United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
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July 20,2004

SUMMARY

FINAL BIOLOGICAL OPINION ON THE EFFECTS TO GILA TROUT AND CHIRICAHUA LEOPARD FROG FROM THE MEOWN WILDFIRE SUPPRESSION ACTIVITIES, WILDERNESS RANGER DISTRICT, GRANT COUNTY, NEW MEXICO

Cons. #2-22-04-F-0090

Date of the final opinion: June 2004

Action agency: Wilderness Ranger District, Gila National Forest

Project: This formal emergency consultation addresses the suppression of the Meown Wildfire on the Wilderness Ranger District, Gila National Forest.

Species affected: Gila trout (*Oncorhynchus gilae*) and Chiricahua leopard frog (*Rana chiricahuensis*)

Emergency Biological Opinion: The emergency action of suppressing the Meown Wildfire did not jeopardize the Gila trout or the Chiricahua leopard frog.

Incidental take statement: One Gila trout and an unknown number of Chiricahua leopard frogs were taken in the form of kill or harassment as a result of this emergency action.

Conservation Recommendations: Implementation of the conservation recommendation is discretionary. One conservation recommendation is provided.

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Cons. #2-22-04-F-0090

Marcia R. Andre, Forest Supervisor
Gila National Forest
3005 E. Camino del Bosque
Silver City, New Mexico 88061-7863

Dear Ms. Andre:

This responds to your January 27, 2004, Biological Assessment (BA) evaluating the effects of the Meown Wildfire suppression actions on Gila trout (*Oncorhyncus gilae*) and Chiricahua leopard frog (*Rana chiricahuensis*). You determined that the suppression actions "may affect, likely to adversely affect" both species. This document represents our Biological Opinion for the Gila trout and Chiricahua leopard frog in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act).

CONSULTATION HISTORY

Informal emergency consultation was initiated on July 31, 2003, when the Forest Service notified us of the Meown wildfire and requested emergency consultation. Formal consultation was initiated on November 12, 2003. This biological opinion is based on information provided in the BA; email and telephone conversations between our staffs; data in our files; data presented in the Recovery Plan for the Gila trout; the final rule listing the Chiricahua leopard frog, the draft Chiricahua leopard recovery plan, peer-reviewed literature, and agency reports. A complete administrative record of this consultation is on file at this office. We received all the information necessary to complete formal consultation on June 25, 2004, when you submitted a revised BA.

DESCRIPTION OF THE EMERGENCY ACTION

The Meown wildfire was discovered on July 7, 2003, near the confluence of Black and Aspen Canyons within the Aldo Leopold Wilderness, Gila National Forest. The fire was ignited by a lightening strike most likely on the afternoon of July 6. Fire-fighting actions were initiated mid-day on July 7. Initial actions included the use of fire retardant drops to slow the fire until personnel could reach the area and begin ground activities. When ground personnel reached the fire, retardant drops were stopped and hand-digging of the fire line was begun. Fire line was constructed parallel to Black and Aspen canyons to reinforce the retardant line. Approximately

400 meters of hand line was constructed, about 2 to 3 meters (m) (6.5 to 10 feet) away from the creeks. The fire was controlled on July 9 at approximately 26 acres. Upon arriving at the fire, ground personnel discovered that retardant had been dropped into Black Canyon, which is occupied by Gila trout and the Chiricahua leopard frog. No rehabilitation work was done in the watershed or to the fire lines.

STATUS OF THE SPECIES (range-wide)

Gila trout

The Gila trout was originally recognized as endangered under the Federal Endangered Species Preservation Act of 1966 (32 FR 4001) and Federal designation of the species as endangered continued under the Act (1973). In 1987, the Service proposed to reclassify the Gila trout as threatened (52 FR 37424); however, we withdrew our proposal for reclassification in 1991, after a series of wildfires impacted relict populations. A second petition was submitted on November 11, 1996, by Mr. Gerald Burton to downlist the species from endangered to threatened. We acknowledged receipt of the letter on January 13, 1997, but no further action was taken.

Species description

The Gila trout is a member of the salmon and trout family (Salmonidae). Gila trout was not formally described until 1950, using fish collected in Main Diamond Creek in 1939 (Miller 1950). It is most closely related to Apache trout (*Oncorhynchus apache*), which is endemic to the upper Salt and Little Colorado River drainages in east-central Arizona. Gila trout and Apache trout are more closely related to rainbow trout (*O. mykiss*) than to cutthroat trout (*O. clarki*) suggesting that Gila and Apache trouts were derived from an ancestral form that also gave rise to rainbow trout (Behnke 1992, Dowling and Childs 1992, Utter and Allendorf 1994, Nielsen *et al.* 1998, Riddle *et al.* 1998).

The Gila trout is readily identified by its iridescent gold sides that blend to a darker shade of copper on the opercles (gill covers). Spots on the body are small and profuse, generally occurring above the lateral line and extending onto the head, dorsal (back, top) fin, and caudal (tail) fin. Spots are irregularly shaped on the sides and increase in size on the back. On the dorsal surface of the body, spots may be as large as the pupil of the fish eye and are rounded. A few scattered spots are sometimes present on the anal fin, and the adipose fin (fleshy fin located behind dorsal fin) is typically large and well-spotted. Dorsal, pelvic, and anal fins have a white to yellowish tip that may extend along the leading edge of the pelvic fins. A faint, salmon-pink band is present on adults, particularly during spawning season when the normally white belly may be streaked yellow or reddish orange. A yellow cutthroat mark is present on most mature specimens. Parr marks (diffuse splotches on the sides of body, usually seen on young trout) are commonly retained by adults, although they may be faint or absent (Miller 1950, David 1976).

Habitat

Nursery and rearing habitats are areas used by larval and juvenile Gila trout. Although no studies have been done on habitat use by these life stages of Gila trout, generalizations can be made based on characteristics of related trout species. Suitable nursery habitat for trout includes areas with slow current velocity such as stream margins, seeps, shallow bars, and side channels (Behnke 1992). Low flows during emergence from the egg and early growth of larval trout may result in strong year classes (young fish are not displaced downstream) (Behnke 1992), as may constant, elevated flows during summer (improved water quality) (Service 2003). Absence of predation by non-native trout, particularly brown trout, is another essential element of nursery and rearing habitat.

Subadult and adult habitats are defined as areas suitable for survival and growth of these life stages. Subadults are sexually immature individuals, generally less than 150 millimeters (mm) (6 inches (in)) total length and adults are sexually mature individuals typically greater than 150 mm (6 in) total length (Propst and Stefferud 1997). Subadult Gila trout occur primarily in riffles (shallow water flowing over cobbles), riffle-runs, and runs, while adults are found mainly in pools (Rinne 1978). Cover (large woody debris, undercut banks, boulders, deep water, and overhanging woody and herbaceous vegetation) is an important component of subadult and adult habitat (Stefferud 1994). The quantity and quality of adult habitat typically limits the population (Behnke 1992). Essential elements of subadult and adult habitat relate principally to channel dimensions, cover, and hydrologic variability. Absence of competition with non-native trouts (brown and rainbow) for foraging habitat is also an essential element of subadult and adult habitat.

Variation in stream flow is a major factor affecting subadult and adult population size (McHenry 1986, Turner 1989, Propst and Stefferud 1997). In particular, high flow events may cause marked decrease in population size. These events result in short-term, radical changes in habitat conditions, primarily in flow velocity. Because most streams occupied by Gila trout have relatively narrow floodplains, the forces associated with high flow events are concentrated in and immediately adjacent to the bankfull channel. High stream flow velocities cause channel scouring and displacement of fish downstream, often into unsuitable habitats (Rinne 1982). Overwintering habitat is defined as areas that afford shelter during periods of low water temperature, generally from November through February. Rinne (1981) and Propst and Stefferud (1997) indicated the importance of pool habitat for overwinter survival of Gila trout. Essential elements of overwintering habitat are deep water with low current velocity and protective cover (Behnke 1992). These elements are important because small streams can freeze, but deep pools provide areas that do not freeze. Trout are typically more sluggish in the winter and cover is important to protect them from predators. Barriers to fish movement (e.g., waterfalls, dry stream bed) that prevent fish from accessing overwintering habitat may impact populations of Gila trout. Gila trout are now restricted to small, headwater streams that typically have fewer deep pools and suitable overwintering habitat than do larger streams (Harig and Fausch 2002).

Life History

Spawning occurs mainly in April (Rinne 1980) when temperatures are 6 to 8oC (43 to 46oF); however, day length may also be an important cue. Stream flow is apparently of secondary importance in triggering spawning activity (Rinne 1980). Young fish less than 25 millimeters (mm) (1.0 inch (in)) emerge from gravel nests 56 to 70 days after egg deposition (Rinne 1980). By the end of the first summer, young attain a total length of 70 to 90 mm (2.7 to 3.5 in) at lower elevation streams and 40 to 50 mm (1.6 to 2.0 in) at higher elevation sites (Rinne 1980, Turner 1986). Growth rates are variable, but Gila trout generally reach 180 to 220 mm (7.1 to 8.7 in) total length by the end of the third growing season in all but higher elevation streams. On average, for every 100 eggs that hatch, only two fish will survive to become adults (Brown et al. 2001).

Females reach maturity at age 2 to 4 at a minimum length of about 130 mm (5 in) (Nankervis 1988, Propst and Stefferud 1997). Males typically reach maturity at age 2 or 3. Most Gila trout live to about age 5 (Turner 1986), with a maximum age of 9 reported by Nankervis (1988). Thus, the majority of female Gila trout only spawn once and most males only spawn two or three times.

Aquatic insects are the primary food of Gila trout. Regan (1966) reported that adult flies, caddisfly larvae, mayfly nymphs, and aquatic beetles were the most abundant food items in stomachs of Gila trout in Main Diamond Creek. There was little variation in food habits over the range of size classes sampled (47 to 168 mm (1.8 to 6.6 in) total length). Gila trout diet shifted seasonally as the relative abundance of various prey changed. Insect taxa consumed by Gila trout were also common in stomach contents of non-native trout species in the Gila River drainage, indicating the potential for interspecific competition. Hanson (1971) noted that Gila trout established a feeding hierarchy in pools during a low flow period in Main Diamond Creek. Larger fish aggressively guarded their feeding stations and chased away smaller fish. Large Gila trout occasionally consume speckled dace and may also cannibalize smaller Gila trout (Van Eimeren 1988, Propst and Stefferud 1997).

Adult Gila trout are typically sedentary and movement is influenced by population density and territoriality (Rinne 1982). Although, individual fish may move considerable distances (e.g., over 1.5 km (0.9 mi)), Rinne (1982) found that after eight months, 75 percent of tagged fish were less than 100 m (328 ft) from their release sites in Main Diamond, South Diamond, and McKnight Creeks. Gila trout showed a tendency to move upstream in South Diamond Creek, possibly to perennial reaches with suitable pool habitat in response to low summer discharge. Downstream movement in Main Diamond and McKnight Creeks involved primarily smaller fish and probably occurred because of nocturnal migrations or displacement downstream during flooding (Rinne 1982). High density of log structures in Main Diamond Creek appeared to reduce mobility of Gila trout in that stream (Rinne 1982).

Population dynamics

Factors affecting population size and dynamics of Gila trout are not well understood. Inferences about factors that control population size have been made from analysis of time-series data (Turner and McHenry 1985, Turner 1989, Propst and Stefferud 1997). Hydrologic variability appears to be most important in regulating population size of Gila trout in many of the streams occupied by the species (e.g., Regan 1966, Mello and Turner 1980, McHenry 1986, Turner 1989, Brown et al. 2001). Gila trout populations typically have high densities during relatively stable flow periods (Platts and McHenry 1988). The overall importance of environmental factors, specifically quantity and variability of stream discharge in determining persistence of Gila trout populations is evidenced by the effects of fire, flood, and low flow on population size and density of this species. Examples of the effects of severe wild fires and subsequent floods and ash flows are the elimination of the Gila trout populations from Main Diamond Creek (1989) and South Diamond Creek (1995).

Status and Distribution

The extent of the historical distribution of the Gila trout is not known with certainty (Behnke 2002). It is known to be native to higher elevation streams in portions of the Gila River drainage, New Mexico. Occurrence of Gila trout in tributaries to the Gila River in Arizona is less certain, although these streams harbored a native trout. Native trout occurred in the Eagle Creek drainage, a tributary of the Gila River in Arizona located west of the San Francisco River drainage (Minckley 1973, Kynard 1976). The identity of this native trout, now lost through hybridization with rainbow trout, is uncertain (Marsh et al. 1990). Native trout were reported from Oak Creek, a tributary to the Verde River, before the turn of the century (Miller, 1950). Four specimens collected from Oak Creek before 1890 were ascribed to Gila trout (Miller 1950, Minckley 1973). Native trout were also reported from West Clear Creek, another Verde River tributary (Miller 1950). Trout collected in 1975 from Sycamore Creek, a tributary of Agua Fria, were reported to be Gila x rainbow trout hybrids. However, this determination was based solely on examination of spotting pattern (Behnke and Zarn 1976). Unfortunately, no pure Gila trout are extant from Arizona tributaries to the Gila River and scientists are unable to make a clear determination of the identity of the four remaining preserved specimens that were collected from Oak Creek (Miller 1972).

According to anecdotal reports, in 1896 Gila trout were found in the Gila River drainage, New Mexico, from the headwaters downstream to a box canyon, about 11.3 km (7 mi) northeast of Cliff, New Mexico (Miller 1950). By 1915, the downstream distribution of Gila trout in the Gila River had receded upstream to Sapillo Creek, a distance of approximately 25 km (15 mi) (Miller 1950). By 1950, water temperature in the Gila River at Sapillo Creek was considered too warm to support any trout species (Miller 1950). The earliest documented collections of Gila trout in the upper Gila River drainage were in 1939, from Main Diamond Creek (Miller 1950). New populations were sporadically found until 1992 when Gila trout were discovered in Whiskey Creek, a tributary to the upper West Fork Gila River (Service 2003).
Miller (1950) documented changes in suitability of habitats for Gila trout in the upper Gila

drainage. Unregulated livestock grazing and logging likely contributed to habitat modifications noted by Miller (1950). The historical occurrence of intensive grazing and resulting effects on the land are indicated in published reports dating back to the early 1900s (Rixon 1905, Rich 1911, Duce 1918, Leopold 1921, Leopold 1924). Logging activities also likely caused major changes in watershed characteristics and stream morphology. Rixon (1905) reported the occurrence of small timber mills in numerous canyons of the upper Gila River drainage. Early logging efforts were concentrated along canyon bottoms, often with perennial streams. Tree removal along perennial streams within the historical range of Gila trout likely altered water temperature regimes, sediment loading, bank stability, and availability of large woody debris (Chamberlin et al. 1991).

When the Gila trout was listed as endangered, it was thought that its range had been reduced to five streams within the Gila National Forest, New Mexico: Iron, McKenna, Spruce, Main Diamond, and South Diamond. In 1998, it was determined that the McKenna and Iron Creek populations had hybridized with rainbow trout and therefore, did not contribute to the recovery of the species because they are not pure (Leary and Allendorf 1998, Service 2003). In 1992, another relict (pure population) of Gila trout was discovered in Whiskey Creek (Leary and Allendorf 1998). Consequently, there are four confirmed relict populations known today. Reasons for listing the Gila trout as endangered, included hybridization, competition, and/or predation by non-native rainbow, cutthroat, and brown trout, and habitat degradation. Today three of the four relict populations (Main Diamond, South Diamond, and Spruce Creeks) are replicated at least once. Because of fires in 2003, Whiskey Creek is no longer replicated; however, this lineage will be reintroduced into two creeks (Cub and upper West Fork Gila) in the fall of 2004. Surveys of the 12 existing populations indicate that the recovery efforts to remove non-native fish and prevent their return to the renovated areas have been successful (Service 2003). Replicated populations in New Mexico are successfully reproducing, indicating that suitable spawning and rearing habitats are available. Reproduction has not been documented in Raspberry or Dude Creeks in Arizona. Because young of the year were planted in Raspberry Creek in 2000, these fish would not be expected to reproduce until 2004. However, based on surveys conducted in 2002, the population in Raspberry Creek appears to be healthy. Factors limiting reproduction in Dude Creek are not known. In 1992, the wild populations of Gila trout were estimated to be less than 10,000 fish greater than age 1. In 2001, the population in New Mexico was estimated to be 37,000 fish (Brown et al. 2001).

Chiricahua Leopard Frog

The Chiricahua leopard frog was listed as threatened without critical habitat on June 13, 2002 (67 FR 40790, Service 2002). Included in the final listing proposal was a special rule to exempt operation and maintenance of livestock tanks on non-Federal lands from the section 9 take prohibitions. The species has a recovery priority number of 2C. This ranking, determined in accordance with the Recovery Priority Criteria (48 FR 43098, 48 FR 51985), is based on the high degree of threat, a high potential for recovery, and taxonomic classification as a species. The draft Chiricahua leopard frog recovery plan is scheduled for completion in November 2004.

Species description

Leopard frogs (*Rana pipiens* complex), long considered to consist of a few highly variable species, are now recognized as a diverse assemblage of 17 or more species, with many of these species described in the last 20 years (Hillis 1988, American Museum of Natural History 2001). Based on morphology, mating calls, and genetic analysis (electrophoretic comparisons of blood proteins), Platz and Platz (1973) demonstrated that at least three distinct forms of leopard frogs occurred in Arizona, including the southern form, which was subsequently described as the Chiricahua leopard frog (Platz and Mecham 1979).

The Chiricahua leopard frog is distinguished from other members of the *Rana pipiens* complex by a combination of characters, including a distinctive pattern on the rear of the thigh consisting of small, raised, cream-colored spots or tubercles on a dark background, dorsolateral folds that are interrupted and deflected medially, stocky body proportions, relatively rough skin on the back and sides, and often green coloration on the head and back (Platz and Mecham 1979). The species also has a distinctive call consisting of a relatively long snore of 1 to 2 seconds in duration (Platz and Mecham 1979, Davidson 1996). Snout-vent lengths of adults range from 54 to 139 mm (2.1 to 5.4 in) (Platz and Mecham 1979).

Habitat

The Chiricahua leopard frog is an inhabitant of cienegas (wetlands), pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations of 1,000 to 2,710 m (3,281 to 8,890 feet) in central and southeastern Arizona; west-central and southwestern New Mexico; and in Mexico in the northern Sonora and the Sierra Madre Occidental of Chihuahua (Platz and Mecham 1979, Degenhardt *et al.* 1996, Sredl *et al.* 1997).

No formal studies of habitat use by Chiricahua leopard frogs have been completed. However, important general characteristics include permanent or nearly permanent water that is free of non-native predators. Additionally, the role of habitat heterogeneity within the aquatic and terrestrial environment is unknown, but is likely to be important. Shallow water with emergent and perimeter vegetation provide tadpole and adult basking habitats, while deeper water, root masses, and undercut banks provide refuge from predators and potential sites for hibernation (Sredl, unpublished data). Most perennial water supporting Chiricahua leopard frogs possess fractured rock substrata, emergent or submergent vegetation, deep water, root masses, undercut banks, or some combination of these features that Chiricahua leopard frogs may use as refugia from predators and extreme climatic conditions (Jennings, unpublished data). Chiricahua leopard frogs likely overwinter at or near breeding sites, although microsites for these "hibernacula" have not been studied. Other leopard frogs typically overwinter at the bottom of ponds or lakes, and may bury themselves in the mud (Nussbaum *et al.* 1983, Cunjak 1986, Harding 1997).

Life History

Degenhardt *et al.* (1996) reported that Chiricahua leopard frogs are shy, nocturnal and are quick to seek shelter when approached. During the day they usually rest hidden among the vegetation surrounding their aquatic habitat and are quick to enter the water. Degenhardt *et al.* (1996) reported that this species is the most aquatic of the leopard frogs within New Mexico. The juvenile habitat requirements of Chiricahua leopard frogs are not well studied, but some spatial and temporal separation of adults and juveniles may enhance survivorship. Sredl *et al.*(1994) studied the association of juvenile-adult stages and pool size in the closely related lowland leopard frog (*Rana yavapaiensis*) and found that juveniles were more frequently associated with small pools and marshy areas while adults were associated with large pools. Fernandez (1996) speculated that lack of cover and cannibalism was the reason for low juvenile survival in a captive colony of Chiricahua leopard frogs. Jennings (1988) found that juveniles were more active during the day, while adults were more active at night.

The food habits of the Chiricahua leopard frog have not been studied in New Mexico, although like other leopard frogs it likely eats a wide variety of insects and other arthropods (Degenhardt *et al.* 1996). Sredl and Jennings (in press) indicate that the tadpoles are herbivorous and likely feed on diatoms, phytoplankton, filamentous green algae, water milfoil (*Myriophyllum* sp.), and duckweed (*Lemna minor*).

Age and size at reproductive maturity are poorly known. In southeastern Arizona, juvenile frogs and late-stage tadpoles introduced to an outdoor enclosure in May and June 1994, reproduced in September 1994 (Rosen and Schwalbe 1998). The smallest males to exhibit secondary sexual characteristics 53.5 mm (2.1 in) and 56.2 mm (2.2 in) snout-vent length (Jennings, unpublished data). Size at which females reach sexual maturity is not known. Although scoring of annuli (annual growth rings in bones) in Chiricahua leopard frogs is more difficult than in lowland leopard frogs (Collins *et al.* 1996), preliminary determination of age based on annual growth rings indicates that they can live as long as six years (Durkin 1995).

Although Chiricahua leopard frog juveniles and adults are generally inactive between November and February, a detailed study of wintertime activity or habitat use has not been done. Male home range sizes (dry season mean = 161.0 m^2: wet season, mean = 375.7 m^2) tended to be larger than those of females (dry season mean = 57.1 m^2; wet season mean = 92.2 m^2). The largest home range size documented for the species was that of a male who used approximately 23,390 m^2 (2,339 m by 10 m) of an intermittent, low elevation canyon (1,775 m) in New Mexico during July and August 1999. Another male moved 3.5 kilometers (2.1 miles) in one direction during that same time period. The largest home range size documented for a female Chiricahua leopard frog was about 9,500 m^2 (950 m by 10 m). Male Chiricahua leopard frogs tended to expand home range size to a greater degree than females when dry season (early July) ranges were compared to wet season (late July and August) (R. Jennings, C. Painter unpublished data).

Adult and juvenile Chiricahua leopard frogs avoid terrestrial predators by jumping into the water (Frost and Bagnara 1977). Among members of the *Rana pipiens* complex, Chiricahua leopard frogs possess the unusual ability to profoundly darken their ventral skin under conditions of low albedo (reflectance) and low temperature (Fernandez and Bagnara 1991; Fernandez and Bagnara 1993). In the clear, swiftly-moving streams they inhabit (low albedo environments) this trait is thought to aid in escape of predators by reducing the amount of attention that bright flashes of white ventral skin would bring. Other anti-predator mechanisms have not been identified, but deep water, vegetation, undercut banks, and root masses and other cover sites have been mentioned as being important retreats.

Population dynamics

Breeding habitat includes all suitable habitat types (i.e., stock tanks, streams, springs, ponds); however, sites with year-round flow, constant water temperature, a depauperate fish community, and thermal springs appear to be particularly important (Scott and Jennings 1985). Oviposition may take place year-round in thermal springs (Scott and Jennings 1985); however, egg masses have been found in all months except November, December, and January, and reports of oviposition in June are also uncommon (Sredl and Jennings, in press). Frost and Platz (1983) found that Chiricahua leopard frogs at elevations below 1,800 m (5,900 ft) tended to oviposit from spring to late summer, while populations above 1,800 m (5,900 ft) bred during the summer months of June, July, and August. Females deposit egg masses on vegetation within 5 cm (2 in) of the water surface (Jennings and Scott 1991) probably in water temperatures between 12.6-29.5°C (54.7-85.1°F). Zweifel (1968) found that the temperature range for Chiricahua leopard frog embryo development is 12.0-31.5°C (53.6-88.7°F). They lay 300-1500 eggs in an egg mass (Jennings and Scott 1991) on aquatic vegetation including *Potamogeton* spp., *Rorippa* spp., *Echinochloa* spp., and *Leerisia* spp. (Sredl and Jennings, in press). Hatching time may be as short as 8 days in geothermally influenced springs (Sredl and Jennings, in press). Tadpoles are known to overwinter (Frost and Platz 1983) with the larval period lasting as short as 3 months and as long as 9 months (Jennings 1988, 1990).

In New Mexico, the Chiricahua leopard frog may exhibit seasonal fluctuations in relative abundance. Overall abundance increases with the metamorphosis of tadpoles in August and September, and is lowest from December through March (Degenhardt *et al.* 1996). Throughout the year, Chiricahua leopard frog activity generally increases as the nocturnal water temperature increases (Jennings 1990).

Populations of the Chiricahua leopard frog occurring in thermally stable habitats (hot springs) may be reproductively active throughout the year. Jennings (1988, 1990) reported reproductive activity throughout the year in Alamosa Warm Springs in Socorro County, New Mexico, where the water temperature remains above 61°F (16°C). He also found that in a nearby stock tank with varying water temperatures, reproduction occurred only during late April through May and mid-August through late September.

Status and distribution

The Chiricahua leopard frog is absent from approximately 75 percent and 82 percent of historic localities in Arizona and New Mexico, respectively (Service 2002). In Arizona, the species still occurs in seven of eight major drainages of historical occurrence (Salt, Verde, Gila, San Pedro, Santa Cruz, Yaqui/Bavispe, and Magdalena river drainages), but appears to be extirpated from the Little Colorado River drainage on the northern edge of the species' range. Within the drainages where the species occurs, it was not found recently in some major tributaries and/or from river mainstems. For instance, the species has not been reported since 1995 from the following drainages or river mainstems where it historically occurred: White River, West Clear Creek, Tonto Creek, Verde River mainstem, San Carlos River, upper San Pedro River mainstem, Santa Cruz River mainstem, Aravaipa Creek, Babocomari River mainstem, and Sonoita Creek mainstem. In southeastern Arizona, no recent records (1995 to the present) exist for the following mountain ranges or valleys: Pinaleno Mountains, Peloncillo Mountains, and Sulphur Springs Valley. Moreover, the species is now absent from all but one of the southeastern Arizona valley bottom cienega complexes. Large, valley bottom cienega complexes may have once supported the largest populations in southeastern Arizona, but non-native predators are now so abundant that the cienegas do not presently support the Chiricahua leopard frog in viable numbers (Rosen *et al.* in press).

In New Mexico the species has been collected or observed at 182 localities (Painter 2000, Service files). Jennings (1995) reported Chiricahua leopard frogs still occurred at 11 sites in New Mexico. Based on additional work, Painter (2000) listed 41 localities at which Chiricahua leopard frogs were found from 1994-1999. Thirty-three of these are north of Interstate 10 (northern populations) and eight are in the southwestern corner of the State (southern populations). Thirty-one of the 41 populations were verified extant during 1998-1999 (Painter 2000). However, during May-August 2000, the Chiricahua leopard frog was found at only 8 of 34 sites (C. Painter, pers. comm. 2000). Three populations east of Hurley, Grant County, declined or went extinct during 1999-2000 (R. Jennings, pers. comm. 2000), and preliminary data indicate populations on the Mimbres River and at Deep Creek Divide have experienced significant die-offs (C. Painter and R. Jennings, pers. comm, 2004).

In New Mexico, of sites occupied by the Chiricahua leopard frog from 1994 to 1999, 67 percent were creeks or rivers, 17 percent were springs or spring runs, and 12 percent were stock tanks (Painter 2000). The Chiricahua leopard frog is still present in all major drainages in New Mexico where it occurred historically; however, it has not been found recently in many rivers, valleys, and mountain ranges, including the San Francisco River. The Chiricahua leopard frog occurs in west central and southwestern New Mexico in Catron, Grant, Hidalgo, Luna, Soccoro, and Sierra Counties. It is most common in the Gila and San Francisco river drainages (Degenhardt *et al.* 1996). Jennings (1995) stated that the Gila Wilderness in the Gila National Forest has the greatest potential for supporting additional extant populations and for securing an intact metapopulation that would have a good chance of long-term persistence.

Threats to the species include disease, drought, floods, degradation and destruction of habitat, water diversions and groundwater pumping, disruption of metapopulation dynamics, increased possibility of extirpation due to low numbers, and environmental contamination (Service 2002). Numerous studies indicate that declines and extirpations of the Chiricahua leopard frog is at least in part caused by predation and possibly competition by non-native organisms, including fish in the family Centrarchidae (*Micropterus* spp., *Lepomis* spp.), bullfrogs (*Rana catesbeiana*), tiger salamanders (*Ambystoma tigrinum*), crayfish (*Oronectes spp.*), and several other fish species (Clarkson and Rorabaugh 1989, Sredl and Howland 1994, Rosen *et al.* 1994, Fernandez and Bagnara 1995, Fernandez and Rosen 1996, Rosen *et al.* 1996, Snyder *et al.* 1996). For example, in the Chiricahua region of southeastern Arizona, Rosen *et al.* (1996) found that almost all perennial waters investigated that lacked introduced vertebrate predators contained Chiricahua leopard frog. In perennial waters with introduced predators, particularly fishes and bullfrogs, Chiricahua leopard frogs were generally absent (Sredl and Howland 1994).

Disruption of metapopulation dynamics is an important factor in the regional loss of populations (Sredl and Howland 1994; Sredl *et al.* 1997). Chiricahua leopard frog populations are often small, with dynamic habitats (appearing and disappearing), resulting in a relatively low probability of long-term population persistence. Historically, populations were more numerous and closer together. If populations disappeared due to drought, disease, or other causes, extirpated sites could be recolonized by immigration from nearby populations. However, as the numbers of populations decline and become more isolated, it is less likely the areas previously occupied will be recolonized. In addition, most of the larger source populations along the major rivers have disappeared.

Recent evidence suggests that a chytridiomycete (*Batrachochytrium* sp.) skin fungus is partly responsible for observed declines of frogs, toads, and salamanders in Panama, Costa Rica, Brazil, Ecuador, Uruguay, Australia, New Zealand, Spain, Germany, South Africa, Kenya, Mexico, and the United States (Berger *et al.* 1998, Longcore *et al.* 1999, Speare and Berger 2000). Ninety-four species of amphibians have been reported as infected with the chytrid fungus (*Batrachochytrium dendrobatidis*) (Speare and Berger 2000). In Arizona, chytrid infections have been reported from the Chiricahua leopard frog, Rio Grande leopard frog (*Rana berlandieri*), plains leopard frog (*Rana blairi*), lowland leopard frog (*Rana yavapaiensis*), Tarahumara frog (*Rana tarahumarae*), canyon treefrog (*Hyla arenicolor*), and Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) (Morell 1999, Sredl and Caldwell 2000).

The disease, Postmetamorphic Death Syndrome (PDS), was implicated in the extirpation of Chiricahua leopard frog populations in Grant County, New Mexico, as well as in other frog and toad species (Declining Amphibian Populations Task Force 1993). All stock tank populations of the Chiricahua leopard frog in the vicinity of Gillette and Cooney tanks in Grant County disappeared within a 3 year period, apparently as a result of PDS (Declining Amphibian Populations Task Force 1993). The syndrome is characterized by death of all or a majority of recently metamorphosed frogs in a short period of time. The syndrome appears to spread among adjacent populations, causing regional loss of populations or metapopulations.

ENVIRONMENTAL BASELINE

Under section 7(a)(2) of the Act, when considering the effects of the action on federally listed species, we are required to take into consideration the environmental baseline. Regulations implementing the Act (50 FR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone section 7 consultation, and the impacts of State and private actions that are contemporaneous with the consultation in progress. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation. We have defined the action area for this fire suppression activity to include the Wilderness District of the Gila National Forest.

A. Status of the species (within the Action Area)

Black Canyon supports a population of Gila trout. This population is a replicate of the Main Diamond lineage and was established in 1998 after ash flows following the Bonner Fire (1995) eliminated non-native trout from the creek. In 2003, 2,500, Age-0 fish were stocked in Black Canyon. Black Canyon is within the Diamond Bar Allotment. Grazing was suspended on this allotment in 1996 because the permitees would not agree to the conditions in a new 10-year term grazing permit. Cattle were not removed until 1997, at which time the allotment was severely overgrazed. Trespass cattle were released on the allotment in April 2003. However, an assessment of the habitat in Black Canyon Creek by a Forest Service Fisheries Biologist on May 20, 2004, indicated that sufficient vegetation was present to prevent erosion into the creek, vegetative and bank conditions indicated that livestock use had been light, and that stream down-cutting, poor riparian conditions, and poor instream habitat were related to historical levels of heavy livestock use, not current levels of grazing.

There is a population of Chiricahua leopard frogs in Black Canyon near the confluence with Aspen Canyon. It is possible that habitat in this area was also impacted by the livestock grazing activities described above; however, an assessment of the habitat has not been conducted.

B. Factors affecting the species environment within the action area

On the Gila National Forest, past and present Federal, State, private, and other human activities that may affect Gila trout and Chiricahua leopard frog and their habitat include livestock grazing, timber harvest, wildfire, recreational activities, and management activities directed specifically towards Gila trout (i.e., stream restoration, transplantation, population surveys). In addition, the stocking of non-native trout by citizens and by the New Mexico Department of Game and Fish (NMDGF) in the early to mid-1900s also affects the environmental baseline. Because specific activities at Black Canyon are generally not known, activities that have occurred within the Aldo Leopold Wilderness are described.

Livestock grazing

In the late 1800s and early 1900s, livestock grazing was uncontrolled and unmanaged over many of the watersheds that contain Gila trout and much of the landscape was denuded of vegetation (Rixon 1905, Duce 1918, Leopold 1921, Leopold 1924, Ohmart 1996). Livestock grazing is more carefully managed now, which has resulted in less impact to streams occupied by Gila trout and the Chiricahua leopard frog. Improved management grazing practices (*e.g.*, fencing) have reduced livestock access to streams. Six of the twelve streams currently occupied by Gila trout are within Forest Service grazing allotments. However, grazing has either been suspended or cattle are typically excluded from creeks occupied by Gila trout.

Black Canyon is within the Diamond Bar Allotment, where grazing was suspended in 1996. Field observations in May 1996, indicated that fish habitat in Black Canyon was impaired by livestock grazing (Gila Trout and Chihuahua Chub Recovery Team 1997). Subsequent suspension of livestock grazing on the allotment resulted in improvements in the condition of riparian and aquatic habitat (A. Telles, Gila National Forest, pers. comm. 2003); however, large, deep pools and large woody debris were still lacking (Gila Trout Recovery Team Meeting, 2003). In April 2003, trespass cattle were observed on the Diamond Bar Allotment (*in litt.* 2003). Sixty to 70 percent forage utilization was noted in South Diamond Creek (another creek within the allotment) on June 25, 2003 (*in litt.* 2003). Cattle and horses were documented in Black Canyon as well (*in litt.* 2003). Although several attempts were made to have the permittees voluntarily remove their cattle, they did not comply. The livestock (414 head) were not completely removed from the allotment until April 2004, a year after their release (http://www2.srs.fs.fed.us/r3/gila/news/newsdetails.asp?newsid=84, viewed, June 3, 2004).

Nine horses and three cows remained in Black Canyon in two pastures until June 12, 2004. Approximately 1000 feet of stream flows through the Diamond Pasture and 800 feet flows through the Meadow Pasture. On May 20, 2004, a Forest Service Fisheries Biologist visited the pastures and found that sufficient vegetation was present to prevent erosion into the creek, vegetative and bank conditions indicated that livestock use had been light, and that stream down-cutting, poor riparian conditions, and poor instream habitat were related to historical levels of heavy livestock use, not current levels of grazing.

Livestock grazing has been shown to increase soil compaction, decrease infiltration rates, increase runoff, change vegetative species composition, decrease riparian vegetation, increase stream sedimentation, increase stream water temperature, decrease fish populations and change channel form (Meehan and Platts 1978, Kaufman and Kruger 1984, Schulz and Leininger 1990, Platts 1991, Fleischner 1994, Ohmart 1996). Although direct impacts to the riparian zone and stream can be the most obvious sign of livestock grazing, upland watershed condition is also important because changes in soil compaction, percent cover, and vegetative type influence the timing and amount of water delivered to stream channels (Platts 1991). Increased soil compaction, decreased vegetative cover, and a decrease in grasslands lead to faster delivery of water to stream channels, increased peak flows, and lower summer base flow (Platts 1991, Ohmart 1996, Belsky and Blumenthal 1997). As a consequence, streams are more likely to experience flood events during monsoons (water runs off quickly instead of soaking into the ground) that negatively affect the riparian and aquatic habitats and are more likely to become intermittent or dry in September and October (groundwater recharge is less when water runs off quickly) (Platts 1991, Ohmart 1996).

Improper livestock grazing practices degrade riparian and aquatic habitats, likely resulting in decreased production of trout (Platts 1991). Livestock affect riparian vegetation directly by eating grasses, shrubs, and trees, by trampling the vegetation, and by compacting the soil. Riparian vegetation benefits streams and trout by providing insulation (cooler summer water temperatures, warmer winter water temperatures), by filtering sediments so that they do not enter the stream (sediment clogs spawning gravel and reduces the survival of salmonid eggs), by providing a source of nutrients to the stream from leaf litter (increases stream productivity), and by providing root wads, large woody debris, small woody debris to the stream (provides cover for the fish) (Kauffman and Krueger 1984, Platts 1991, Ohmart 1996). Livestock grazing increases sedimentation through trampling of the steam banks (loss of vegetative cover), by removal of riparian vegetation (filters sediment), and through soil compaction (decreases infiltration rates, increases runoff, causes increased erosion). Sediment is detrimental to trout because it decreases the survival of their eggs (Bjornn and Reiser 1991), and because of its negative impact on aquatic invertebrates, a food source for trout (Wiederholm 1984).

Adverse effects to the Chiricahua leopard frog and its habitat as a result of livestock grazing and management actions may occur under certain circumstances. These effects include: facilitating dispersal of non-native predators; trampling of egg masses, tadpoles, and frogs; incidental ingestion of small larvae or eggs while drinking; deterioration of watersheds; degraded water quality and subsequent toxic effects on frogs; erosion and/or siltation of stream courses; elimination of undercut banks that provide cover for frogs; loss of cover provided by wetland and riparian vegetation; loss of backwater pools; and spread of disease (Arizona State University 1979, Hendrickson and Minckley 1984, Ohmart 1995, Jancovich *et al.* 1997, Bartelt 1998, Belsky *et al.* 1999, Service 2002). Improper livestock grazing can accelerate erosion in the watershed, resulting in the sedimentation of deep pools used by frogs (Gunderson 1968). Maintenance of livestock tanks can result in death or injury of frogs. Chiricahua leopard frogs, particularly eggs, tadpoles, and juveniles, are vulnerable to being trampled by cattle on the perimeter of stock tanks and in pools along streams (Bartelt 1998, Ross *et al.* 1999, U.S. Fish and Wildlife Service 2002). Working in Nye County, Nevada, Ross *et al.* (1999) found a dead adult Columbia spotted frog (*Rana luteiventris*) in the hoof print of a cow along a heavily grazed stream. They observed numerous other dead frogs in awkward postures suggesting traumatic death, likely due to trampling. In Idaho, Bartelt (1998) documented the near loss of a cohort of metamorphic boreal toads (*Bufo boreas*) due to trampling by sheep at a livestock tank. Juvenile and adult frogs can probably often avoid trampling when they are active; however, leopard frogs are know to hibernate on the bottom of ponds (Harding 1997), where they may be subject to trampling during the winter months.

Chiricahua leopard frogs can be adversely affected by degraded water quality caused by cattle urine and feces. At Headquarters Windmill Tank on the Coronado National Forest in the

Chiricahua Mountains of southeastern Arizona, Sredl *et al.* (1997) documented heavy cattle use at a stock tank that resulted in degraded water quality, including elevated hydrogen sulfide concentrations. A die-off of Chiricahua leopard frogs at the site was attributed to cattle-associated water quality problems, and the species has been extirpated from the site since the die-off occurred (Service 2002). Larval frogs may be particularly susceptible to nitrogenous compounds that can be associated with grazing (Schepers and Francis 1982, Boyer and Grue 1995). Toxicity could result from high concentrations of un-ionized ammonia (Schuytema and Nebeker 1999), particularly in combination with primary-production induced elevation in pH.

Grazing activities could result in spread of infectious disease. Chytrid fungus can survive in wet or muddy environments and could conceivably be spread by livestock carrying mud on their hooves and moving among frog habitats. Personnel working at an infected tank or aquatic site and then traveling to another site, thereby transferring mud or water from the first site, could also spread this disease. Grazing activities could also increase the susceptibility of frogs to disease. Degraded water quality, threat of trampling, or other stressors caused by grazing activities could alter immune response of frogs, making them more susceptible to disease (Carey *et al.* 1999).

Timber harvest

Logging activities in the early to mid 1900s likely caused major changes in watershed characteristics and stream morphology (Chamberlin *et al.* 1991). Rixon (1905) reported the occurrence of small timber mills in numerous canyons of the upper Gila River drainage. Early logging efforts were concentrated along canyon bottoms, often with perennial streams. Tree removal along perennial streams within the historical range of Gila trout and Chiricahua leopard frog likely altered water temperature regimes, sediment loading, bank stability, and availability of large woody debris (Chamberlin *et al.* 1991). Timber harvest is not currently allowed in wilderness or primitive areas.

Fire

High-severity wild fires and subsequent floods and ash flows, caused the extirpation of seven populations of Gila trout since 1989: Main Diamond (1989), South Diamond (1995), Burnt Canyon (1995), Trail Canyon (1996), Woodrow Canyon (1996), Sacaton Creek (1996), Upper Little Creek (2003) (Propst *et al.* 1992, Brown *et al.* 2001, J. Brooks, Service, pers. comm. 2003). Lesser impacts were experienced in 2002, when ash flows following the Cub Fire affected the lower reach of Whiskey Creek. However, this reach of Whiskey Creek is frequently intermittent and typically contains few fish (Brooks 2002).

Severe wild fires capable of extirpating or decimating fish populations are a relatively recent phenomena, and result from the cumulative effects of historical or ongoing grazing (removes the fine fuels needed to carry fire) and fire suppression (Madany and West 1983, Savage and Swetnam 1990, Swetnam 1990, Touchan *et al.* 1995, Swetnam and Baisan 1996, Belsky and Blumenthal 1997, Gresswell 1999). Historic wildfires were primarily cool-burning understory fires with return intervals of 3-7 years in ponderosa pine (Swetnam and Dieterich 1985). Cooper

(1960) concluded that prior to the 1950s, crown fires were extremely rare or nonexistent in the region. In 2003, over 200,000 acres burned in the Gila NF (*in litt.* 2004). The watersheds of Little Creek, Black Canyon, White Creek, and Mogollon Creek were affected. Because Gila trout are found primarily in isolated, small streams, avoidance of ash flows is impossible and opportunities for natural recolonization usually do not exist (Brown *et al.* 2001). Persistence of Gila trout in streams affected by fire and subsequent ash flows depends on management actions. In some instances, evacuation of Gila trout from streams in watersheds that have burned is necessary, and in other cases populations are lost and must be replaced through stocking (Service 2004).

Effects of fire may be direct and immediate or indirect and sustained over time (Gresswell 1999). The cause of direct fire-related fish mortalities has not been clearly established (Gresswell 1999). Fatalities are most likely during intense fires in small, headwater streams with low flows (less insulation and less water for dilution). In these situations, water temperatures can become elevated or changes in pH may cause immediate death (Cushing and Olson 1963). Spencer and Hauer (1991) documented 40-fold increases in ammonium concentrations during an intense fire in Montana. The inadvertent dropping of fire retardant in streams is another source of direct mortality during fires (*in litt.* 2003).

Indirect effects of fire include ash and debris flows, increases in water temperature, increased nutrient inputs, and sedimentation (Swanston 1991, Bozek and Young 1994, Gresswell 1999). Ash and debris flows can cause mortality months after fires occur when barren soils are eroded during monsoonal rain storms (Bozek and Young 1994, Brown *et al.* 2001). Fish suffocate when their gills are coated with fine particulate matter, they can be physically injured by rocks and debris, or they can be displaced downstream below impassable barriers into habitat occupied by non-native trout. Ash and debris flows or severe flash flooding can also decimate aquatic invertebrate populations that the fish depend on for food (Molles 1985, Rinne 1996, Lytle 2000). In larger streams, refugia are typically available where fish can withstand the short-term adverse conditions; small headwater streams are usually more confined concentrating the force of water and debris (Pearsons *et al.* 1992, Brown *et al.* 2001).

Increases in water temperature occur when the riparian canopy is eliminated by fire and the stream is directly exposed to the sun. After fires in Yellowstone National Park, Minshall *et al.* (1997) reported that maximum water temperatures were significantly greater in headwater streams affected by fire than in reference (unburned) streams and often surpassed tolerance levels of salmonids. Warm water is stressful for salmonids and can lead to increases in disease and lowered reproductive potential (Bjornn and Reiser 1991). Salmonids need clean, loose gravel for spawning sites (Bjornn and Reiser 1991). 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. Increases in water temperature and sedimentation can also impact aquatic invertebrates changing species composition and reducing population numbers (Minshall 1984, Wiederholm 1984, Roy *et al.* 2003), consequently affecting the food supply of trout.

As is true of the effects of fire on most amphibians (Pilliod *et al.* 2003), the effects of fire on Chiricahua leopard frog are not known. It is expected that adults would retreat into the water if fire were present. Probably of greater consequence would be the effect of ash flows on eggs and juveniles. Adults most likely could escape an ash flow but aquatic life stages would likely perish. Following the Rattlesnake fire in the Chiricahua Mountains, Arizona, in 1994, a debris flow filled Rucker Lake, a historical Chiricahua leopard frog locality. Leopard frogs (either Chiricahua or Ramsey Canyon leopard frogs) apparently disappeared from Miller Canyon in the Huachuca Mountains of Arizona, after a 1977 crown fire in the upper canyon and subsequent erosion and scouring of the canyon during storm events (Tom Beatty, Miller Canyon, pers. comm. 2000). Leopard frogs were historically known from many localities in the Huachuca Mountains; however, natural pool and pond habitat is largely absent now and the only breeding leopard frog populations occur in man-made tanks and ponds. Crown fires followed by scouring floods are a likely cause of this absence of natural leopard frog habitats.

Recreational activities

It is likely that early settlers and Native Americans harvested Gila trout for subsistence. The extent to which either group depended on Gila trout is unknown. Before the Gila trout was listed as a threatened species, NMDGF managed harvest through fishing regulations. However, most of the streams with Gila trout are remote and enforcement of regulations was most likely difficult. All stream reaches that contain Gila trout have been closed to sport fishing since the fish was listed in 1967. While some illegal fishing may take place, the amount of take is most likely small and has a minimal effect on populations because of stream inaccessibility and because most citizens follow fishing regulations.

The extent to which recreational activities may have affected the Chiricahua leopard frog are unknown. The confluence of Aspen and Black Canyons is approximately 4 miles by trail from the nearest campground. It is possible that day-hikers visit the site and try to catch the frogs or tadpoles. However, the extent to which this occurs is not known. Recreationists (and possibly their dogs) may inadvertently introduce chytrids from other locales, or may intentionally introduce non-native predators for angling or other purposes. Such activities would also facilitate introduction of non-native predators with which the Chiricahua leopard frog cannot coexist.

Management activities

When the Gila trout was listed as endangered the most important reason for the species' decline was hybridization and competition with and/or predation by non-native salmonids (52 FR 37424, Service 1987). Uncontrolled angling depleted some populations of Gila trout, which in turn encouraged stocking of hatchery raised, non-native species (Miller 1950, Propst 1994). Due to declining native fish populations, the NMDGF propagated and stocked Gila trout, rainbow trout, cutthroat trout, and brown trout during the early 1900s to improve angler success. Gila trout were propagated from 1923 to 1935, at the Jenks Cabin Hatchery in the Gila Wilderness, but the program was abandoned because of the hatchery's poor accessibility and low productivity

(Service 1984). After early stocking programs were discontinued the non-native trout species persisted and seriously threatened the genetic purity and survival of the few remaining populations of Gila trout. Recent efforts to recover the species have included eliminating non-native salmonids from the species historic habitat through piscicide (fish-killing) treatment and mechanical removal and building waterfall barriers to prevent their reinvasion. Presently, 12 viable populations of Gila trout exist in the absence of non-native salmonids, including the population in Black Canyon.

Rennovation of streams continues on the Gila National Forest in an attempt to recover Gila trout. Typically these activities include the use of antimycin for the removal of non-native trout and the use of electrofishing to monitor Gila trout populations, determine the presence of non-native trout, and to check for the presence of fish after antimycin treatments. These activities could have impacted Chiricahua leopard frog populations in the past, but the extent that populations may have been affected is unknown. Much more attention and protection is provided to the Chiricahua leopard frog now that it is listed as threatened.

EFFECTS OF THE ACTION

Suppression actions for the Meown Wildfire included dropping of fire retardant until hand crews arrived at the fire scene. A partial load of fire retardant was dropped in Black Canyon which is occupied by Gila trout and Chiricahua leopard frog. A plume of retardant extended at least 0.75 mile downstream from where the retardant entered the stream. Movement of the retardant was stopped because the stream became dry. Fire fighting personnel saw one dead Gila trout. Black Canyon is also occupied by Chiricahua leopard frogs in the vicinity of the Meown fire. Although no tadpole or adult mortalities were observed, if Chiricahua leopard frog eggs, tadpoles, or adults were present, it is very likely that the retardant killed or harmed individuals.

Trout mortality has been reported previously from fire retardant accidentally being dropped on streams during fire suppression activities (*in litt.* 2003). In addition, laboratory tests of the effects of fire retardant on rainbow trout juveniles showed that the accidental inputs of these chemicals into streams would require dilutions of 100-1750 fold to reach concentrations non-lethal to trout (Buhl and Hamilton 2000). Considering that Black Canyon is a small stream with a flow of approximately 1 cfs or less in the summer, it is highly unlikely that there was sufficient dilution to prevent mortality.

Fire retardants contain ammonium compounds that are typically toxic to fish (Gaikowski et al. 1996, Buhl and Hamilton 2000). Amphibians may be less sensitive to ammonia toxicity. Prolonged exposure to elevated levels of ammonium compounds have been shown to have minimal to moderate affects on the survival and development of amphibian embryos and larvae (Jofre and Karasov 1999). Probably more important, is sodium ferrocyanide, an ingredient in retardants which is used as a corrosion inhibitor. This substance has been shown to be highly toxic to fish and amphibians at very dilute concentrations, especially when exposed to sunlight (Burdick and Lipschuetz 1950, Little and Calfee 2000). Little and Calfee (2000) reported that fire retardants with sodium ferrocyanide, under natural light conditions were highly toxic to southern leopard frogs and boreal toads compared to treatments using the same chemical formulations without sodium ferrocyanide or without exposure to sunlight. Sodium ferrocyanide is oxidized in the presence of ultraviolet radiation, releasing higher concentrations of free cyanide.

It is not known if more than one Gila trout or how many Chiricahua leopard frogs were killed or harmed by the emergency action. However, use of the retardant was justified. Had the fire escaped initial attack efforts and become much larger, the effects on the stream, Gila trout, and Chiricahua leopard frog would have potentially been much greater. Populations of Gila trout have been lost after high intensity wild fires because of subsequent ash and sediment flows (Brown *et al.* 2001). It is likely that construction of a fire line so close to the active channel may lead to increased runoff and sediment delivery to the creek during rain events. Because the fire line construction was at the lower end of occupied habitat, the amount of habitat affected is relatively small. However, the increased sediment levels may be detrimental to the amount and quality of spawning gravels available to Gila trout in this reach and may decrease the volume of pools, important habitat for both Gila trout and Chiricahua leopard frog.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions on endangered or threatened species or critical habitat that are reasonably certain to occur in the foreseeable future in the action area considered in this biological opinion. Future Federal actions that are unrelated to the action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Cumulative effects analysis as stated here applies to section 7 of the Act and should not be confused with the broader use of this term in the National Environmental Policy Act or other environmental laws.

The Service has proposed to downlist the Gila trout from endangered to threatened with a special 4(d) rule that would permit angling for Gila trout in some (as yet undetermined) streams. The NMDGF in conjunction with the Service will determine what streams will be opened to angling. It is anticipated that this change in fishing regulations (allowing take of Gila trout) will increase the amount of recreational use to streams occupied by Gila trout. In the case of Black Canyon this could also impact the Chiricahua leopard frog by increasing levels of human disturbance and by possible transmission of the chytrid fungus by anglers unaware or unwilling to disinfect their gear between visits to various bodies of water.

CONCLUSION

After reviewing the current status of Gila trout and Chiricahua leopard frog, the environmental baseline for the action area, the effects of the emergency action, and the cumulative effects, it is the Service's biological opinion that the emergency action did not jeopardize the continued existence of the two species. No critical habitat is currently designated for either species; therefore, none was affected. This conclusion was reached because the emergency action (dropping of fire retardant into Black Canyon) was very limited in scope and it appears that very few individuals of Gila trout or Chiricahua leopard frog were taken.

INCIDENTAL TAKE

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting, or attempting to engage in any such conduct. Harass is further defined by us as intentional or negligent actions that creates the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering. Harm is further defined by us to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of the agency action is not considered a prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Using available information as presented within this document, we have identified take for the Gila trout and probable take for the Chiricahua leopard frog as a result of dropping fire retardant into Black Canyon.

Amount or extent of take

This emergency biological opinion anticipates the following form and amount of take:
1. Death of a least one but possibly several Gila trout
2. Death or harm of several Chiricahua leopard frogs

Effect of the take

In this biological opinion, the Service determines that the level of take did not jeopardize the continued existence of the Gila trout or the Chiricahua leopard frog.

Incidental take statements in emergency biological opinions do not include reasonable and prudent measures or terms and conditions to minimize take unless the agency has ongoing action related to the emergency. The Forest Service has not advised us of any ongoing actions related to the emergency.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of an action on listed species or critical habitat, to help implement recovery plans, or to develop information. The recommendations provided here relate only to the action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibility for these species. In order for us to be kept informed of actions that either minimize or avoid adverse effects or that benefit listed species and their habitats, we request notification of the implementation of the conservation recommendations. We recommend the following conservation recommendations be implemented:

1. We recommend that the Forest Service consider initiating a Forest-wide programmatic consultation on fire suppression and rehabilitation activities with the New Mexico Ecological Services Field Office.

CLOSING STATEMENT

This concludes formal emergency consultation on the Meown Wildfire, on the Wilderness Ranger District, Gila National Forest. In future communications regarding this project, please refer to consultation #2-22-04-F-0090. If you have any questions or would like to discuss any part of this biological opinion, please contact Marilyn Myers of my staff at (505) 761-4754.

Sincerely,

Susan MacMullin

Susan MacMullin
Field Supervisor

cc:
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