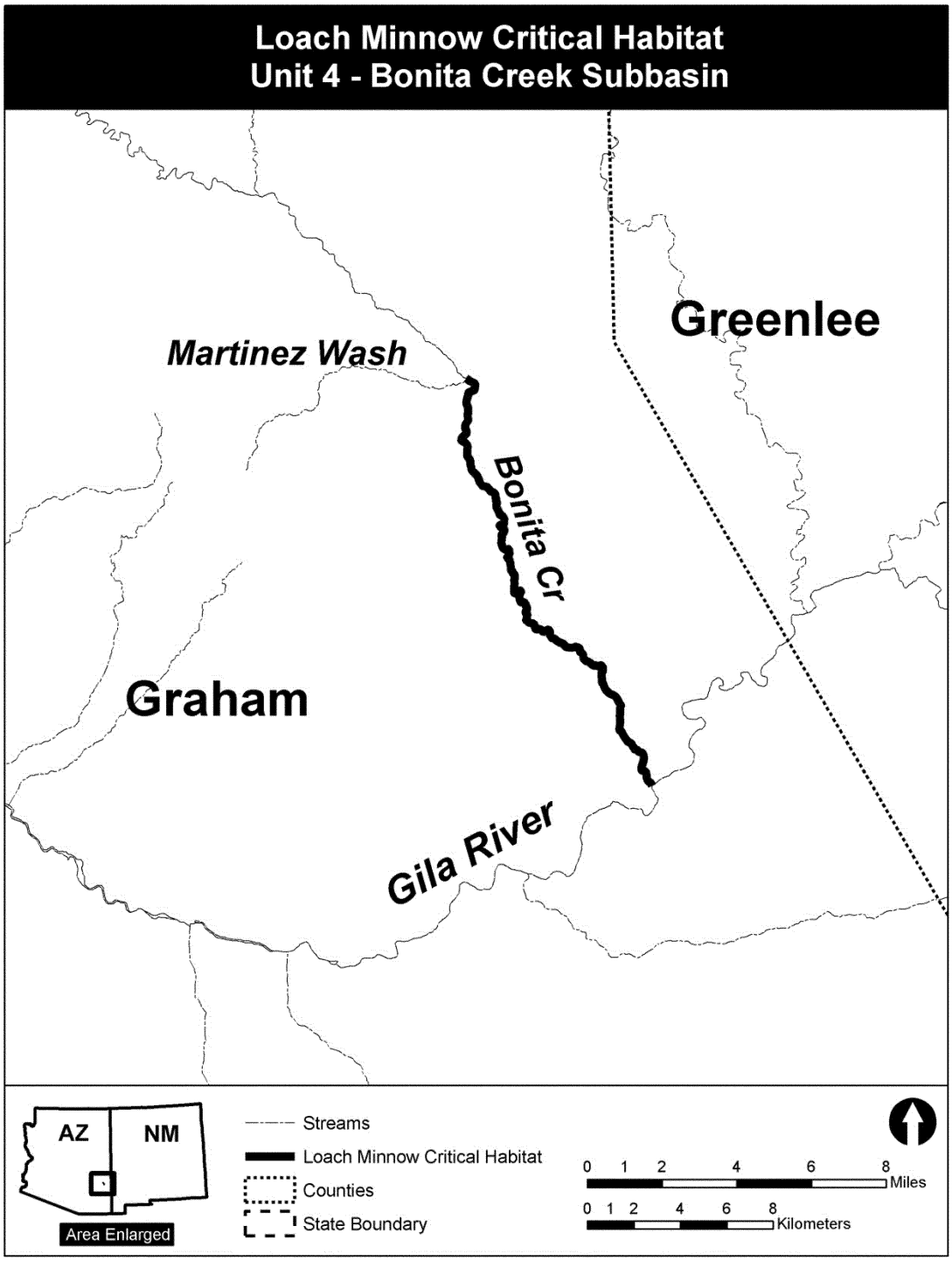


(9) Unit 4: Bonita Creek Subbasin, Graham County, Arizona.

(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 follows.

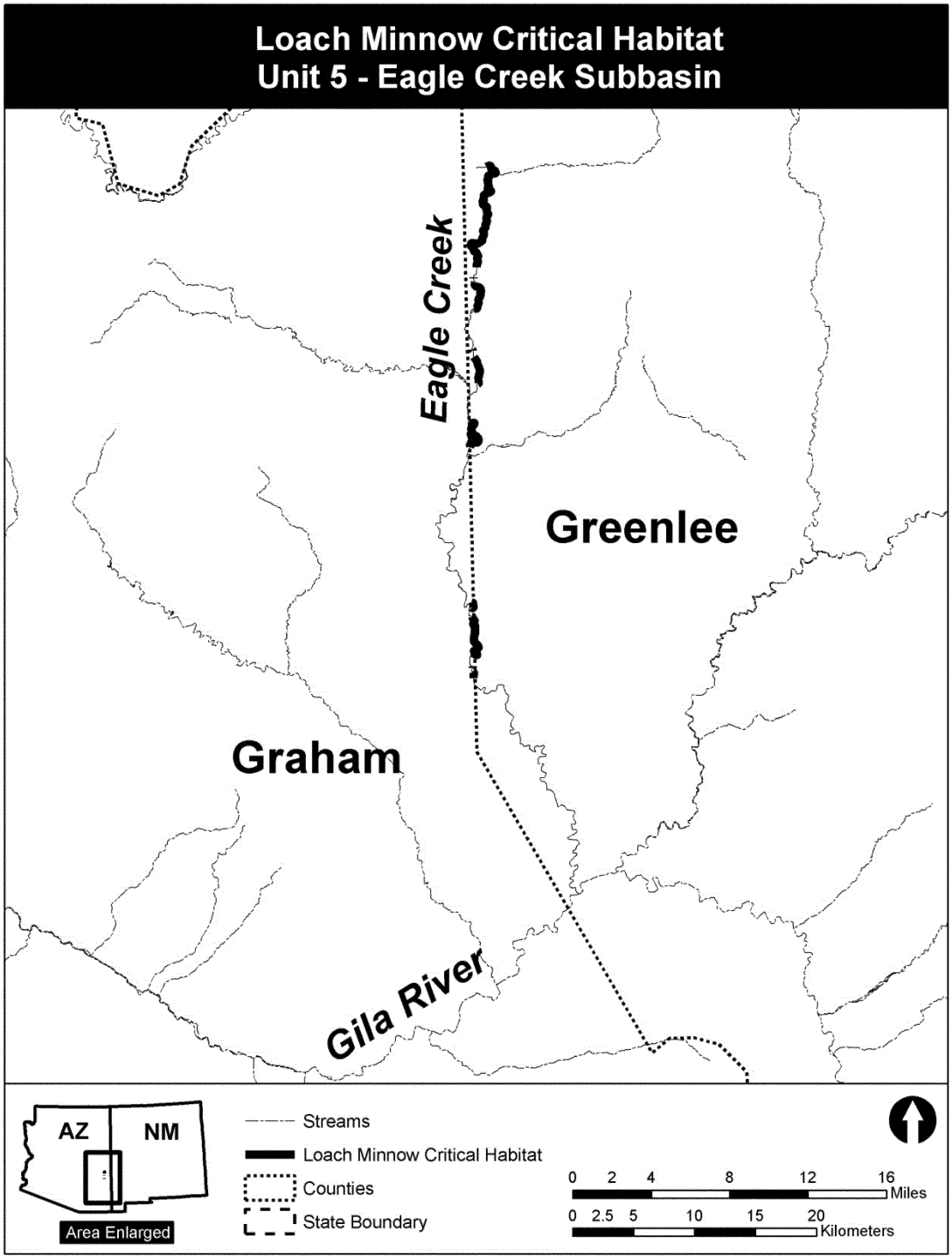


(10) Unit 5: Eagle Creek Subbasin, Graham and Greenlee Counties, Arizona.

(i) Eagle Creek for approximately 26.5 km (16.5 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.

This mileage does not include approximately 21.4 km (13.3 mi) of Eagle Creek on lands belonging to Freeport-McMoRan, which is excluded from this designation.

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



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

(i) San Francisco River for approximately 189.5 km (117.7 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 northern boundary of Township 6 South, Range 19 West, section 2. This mileage includes approximately 14.1 km (8.8 mi) of the San Francisco River on lands belonging to Freeport-McMoRan, which is excluded from this designation.

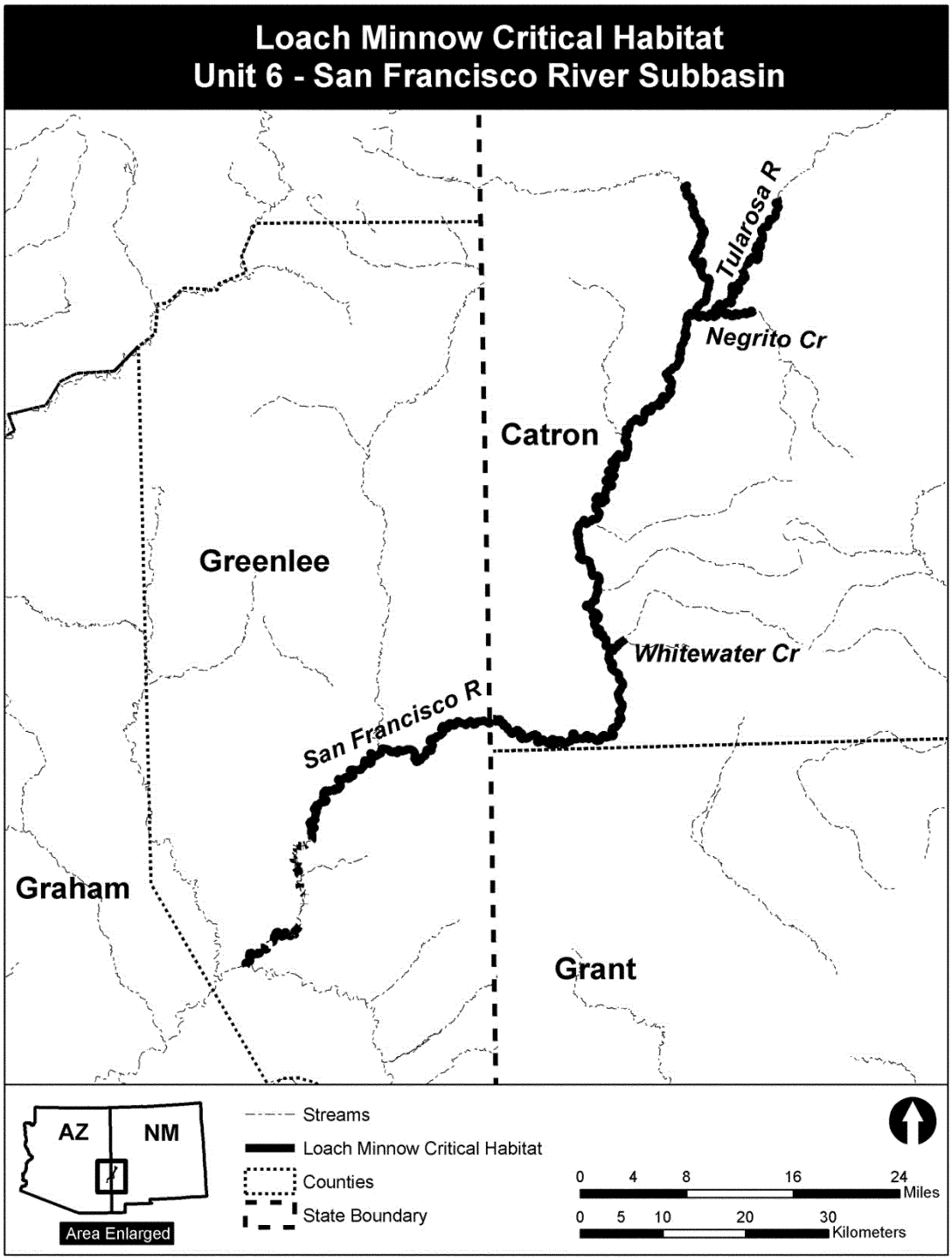
(ii) Tularosa River for approximately 30.0 km (18.6 mi) from the confluence with the San Francisco River at Township 7 South, Range 19 West, southwest quarter of section 23 upstream to the town of Cruzville at Township 6 South, Range 18 West, southern boundary of section 1.

(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 River Subbasin follows.



(12) 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.

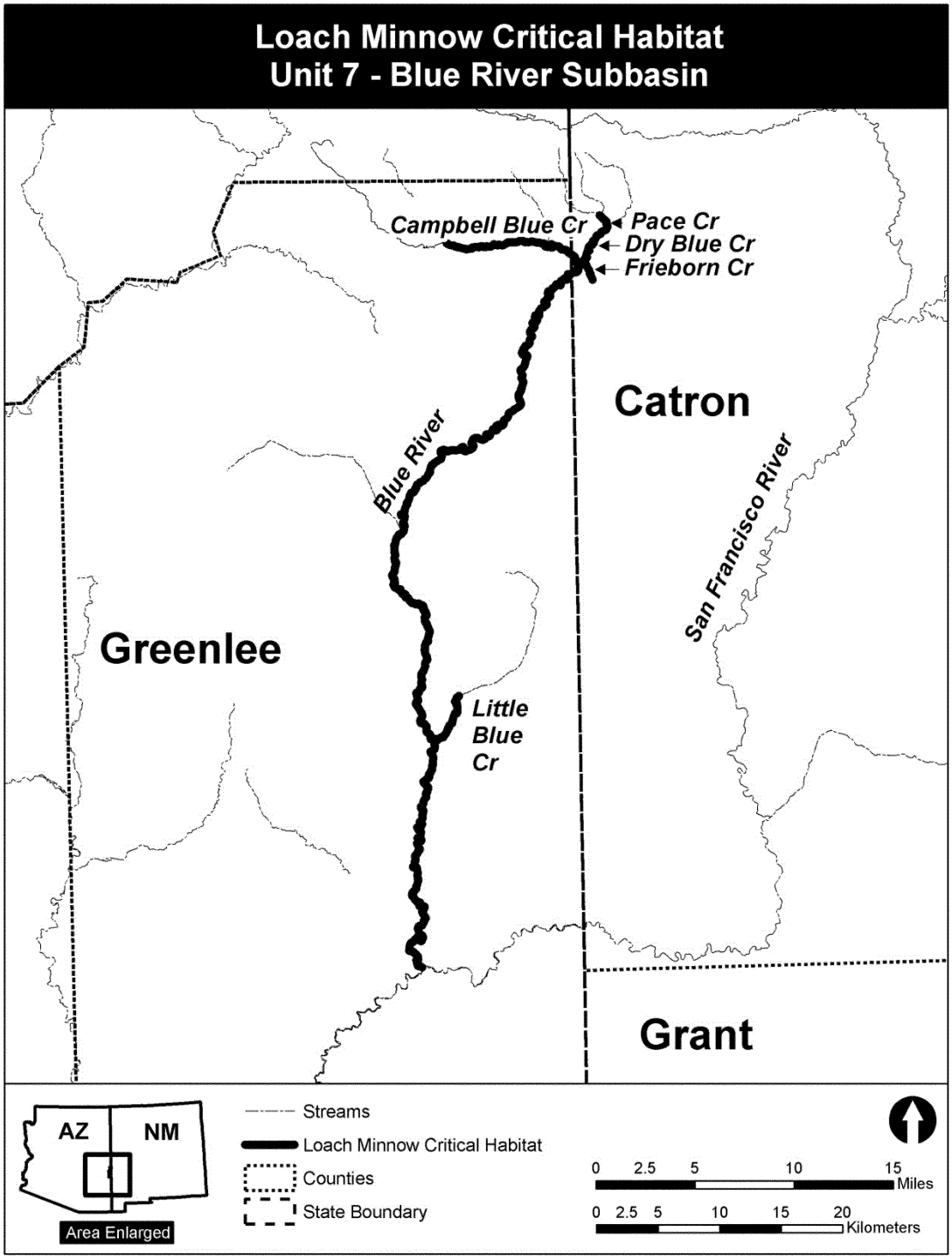
(iii) Little Blue Creek for approximately 5.1 km (3.1 mi) from the confluence with the Blue River at Township 1 South, Range 31 East, center of section 5 upstream to the mouth of a canyon at Township 1 North, Range 31 East, northeast quarter of section 29.

(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 follows.



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

(i) Gila River for approximately 153.5 km (95.4 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. This mileage does not include approximately 11.5 km (7.2 mi) of the Gila River on lands owned by Freeport-McMoRan, which is excluded from this designation.

(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.

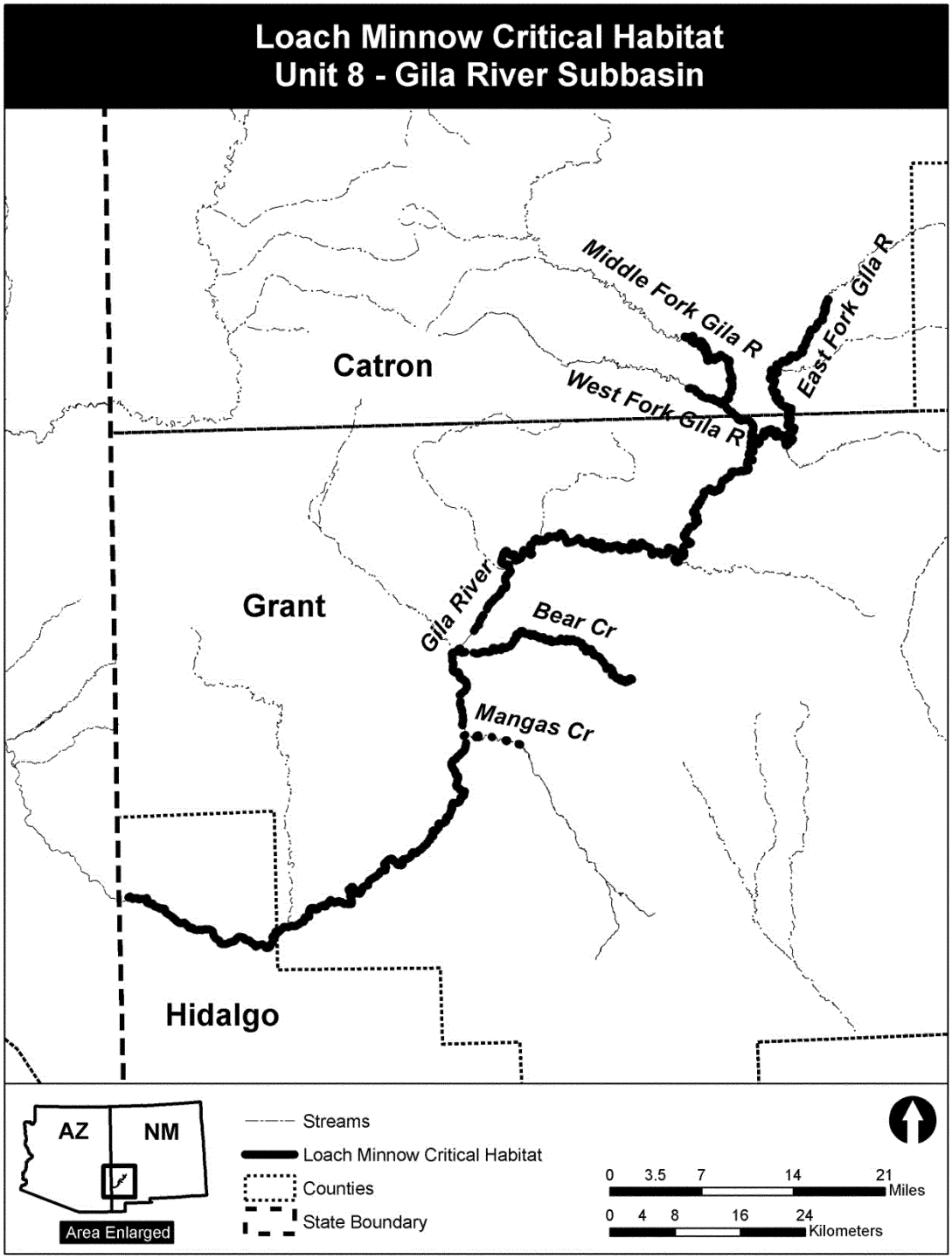
(iii) Middle Fork Gila River for approximately 19.1 km (11.9 mi) of the Middle Fork Gila River extending from the confluence with West Fork Gila River at Township 12 South, Range 14 West, southwest quarter of section 25 upstream to the confluence of Brothers West Canyon in Township 11 South, Range 14 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 1.2 km (0.8 mi) extending from Township 17 South, Range 17 West, at the eastern boundary of section 3 upstream to the confluence with Blacksmith Canyon at Township 17 South, Range 17 West, northwest quarter of section 3. This mileage does not include approximately 7.9 km (4.9 mi) of Mangas Creek on lands belonging to Freeport-McMoRan, which are excluded from the designation.

(vi) Bear Creek for approximately 29.5 km (18.4 mi) extending from Township 15 South, Range 17 West, eastern boundary of section 33 upstream to the confluence with Sycamore and North Fork Walnut Creek at Township 16 South, Range 15 West, eastern boundary of section 15. This designation does not include approximately 1.9 km (1.2 mi) of Bear Creek on lands belonging to Freeport-McMoRan, which are excluded from this designation.

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


Loach Minnow Critical Habitat
Unit 8 - Gila River Subbasin
Middle Fork Gila R
East Fork Gila R
Catron
West Fork Gila R
Gila River
Grant
Bear Cr
Mangas Cr
Hidalgo
AZ
NM
Area Enlarged
Streams
Loach Minnow Critical Habitat
Counties
State Boundary
0 3.5 7 14 21
Miles
0 4 8 16 24
Kilometers

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) Within these areas, the primary constituent elements (PCE) of the physical or biological features essential to the conservation of spikedace consist of six components:

(i) 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).

(ii) An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddis flies, 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.

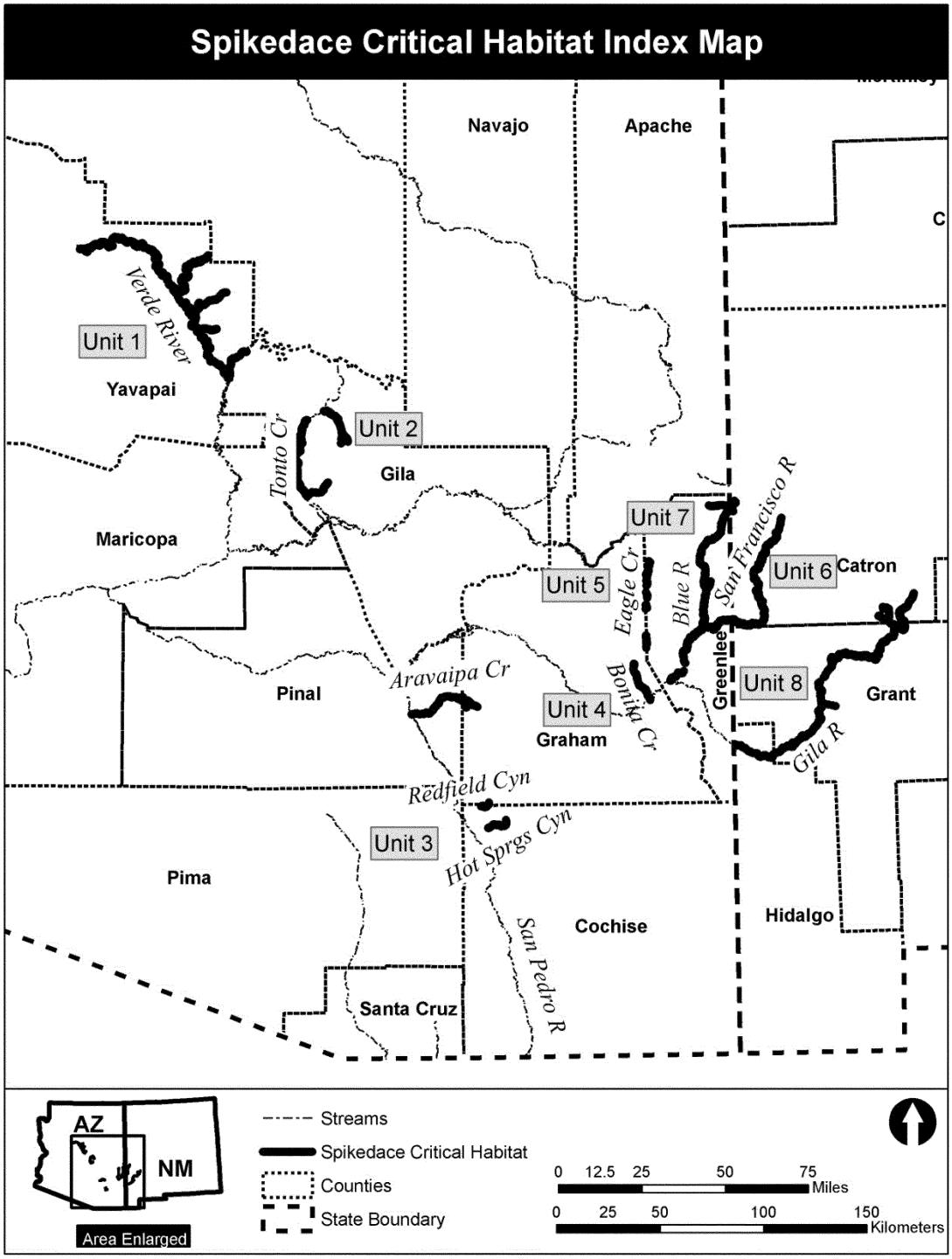
(v) No nonnative aquatic species, or levels of nonnative aquatic species that are sufficiently low as to allow persistence of spikedace.

(vi) Streams with a natural, unregulated flow regime that 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) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on the effective date of this rule. We have determined that all designated areas contain at least one PCE for spikedace.

(4) *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.

(5) **Note:** Index map follows:



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

(i) Verde River for approximately 170.6 km (105.9 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. This mileage does not include the 1.2 km (0.8 mi) belonging to the Yavapai-Apache Nation, which is excluded from this designation. 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.

(ii) 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.

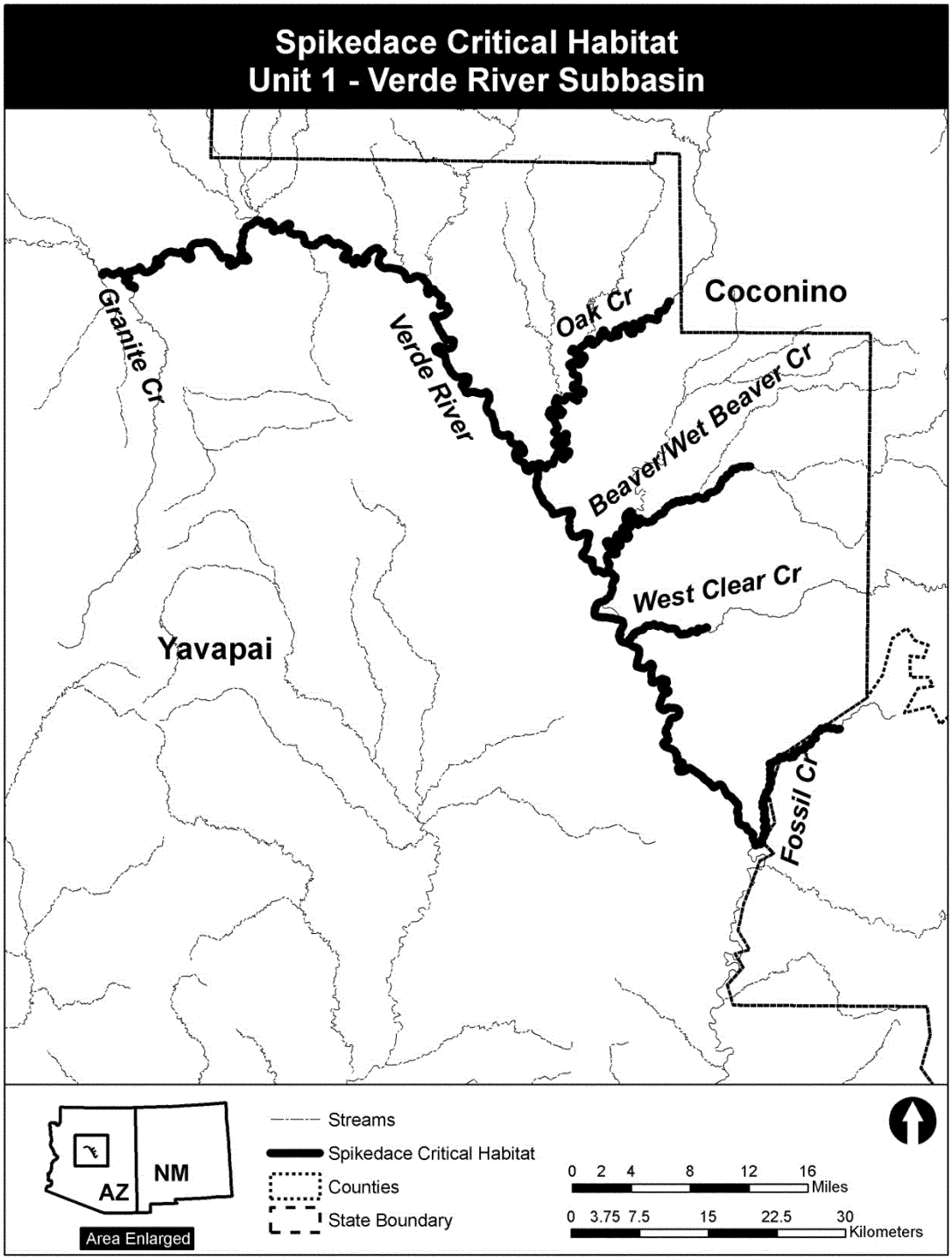
(iii) Beaver Creek/Wet Beaver Creek for approximately 33.3 km (20.7 mi), extending from the confluence with the Verde River in Township 14 North, Range 5 East, southeast quarter of section 30 upstream to the confluence with Casner Canyon in Township 15

North, Range 6 East, northwest quarter of section 23. This mileage does not include the 0.2 km (0.1 mi) belonging to the Yavapai-Apache Nation and excluded from these designations.

(iv) 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.

(v) Fossil Creek for approximately 22.2 km (13.8 mi) from its confluence with the Verde River at Township 11 North, Range 6 East, northeast quarter of section 25 upstream to the old Fossil Diversion Dam site at Township 12 North, Range 7 East, southeast quarter of section 14.

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



(7) 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.

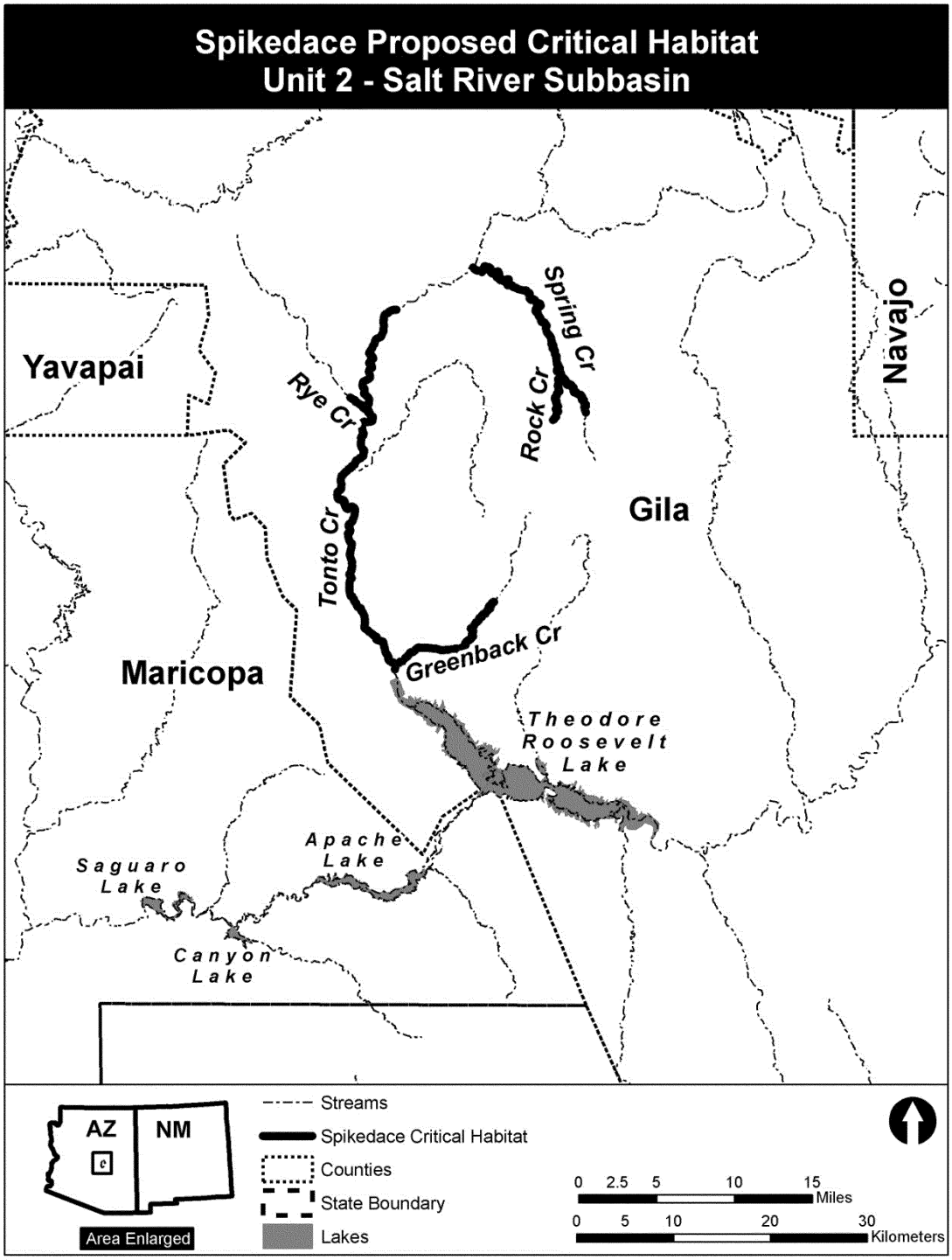
(ii) Greenback Creek for approximately 15.1 km (9.4 mi) from the confluence with Tonto Creek in Township 5 North, Range 11 East, northwest quarter of section 8 upstream to Lime Springs in Township 6 North, Range 12 East, southwest quarter of section 20.

(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 follows.



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

(i) 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. 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.

(ii) 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.

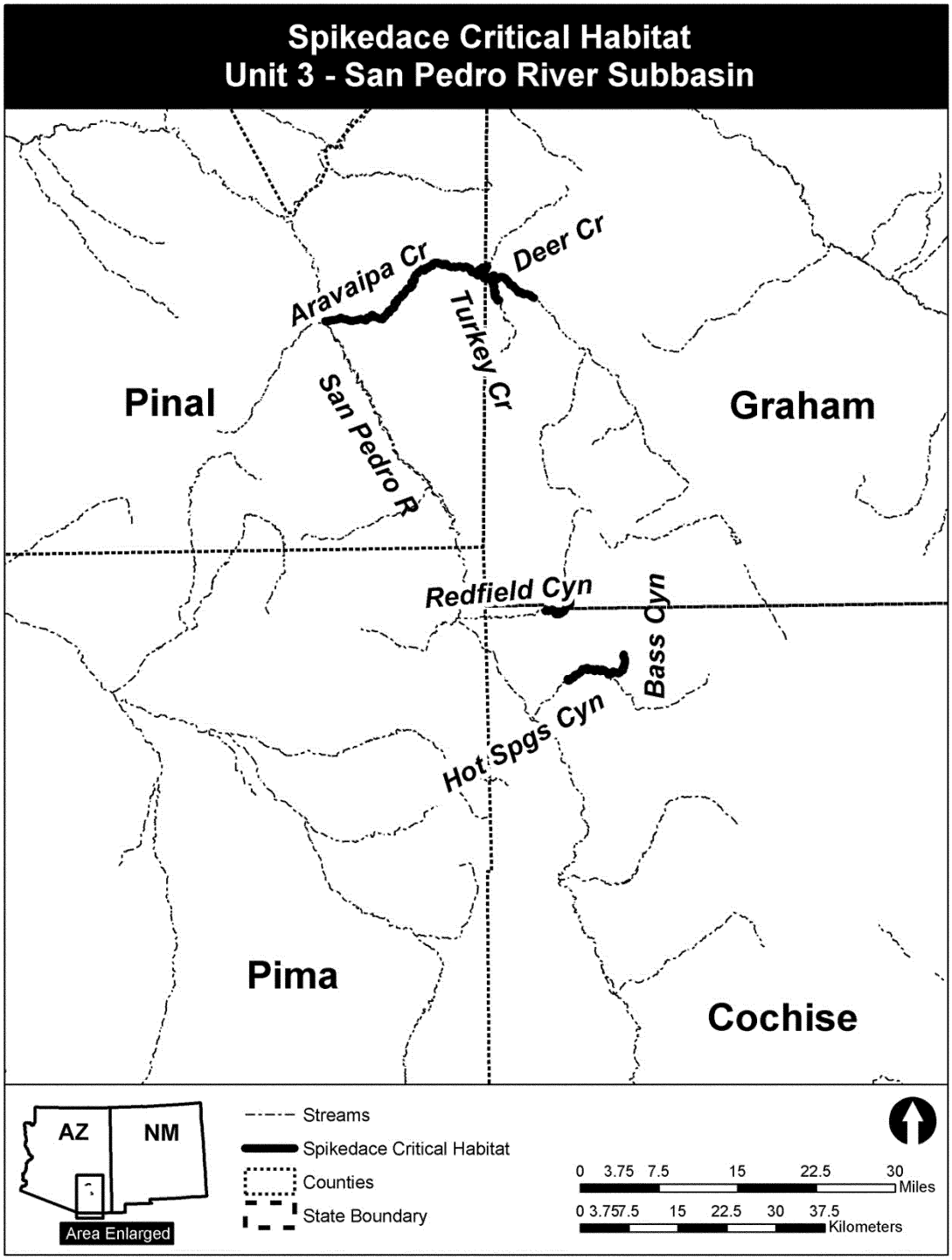
(iii) Hot Springs Canyon for approximately 9.3 km (5.8 mi) extending from the confluence with Bass Canyon in Township 12 South, Range 20 East, northeast quarter of section 36 downstream to Township 12 South, Range 20 East, southeast quarter of section 32.

(iv) Redfield Canyon for approximately 6.5 km (4.0 mi)

extending from Township 11 South, Range 19 East, northeast quarter of section 36 upstream to the confluence with Sycamore Canyon in Township 11 South, Range 20 East, northwest quarter of section 28.

(v) 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.

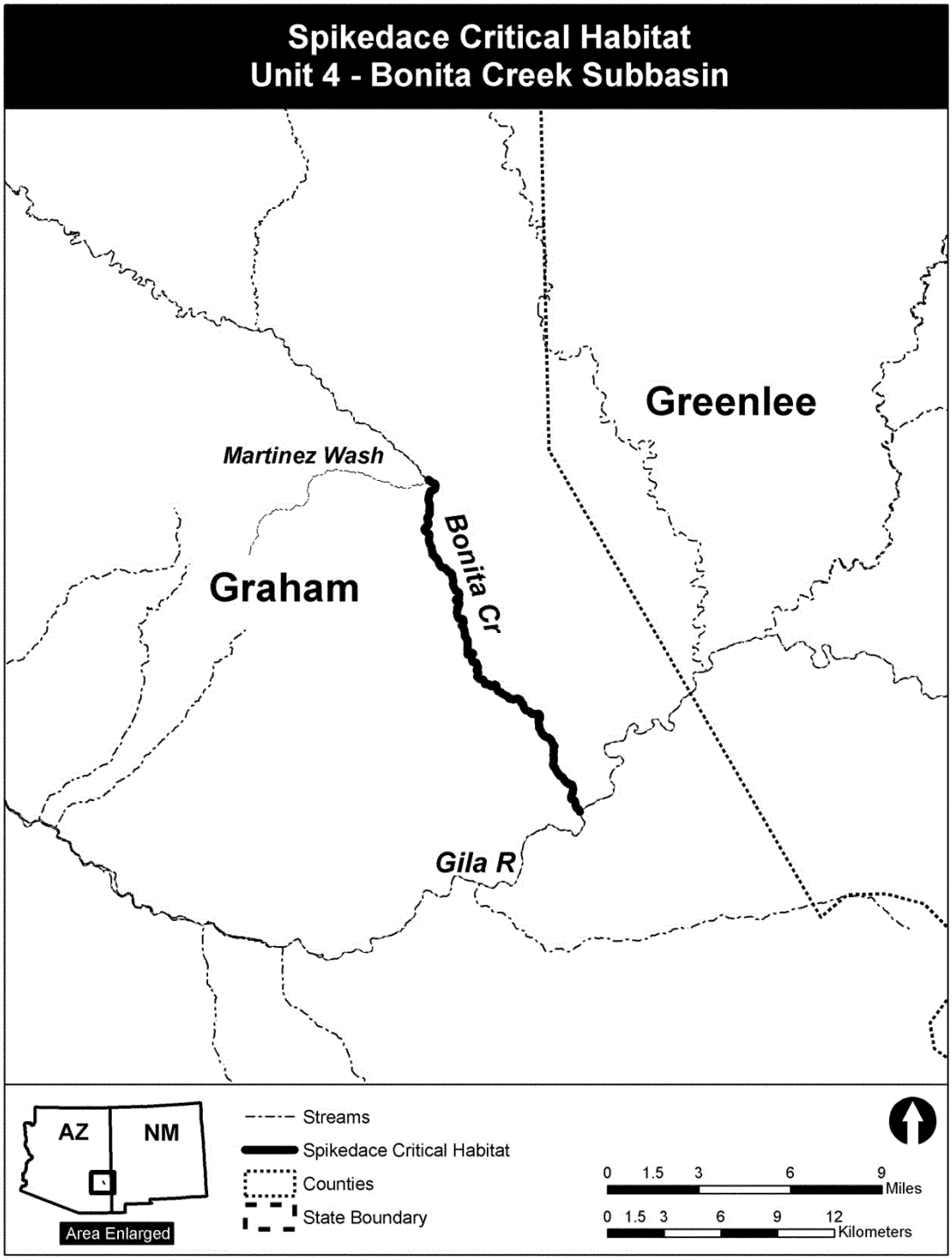
(vi) **Note:** Map of Unit 3, San Pedro River Subbasin follows.



(9) 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.

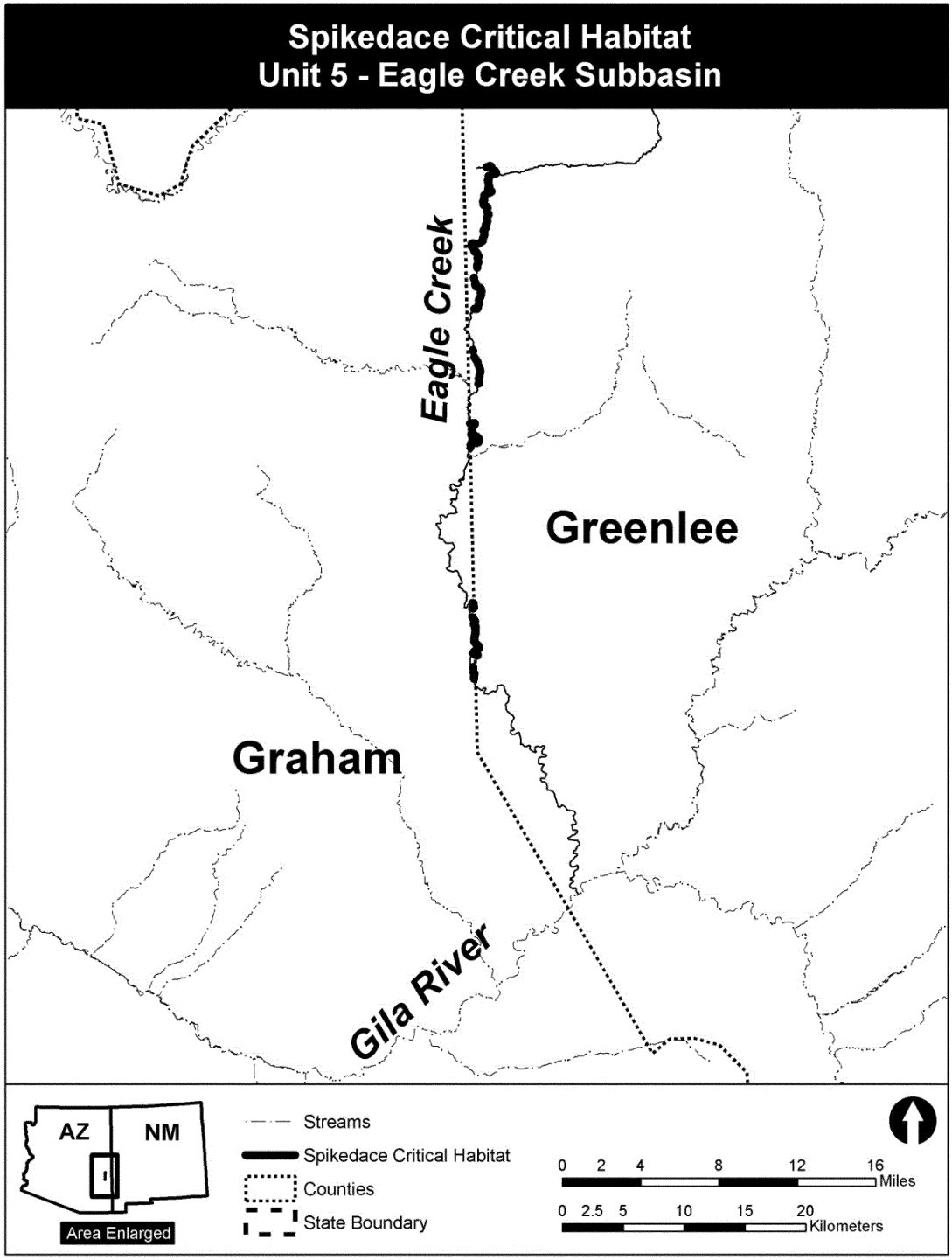
(ii) **Note:** Map of Unit 4, Bonita Creek Subbasin follows.



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

(i) Eagle Creek for approximately 26.5 km (16.5 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. This mileage does not include approximately 21.4 km (13.3 mi) of Eagle Creek on lands belonging to Freeport-McMoRan, which is excluded from this designation.

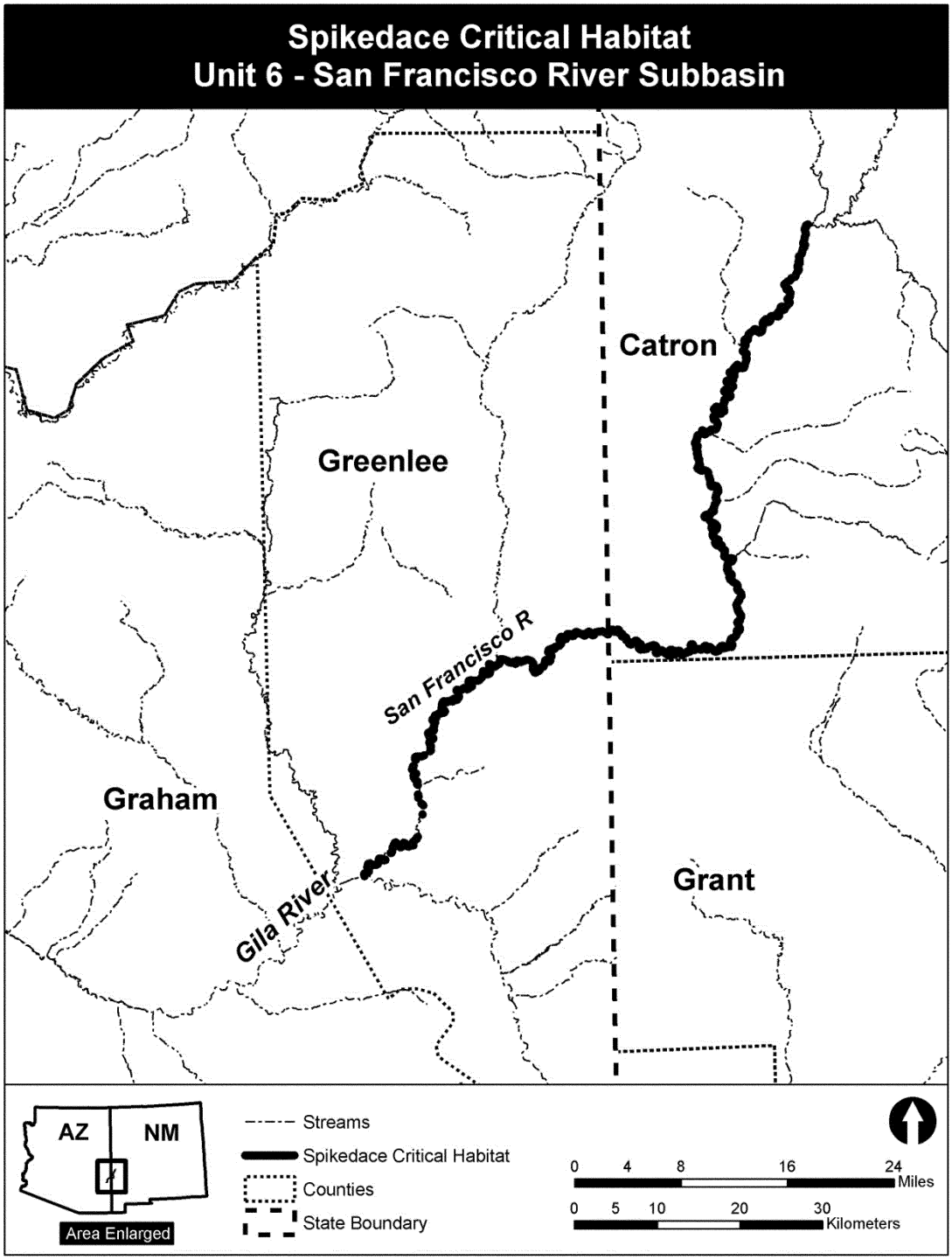
(ii) **Note:** Map of Unit 5, Eagle Creek Subbasin follows.



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

(i) San Francisco River for approximately 166.7 km (103.5 mi) of the San Francisco River extending from the confluence with the Gila River in Arizona in Township 5 South, Range 29 East, southeast quarter of section 21 upstream to Township 6 South, Range 19 West, section 2 in New Mexico. This mileage does include approximately 14.1 km (8.8 mi) of the San Francisco River on lands belonging to Freeport-McMoRan, which is excluded from this designation.

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



(12) 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.

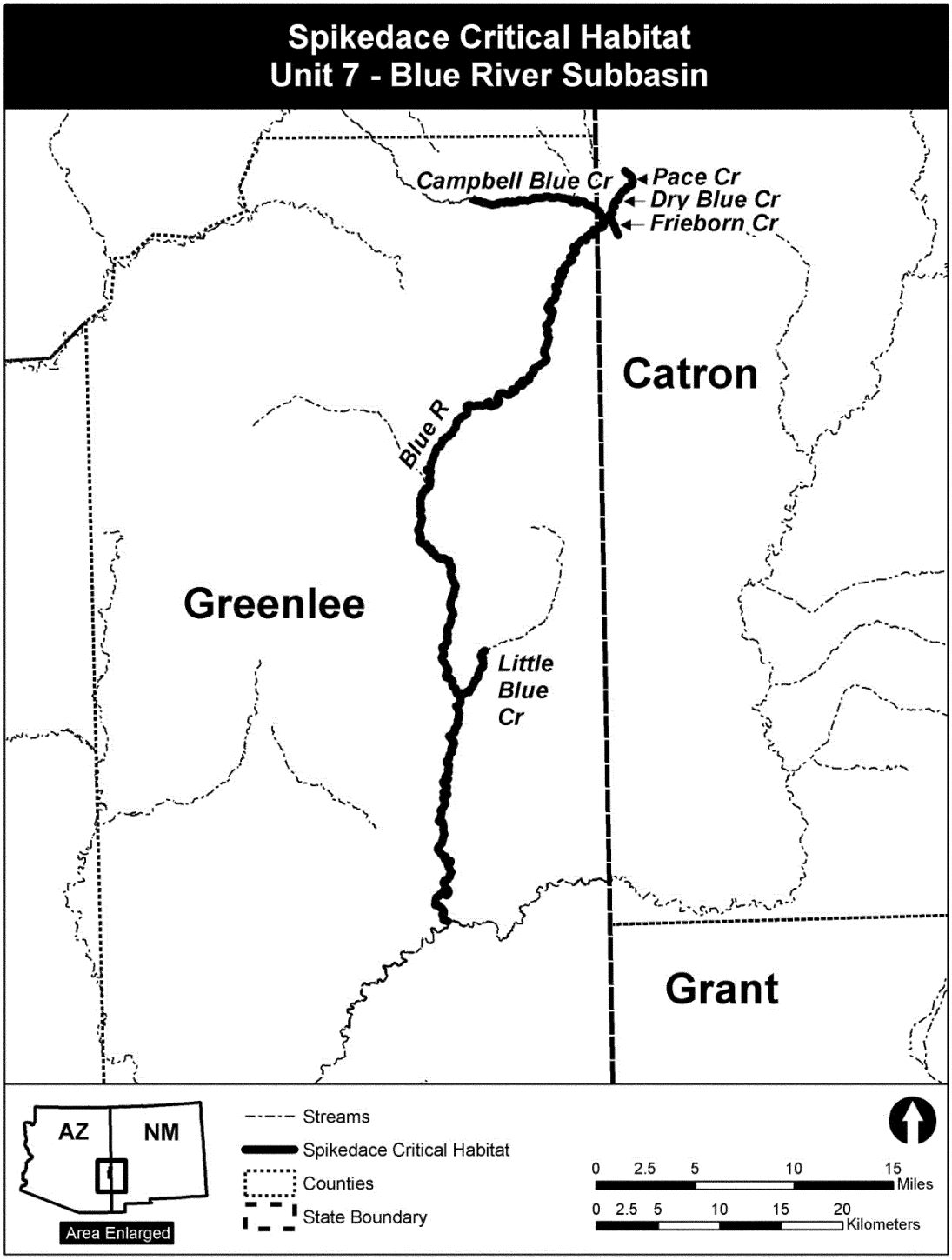
(iii) Little Blue Creek for approximately 5.1 km (3.1 mi) from the confluence with the Blue River at Township 1 South, Range 31 East, center Section 5 upstream to the mouth of a canyon at Township 1 North, Range 31 East, northeast quarter of section 29.

(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 follows.



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

(i) Gila River for approximately 153.5 km (95.4 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. This mileage does not include approximately 11.5 km (7.2 mi) of the Gila River on lands owned by Freeport-McMoRan, which is excluded from this designation.

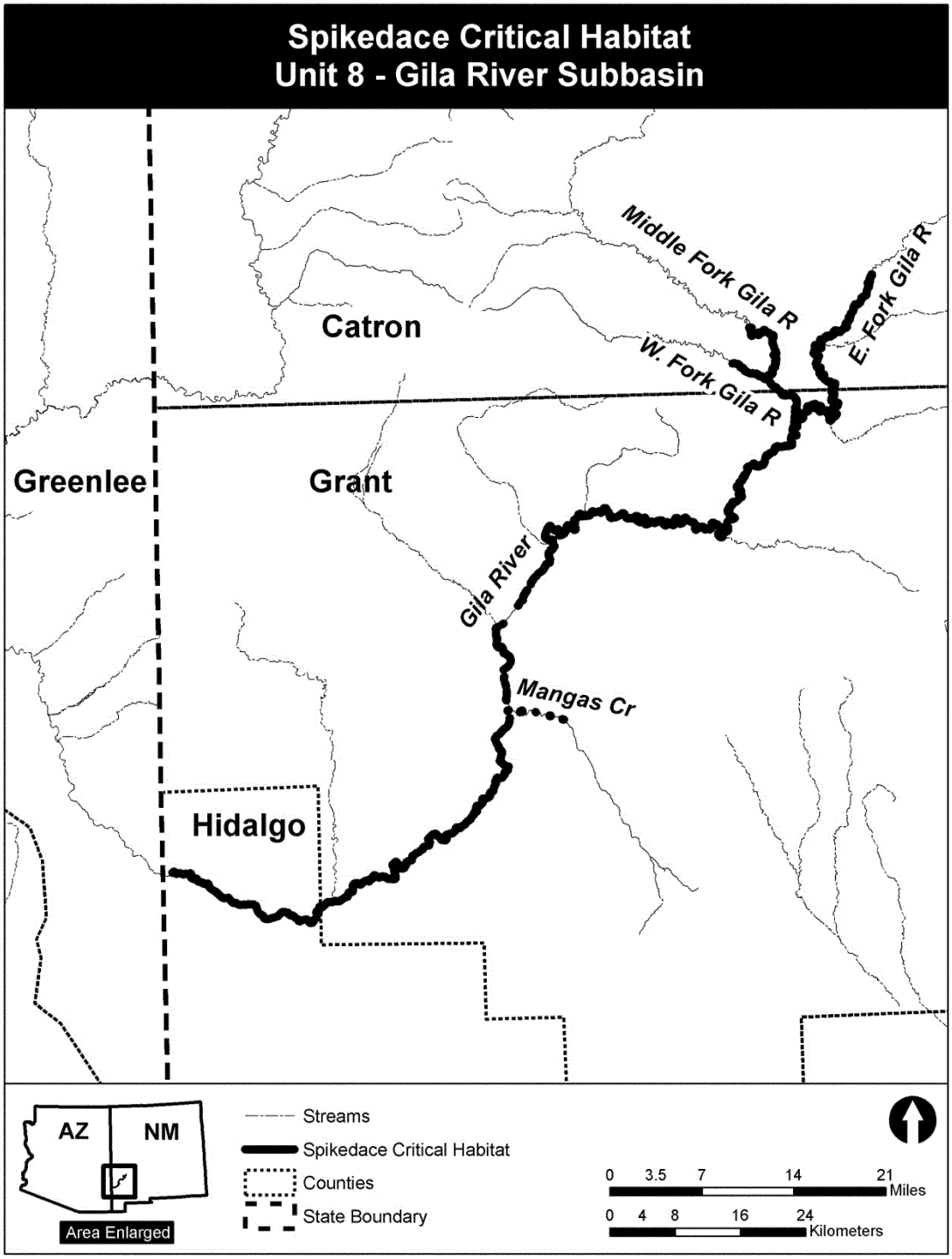
(ii) West Fork Gila River for approximately 13.0 km (8.1 mi) from the confluence with the East Fork Gila River at Township 13 South, Range 13 West, center of section 8 upstream to the confluence with EE Canyon at Township 12 South, Range 14 West, east boundary of Section 21.

(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 1.2 km (0.8 mi) extending from Township 17 South, Range 17 West, at the eastern boundary of section 3 upstream to the confluence with Blacksmith Canyon at Township 17 South, Range 17 West, northwest quarter of section 3. This mileage does not include approximately 7.9 km (4.9 mi) of Mangas Creek on lands belonging to Freeport-McMoRan, which are excluded from the designation.

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



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Dated: February 7, 2012.

Rachel Jacobson,

Acting Assistant Secretary for Fish and Wildlife and Parks.

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BILLING CODE 4310–55–C