United States Department of the Interior

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Cons: #22420-2011-F-0034

Memorandum

To: Chief, Division of Wildlife and Sport Fisheries Restoration, U.S. Fish and Wildlife Service, Albuquerque, New Mexico (Attn: Steve Robertson)

From: Field Supervisor

Subject: Biological Opinion on the Effects of Granting of Funds to Stock Sport Fish for Recreational Angling at Bear Canyon Lake, New Mexico

Thank you for your request of December 28, 2010, for formal intra-Service consultation with the New Mexico Ecological Services Field Office (NMESFO) pursuant to section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). At issue are impacts that may result from the granting of funds (Grant NM F-66M) to stock triploid rainbow trout (*Oncorhynchus mykiss*) and channel catfish (*Ictalurus punctatus*) into Bear Canyon Lake, Grant County, New Mexico. The proposed action may affect the Chiricahua leopard frog (*Lithobates chiricahuensis*) (frog), a threatened species. You have determined that the action "may affect, is likely to adversely affect" the frog and its proposed critical habitat.

The current biological opinion (BO) does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statute and the August 6, 2004, Ninth Circuit Court of Appeals decision in Gifford Pinchot Task Force v. USDI Fish and Wildlife Service (CIV No. 03-35279) to complete the following analysis with respect to proposed critical habitat. This consultation analyzes the effects of the action and its relationship to the function and conservation role of frog critical habitat to determine whether the current proposal destroys or adversely modifies proposed frog critical habitat. This document transmits the NMESFO's biological opinion (BO) for the frog and our conference opinion (CO) on the frog's proposed critical habitat in accordance with the Act.

CONSULTATION HISTORY

This BO is based on the information provided in your consultation request dated December 28, 2010, other information available to the Service, email and telephone conversations with your staff, data in our files; data presented in the Recovery Plan (Service 2007); literature review; and other sources of information including the final rule to list the frog as threatened (Service 2002; 67 FR 40790) and proposed critical habitat for the species (76 FR 14126). References cited in

this BO are not a complete bibliography of all literature available on the frog. A complete administrative record of this consultation is on file at this office.

BIOLOGICAL OPINION

Action Area

The action area for the proposed project includes all areas directly or indirectly affected by the Federal action. For this consultation, we defined the action area as Bear Canyon Lake and adjacent areas of the Mimbres River within a reasonable dispersal distance for the frog. Dispersal distances from occupied habitat are: a) within 1 mile overland, b) within 3 miles along an ephemeral or intermittent drainage, or c) within 5 miles along a perennial stream. Thus, the action area includes the frog's Rio Mimbres Management Area of Recovery Unit 8 (Service 2007).

DESCRIPTION OF THE PROPOSED ACTION

The U.S. Fish and Wildlife Service's (Service) Division of Wildlife and Sport Fisheries Restoration (WSFR) proposes to provide Sport Fish Restoration funding under the NM F-66M Fish and Wildlife Management Coordination and Planning grant to the New Mexico Department of Game and Fish (NMDGF) for annual stocking of 12,600 catchable (>8 inches) triploid rainbow trout into Bear Canyon Lake, within the Mimbres watershed, which is considered a closed basin. Fish are stocked monthly from January through March and October through December to provide a put/take fishery. The lake has been stocked in the past and may be stocked in the future with channel catfish fingerlings (3-5 inches). For each stocking event, fish would be loaded into a tanker truck and transported to stocking locations via established roads and access points. Fish may be stocked directly from the truck, netted out along a "bus route", or delivered via foot or boot to specific locations.

Conservation Measures

1) NMDGF proposes to construct and operate a frog ranarium facility at its Glenwood State Fish Hatchery. This facility will be designed and operated in cooperation with the Chiricahua leopard frog recovery team, and is intended to rear frogs for reintroduction into suitable habitat. It could also serve as a temporary refugium if necessary.

2) NMDGF will develop an outreach program to educate anglers and other members of the public about the threats to the frog and other listed aquatic species. Outreach will focus on actions that can be taken to reduce potential adverse effects, especially inadvertent transport of aquatic pathogens.

3) NMDGF will propose a study to determine the level of use of waterdogs (Tiger salamander (*Ambystoma tigrinum*) larvae)) in the Gila and Mimbres drainages. If the study finds that the use of waterdogs by anglers is a threat to Federally-listed species,

NMDGF will propose to the New Mexico State Game Commission that the use of waterdogs be restricted within these watersheds.

STATUS OF SPECIES/CRITICAL HABITAT

The Chiricahua leopard frog was listed as threatened without critical habitat on June 13, 2002, (67 FR 40790). Included was a special rule to exempt operation and maintenance of livestock tanks on non-Federal lands from the section 9 take prohibitions of the Act.

The frog is distinguished from other members of the *Lithobates 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 approximately 2.1 to 5.4 inches (Platz and Mecham 1979, Stebbins 2003). The Ramsey Canyon leopard frog (Lithobates "subaquavocalis"), found on the eastern slopes of the Huachuca Mountains, Cochise County, Arizona, has recently been subsumed into *Lithobates chiricahuensis* (Crother 2008) and recognized by the U.S. Fish and Wildlife Service (Service) as part of the listed entity (Service 2009).

The range of the Chiricahua leopard frog includes central and southeastern Arizona; west-central and southwestern New Mexico; and, in Mexico, northeastern Sonora, the Sierra Madre Occidental of northwestern and west-central Chihuahua, and possibly as far south as northern Durango (Platz and Mecham 1984, Degenhardt et al. 1996, Lemos-Espinal and Smith 2007, Rorabaugh 2008). Reports of the species from the State of Aguascalientes (Diaz and Diaz 1997) are questionable. The distribution of the species in Mexico is unclear due to limited survey work and the presence of closely related taxa (especially *Lithobates lemosespinali*) in the southern part of the range of the Chiricahua leopard frog. Historically, the frog was an inhabitant of a wide variety of aquatic habitats, including cienegas, pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations of 3,281 to 8,890 feet. However, the species is now limited primarily to headwater streams, springs and cienegas, and cattle tanks into which non-native predators (e.g. sport fishes, American bullfrogs, crayfish, and tiger salamanders) have not yet invaded or where their numbers are low (U.S. Fish and Wildlife Service 2007). The large valley-bottom cienegas, rivers, and lakes where the species occurred historically are populated with non-native predators at densities with which the species cannot coexist.

Based on 2009 data, the species is still extant in the major drainage basins in Arizona and New Mexico where it occurred historically; with the exception of the Little Colorado River drainage in Arizona and possibly the Yaqui drainage in New Mexico. It has not been found recently in many rivers within those major drainage basins, valleys, and mountains ranges, including the following in Arizona: White River, West Clear Creek, Tonto Creek, Verde River mainstem, San Francisco River, 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 Pinaleño Mountains or Sulphur Springs Valley; and the species is now apparently extirpated from the Chiricahua Mountains. Moreover, the species is now absent from all but one of the southeastern Arizona valley bottom cienega complexes. In many of these regions Chiricahua leopard frogs were not found for a decade or more despite repeated surveys.

As of 2009, there were 84 sites in Arizona at which Chiricahua leopard frogs occur or are likely to occur in the wild, with an additional four captive or partially captive refugia sites. At least 33 of the wild sites support breeding. In New Mexico, occurrences are characterized by few, mostly small, isolated populations. The final rule listing the species indicated the frog had been found at 41 sites in New Mexico from 1994-1999, and 31 of these 41 sites were verified as extant during 1998-1999. The rule explains that frogs were found at only 8 of 34 surveyed sites (of the original 41 sites) in 2000. The recovery plan indicated that 30-35 populations of Chiricahua leopard frogs were likely extant in New Mexico at the time of writing (2006-7) (Service 2007). The tally of these 30-35 populations included dispersal sites, which indicates that not all of these populations were robust, breeding sites. Starting with the 41 sites from 1994-1999, 27 of those sites are now extirpated, 4 of them are considered unstable with low population numbers or are possibly extirpated, 2 are considered dispersal observations with no reproduction, 1 has an unknown status due to inaccessibility, and 7 sites support reproduction and no significant die-off or population loss has been observed. Based on these data, 27 of the 41 sites are considered extirpated, representing a 66 percent drop in the known Chiricahua leopard frog sites in New Mexico during this 5-year period. Since listing in 2002, an additional 30 new sites have been identified. To date, 15 of these 30 new sites have been extirpated, 6 are unstable with low population numbers or are possibly extirpated, 4 are considered dispersal observations with no reproduction, 1 site is on private property with an unknown population status, and at 4 sites reproduction is occurring and no significant die-off or population loss has been observed.

The species has been extirpated from about 80 percent of its historical localities in Arizona and New Mexico. Nineteen and eight localities are known from Sonora and Chihuahua, respectively. The species' current status in Mexico is poorly understood; however, it has been found in recent years in western Chihuahua. Some threats, such as introduced non-native predators and the threat of catastrophic wildfire, appear to be less important south of the border, particularly in the mountains where Chiricahua leopard frogs have been found (Gingrich 2003, Rosen and Melendez 2006, Rorabaugh 2008).

The primary threats to this species are predation by non-native organisms and die offs caused by a fungal skin disease – chytridiomycosis. Additional threats include drought; floods; degradation and loss of habitat as a result of water diversions and groundwater pumping; poor livestock management; altered fire regimes due to fire suppression and livestock grazing; mining, development, and other human activities; disruption of metapopulation dynamics; increased chance of extirpation or extinction resulting from small numbers of populations and individuals; and environmental contamination (U.S. Fish and Wildlife Service 2007). Loss of Chiricahua leopard frog populations is part of a pattern of global amphibian decline, suggesting other regional or global causes of decline may be important as well (Carey et al. 2001). Witte et al. (2008) analyzed risk factors associated with disappearances of ranid frogs in Arizona and found

that population loss was more common at higher elevations and in areas where other ranid population disappearances occurred. Disappearances were also more likely where introduced crayfish occur, but were less likely in areas close to a source population of frogs.

The chytridiomycete skin fungus, *Batrachochytrium dendrobatidis* (*Bd*), the organism that causes chytridiomycosis, is responsible for global declines of frogs, toads, and salamanders (Berger et al. 1998, Longcore et al. 1999, Speare and Berger 2000, Hale 2001). Decline or extinction of about 200 amphibian species worldwide has been linked to the disease (Skerratt et al. 2007). In Arizona, *Bd* infections have been reported from numerous populations of Chiricahua leopard frogs in southeastern Arizona and one population on the Tonto National Forest, as well as populations of several other frogs and toads in Arizona (Morell 1999, Davidson et al. 2000, Sredl and Caldwell 2000, Hale 2001, Bradley et al. 2002, U.S. Fish and Wildlife Service 2007). In New Mexico, chytridiomycosis appears to be widespread in populations in west-central New Mexico, where it often leads to population extirpation. A threats assessment conducted for the species during the development of the recovery plan identified *Bd* as the most important threat to the frog in recovery units 7 and 8 in New Mexico. In recovery unit 6, which includes much of the mountainous region of west-central New Mexico, *Bd* and non-native predators were together identified as the most important threats. Die-offs typically occur during the cooler months from October-February (U.S. Fish and Wildlife Service 2007).

The role of the fungi in the population dynamics of the Chiricahua leopard frog is as yet undefined. Some populations are driven to extinction soon after the animals become symptomatic; however, other Chiricahua leopard frog populations can exist with the disease for years (U.S. Fish and Wildlife Service 2007). For instance, the frog has coexisted with *Bd* in Sycamore Canyon, Santa Cruz County, Arizona since at least 1972. That is the earliest record for *Bd* in the western United States, which roughly corresponds to the first observed mass die-offs of ranid frogs in Arizona. Even in cases where populations exist with the disease, it is an additional stressor, resulting in periodic die-offs that increase the likelihood of extirpation and extinction.

Epizootiological data from Central America and Australia (high mortality rates, wave-like spread of declines, wide host range) suggest introduction of the disease into previously uninfected populations and the disease subsequently becoming enzootic in some areas. Alternatively, the fungus may be a widespread organism that has emerged as a pathogen because of either higher virulence or an increased host susceptibility caused by other factors such as environmental changes (Berger et al. 1998), including changes in climate or microclimate, contaminant loads, increased UV-B radiation, or other factors that cause stress (Pounds and Crump 1994; Carey et al. 1999, 2001; Daszak 2000). Morehouse et al. (2003) found low genetic variability among 35 *Bd* strains from North America, Africa, and Australia, suggesting that the first hypothesis – that it is a recently emerged pathogen that has dispersed widely – is the correct hypothesis. Retrospective analysis revealed presence of chytridiomycosis in wild African clawed frogs (*Xenopus laevis*) dating to 1938 (Weldon et al. 2004). African clawed frogs were exported to many areas of the globe from Africa for use in human pregnancy testing beginning in the 1930s. Some of the test frogs escaped or were released and established populations in California,

Arizona, and other areas. Although other explanations for the origin of the disease are viable, Weldon et al. (2004) suggest that Africa is where the disease originated and that international trade in African clawed frogs was the means of disease dissemination.

If the disease was introduced to the Southwest via escaped or released clawed frogs, it may have spread across the landscape by human introductions or natural movements of secondarily-infected American bullfrogs, tiger salamanders, or leopard frogs. If this is the case, its rapid establishment and spread could be attributable to humans. *Bd* does not have an airborne spore, so it must spread via other means. Amphibians in the international pet trade (Europe and USA), outdoor pond supplies (USA), zoo trade (Europe and USA), laboratory supply houses (USA), and species recently introduced (*Rhinella marinus* in Australia and American bullfrog in the USA and Uruguay) have been found infected with *Bd*, suggesting human-induced spread of the disease (Daszak 2000, Mazzoni et al. 2003).

Free-ranging healthy bullfrogs with low-level *Bd* infections have been found in southern Arizona (Bradley et al. 2002). Tiger salamanders and bullfrogs can carry the disease without exhibiting clinically significant or lethal infections. When these animals move, or are moved by people, among aquatic sites, *Bd* may be carried with them (Collins et al. 2003, Picco and Collins 2008). Other native or non-native frogs may serve as disease vectors or reservoirs of infection, as well (Bradley et al. 2002). Green and Dodd (2007) found Bd in bullfrogs at a fish hatchery in Georgia and suggested the disease could be moved with stocks of fish. Since that study, *Bd* was confirmed from a bullfrog captured at the Bubbling Ponds Hatchery in Arizona (V. Boyarski, pers. comm.). *Bd* could also be spread by tourists or fieldworkers sampling aquatic habitats (Halliday 1998). The fungus can exist in water or mud and thus could be spread by wet or muddy boots, vehicles, cattle, fishing gear, and other animals moving among aquatic sites, or during scientific sampling of fish, amphibians, or other aquatic organisms.

Numerous studies indicate that declines and extirpations of Chiricahua leopard frogs are at least in part caused by predation and possibly competition by non-native organisms, including fishes in the family Centrarchidae (*Micropterus* spp., *Lepomis* spp.), bullfrogs (*Lithobates catesbeiana*), tiger salamanders (*Ambystoma mavortium mavortium*), crayfish (*Orconectes virilis* and possibly others), and several other species of fishes (Clarkson and Rorabaugh 1989; Sredl and Howland 1994; Fernandez and Bagnara 1995; Rosen et al. 1996, 1994; Snyder et al. 1996; Fernandez and Rosen 1996, 1998). For instance, in the Chiricahua region of southeastern Arizona, Rosen et al. (1996) found that almost all perennial waters investigated that lacked introduced predatory vertebrates supported Chiricahua leopard frogs. All waters except three that supported introduced vertebrate predators lacked Chiricahua leopard frogs. Sredl and Howland (1994) noted that Chiricahua leopard frogs were nearly always absent from sites supporting bullfrogs and non-native predatory fish. Rosen et al. (1996) suggested further study was needed to evaluate the effects of mosquitofish, trout, and catfish on frog presence.

Knapp and Mathews (2000) evaluated the likelihood that other factors, such as disease, contaminants, and increasing UV-B radiation might be important factors in the observed declines of Mountain yellow-legged frogs. They concluded that introduced trout was the key factor in those declines, although these other factors might be contributing to declines, as well. Similar to the

situation with the Mountain yellow-legged frog, the Chiricahua leopard frog occurred historically at a number of the large lakes in the Mogollon Rim region of east-central Arizona, but no longer occurs at these sites (e.g. Hawley Lake – 1967, Blue Lake – 1984, Horseshoe Lake – 1967, Blue Ridge Reservoir – 1972, Nelson Reservoir – 1971, Rainbow Lake – 1972, Tonto Lake – 1971, Baker lake – 1980, and Luna Lake ~1979; year shown is the last year Chiricahua leopard frogs were found). These lakes all contain introduced trout and in some cases other fishes and the last record of a Chiricahua leopard frog at any of these sites is 1984. This is not definitive proof that trout causes extirpation of Chiricahua leopard frogs, but these observations provide evidence that trout may be a factor in the species' decline.

On the other hand, trout and Chiricahua leopard frogs apparently coexisted for some time at the species' type locality, Herb Martyr in the Chiricahua Mountains. However, the length of time the two persisted, or whether the population of frogs may have been a sink into which individuals immigrated from other populations, is unknown. Field notes of Dr. Richard Zweifel suggest that the frogs disappeared between 1974 and 1992; during the latter visit, Zweifel noted that the pond had largely filled in with gravel, although trout persisted in deeper pools below the dam. Whether predation by trout contributed to the demise of the frog at Herb Martyr is unknown.

Disruption of metapopulation dynamics is likely an important factor in regional loss of populations (Sredl and Howland 1994, Sredl et al. 1997). Chiricahua leopard frog populations are often small and habitats are dynamic, resulting in a relatively low probability of long-term population persistence. Historically, populations were more numerous and closer together. If populations were extirpated due to drought, disease, or other causes, sites could be recolonized via immigration from nearby populations. However, as numbers of populations declined, populations became more isolated and were less likely to be recolonized if extirpation occurred. Also, most of the larger source populations along major rivers and in cienega complexes have disappeared.

Fire frequency and intensity in Southwestern forests are much altered from historical conditions (Dahms and Geils 1997). Before 1900, surface fires generally occurred at least once per decade in montane forests with a pine component. Beginning about 1870-1900, these frequent ground fires ceased to occur due to intensive livestock grazing that removed fine fuels, followed by effective fire suppression in the mid to late 20th century (Swetnam and Baisan 1996). Absence of ground fires allowed a buildup of woody fuels that precipitated infrequent but intense crown fires (Swetnam and Baisan 1996, Danzer et al. 1997). Absence of vegetation and forest litter following intense crown fires exposes soils to surface and rill erosion during storms, often causing high peak flows, sedimentation, and erosion in downstream drainages (DeBano and Neary 1996). These post-fire events have likely resulted in scouring or sedimentation of frog habitats (Wallace 2003).

An understanding of the dispersal abilities of Chiricahua leopard frogs is key to determining the likelihood that suitable habitats will be colonized from a nearby extant population of frogs. As a group, leopard frogs are surprisingly good at dispersal. In Michigan, young northern leopard frogs (Lithobates pipiens) commonly move up to 0.5 mile from their place of metamorphosis, and three young males established residency up to 8.4 miles from their place of metamorphosis (Dole 1971). Both adults and juveniles wander widely during wet weather (Dole 1971). In the

Cypress Hills, southern Alberta, young-of-the year northern leopard frogs successfully dispersed to downstream ponds 3.4 miles from the source pond, upstream 0.6 mile, and overland 0.6 mile. At Cypress Hills, a young-of-the-year northern leopard frog moved 5 miles in one year (Seburn et al. 1997). The Rio Grande leopard frog (*Lithobates berlandieri*) in southwestern Arizona has been observed to disperse at least one mile from any known water source during the summer rainy season (Rorabaugh 2005). After the first rains in the Yucatan Peninsula, leopard frogs have been collected a few miles from water (Campbell 1998). In New Mexico, Jennings (1987) noted collections of Rio Grande leopard frogs from intermittent water sources and suggested these were frogs that had dispersed from permanent water during wet periods.

Dispersal of leopard frogs away from water in the arid Southwest may occur less commonly than in mesic environments in Alberta, Michigan, or the Yucatan Peninsula during the wet season. However, there is evidence of substantial movements even in Arizona. Movement may occur via locomotion of frogs or passive movement of tadpoles along streamcourses. The maximum distance moved by a radio-telemetered Chiricahua leopard frog in New Mexico was 2.2 miles in one direction (R. Jennings, C. Painter, pers. comm. 2004). In 1974, Frost and Bagnara (1977) noted passive or active movement of Chiricahua and Plains (*Lithobates blairi*) leopard frogs for 5 miles or more along East Turkey Creek in the Chiricahua Mountains. In August, 1996, Rosen and Schwalbe (1998) found up to 25 young adult and subadult Chiricahua leopard frogs at a roadside puddle in the San Bernardino Valley, Arizona. They believed that the only possible origin of these frogs was a stock tank located 3.4 miles away. Rosen et al. (1996) found small numbers of Chiricahua leopard frogs at two locations in Arizona that supported large populations of non-native predators. The authors suggested these frogs could not have originated at these locations because successful reproduction would have been precluded by predation. They found that the likely source of these animals were populations 1.2-4.3 miles distant. In September 2009, 15-20 Chiricahua leopard frogs were found at Peña Blanca Lake west of Nogales. The nearest likely source population is Summit Tank, a straight line distance of 3.1 miles overland and approximately 4.1 miles along intermittent drainages.

Movements away from water do not appear to be random. Streams are important dispersal corridors for young northern leopard frogs (Seburn et al. 1997). Displaced northern leopard frogs will home, and apparently use olfactory and auditory cues, and possibly celestial orientation, as guides (Dole 1968, 1972). Rainfall or humidity may be an important factor in dispersal because odors carry well in moist air, making it easier for frogs to find other wetland sites (Sinsch 1991). Based on these studies, the Chiricahua leopard frog recovery plan (U.S. Fish and Wildlife Service 2007) provides a general rule on dispersal capabilities. Chiricahua leopard frogs are assumed to be able to disperse one mile overland, three miles along ephemeral drainages, and five miles along perennial water courses.

Additional information about the Chiricahua leopard frog can be found in Platz and Mecham (1984, 1979), Sredl and Howland (1994), Jennings (1995), Rosen et al. (1996, 1994), Degenhardt et al. (1996), Sredl et al. (1997), Painter (2000), Sredl and Jennings (2005), and Service (2007).

Proposed Critical Habitat

On March 15, 2011, we proposed to designate approximately 11,136 acres in Arizona and New Mexico as critical habitat for the frog (76 FR 14126). Primary constituent elements for the proposed Chiricahua leopard frog critical habitat were determined from the studies and information on the species' habitat, ecology, and life history as described below. These needs are identified in the species' recovery plan (Service 2007), particularly in the Habitat Characteristics and Ecosystems section of Part1: Background (pp. 15-18); in the Recovery Strategy in Part 11: Recovery (pp. 49-51); in Appendix C – Population and Habitat Viability Analysis (pp. C8-C35); and in Appendix D – Guidelines for Establishing and Augmenting Chiricahua Leopard Frog Populations, and for Refugia and Holding Facilities (pp. D2-D5). Additional insight is provided by Degenhardt *et al.* (1996, pp. 85-87), Sredl and Jennings (2005, pp. 546-549), and Witte *et al.* (2008, pp. 5-8).

Proposed critical habitat units occur in Apache, Cochise, Gila, Graham, Greenlee, Pima, Santa Cruz, and Yavapai Counties, Arizona; and Catron, Grant, Hidalgo, Socorro, and Sierra Counties, New Mexico (76 FR 14126). The primary constituent elements of critical habitat for the Chiricahua leopard frog are:

(i) Aquatic breeding habitat and immediately adjacent uplands exhibiting the following characteristics:

(A) Perennial (water present during all seasons of the year) or nearly perennial pools or ponds at least 6.0 feet (1.8 meters) in diameter and 20 inches (0.5 meters) in depth;

(B) Wet in most years, and do not or only very rarely dry for more than a month;

(C) pH greater than or equal to 5.6;

(D) Salinity less than 5 parts per thousand;

(E) Pollutants absent or minimally present at low enough levels that they are barely detectable;

(F) Emergent and or submerged vegetation, root masses, undercut banks, fractured rock substrates, or some combination thereof; but emergent vegetation does not completely cover the surface of water bodies;

(G) Nonnative crayfish, predatory fishes, bullfrogs, barred tiger salamanders, and other introduced predators absent or occurring at levels that do not preclude presence of the Chiricahua leopard frog;

(H) Absence of chytridiomycosis, or if chytridiomycosis is present, then conditions that allow persistence of Chiricahua leopard frogs with the disease (e.g., water temperatures that do not drop below 20 °C (68 °F), pH of greater than 8 during at least part of the year); and

(I) Uplands immediately adjacent to breeding sites that Chiricahua leopard frogs use for foraging and basking.

(ii) Dispersal habitat, consisting of ephemeral (water present for only a short time), intermittent, or perennial drainages that are generally not suitable for breeding, and associated uplands that provide overland movement corridors for frogs among breeding sites in a metapopulation with the following characteristics:

(A) Are not more than 1.0 mile (1.6 kilometers) overland, 3.0 miles (4.8 kilometers) along ephemeral or intermittent drainages, 5.0 miles (8.0 kilometers) along perennial drainages, or some combination thereof not to exceed 5.0 miles (8.0 kilometers);

(B) Provide some vegetation cover for protection from predators, and in drainages, some ephemeral, intermittent, or perennial aquatic sites; and

(C) Are free of barriers that block movement by Chiricahua leopard frogs, including urban, industrial, or agricultural development; reservoirs that are 50 acres (20 hectares) or more in size and stocked with predatory fishes, bullfrogs, or crayfish; highways that do not include frog fencing and culverts; and walls, major dams, or other structures that physically block movement.

Recovery Plan

A recovery plan has been completed (U.S. Fish and Wildlife Service 2007), the goal of which is to improve the status of the species to the point that it no longer needs the protection of the Act. The recovery strategy calls for reducing threats to existing populations; maintaining, restoring, and creating habitat that will be managed in the long term; translocating frogs to establish, reestablish, or augment populations; building support for the recovery effort through outreach and education; monitoring; conducting research needed to provide effective conservation and recovery; and application of research and monitoring through adaptive management. Recovery actions are recommended in each of eight recovery units throughout the range of the species. Management areas are also identified within recovery units where the potential for successful recovery actions is greatest.

ENVIRONMENTAL BASELINE

Under section 7(a)(2) of the Act, when considering the effects of the action on federally listed species, the Service is required to take into consideration the environmental baseline. Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impacts of State and private actions that are contemporaneous with the consultation in progress.

Environmental Setting

Bear Canyon Lake, when full, covers roughly 25 acres in pinyon-juniper habitat at about 6,100 feet elevation. This lake was constructed in the 1930s along a tributary to the Mimbres River. The area was purchased by NMDGF in 1949 and supports a non-native sport fishery including channel catfish, rainbow trout, and largemouth bass (*Micropterus salmoides*). Sediment accumulation in Bear Canyon Lake prompted recent draining and excavation to improve sportfish habitat. The dam was refurbished from 2001-2003 and the outlet was modified and a "Coanda" fish screen (1-mm mesh) was installed to prevent escape of any fish from the lake. Channel catfish and rainbow trout have been stocked annually since 2002. The recent proposed critical habitat rule for the frog identified that channel catfish, black crappie (*Pomoxis nigromaculatus*), largemouth bass, and bluegill (*Lepomis macrochirus*), plus winter stocked rainbow trout may spill periodically from Bear Canyon Lake into the Mimbres River. However, the BA identifies that, despite numerous flood events in recent years within the drainage, no escaped fish have been detected during multiple years of fish surveys in the Mimbres River. We believe this indicates that the screen has been successful in preventing fish escape in recent years, and the proposed rule is in error. The area is popular with bird watchers and hikers. The lake has a primitive campground and is surrounded by Gila National Forest lands that support a variety of recreational opportunities. The Gila National Forest has a land base of approximately 3.3 million acres. This land base is drained by several major drainages with considerable occupied or potential habitat within the historic range of the frog.

No bullfrogs or crayfish have ever been found in this section of the Mimbres River; although if introduced, they could pose a significant threat. Nevertheless, low numbers of bullfrogs are found in tributaries of the Mimbres River (Service 2007). The threatened Chihuahua chub (*Gila nigrescens*) occurs in the upper reach, and introduced rainbow trout occur throughout the areas where there is water. Both trout and chub likely prey upon Chiricahua leopard frog tadpoles. A barrier to invasion of Moreno Spring by non-native fish exists and is maintained in operating condition. Bear Canyon Lake reportedly supports populations of channel catfish, black crappie (*Pomoxis nigromaculatus*), largemouth bass, and bluegill (*Lepomis macrochirus*), plus winter stocked rainbow trout (Service 2011).

Chiricahua Leopard Frogs in and near the Action Area

Bear Canyon Lake is a tributary to the Mimbres River, which is located within the Rio Mimbres Management Area of Recovery Unit 8 for the frog (Service 2007). There are several populations of Chiricahua leopard frogs present within the Mimbres Drainage. One of these is located at Moreno Spring (private property) located about 0.5 river miles from Bear Canyon Lake. The spring is located within the Mimbres River approximately 0.25 miles downstream of the Bear Canyon Lake Dam, then 0.25 miles upstream to the spring. This robust breeding population has remained stable in recent years. Another population of frogs also breeds in the river itself and at ponds at Emory Oak Ranch. The third population is located within the lower stretches of the Mimbres River (some Nature Conservancy property) near the pueblo of Mimbres, near the New Mexico 152 bridge, and near San Juan (also Nature Conservancy property). Chiricahua leopard frogs from this area have persisted with *Bd* since at least 2001.

The proposed Mimbres River Critical Habitat Unit 40 is located within the action area and divided into two disjunct reaches of the Mimbres River that are separated by a 6.6-mi (10.6-km) intermittent reach. This unit consists of 1,097 acres of private lands. Proposed critical habitat in the upper Mimbres River includes an approximate 2.42-mile reach that begins where the river flows into The Nature Conservancy's property and continues downstream to the confluence with Bear Canyon. The approximate 5.82-mile proposed lower critical habitat reach begins at the bridge over the Mimbres River just west of San Lorenzo and continues downstream to where it exits The Nature Conservancy's Disert parcel near Faywood. Frogs are currently present in both reaches of the proposed unit in the Mimbres River.

EFFECTS OF THE ACTION

No studies have been conducted on the effects of introduced trout on the Chiricahua leopard frog. However, there is no reason to believe rainbow trout would not feed upon Chiricahua leopard frog tadpoles. Rainbow trout feed primarily on emerging and terrestrial insects drifting in the water column, but are also known to take fish (McGinnis 1984, Richard and Soltz 1986), and can be significant predators on ranid tadpoles. Chiricahua leopard frogs and other leopard frogs can coexist with introduced predators in complex habitats that provide escape cover for frogs and tadpoles (U.S. Fish and Wildlife Service 2007). The current conditions at Bear Canyon Lake do not include ample vegetative, escape cover around the perimeter of the lake.

Stocking of the rainbow trout and channel catfish across the six-month season would result in a continuing presence of these species at some level across the stocking season and throughout the year. Stocked rainbow trout and channel catfish in Bear Canyon Lake would, given the opportunity, prey upon Chiricahua leopard frogs. An absence of Chiricahua leopard frog records from the lake suggests the either frogs are unable to emigrate from the Mimbres River or that the mix of non-native fishes, that occurred since the 1930s prevents Chiricahua leopard frogs from successfully establishing a population. Nevertheless, it is improbable that frogs would ever reach the lake because individuals would need to ascend the dam which is composed of about 75 feet of steep, rocky terrain. For these reasons, we do not anticipate frogs will ever successfully immigrate to the lake. We also do not find that the proposed stocking of fish would directly affect the frog populations downstream of Bear Canyon Lake within the Mimbres River because a fish screen was installed in 2003 and it has been successful in preventing fish from spilling over the dam and escaping into the Mimbres River.

Indirect Effects

Two types of indirect effects are possible: 1) unintentional movement of *Bd* to Bear Canyon Lake; and 2) sport fishing attracting anglers that might inadvertently introduce non-native species to the action area.

Transportation of sport fish from hatcheries has the potential to move non-target plants, mollusks, amphibians, diseases, and parasites. Bullhead catfish and some of the sunfishes likely were introduced unintentionally to the Southwest with stocks of more desirable sport fishes (Minckley and Marsh 2009). Dodd and Barichivich (2007) found evidence of inadvertent movement of bullfrog tadpoles with warm water fishes to Harris Neck National Wildlife Refuge, Georgia. Platz et al. (1990) indicated the most likely way that Rio Grande leopard frogs (*Lithobates berlandieri*) arrived

in Arizona was via unintentional transport with warm water fishes from a hatchery in New Mexico. Presence of Plains leopard frogs (*Lithobates blairi*) well outside of their range at the Utah State Fish Hatchery near Glen Canyon City is also likely the result of inadvertent transport with fish stocks. Green and Dodd (2007) also documented *Bd* and amphibian microsporidian and myxozoan parasites in bullfrog tadpoles at four warmwater hatcheries in the southeastern U.S., which were likely moved inadvertently with stocks of hatchery fishes. A bullfrog in the outside ponds at Bubbling Ponds Fish Hatchery, adjacent to the Page Springs Hatchery, recently tested positive for *Bd* (V. Boyarski, pers. comm. 2009).

Inadvertent transport of bullfrogs or their tadpoles with stocks of fish could move *Bd* into Bear Canyon Lake. *Bd* can survive in water and remain infectious for 3-6 weeks (Johnson and Speare 2003), so potentially *Bd* could be moved in the water in which the fish are transported. Retallick (pers. comm. in Wixson and Rogers 2009) found *Bd* on the scales of fathead minnows; however, swab, scrape, and fin samples from rainbow trout in ponds known to harbor *Bd*- infected amphibians failed to test positive for the disease (Wixson and Rogers 2009). As noted above, *Bd*, has been present in the Mimbres since at least 2001 (Service 2011a). Although we consider the inadvertent transport of *Bd* to be an adverse affect to the frog, we do not be expect the frogs in the Mimbres River to be impacted, because it is already found in the Rio Mimbres Management Area of Recovery Unit 8 and Chiricahua leopard frogs continue to persist. Therefore, we do not expect this indirect effect would appreciably add to the current baseline conditions and or result in take of frogs within the action area.

Additionally, the continuing stocking and presence of sport fish at Bear Canyon Lake attracts anglers. These anglers bring with them boats and fishing gear that may be wet or have mud attached to them that could carry *Bd*. We believe the potential transport or *Bd* could have an adverse effect on the existing populations of leopard frogs in the Mimbres River. Still, it is unclear whether the continued use of these baits or equipment would increase the likelihood of *Bd* infection rates above existing levels in the Mimbres River. Currently, we do not anticipate that the inadvertent transport of *Bd* by anglers would result in incidental take of frogs within the action area.

Anglers may use crayfish or tiger salamanders as bait for some warm water fish, such as largemouth bass or channel catfish. Numerous studies indicate that declines and extirpations of Chiricahua leopard frogs are at least in part caused by predation and possibly competition by non-native organisms, including tiger salamanders or crayfish (Service 2007). Picco and Collins (2008) found waterdogs (tiger salamanders) infected with chytridiomycosis in Arizona bait shops, and waterdogs infected with ranavirus in Arizona, New Mexico, and Colorado bait shops. Additionally, in a survey of anglers that use tiger salamanders as bait, 67% of them claimed to release bait salamanders into the bodies of water they fished, even though such release is strictly prohibited by AGFD fishing regulations (Picco and Collins 2008). Even though tiger salamanders will prey upon leopard frogs, the two can coexist. Presence of tiger salamanders should not preclude recovery potential for leopard frogs, except perhaps in simple systems. We do not consider the Mimbres River in the action area a simple system, because it supports a robust population of frogs. Chiricahua leopard frogs are more likely to coexist with non-native predators in habitats that provide habitat diversity and complexity, where shallow water, vegetation cover, and other features provide refuge from predators (Service 2007). The use of crayfish and salamanders as baits has likely historically occurred and we anticipate their use will be ongoing in Bear Canyon Lake. We believe their use could have an

adverse effect on the existing populations of leopard frogs in the Mimbres River. Still, it is unclear whether the continued use of these baits would increase the likelihood of these organisms to become established in the Mimbres River. Currently, we do not anticipate that the use of crawfish or tiger salamanders would result in incidental take of frogs.

Finally, to prevent further colonization and/or transmittal of diseases by American bullfrogs, the use of live bullfrogs or their tadpoles for bait is illegal throughout New Mexico. The use or release of any bait fish is also prohibited in Bear Canyon Lake. Therefore, we do not anticipate adverse affects to Chiricahua leopard frogs from using dead bullfrogs or their part, or from bait fish.

Proposed Critical Habitat

There are 1,047 acres of proposed critical habitat unit within the action area. Two of the PCEs of proposed frog critical habitat within the upper reach have the potential to be adversely affected. We do not expect that any PCEs in the lower reach of proposed critical habitat will be affected since it is located too far from the upper reach to reasonably expect frogs to move between the two sites.

In the upper reach, the PCE under aquatic breeding habitat with the characteristic of nonnative crayfish, predatory fishes, bullfrogs, barred tiger salamanders, and other introduced predators absent or occurring at levels that do not preclude presence of the Chiricahua leopard frog could be adversely affected if bullfrogs, crawfish, or tiger salamanders are introduced into Bear Canyon Lake. Additionally, we would anticipate adverse effects to the PCE relating to the absence of chytridiomycosis if *Bd* is inadvertently transported as a result of the proposed action. Nevertheless, we do not expect either of these PCEs would be compromised to the extent that the function and conservation role of proposed critical habitat would be compromised or appreciably reduced over the entire recovery unit. We also do not anticipate any effects to the other PCEs of proposed frog critical habitat. We find that the effects to the function and conservation role of critical habitat relative to the recovery unit and the entire proposed designation are not significant because the impacts only have the potential to affect a relatively small area relative to the recovery unit and the overall proposed critical habitat designation. Therefore, we conclude that the PCEs of proposed frog critical habitat will serve the intended conservation role for species with implementation of the proposed action.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Although State law prohibits the use of bait fish and live bullfrogs in Bear Canyon Lake, the opportunity for transfers of nonnative species may occur illegally. The dumping of nonnative fish, crayfish, tiger salamanders, or bullfrogs by private individuals is considered a serious threat to the Chiricahua leopard frog in the Rio Mimbres Management Area.

CONCLUSION

After reviewing the current status of the Chiricahua leopard frog, the environmental baseline for the action area, the effects of the proposed annual fish stocking at Bear Canyon Lake, and the cumulative effects, it is the Service's biological and conference opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Chiricahua leopard frog, nor is the project likely to destroy or adversely modify proposed critical habitat. We reached these conclusions based on the following:

1. The potential for the Chiricahua leopard frog to immigrate to Bear Canyon Lake is minimal because of the steep rocky terrain. If any frogs reach the lake, stocked rainbow trout and channel catfish, will likely prey upon them. Nevertheless, we do expect that the existing populations of Chiricahua leopard frogs from the Mimbres River source populations would be eliminated or much affected.

2. If *Bd* is inadvertently introduced directly or indirectly as a result of the fish stocking or angling, it is not expected to affect the population persistence or result in take of the Chiricahua leopard frog in recovery the Rio Mimbres Management Area, Recovery Unit 8 because a) the disease is already present in the in the Management Area, and b) frogs continue to persist, despite presence of *Bd* in this area.

3. The potential transport of Bd or non-native species have the potential to cause adverse effects to some of the primary constituent elements of proposed critical habitat; yet, it is anticipated that these impacts will not affect the role of critical habitat unit 40 relative to the conservation of the frog and to the overall proposed critical habitat designation.

4. It is anticipated that the conservation measures that are part of the project proposal will contribute significantly to the recovery for Chiricahua leopard frog.

5. Fish stocking and angling in Bear Canyon Lake has been occurring for years. The use of nonnative crayfish, salamanders or other fish baits has likely historically occurred and we anticipate their use will be ongoing in Bear Canyon Lake. Still, we do not anticipate that the use of crawfish or tiger salamanders would result in incidental take of frogs.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any Conservation Measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined (50 CFR 17.3) to include significant

habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined (50 CFR 17.3) as intentional or negligent actions that create 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 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 to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

AMOUNT OR EXTENT OF TAKE

We do not anticipate that the proposed project will result in incidental take of frogs. Although we found the potential transport of *Bd* and non-native species may adversely affect the frog, these actions will not disrupt breeding, feeding, or sheltering activities. We do not anticipate that any direct mortality of individual frogs. Therefore, no reasonable and prudent measures are provided. However, if during the course of the action, incidental take occurs, such incidental take would represent new information requiring review of the project's effects. WSFR must immediately provide an explanation of the causes of the taking and review with us the need for possible addition of reasonable and prudent measures.

a. NMDGF shall, within 30 days of the erection of the sign described above submit to the New Mexico Ecological Services a brief, written report of the installation of the sign and the text of the sign.

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. The term "conservation recommendations" has been defined as Service suggestions regarding discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibility. In order for the Service to be kept informed of activities that either minimize or avoid adverse effects or that benefit listed species or their habitats, the Service requests notification of the implementation of the conservation recommendations below. The Service recommends the following conservation recommendations be implemented for the frog:

1. Coordinate with the Service on the design and implementation a study to determine the level of use of waterdogs in the Gila and Mimbres drainages.
2. Post an informational sign at Bear Canyon Lake for anglers and recreationists. The sign

should include, at a minimum, the fishing regulations for Bear Canyon Lake, including that use of bait fish and live American bullfrogs is illegal, and the release of any live animals is also illegal.

3. Immediately report bullfrogs, tiger salamanders, or crawfish captured or observed during NMDGF's annual monitoring of Chihuahua Chub populations along the Mimbres River.

REINITIATION - CLOSING STATEMENT

This concludes formal biological and conference opinion on the proposed action on the effects of granting of funds to stock sport fish for recreational angling at Bear Canyon Lake, New Mexico. You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if the proposed Chiricahua leopard frog critical habitat is designated within the action area. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

As provided in 50 CFR §402.16, reinitation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitation.

We appreciate your continued coordination and support for the recovery and protection of the frog. In future communications regarding this consultation, please refer to consultation #22420-2011-F-0034. Please contact Eric Hein or Michele Christman if you have any comments or questions at the letterhead address or at (505) 346-4735 or 346-4715.

Wally Murphy

cc:
Forest Supervisor, Gila National Forest, Silver City, New Mexico (Attn: Art Telles)
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico

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