

Arroyo Toad
(Bufo californicus (=microscaphus))

**5-Year Review:
Summary and Evaluation**



Arroyo Toad (*Bufo californicus*)
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**U.S. Fish and Wildlife Service
Ventura Fish and Wildlife Office
Ventura, California**

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5-YEAR REVIEW

Arroyo Toad (*Bufo californicus* (=microscaphus))

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act of 1973 (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview:

The arroyo toad (*Bufo californicus*) is a small, dark-spotted toad of the family Bufonidae. At the time the arroyo toad was listed in 1994, it was classified as a subspecies (*Bufo microscaphus californicus*) of the southwestern toad (*B. microscaphus*) (59 Federal Register (FR) 64859). However, the taxonomy of the arroyo toad was re-examined (Gergus 1998), and in 2001, the Service formally changed the name of the arroyo toad to *B. californicus* (66 FR 9414).

The most favorable breeding habitat for arroyo toads consists of slow-moving streams with shallow pools, nearby sandbars, and adjacent stream terraces. Arroyo toads breed and deposit egg masses in shallow, sandy pools that are usually bordered by sand and gravel flood terraces. Outside of the breeding season, arroyo toads are essentially terrestrial and are known to use a variety of upland habitats including but not limited to: sycamore-cottonwood woodlands, oak woodlands, coastal sage scrub, chaparral, and grassland (Holland 1995, Griffin et al. 1999).

Arroyo toads have disappeared from approximately 75 percent of the species' historically occupied habitat in California. They were known historically to occur in coastal drainages in southern California from San Luis Obispo County to San Diego County and in Baja California, Mexico. In Orange and San Diego Counties, the species occurred from estuaries to the headwaters of many drainages. Arroyo toads now survive primarily in the headwaters of coastal streams as small, isolated populations, having been extirpated from much of their historic habitat.

Methodology Used to Complete This Review:

This review was prepared by the Ventura Fish and Wildlife Office (VFWO), following the Region 8 guidance issued in March 2008. We used information from the recovery plan for the arroyo toad (Service 1999), survey information from experts who have been monitoring various populations of this species, information available in published and unpublished literature, discussions with other agency biologists, discussions with species experts, information available on the Internet, and VFWO species files. This 5-year review contains updated information on the species' biology and threats, and an assessment of that information compared to that known at the time of listing. There has been no previous 5-year review. We focus on current threats to the species that are attributable to the Act's five listing factors. The review synthesizes all this information to evaluate the listing status of the species and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

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Federal Register (FR) Notice Citation Announcing Initiation of This Review: A notice announcing initiation of the 5-year review of this species and the opening of a 60-day period to receive information from the public was published in the FR on March 5, 2008 (73 FR 11945). The Service received one response collectively regarding all 58 species covered in the notice, which we have considered in preparing this 5-year review.

Listing History:

Original Listing

FR Notice: 59 FR 64859

Date of Final Listing Rule: December 16, 1994

Entity Listed: *Bufo californicus* (=microscaphus) (species)

Classification: Endangered

Associated Rulemakings

Critical Habitat Designation: February 7, 2001 (66 FR 9414).

Revised Critical Habitat Designation: April 13, 2005 (70 FR 19562).

State Listing

The arroyo toad is not listed as a threatened or endangered species by the State of California.

Review History: Since the original listing in 1994, the recovery plan (Service 1999) has been the only written status review produced for this species, but it does not contain a formal five-factor analysis or an analysis of the appropriate listing status of the species under the Act.

Species' Recovery Priority Number at Start of 5-Year Review: The recovery priority number for the arroyo toad is 8 according to the Service's 2007 Recovery Data Call for the Ventura Fish and Wildlife Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, September 21, 1983). The value of 8 indicates that the arroyo toad is a species that faces a moderate degree of imminent threat and has a high probability of recovery.

Recovery Plan or Outline

Name of Plan or Outline: *Arroyo Southwestern Toad (Bufo microscaphus californicus) Recovery Plan*

Date Issued: July 24, 1999

Dates of previous revisions: There have been no revisions to this plan.

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Endangered Species Act defines "species" as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. The 1996 Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Endangered Species Act (61 FR 4722, February 7, 1996) clarifies the interpretation of the phrase "distinct population segment" for the purposes of listing, delisting, and reclassifying species under the Act.

We have no relevant information regarding the application of the Distinct Population Segment Policy to the arroyo toad.

Information on the Species and its Status

Species Biology and Life History

The arroyo toad is relatively small compared to other toads (snout-vent length = 2 to 3 inches (in) (5.1 to 7.6 centimeters (cm))). Its coloration ranges from light olive green or gray to light brown. It can be distinguished from other toads by the presence of non-paired, symmetrical, dorsal (back) splotches, and the pale coloration of the anterior portion of the oval parotoid glands (just behind the eyes) (Stebbins 2003). It has a prominent, white, "v-shaped" stripe that crosses

the top of the head between the eyes. The belly is white or buff and often lacks dark blotches or spots. Unlike the western toad (*Bufo boreas*), arroyo toads normally lack a mid-dorsal stripe. Compared to other toads, arroyo toads generally hop high and fast rather than walk (Stebbins 2003).

Arroyo toad tadpoles are difficult to distinguish from those of the western toad until several weeks after hatching. At hatching, the tadpoles of each species are small and black, but arroyo toad tadpoles become tan and more fusiform in shape after several weeks as opposed to the darker and more globose shape of western toad tadpoles. After metamorphosis, toadlets (small toads) appear as miniature adults, although they do not have the large parotoid glands that are evident on adults (Sanders 1950).

Breeding typically occurs from February to July on streams with persistent water (Griffin et al. 1999). Female arroyo toads must feed for a minimum of approximately 2 months to develop the fat reserves needed to produce a clutch of eggs. Eggs are deposited and tadpoles develop in shallow pools with minimal current and little or no emergent vegetation. The substrate in these pools is generally sand or fine gravel overlain with silt. The eggs hatch in 4 to 5 days and the tadpoles are essentially immobile for an additional 5 to 6 days. They then begin to disperse from the pool margin into the surrounding shallow water, where they spend an average of 10 weeks. After metamorphosis (June and July), toadlets and juvenile arroyo toads remain on the bordering gravel bars until the pool dries out (usually from 8 to 12 weeks depending on the site and rainfall). Most individuals become sexually mature by the following spring (Sweet 1992).

Arroyo toad tadpoles feed on loose organic material, such as interstitial algae, bacteria, and diatoms. They do not forage on macroscopic vegetation (Sweet 1992, Jennings and Hayes 1994). Toadlets and juvenile arroyo toads feed on ants almost exclusively but by the time they reach 0.7 to 0.9 in (1.7 to 2.3 cm) in length, they feed on beetles in addition to ants (Sweet 1992). Adult arroyo toads probably consume a wide variety of insects and arthropods including ants, beetles, spiders, larvae, and caterpillars.

Habitat or Ecosystem

The breeding habitat of the arroyo toad is restricted to shallow, slow-moving stream habitats, and riparian habitats that are disturbed naturally on a regular basis, primarily by flooding. To provide appropriate arroyo toad habitat, a stream must be large enough for channel scouring processes to occur but not so large that habitat structure is lost after floods (Sweet 1992). Stream order, elevation, and floodplain width appear to be important factors in determining habitat suitability (Sweet 1992, Griffin et al. 1999). (Stream order ranks the size and potential power of streams. The smallest channels in a watershed with no tributaries are called first order streams. When two first order streams come together, they form a second order stream; when two second order streams come together, they form a third order, and so on. Fifth and sixth order streams are usually larger rivers, while first and second orders are often small, steep, or intermittent.) Arroyo toads tend to be located at the lower end of the upstream sections of third to sixth order stream segments where the coarsest sediments are lacking due to low water power, but where flow rates are great enough to keep silt and clay suspended (Sweet 1992). According to Campbell et al. (1996), arroyo toads are found in large river systems because larger watersheds

erode the landscape laterally as well as vertically. As the stream bed widens, the power of the river decreases, reducing its ability to move large volumes of material. Sediment deposition decreases local stream gradient producing a meandering channel. In these channels, the power of flood waters become laterally directed, forming channel and terrace systems which can change annually as sections are scoured or filled by winter floods. The characteristics of these stream sections provide for near perennial flow and persistence of shallow pools into at least mid-summer (Campbell et al. 1999). Arroyo toads breed and deposit egg masses in these shallow, sandy pools, which are usually bordered by sand and gravel flood terraces. However, small arroyo toad populations are found along first and second order streams at elevations up to 4,600 ft (1,402 meters (m)) (Griffin et al. 1999).

Outside of the breeding season, arroyo toads are essentially terrestrial and use a variety of upland habitats for foraging, burrowing, and dispersal that include but are not limited to sycamore-cottonwood woodlands, oak woodlands, coastal sage scrub, chaparral, and grassland (Holland 1995, Griffin et al. 1999). During the non-breeding season, arroyo toads seek shelter during the day and other periods of inactivity by burrowing into the sandy areas of upland terraces. They also use the marginal zones between stream channels and upland terraces for burrowing, especially during late fall and winter (Sweet 1992). Areas of sandy or friable (readily crumbled) soils are necessary, but these soils can be interspersed with gravel or cobble deposits. Additionally, arroyo toads may seek temporary shelter under rocks or debris and have been found in mammal burrows on occasion. Upland sites with compact soils can also be used for foraging and dispersal (Holland *in litt.* 2000). Arroyo toads will go into aestivation (a state of dormancy somewhat similar to hibernation to prevent dehydration during hot or dry times of the year) in their burrows during the non-breeding season, starting in the late summer from about August to January (Ramirez 2003).

Distribution and Abundance

Historically, arroyo toads occurred from the upper Salinas River system on Fort Hunter Liggett Military Reservation (FHL), Monterey County, at the northern end of its range, south through the Santa Ynez, Santa Clara, and Los Angeles River Basins; the coastal drainages of Orange, Riverside, and San Diego Counties; to the Arroyo San Simeon system in Baja California, Mexico (Campbell et al., 1996). The species also now occurs on the desert slopes of the San Gabriel Mountains (in Little Rock Creek in Los Angeles County) and the San Bernardino Mountains (in the Mojave River and in its tributaries, Little Horsethief Creek and Deep Creek, in San Bernardino County) (Hitchcock et al., 2004b). Arroyo toads now survive primarily in the headwaters of streams as small, isolated populations, having been extirpated from much of their historic habitat.

Although arroyo toads may be found along relatively long stretches of some creeks and rivers, suitable breeding or upland habitat may not occur throughout the entire distance. The proportion of suitable habitat may change during the year and from year to year, depending on climatic conditions, fires, or other natural (e.g., flooding) or human-related events. Because of this, it is difficult to estimate the exact distribution of arroyo toads or the extent of suitable habitat on any particular system at a given time. In addition, the highly variable nature of arroyo toad habitat results in similar levels of variation in population density. For example, arroyo toad densities

can range from fewer than 25 to over 200 adults over different stretches of the same stream (Bloom *in litt.* 1998).

Since the listing of the arroyo toad, new locations in areas that were not previously known to be occupied by arroyo toads have been discovered as a result of site-specific surveys. The largest of these newly discovered populations was found on FHL in 1996 (U.S. Army Reserve Command 2004). Although a substantial proportion of currently occupied habitat is found on U.S. Forest Service (USFS) lands, recovery of the arroyo toad on privately-owned lands will likely be necessary for recovery of the species (Riverside County 2003). When listed in 1994, only 6 of the 22 extant populations south of Ventura County were known to contain more than a dozen adults (59 FR 64859). The recovery plan (Service 1999) describes 22 river basins in the coastal and desert areas of 9 counties along the central and southern coast of California that were known in 1999 to be occupied by arroyo toads at that time. Three recovery units (Northern, Southern, and Desert) were established to reflect the ecological and geographic distribution of the species and its current and historic range (Service 1999).

The Northern Recovery Unit encompasses arroyo toad populations and habitat in Monterey, San Luis Obispo, Santa Barbara, and Ventura Counties, and on the coastal slopes of Los Angeles County. All arroyo toad locations currently receiving protection and management in this recovery unit are on Federal lands. Threats are low-to-moderate in intensity and management efforts have been successful in reducing some impacts.

The Southern Recovery Unit encompasses arroyo toad populations and habitat in the coastal drainages of Orange, San Bernardino, Riverside, and San Diego Counties. Arroyo toads in this recovery unit occur on Federal, State, County, City, water district, and private land. Threats are moderate to high, and will continue to increase as the demand for suitable development sites continues.

The Desert Recovery Unit includes arroyo toad populations and habitat on streams and rivers that drain the northern and eastern slopes of the San Gabriel, San Bernardino, and Peninsular mountain ranges in Los Angeles, San Bernardino, Riverside, San Diego, and Imperial Counties. These streams flow into closed desert valleys and basins, including the Antelope Valley, Mojave Basin, and the Salton Sea Basin. Threats are moderate in intensity, and result primarily from recreational activities, with some threat of development.

Changes in Taxonomic Classification or Nomenclature

At the time of listing, the arroyo toad was considered a subspecies of the southwestern toad (*Bufo microscaphus*) (59 FR 64589). By the late 1990s, it had become increasingly clear that the arroyo toad was morphologically distinct from the other two subspecies, *B. m. microscaphus* and *B. m. mexicanus* (Jennings and Hayes 1994). In 1998, Gergus reviewed the evolutionary relationships of the complex of toads assigned to the name *B. microscaphus* by comparing allozyme frequencies between the three recognized subspecies, *B. m. microscaphus*, *B. m. californicus*, and *B. m. mexicanus*. Gergus (1998) found that each subspecies exhibited mutually exclusive evolutionary lineages and determined that each should be treated as a full species. As

a result of this research, Gergus (1998) reclassified the arroyo toad as the full species *Bufo californicus*.

In 2006, in an effort to move amphibian systematics towards a taxonomy more consistent with new information on evolutionary relationships, Frost et al. (2006) recommended partitioning the genus *Bufo* into three genera, with the North American clade of *Bufo* renamed as the genus *Anaxyrus* Tschudi, 1845. Recognition of the *Anaxyrus* taxon by Frost et al. (2006) and Frost (2008) is consistent with the results of research on molecular phylogenetics of Nearctic toads (*Bufo*) (Pauly et al. 2004). Thus, the arroyo toad *Bufo californicus* has been renamed *Anaxyrus californicus*, and this revised nomenclature has been adopted by the Center for North American Herpetology, the American Museum of Natural History, the Society for the Study of Amphibians and Reptiles, the American Society of Ichthyologists and Herpetologists, and the Herpetologists' League (Crother 2008). Based on our interpretation of the best available information, we therefore recommend that the name used for the arroyo toad under the Act, *Bufo californicus* (= *microscaphus*), be changed to *Anaxyrus californicus*.

Five-Factor Analysis

Section 4 of the Act established a rulemaking procedure that requires a five-factor analysis for determining whether to list a species as endangered or threatened. As identified in the listing rule (59 FR 64859), the arroyo toad is threatened by habitat destruction and alteration due to short- and long-term changes in river hydrology, including construction of dams and water diversions; alteration of riparian wetland habitats by agriculture and urbanization; construction of roads; site-specific damage by off-highway vehicle use and other recreational activities; overgrazing; and mining activities. Arroyo toads are also threatened by introduced nonnative predators (e.g., bullfrogs (*Rana catesbeiana*) and predatory fish); drought; periodic fires; unseasonal water releases from dams; livestock grazing; and light and noise pollution from adjacent developments and campgrounds.

The following analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act. See Appendix A for a description of the threats for each population.

FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Habitat destruction and alteration were considered to be the most serious threats to the arroyo toad in the final listing rule (59 FR 64859). Historically, because arroyo toad habitats are favored sites for dams and reservoirs, roads, agriculture, urbanization, and recreational facilities, such as campgrounds and off-highway vehicle parks, many arroyo toad populations were reduced in size or extirpated due to extensive habitat loss that occurred from about 1920 to 1980 (Service 1999). Since the listing of the arroyo toad, the Service has developed a recovery plan (Service 1999) and designated critical habitat (70 FR 19562). Currently, we are in the process of revising critical habitat for the species and expect to publish a final rule by October 1, 2010.

Dams and Reservoirs

California, along with the rest of the United States, experienced major population growth with the “Baby Boomer” era following World War II. Agencies seeking to meet water demands constructed most of the major dams in California by the 1960’s. Approximately 25 dams have been constructed in the 22 river basins where arroyo toads currently occur and there are several instances where multiple dams have been constructed along the same river or stream (see Appendix B). Only 2 rivers currently occupied by arroyo toads, the Sisquoc River and Sespe Creek, do not have dams. The most recent dam to be built in southern California was Diamond Valley Lake in Riverside County near the city of Hemet, completed in 2003. At present, we are unaware of any plans to build new dams in southern California.

Nearly half of the arroyo toad extirpations prior to listing can be attributed to the initial effects of dam building and operation (Sweet 1992, Ramirez 2003). Dam construction results in the immediate destruction of arroyo toad habitat through inundation, and by regulated stream flows that destroy sand bars used during the breeding season, reconfigure and in some cases eliminate suitable breeding pools, and disrupt clutch and larval development (Ramirez 2005). Suitable upstream habitat is often flooded out by reservoir water, destroying both arroyo toad breeding and upland habitats. Downstream habitat is often also destroyed or severely altered. Although the original construction of a new dam results in immediate habitat destruction, ongoing dam operations continue to threaten remaining habitat. For example, fine sediments necessary for replacement of breeding habitat are trapped behind the dam of Silverwood Lake and the reduction of natural flooding along with sustained summer flows from upstream water releases favor non-native species at the expense of the arroyo toad. Within the 22 river basins with arroyo toad populations, there are numerous existing dams where downstream breeding and non-breeding habitats have been or are still being impacted by reduced flows and unnatural discharges (see Appendix B).

Although dam operations are an ongoing threat to arroyo toads, dam operations can be modified to restore or enhance downstream arroyo toad breeding habitat. The construction and operation of Pyramid Dam on Piru Creek in Ventura County, which flows approximately 18 mi (29 km) south through mountainous terrain to Lake Piru, inundated 2 to 3 mi (3.2 to 4.8 km) of suitable arroyo toad habitat upstream, and contributed to or caused the extinction of arroyo toad populations on the lower segment of Piru Creek (Sweet 1992). Prior to 2005, the flow release schedule from Pyramid Dam called for enhanced summer flows to maintain a trout fishery downstream of Pyramid Dam. This steady release of water created entrenched channels with encroaching vegetation and increased habitat for predators of arroyo toads (e.g., bullfrogs) (Sandburg 2006). Sandberg (2006) reported that surveys conducted in 2002 through 2004 found pool habitats were becoming increasingly degraded and unsuitable for arroyo toad breeding.

In 2005, the California Department of Water Resources (CDWR) began discharging water from Pyramid Dam into Piru Creek according to a water release schedule that generally simulated the natural hydrology of Piru Creek. In the following breeding season, Sandburg (2006) reported a dramatic improvement in arroyo toad breeding success, from 12 egg clutches observed in 2004 to approximately 165 egg clutches in 2005. The simulated natural flow regime improved breeding success of arroyo toads and continues to reduce non-native predators and improve

arroyo toad habitat. If the current simulated natural flow regime is maintained, it appears that Pyramid Dam may no longer be a threat to the arroyo toad population and existing habitat in Piru Creek.

Another example of the relationship between dam operations and arroyo toad habitat is the operation of Loveland Dam on the Sweetwater River in San Diego County. This dam typifies the impacts of dam operation on arroyo toad habitat, which include changes in the timing, amount, and duration of channel flows; loss of coarse sediments below the dam; and an increase in vegetation density due to the decrease or elimination of scouring flows (Madden-Smith et al. 2003). The only known extant population of arroyo toads within the stretch of Sweetwater River between Loveland and Sweetwater Reservoirs occurs in Sloan Canyon on private property previously owned by the Vulcan Minerals, Inc., Sloan Canyon Mining Company. The mining company denied access to their land for an assessment of the status of the arroyo toad population but according to limited survey data from 1998, as many as 26 adult males and 16 adult females were present during surveys in 1997 and successful recruitment was documented in 1995 through 1998 (Madden-Smith et al. 2005). Sloan Canyon is now owned by the Sycuan Band of Kumeyaay Nation. Despite the presence of this population, the arroyo toad is not known to have colonized the high or good quality habitat upstream or downstream from the Sloan Canyon location because the intervening terrain has been disturbed and hydrologically altered by operation of Loveland Dam (Madden-Smith et al. 2005). The U.S. Geological Survey (USGS) conducted a risk assessment for the Sweetwater Authority (Madden-Smith et al. 2003) and developed protocol to minimize impacts to arroyo toads, which the Authority has incorporated into dam operations (Famolaro *in litt.* 2009). For example, water transfers between Loveland and Sweetwater Reservoirs generally take place during the winter months of December, January or February to take advantage of existing flows in the river, minimize water lost to the river system, and avoid the arroyo toad breeding season. Under the protocol, if feasible, arroyo toad breeding surveys are conducted within 72 hours prior to a release to determine if breeding has commenced. If breeding has commenced, then the release is postponed until toads are no longer breeding.

In addition to dams and water diversions, other man-made structures, such as culverts, low-water road crossings, pipeline crossings, and bridges prevent arroyo toads from moving up and downstream and block stream flows and sediment transport (California Department of Fish and Game (CDFG) 2005). Agricultural and urban land uses often include efforts to control flooding through various means, such as vegetation removal, dredging, channelization, riprap and energy dissipaters, constructions of dams and levees, and stream bank recontouring (CDFG 2005).

Mining, Agriculture and Urban Development

In addition to flood control projects, stream terraces and adjacent upland habitat have been degraded and are continually at risk of loss due to agriculture, mining, and urban development (Service 1999, Ramirez 2003).

Although mining operations are not widespread, impacts at affected locations can be substantial (CDFG 2005). Mining operations adjacent to rivers can result in sediment or other contaminant runoff and can increase water temperature and turbidity and destroy breeding habitat (CDFG

2005). This has happened downstream from the Sloan Canyon population where habitat degradation has occurred as a result of the sand and gravel mining operations of Vulcan Minerals Inc., and the subsequent formation of the sand/gravel pond known as Lake Emma (Madden-Smith et al. 2005). These and several other development projects (housing and a golf course) in addition to reduced water flows due to the presence of the dam at Lake Emma, have acted as barriers to the successful establishment of arroyo toads downstream from Sloan Canyon.

Instream gravel mining (suction dredge mining) removes gravel from the stream channel, interrupting natural sediment transport processes, deepening and degrading the channel, and creating noise disturbance. It also increases water temperature and turbidity and destroys breeding habitat. Suction dredge placer mining essentially acts like an underwater vacuum cleaner. Suction dredges pull material up from a stream bottom and after separating the minerals out, redeposit the stream material back onto the bottom of the stream. This increases the suspended sediments in the stream, which can suffocate arroyo toad tadpoles. Arroyo toad tadpoles can also be entrained in the suction pump. Suction dredge mining has occurred in Pine Valley Creek on the Cleveland National Forest (CNO) and until recently, in Piru Creek on the Los Padres National Forest (LPNF) (Service 1999). Prospecting activities, including the digging of pits in the stream bed and banks, has occurred on Little Horsethief Creek on the San Bernardino National Forest (Loe *in litt.* 1997). Currently, the Los Padres National Forest has restricted suction dredge mining in Piru Creek to protect arroyo toad habitat.

Urban, suburban, and rural development has resulted in severe arroyo toad habitat loss and fragmentation (CDFG 2005). Rampant development and urban sprawl have occurred throughout southern California; nearly 40 percent of the natural areas along the coast from Ventura County to the Mexican border are in urban and suburban use (CDFG 2005). With nearly 20 million people living within driving distance of the national forests and other public lands in southern California, recreational access and its subsequent effects are a continual concern (CDFG 2005). Recreational off-road vehicle use of trails open relatively undisturbed areas to increased use. Vehicles can disturb or run over arroyo toads; crush and uproot riparian plants; spread seeds of invasive plants; and disturb soils, contributing to erosion and sedimentation of aquatic habitats. Toad mortality on roadways is also a factor, especially on sandy, unpaved roads where increased food sources lure toads out at night and where toads burrow during the day (Sandburg, U.S. Forest Service, pers. comm., 1997). High levels of human and vehicular traffic on roads adjacent to toad habitat can kill many adult and juvenile toads.

Grazing

The effects of livestock grazing on arroyo toads include directly crushing individuals and burrows; trampling of stream banks resulting in soil compaction, loss or reduction in vegetative bank cover, stream bank collapse, and increased instream water temperatures from loss of shade; and added sedimentation of stream segments at crossings or other stream areas used by livestock for watering or grazing on riparian vegetation.

Although livestock grazing remains a threat to arroyo toads, progress has been made toward reducing or eliminating the threat in some areas (see Appendix C) and in raising public awareness of the problem. The USFS has developed grazing allotment management guidelines

to reduce the effects of livestock grazing on threatened and endangered species and habitat. The Service has consulted with the USFS on various grazing allotment permit renewal projects that resulted in biological opinions 1-6-99-F-21 (Service 2000a), 1-8-03-F-53 (Service 2004a), 1-6-01-F-1694 (Service 2001a), and FWS-SB-1464.2 (Service 2001b). However, few of these consultations have specifically addressed grazing impacts to arroyo toads. Arroyo toad habitat on the West Fork of the Mojave River has been degraded by cattle grazing on Rancho Las Flores near Hesperia. Also, in developing the Rancho Las Flores planned community and associated infrastructure, land managers informally consulted with the Service to develop several grazing protective measures for arroyo toads, such as installation and monitoring of exclusionary fencing in designated riparian habitats; avoiding construction or maintenance activities in the arroyo toad breeding season; and the use of biological monitors. The plans for this development have not been completed.

Non-native Invasive Plants

Non-native plant species, particularly tamarisk (*Tamarix* spp.) and giant reed (*Arundo donax*; *Arundo*), alter the natural hydrology of stream drainages by eliminating sandbars, breeding pools, and upland habitats. Tamarisk is an aggressive, woody invasive plant species that can tolerate a variety of environmental conditions and has become established over as much as 1,000,000 acres of floodplains, riparian areas, wetlands and lake margins in the western United States (Carpenter 2004). Tamarisk consumes large quantities of water, possibly more than woody native plant species occupying the same habitat (Carpenter 2004). Highly resistant to removal by flooding, tamarisk has the potential to form dense corridors along most large streams. Where this has been allowed to occur, tamarisk has replaced native vegetation, invaded sand bars, and led to channelization by constricting flood flows. *Arundo* is a tall, grass-like plant that grows up to 20 feet in height with jointed stems that resemble corn stalks. It invades wetlands such as ditches, stream banks and lakeshores, where it can completely displace native vegetation, reduce wildlife habitat, increase fire risks, and interfere with flood control. *Arundo* is widespread along the Ventura, Santa Clara, Santa Ana, Santa Margarita, San Luis Rey, and San Diego Rivers, and is the most problematic non-native plant species in aquatic systems (CDFG 2005). Tamarisk is less widespread but also invades riparian habitats in the above rivers and is distributed in coastal and desert drainages (Stephenson and Calcarone 1999). Both species choke waterways, increase flash flood risks, crowd out native plants, and provide inferior habitat for riparian species.

Conservation Measures and Management Plans

Since the arroyo toad was listed in 1994, many of the threats to the arroyo toad discussed above have been reduced as a result of various conservation measures that have been undertaken for the species and management plans that have been developed that include the species (see Appendix C). As discussed above, dam operations have been modified to benefit arroyo toads in some cases. Other examples of conservation measures include closing roads, trails, and campgrounds on national forest lands, and implementing minimization measures in grazing allotment permits to reduce the effects from livestock grazing. The USFS has revised the land management plans (LMP) for the four southern California national forests (Los Padres, Angeles, San Bernardino, and Cleveland) to include conservation measures for listed species, including the arroyo toad.

These plans direct USFS staff to ensure that any project activities conducted in arroyo toad suitable habitat in the national forests are neutral or beneficial to arroyo toads, and any expansion of existing facilities or development of new facilities will focus recreational use away from arroyo toad occupied habitat.

Development and potential training activities within arroyo toad habitat on Marine Corp Base Camp Pendleton (MCBCP) are limited in accordance with the biological opinion of ongoing activities in riparian habitats (Service 2000a), Range and Training Regulations (RTRs), and the MCBCP Integrated Natural Resources Management Plan (INRMP). Monitoring of toad populations and habitat management are also implemented on MCBCP consistent with the INRMP and the aforementioned biological opinion. The arroyo toad population in Cole Creek is conserved and managed by the Santa Rosa Plateau Ecological Reserve. The Santa Rosa Plateau Ecological Reserve is comprised of approximately 9,000 acres (3,642 hectares). It was assembled between 1983 and 1991 and is being managed by The Nature Conservancy, the U.S. Fish and Wildlife Service, the California Department of Fish and Game, the Riverside County Parks and Open Space District, and the Metropolitan Water District of Southern California (Dangermond & Associates, Inc. 1991; Metropolitan Water District of Southern California et al. 1991). The arroyo toads on Temecula Creek and Arroyo Seco Creek occur on a combination of USFS land and private land. USFS lands are managed consistent with the LMPs described above. Development on private lands in western Riverside County is addressed by the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP), which identifies development areas and areas targeted for conservation. The majority of arroyo toad habitat along Temecula Creek and Arroyo Seco Creek is targeted for conservation under the MSHCP; however, there are a few pockets of development anticipated, primarily in previously disturbed areas.

FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Collecting for recreational or scientific purposes was considered to be a threat to the arroyo toad in the final listing rule (59 FR 64859). However, since that time we are not aware of any information that would indicate recreational collecting is a threat, and the scientific community is now well aware of the endangered status of the species and the prohibitions of section 9 of the Act. Therefore, we no longer believe overutilization is a threat to the species.

FACTOR C: Disease or Predation

Predation by non-native species was considered to be a threat to the arroyo toad in the final listing rule (59 FR 64859). Non-native predators have caused substantial reductions in the sizes of extant populations of arroyo toads and have caused arroyo toads to disappear from large portions of historically occupied habitat (Jennings and Hayes 1994). The introduction of non-native aquatic species to southern California watercourses has been facilitated by construction of the California Aqueduct and other sources of inter-basin transport (Service 1999). Currently, the California Aqueduct is linked directly to the Santa Ynez River, Santa Clara River, San Jacinto River, and Mojave River Basins. Predatory species, many of which have used the aqueduct to colonize these river basins, include green sunfish (*Lepomis cyanellus*), largemouth bass

(*Micropterus salmoides*), black bullhead (*Ictalurus nebulosus*), prickly sculpin (*Cottus asper*), stocked rainbow trout (*Oncorhynchus mykiss*), oriental gobies (*Tridentiger sp.*), red shiners (*Notropis lutrensis*), and crayfish (i.e., *Pacifastacus leniusculus* and *Procambarus clarki*) (Sweet 1992). All of these species prey on arroyo toad tadpoles. Most streams with populations of arroyo toads also have populations of bullfrogs and African clawed frogs (*Xenopus laevis*), which prey on arroyo toads in various life stages. Bullfrogs in particular are known to be a major predator of arroyo toads (Stephenson and Calcarone 1999). Bullfrogs are well adapted to deep water conditions in ponded areas above dams, and dam releases can introduce them to downstream habitats (CDFG 2005). A broad diet and an extended breeding season give bullfrogs a competitive advantage over native amphibians. Bullfrogs can tolerate elevated water temperatures and make use of standing pools resulting from urban runoff to complete their 2-year life cycle. Although these frogs are favored by habitat alteration and flood control, they cannot maintain dense populations in creeks subject to winter flooding (Sweet 1992).

Artificially sustained flow regimes and activities that create ponds, including the introduction of beaver (*Castor canadensis*), make habitat more suitable for bullfrogs and African clawed frogs and less so for arroyo toads (Sweet 1992). Arroyo toad breeding habitat in Little Horsethief Creek and the West Fork of the Mojave River at Rancho Las Flores has been severely altered by beaver dams. Beavers, which are not native to this area, have created and maintain a series of large, deep pools within the channel of Horsethief Creek. These pools provide suitable habitat for bullfrogs, non-native fish and crayfish (Ramirez 2003) which prey on arroyo toads; the pools are unsuitable habitat for arroyo toads. Heavy rains in January and February 2005 destroyed the pools and removed the beavers temporarily; a “series of shallow, braided channels,” which provided high quality habitat for arroyo toads replaced the pools (Hunt 2005). Without constant removal, beavers would eventually transform Horsethief Creek into a series of pools again.

Disease was not considered to be a threat to the arroyo toad at the time of listing. During the last 20 years, significant declines in populations of amphibians have been observed worldwide (Gaertner et al. 2007). Since the arroyo toad was listed, chytridiomycosis, an infectious amphibian disease caused by a fungus (*Batrachochytrium dendrobatidis*), has been clearly linked to these amphibian declines and extinctions worldwide. It has also been implicated in mass amphibian die-offs and species extinctions in pristine areas of Central America and Australia, and is considered a probable cause of precipitous boreal toad (*Bufo boreas boreas*, a sub-species of the western toad) declines in Colorado (Hahr 2006). Chytrid fungus is a water-borne fungus that can be spread through direct contact between aquatic animals or by spores that can move short distances through the water. The fungus only attacks the parts of an amphibian’s skin that have keratin (thickened skin), such as the mouthparts of tadpoles and the toes of adults. The fungus can decimate amphibian populations, causing fungal dermatitis which usually results in death in 1 to 2 weeks, but not before infected animals may have spread the fungal spores to other ponds and streams. Once a pond has become infected with chytrid fungus, the fungus stays in the water for an undetermined amount of time. To prevent the spread of chytrid fungus, the Service recommends that strict disease prevention protocols as described in the Declining Amphibian Population Task Force’s Code of Practice (Appendix D) should be followed in the field. For example, all footwear and equipment should be disinfected before and between visits to aquatic habitat. These same precautions should be taken by anyone visiting amphibian breeding ponds in the wild, and the handling of toads should be avoided whenever possible.

The literature generally indicates chytridiomycosis was first identified in 1998 by an international team of scientists from Australia, the United States and Great Britain (Hahr 2006). However, in 1991, Nichols (2003) examined 3 dead formalin-fixed arroyo toads that had died of an amphibian skin disease characterized by thickening of the epidermis. These arroyo toads had been part of a captive colony consisting of approximately 120 animals kept at the University of California, Santa Barbara. A disease outbreak had already caused the death of 60 percent of the toads in this colony and the 3 specimens were sent to Nichols to determine the cause. Nichols, along with Dr. Joyce Longcore at the University of Maine, spent the next 5 years characterizing the fungal organism that caused the skin disease and the factors that influence the development of chytridiomycosis in amphibians (Nichols 2003). It is clear from Nichols' research that arroyo toads can be infected and killed by this disease and, therefore, it must be considered a serious threat.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

Inadequacy of existing regulatory mechanisms was not considered to be a threat to the arroyo toad in the final listing rule (59 FR 64859), and there is no information to suggest that it has become a threat as long as the species continues to be protected under the Act.

The Act is the primary Federal law providing protection for this species. Since its listing, the Service has analyzed the potential effects of Federal projects under section 7(a)(2), which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 Code of Federal Regulations (CFR) 402.02). A non-jeopardy biological opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project. Take is broadly defined in the Act as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect a listed species, or to attempt to engage in any such conduct. Incidental take refers to taking of listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). In cases where some incidental take is unavoidable, the Service works with the agency to include additional conservation measures to minimize negative impacts. For projects without a Federal nexus that may negatively impact listed species, the Service may issue incidental take permits pursuant to section 10(a)(1)(B) of the Act. To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved habitat conservation plan (HCP) that details measures to minimize and mitigate the project's adverse impacts to listed species. Regional HCPs in some areas now provide an additional layer of regulatory protection for covered species, and these HCPs are coordinated with the State of California's similar Natural Community Conservation Planning program.

FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

The arroyo toad appears to be restricted naturally as the result of specific habitat requirements for breeding and development (Service 1999). These natural restrictions, coupled with the small

sizes of many arroyo toad populations, make them particularly vulnerable to the negative effects of human-induced changes to their habitat (Jennings and Hayes 1994). Other threats to the arroyo toad in the final listing rule are drought and fire (59 FR 64859).

Depending on severity and duration, drought is potentially a threat to arroyo toads because it can result in serious impacts to riparian habitats that species depends on. For example, in the late 1980's, California experienced a 5-year drought. Sweet (1992) reported that this drought, combined with water diversions from streams, had created extremely stressful conditions for most aquatic species. Drought causes soil degradation and increased erosion that damages aquatic and riparian habitat; drought-stressed plants become diseased more easily; vegetation dries out and becomes highly flammable causing uncontrolled fires; and the lack of water and lack of food stresses wildlife and plant species. A major concern regarding the effect of drought and water diversion on arroyo toads is that female toads may not be able to find sufficient insect prey to build up enough fat storage for egg production in time to find a mate, resulting in no reproduction for that year (Sweet 1992). In addition, if streams dry up too early in the breeding season, arroyo toad tadpoles may not have enough time to reach metamorphosis. According to the California Department of Water Resources (CDWR 2008), California is currently facing the most serious water crisis in its history. Currently (in 2009), after experiencing 2 years of drought and the driest spring in recorded history, water reserves are extremely low. Drought therefore remains a threat to arroyo toads.

In recent decades, large fires in the West have become more frequent, more widespread, and potentially more deadly (Joint Fire Science Program (JFSP) 2007). Wildfire has always been a periodic visitor to southern California forests, as part of the cycle of natural dynamics that influences the composition of our forests (JFSP 2007). However, recently there has been a shift to more severe fires in some locations and wildfire effects are often exacerbated by drought and insect attack. Pilliod et al. (2003) state that the effects of fire may be greatest for amphibians that are habitat specialists (e.g., arroyo toads) compared to species that occupy different types of habitat and tolerate a wide range of environmental conditions. Periodic fires adversely affect arroyo toads by causing direct mortality, destroying streamside vegetation, and eliminating vegetation that sustains the watershed. Other effects include increased water temperature (as a result of canopy loss), smoke and fire retardant effects to water chemistry, increased sedimentation in streams and ponds that negatively impact reproduction and recruitment, and the effects of fire and post-fire conditions on arroyo toad terrestrial movements (Pilliod et al. 2003). In addition, wildfires often generate a substantial increase in erosion potential following the loss of protective ground cover and root anchors (Service 2003b). For example, it was known at the time of listing from surveys following the 1991 Sespe Fire that subsequent flooding, erosion, and siltation caused the death of at least 50 percent of the resident adult population of arroyo toads in the Sespe drainage (Service 2003b).

In some cases, however, fire can potentially improve arroyo toad habitat, depending on when the fire occurs and what conditions exist at the time it occurs. The effect of wildland and prescribed fires depends on many factors, including time of year, weather, intensity and extent of the fire, severity of the burn, soil and vegetation, steepness of terrain, and general topography of the burn area. For example, in 2004, Mendolsohn et al. (2005) conducted arroyo toad surveys along the Sweetwater River in Cuyamaca Rancho State Park, much of which was burned during the 2003

Cedar Fire. Based on the presence of hundreds to thousands of arroyo tadpoles and toadlets, they inferred that the fire did not result in substantial toad mortality and may have actually improved arroyo toad habitat. The Cedar Fire occurred in the fall when most juvenile and adult arroyo toads were underground in their upland burrows. In addition, the fire increased suitable arroyo toad habitat by removing dense riparian vegetation including much of the canopy so that potential breeding pools and terraces with friable soils for burrowing were opened up.

Fire suppression activities may pose a threat to the arroyo toad in some cases. For example, in response to the 2007 Zaca Fire, a number of broad fuelbreaks and safety zones were bulldozed in several areas, including the lower portions of Mono and Indian Creeks (Sweet 2007a). Based on research along Mono and Indian Creeks prior to the fire (Sweet 1992, 1993), juvenile and adult arroyo toads were known to make extensive use of the stream terraces where several of the fuelbreaks and safety zones were constructed and that in August/September of 2007 when construction occurred a large proportion of the population would be within burrows on the terraces (Sweet 2007a). Therefore, any toads that were in burrows were very likely killed by the bulldozing. In addition to causing direct mortality, Sweet (2007a; 2007b) reported that the bulldozing operations severely degraded essential upland habitat by removing shade and the opportunity for toads to select microclimates based on soil temperature, moisture content and ground cover. The bulldozing also created substantial barriers to toad movement through the placement of large piles of woody debris between the creek bed and the terraces and formed ideal conditions for the terraces to become invaded by non-native weeds, in particular yellow star thistle (*Centaurea solstitialis*) (toads are unable to inhabit terraces where yellow star thistle is well-established (Sweet 2007a)).

Global climate change is a new threat identified since listing. Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field et al. 1999, Cayan et al. 2005, IPCC 2007). However, predictions of climatic conditions for smaller sub-regions such as California remain uncertain. It is unknown at this time if climate change in California will result in a warmer trend with localized drying, higher precipitation events, or other effects. While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make accurate predictions regarding its effects to particular species at this time.

III. RECOVERY CRITERIA

Recovery plans provide guidance to the Service, States, and other partners and interested parties on ways to minimize threats to listed species, and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, we may determine that, over all, the threats have been minimized sufficiently, and the status of the species is robust enough, to downlist or delist the species. In other cases, new recovery approaches and/or opportunities unknown at the time the recovery plan was approved may be more appropriate ways to achieve recovery. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall,

recovery is a dynamic process requiring adaptive management, and assessing a species' degree of recovery is likewise an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan. We focus our evaluation of species status in this 5-year review on progress that has been made toward recovery since the species was listed (or since the most recent 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. In that context, progress towards fulfilling recovery criteria serves to indicate the extent to which threat factors have been reduced or eliminated.

Downlisting Criteria

The recovery criteria and tasks for the arroyo toad are listed in the recovery plan for the species (Service 1999). Although the five factors are not mentioned specifically, the recovery plan addresses factors A, B, C, and E. Listing factor D is not considered to be a threat to the species as long as it remains protected under the Act.

The arroyo toad will be considered for downlisting to threatened status when management plans have been approved and implemented on federally managed lands to provide for conserving, maintaining, and restoring the riparian and upland habitats used by arroyo toads for breeding, foraging, and wintering habitat. In addition, these measures must maintain at least 20 self-sustaining metapopulations or populations at the following locations:

Northern Recovery Unit – 7 populations or metapopulations

Fort Hunter Liggett Army Reserve Training Center: 1 population – San Antonio River.

Los Padres National Forest: 4 populations – Sisquoc River; Upper Santa Ynez River Basin, including Indian and Mono Creeks; Sespe Creek; and upper and lower Piru Creek.

Angeles National Forest: 2 populations – Castaic Creek; Los Angeles River Basin, including Upper Big Tujunga, Mill, and Alder Creeks.

Southern Recovery Unit – 10 populations or metapopulations

Marine Corps Base Camp Pendleton: 2 metapopulations – San Mateo and San Onofre Creeks; Santa Margarita River.

Cleveland National Forest: 8 populations – San Juan Creek Basin; San Mateo Creek Basin; Upper Santa Margarita River Basin; San Luis Rey River Basin; San Dieguito River Basin, San Diego River Basin; Sweetwater River Basin; Tijuana River-Cottonwood Creek Basin.

Desert Recovery Unit – 3 populations or metapopulations

Angeles National Forest: 1 population – Little Rock Creek.

San Bernardino National Forest: 1 metapopulation – Mojave River Basin, including West Fork of the Mojave River, Little Horsethief Canyon, and Deep Creek.

Bureau of Land Management: 1 population – Pinto Wash Basin, in the Jacumba (In-Ko-Pah Mountains) Wilderness Study Area.

This criterion addresses Factors A, C, and E.

We believe that the downlisting criterion has been achieved. The federally managed lands component has been met by the USFS's approved LMPs for the four southern California national forests that include arroyo toad populations. The MCBCP and FHL have approved INRMPs that benefit the arroyo toad. We believe that the conservation measures for arroyo toads included in these management plans are such that at least 19 of the required 20 self-sustaining metapopulations or populations have and will be maintained. We do not have any information on the current status of the remaining required population in the Pinto Wash Basin. However, this population is located within a wilderness area managed by the Bureau of Land Management, and biological resources in wilderness areas are afforded the highest level of protection due to severe restrictions on uses. The general management goals for wilderness areas require that the Bureau of Land Management provide for and manage wilderness areas for long-term protection and preservation of wilderness, scenic, cultural, and natural characteristics for recreation, scientific, and educational purposes.

Delisting Criteria

The arroyo toad will be considered for delisting when the genetic and phenotypic variation of the arroyo toad throughout its range in California is secured by maintaining 15 additional self-sustaining populations of arroyo toads in coastal plain, coastal slope, desert slope, and desert river basins, including known populations and metapopulations outside of Federal jurisdiction. Each of the three recovery units should look for opportunities to find previously unknown populations or to reestablish populations on rehabilitated habitat.

Northern Recovery Unit – Upper Salinas River, tributaries to the Santa Maria and Sisquoc Rivers, and tributaries to the upper Santa Clara River such as San Francisquito and Bouquet Creeks. At least one additional population should be protected in this recovery unit.

Southern Recovery Unit – At least eight protected populations in each of the following systems: Santa Margarita River; San Juan Creek, San Luis Rey River; San Dieguito River/Santa Ysabel Creek; San Diego River; Sweetwater River; Otay/Dulzura Creek; and Tijuana River-Cottonwood Creek Basins.

Desert Recovery Unit – Two known populations on private and other non-Federal lands in the Mojave River and Whitewater River Basins is essential for delisting the arroyo toad. Historically, populations were found in the San Felipe Creek and Vallecitos Creek basins in what is now Anza-Borrego State Park. These drainages, as well as Coyote Creek and other potential desert slope sites should be surveyed and protected as appropriate.

This criterion addresses Factor A, B, C and E. Progress has been made toward delisting the arroyo toad. For example, two HCPs that include measures for managing and protecting arroyo

toads have been approved; however, these are in the Southern Recovery Unit, and no HCPs occur in the other two recovery units. Therefore the delisting criterion has not been achieved.

IV. SYNTHESIS

Arroyo toads have disappeared from approximately 75 percent of previously occupied habitat in California and now occur primarily in the headwaters of coastal streams as small, isolated populations. At the time of listing, only 22 populations were thought to remain in California; today there are 23 known populations.

Threats to the arroyo toad remain basically the same as when it was listed in 1994. The primary threats to arroyo toads at the time of listing were habitat destruction and alteration from water storage reservoirs, flood control structures, roads, agriculture, urban development, recreational facilities, and mining activities. Non-native plants, such as tamarisk and *Arundo*, have also altered arroyo toad habitat. In addition to habitat threats, introduced non-native predators (e.g., bullfrogs, green sunfish, and African clawed frogs) and fire are substantial threats to the arroyo toad. Threats to the arroyo toad identified subsequent to listing are the chytrid fungus disease and wildfire suppression activities.

Although the types of threats remain the same, the status of the arroyo toad has improved. Since the listing of the arroyo toad, a new population has been discovered at FHL in Monterey County, and the area known to be occupied by the original 22 populations has expanded as a result of the discovery of new arroyo toad localities. New dam construction, which likely caused the major decline in arroyo toads that occurred prior to listing, is not likely to occur in the future. Although no new dams are likely to be constructed, the operation of existing dams poses a threat to arroyo toads. However, progress is being made toward modifying dams to maintain a more natural hydrologic regime below the dam for the benefit of arroyo toads. Several major management plans that cover arroyo toad populations on Federal lands and that include conservation measures for the species have been developed. The USFS has approved LMPs for the four southern California national forests that include arroyo toad populations. The MCBCP and FHL have developed INRMPs, which have been approved by the Service, that include conservation measures that benefit the arroyo toad. Although tamarisk and *Arundo* persist in arroyo toad habitat, efforts are being made to remove them from some drainages.

Therefore, based on the improvements in the status of the arroyo toad and conservation management to control threats that have occurred since it was listed, we recommend the species be downlisted to threatened.

V. RESULTS

Recommended Listing Action:

- Downlist to Threatened
- Uplist to Endangered
- Delist (indicate reason for delisting according to 50 CFR 424.11):
 - Extinction*
 - Recovery*
 - Original data for classification in error*
- No Change

New Recovery Priority Number and Brief Rationale: The current number for the arroyo toad is 8. This recovery priority number reflects a species that faces a moderate degree of imminent threat and has a high probability of recovery. We do not recommend any change in the current number because although threats remain, the downlisting criterion of establishing 20 self-sustaining populations of arroyo toads has been achieved, reflecting a high probability of recovery.

Listing and Reclassification Priority Number and Brief Rationale:

We expect that downlisting of the arroyo toad would have a low impact on management, as we expect that the level of management the species receives under the Act would be very similar to the current level, if it were downlisted from endangered to threatened. We have not received a petition to downlist the arroyo toad. The appropriate reclassification priority number for a species where the reclassification would have a low impact on management and has not been petitioned is 6 (48 FR 43098).

VI. RECOMMENDATIONS FOR FUTURE ACTIONS

The following recommendations are based on those suggested by Madden-Smith et al. (2003) and CDFG (2005):

1. Expand the abundance and range of arroyo toad populations through restoration of breeding habitat and restoration of natural hydrologic regimes below dams. Restoration activities for the arroyo toad include enhancing riparian habitat and vegetation; relocating or removing confining levees to allow river-channel meandering and reconnection of rivers with their floodplains; removing dams, diversions, or other obstacles to sediment transport; and providing more water for instream flows.
2. Agencies should increase efforts to control invasive aquatic animals, particularly bullfrogs, African clawed frogs, and introduced crayfish species through a combination of eradication and trapping efforts and improved water-management practices.
3. Agencies should design and implement measures to prevent infrastructure development and utility maintenance projects from introducing non-native species.

4. Based on the best available science and site-specific conditions, fire management policies and practices should be designed to restore the ecological integrity of natural communities.
5. Wildlife agencies, local governments, and conservation organizations should work to protect land and limit development within targeted priority watersheds through acquisitions, easements, or zoning regulations.
6. The U.S. Forest Service should conduct implementation and effectiveness monitoring of high use sites to ensure that corrective actions are working, and complete surveys of all modeled habitat to determine suitability and occupancy.

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**U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW**

Arroyo Toad (*Bufo californicus*)

Current Classification: Endangered

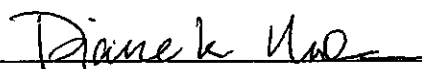
Recommendation Resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No Change


Review Conducted By: Della Snyder-Velto

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office

Approve  Date 7/31/09

Cooperating Field Supervisor, U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office

Approve  Date 8/3/09

Assistant Regional Director, U.S. Fish and Wildlife Service, Region 8

Approve _____ Date _____

APPENDIX A

CURRENT ARROYO TOAD DISTRIBUTION AND HABITAT

Northern Recovery Unit

1) Salinas River Basin, Monterey and San Luis Obispo Counties: Arroyo toads (*Bufo californicus*) were not known to occur in this area at the time of listing. Arroyo toads were found during surveys on Fort Hunter Liggett (FHL) approximately 40 miles (mi) (64 kilometers (km)) downstream of the historical Santa Margarita site in 1996. In 1997, arroyo toads were detected along a 17-mi (27-km) stretch of the San Antonio River on FHL. This locality starts approximately 1 mi (1.6 km) north of the confluence of San Antonio River with Mission Creek and extends approximately 1 mi (1.6 km) north of Lake San Antonio. At present, annual surveys have not detected any new localities on FHL (Clark *in litt.* 2009), but the base likely supports one of the largest populations of arroyo toads in the northernmost portion of the species' range (U.S. Army Reserve Command 2004). The Army surveyed 10 mi (16 km) of the San Antonio River on the base in 2001 and counted 126 clutches, comprising nearly 20,000 tadpoles and toadlets (U.S. Army Reserve Command 2004).

Threats specific to this population: The habitat on FHL is in a relatively natural state and is considered high quality for arroyo toads despite the presence of bullfrogs (*Rana catesbeiana*). Also present are non-native beavers (*Castor canadensis*), considered a threat to arroyo toads because beaver dams alter arroyo toad habitat by disrupting normal stream flow and impounding water, which inundates breeding habitat.

2) Sisquoc River, Santa Maria River Basin, Santa Barbara County: The Sisquoc River is undammed, and suitable arroyo toad habitat extends from the junction of Manzana Creek upstream about 9 mi (14 km) to Sycamore Campground in the Los Padres National Forest (LPNF). During a 1999-2000 survey, a single adult arroyo toad was observed on the Sisquoc River but none were seen along Manzana Creek (Hubbartt and Murphey 2005).

Threats specific to this population: Due to lack of survey data, we do not know the status of threats to this population.

3) Santa Ynez River Basin, Santa Barbara County: Arroyo toads are present at scattered locations on the upper Santa Ynez River, between Gibraltar Reservoir and Juncal Dam. Arroyo toad habitat extends from Mono Creek to Fox Creek for a distance of about 8.6 mi (13.8 km) (U.S. Fish and Wildlife Service (Service) 1999). Arroyo toads are also present on the lower reaches of Mono Creek and Indian Creek. During a 1999-2000 arroyo toad survey, approximately 70 adult arroyo toads were observed on the Santa Ynez River, Mono Creek, Indian Creek, and Agua Caliente Creek (Hubbartt and Murphey 2005), and breeding was confirmed at Santa Ynez River, Mono Creek, Indian Creek. Arroyo toad breeding occurred from April to the end of May, and toads were still calling as late as the end of June (Hubbartt and Murphey 2005).

Threats specific to this population: The population of arroyo toads in the Upper Santa Ynez River are threatened by non-native species, recreation, and affects from the operation of an upstream dam and several water diversions that have lead to sediment trapping, an altered hydrological regime, and changes in water temperature.

4) Santa Clara River Basin, Ventura and Los Angeles Counties: Arroyo toads are present in large numbers in suitable habitat along Sespe Creek, from about Hot Springs Canyon extending 15 mi (24 km) upstream to the mouth of Tule Creek in the Los Padres National Forest, Ventura County. During a 1999-2000 arroyo toad survey, 54 adult arroyo toads were observed, and breeding was confirmed at Sespe Creek (Hubbartt and Murphey 2005). The upper Piru Creek segment, which extends from Pyramid Lake upstream to Bear Gulch, generally has small populations of arroyo toads distributed in a range of good to marginal habitats. During the 1999-2000 arroyo toad survey, breeding was confirmed at Piru Creek, and 44 adult arroyo toads were observed (Hubbartt and Murphey 2005).

According to the recovery plan (Service 1999), the lower Piru Creek segment, from Blue Point Campground upstream to lower Piru Gorge (also known as Middle Piru Creek), generally has larger numbers of arroyo toads distributed over areas of good-to-excellent habitat. Ninety-seven arroyo toad clutches were recorded on middle Piru Creek between Blue Point Campground and Ruby Canyon during the 2008 breeding season (Cameron 2009).

Threats specific to this population: Sandburg (2006, 2008) and Sweet (1993) contend that a natural flow regime is a critical component for productive arroyo toad breeding habitat. As in 2007, water releases were made from Pyramid Dam in 2008 to simulate natural flows from upper Piru Creek. In general, optimum breeding conditions were present throughout much of the survey area. Clutches were not recorded downstream of Blue Point Campground. According to Cameron (2009), the relatively high arroyo toad clutch productivity of 2008 in middle Piru Creek indicates that, if arroyo toad breeding habitat is maintained under simulated natural conditions, the species will respond accordingly.

5) Los Angeles River Basin, Los Angeles County: On the Angeles National Forest, arroyo toad populations occur along Castaic Creek, Big Tujunga Canyon including associated lower reaches of Mill and Alder Creeks, Soledad Canyon, and on the desert side of the San Gabriel Mountains along Little Rock Creek. Arroyo toads are also found along Castaic Creek for about 2 mi (3.2 km) below Castaic Dam, and for a distance of about 1 mi (1.6 km) above the lake. Except for Castaic Creek, these areas were apparently not known to be occupied by arroyo toads when the species was listed (70 Federal Register (FR) 19590 and 59 FR 64859). These populations lie near or within the U.S. Forest Service (USFS) boundary and, in some cases, extend beyond it (70 FR 19562). The USFS estimates about 4,000 acres (ac) (1,618 hectares (ha)) of occupied arroyo toad habitat occur on the Angeles National Forest (70 FR 19562). About 1,106 ac (447 ha) of arroyo toad critical habitat occurs on the Angeles National Forest in the Little Rock Creek Unit (Unit 21) (70 FR 19562).

Threats specific to this population: The population of arroyo toads in Big Tujunga Canyon are threatened by non-native species including crayfish (*Procambarus clarkii*), bullfrogs, and giant reed (*Arundo donax*; *Arundo*) (70 FR 19590). The sandy terrace habitat in Big Tujunga Canyon

has been scoured away by periodic dam releases from Big Tujunga Canyon Dam so that the sand that was once naturally deposited has been mostly washed away. Stands of *Arundo* dominate and enclose the riparian habitat in Big Tujunga Canyon, making it unsuitable for arroyo toads, although habitat patches still remain at Delta Flat and the lower portion of Big Tujunga Canyon. The Angeles National Forest removed the *Arundo* along 8 mi (13 km) of Big Tujunga Canyon in 2003 and 2004 (Service 2005b). In 2007, the Angeles National Forest removed the non-native white sweetclover (*Melilotus alba*) from Upper Big Tujunga Canyon and Little Rock Creek to help improve arroyo toad habitat (USFS 2007a, 2007b).

In 1996, arroyo toads were found along a small tributary of Arroyo Seco above Devil's Gate Reservoir in Pasadena, California, and near the settling ponds in the main channel above Devil's Gate Dam (Cooperative Conservation America 2008). The Service included this portion of the Arroyo Seco in the 2001 designation of critical habitat but it was not included in the 2005 revised designation of critical habitat, as there had been no sightings of arroyo toads since 1996 (Service 1999). The population that historically occurred at this location is believed to be extirpated.

Southern Recovery Unit

6) Santa Ana River Basin, Orange and Riverside Counties: The Santa Ana River watershed is a large watershed that includes portions of Orange, Riverside, and San Bernardino Counties, but arroyo toads are known only from Santiago Creek Basin in eastern Orange County. Arroyo toads were known to occur in Santiago Canyon and Baker Canyon in the 1970's and 1980's but no sightings of arroyo toads were made during the 1990's (Service 1999). Arroyo toads have recently been reported from Silverado Creek and Santiago Creek on private land near Irvine Lake (Glenn Lukos Associates 2005; Haase 2005a, 2005b, 2008) and farther upstream in Silverado Creek in the Cleveland National Forest (CNO) (Thomas *in litt.* 1998). New arroyo toad locations in the Santa Ana River watershed have been documented since the arroyo toad was listed.

Most of the arroyo toad observations along the downstream stretch of Silverado Creek are on private land conserved and managed by The Irvine Company. A portion of Silverado Creek is on private lands that are subject to potential development as described below. The upstream observations of arroyo toad in Silverado Creek are in the Cleveland National Forest, so there is little development pressure, and future activities will be conducted consistent with the land management plans (LMP) for the USFS.

Threats specific to this population: Santiago Creek Basin empties into Irvine Lake, which contains large populations of non-native predators. Large populations of non-native predators occur in Santiago Creek near Irvine Lake, but the predator density is lower farther upstream in Santiago Creek and Silverado Creek, likely because these upstream stretches dry up each year (Glenn Lukos Associates 2005). A golf course development is proposed immediately adjacent to Santiago Creek near Irvine Lake, which is an area where arroyo toads have not been observed, likely because of the high levels of non-native predators (Glenn Lukos Associates 2005). In addition, a residential development is proposed in upland habitat adjacent to Silverado Creek, near a location where arroyo toads were observed (Haase 2008). Existing homes line much of

Silverado Creek between the downstream observations on private lands and the upstream observations in the Cleveland National Forest.

7) San Juan Creek Basin, Orange and Riverside Counties: Arroyo toads were originally found in San Juan Creek in 1974 about 1 mi (1.6 km) southwest of the Lower San Juan Picnic Area, Cleveland National Forest, Orange County. Arroyo toads have also been found in the drainage from Interstate 5 near San Juan Capistrano, Orange County, upstream through Ronald W. Caspers Wilderness Park and the Cleveland National Forest, to the Upper San Juan Campground area, Riverside County ((Swift, Entrix, Inc., pers. comm. 2006; Bloom 1998; Ervin et al. *in litt.* 2000). Subsequent surveys for arroyo toads have found them in Bell Canyon (Bloom 1998; Haase, Glenn Lukos Assoc., pers. comm. 2009), Trabuco Creek (Holland, Biological Consultant, pers. comm. 2005) and Verdugo Canyon. New arroyo toad locations in the San Juan Creek watershed have been documented since the arroyo toad was listed.

Threats specific to this population: Potential threats include predation by non-native aquatic species, habitat degradation due to invasion by non-native plants (e.g., *Arundo*), and loss of habitat and changes in hydrology due to development. The Southern Orange County Habitat Conservation Plan (Southern Orange HCP) anticipates that up to 37 percent of modeled toad habitat in the San Juan Creek on Rancho Mission Viejo lands will be impacted by development. However, direct impacts to breeding habitat will be minimal, and the remaining habitat will be conserved and managed.

There are several stretches along San Juan Creek where substantial numbers of bullfrogs and crayfish have been observed (e.g., Bonterra 2008); therefore, non-native predators are likely to be an ongoing threat in this area. There are patches of *Arundo* along San Juan Creek and Bell Canyon, but to date this threat has been managed through *Arundo* control efforts, such as the County of Orange's commitment under the Southern Orange HCP to remove *Arundo* in Casper's Wilderness Park and the California Department of Transportation's commitment to remove *Arundo* from the Cleveland National Forest (Service 2005a).

San Mateo Creek Basin, Orange, Riverside, and San Diego Counties: The San Mateo Creek watershed straddles the border between northern San Diego and southern Orange Counties, and the headwaters extend into southwestern Riverside County. In San Diego County, arroyo toads have been found in San Mateo Creek from the coastal estuaries to the northern border of Marine Corps Base Camp Pendleton (MCBCP). Arroyo toads have also been found in Cristianitos Creek and Talega Canyon (on the border between San Diego and Orange Counties). In southern Orange County, arroyo toads have been found in Cristianitos Creek, Gabino Canyon, and La Paz Canyon (Service 1999). In western Riverside County, arroyo toads are known from the mainstem of San Mateo Creek and associated tributaries (Service 1999). Recent surveys in the San Mateo Creek watershed on MCBCP and in southern Orange County have documented arroyo toads throughout the areas where they have been previously identified (Bloom 1998, 2006; Service 1999; Brehme et al. 2006).

The portion of the watershed in San Diego County is primarily within MCBCP but extends into Cleveland National Forest along the northern border of the county. The portion of the watershed in Riverside County is primarily within the San Mateo Canyon Wilderness area of the Cleveland

National Forest and associated private inholdings. The portion of the watershed in southern Orange County is within the area addressed by the Southern Orange HCP, as described above.

Threats specific to this population: Potential threats to the arroyo toad in the San Mateo Creek watershed include predation by non-native aquatic species, habitat degradation due to invasion by non-native plants, loss of habitat due to development, and impacts associated with military training. Surveys on MCBCP have documented a negative correlation between the presence of non-native predators (fish, bullfrogs, and crayfish) and arroyo toads (Brehme et al. 2006). Arroyo toads are persisting within the watershed under current conditions, but non-native predators are likely to remain an ongoing threat. There are patches of *Arundo* in the watershed, but the Marine Corps implements an active program to control *Arundo*, so this threat is being effectively managed on MCBCP. Consistent with the Southern Orange HCP, a program to control *Arundo* will eventually be implemented in the Orange County portion of the watershed.

Within the San Mateo Creek watershed on MCBCP, there have been limited impacts from development in the upland environment and minor impacts in breeding habitat since the listing of the arroyo toad. Impacts associated with military training activities are also limited in accordance with the biological opinion “Programmatic Activities and Conservation Plans in Riparian and Estuarine/Beach Ecosystems on Marine Corps Base, Camp Pendleton” (Riparian BO) (Service 2000a), Range and Training Regulations (RTRs), and the MCBCP Integrated Natural Resources Management Plan (INRMP). The Southern Orange HCP authorizes up to 500 ac (202 ha) of development within the watershed in Orange County, but the development will not directly impact breeding habitat and will impact only up to 40 ac (16 ha) of modeled arroyo toad upland habitat (Service 2007). Because most of the San Mateo Creek watershed in Riverside County is within the San Mateo Canyon Wilderness area in the Cleveland National Forest, the threat of development is limited in this portion of the watershed.

Development of arroyo toad habitat and potential training activities on MCBCP are limited in accordance with the Riparian BO, RTRs, and the MCBCP INRMP. Monitoring of toad populations and habitat management are also implemented on MCBCP consistent with the Riparian BO and the INRMP. The great majority of the upland habitat and all breeding habitat in the portion of the watershed in Orange County will be conserved and managed consistent with the Southern Orange HCP. The 500-ac (202-ha) development in southern Orange County will be sited to minimize potential impacts to arroyo toad. The portion of the arroyo toad population in the San Mateo Canyon Wilderness area of the Cleveland National Forest is largely protected from development, and the LMPs for the USFS include the provision that new projects will be neutral or beneficial with respect to the arroyo toad.

San Onofre Creek Basin, San Diego County: The San Onofre watershed lies to the south of the San Mateo Creek watershed and is entirely contained within the boundaries of MCBCP (Marine Corps 2007). Arroyo toads have been found from the mouth of San Onofre Creek to the confluence of the North and South Forks of San Onofre Canyon; beyond this confluence, toads extend less than 0.4 mi (0.6 km) up the South Fork of San Onofre Canyon, approximately 3.7 mi (6.0 km) up the North Fork of San Onofre Canyon, and approximately 2.3 mi (3.7 km) up Jardine Canyon beyond its confluence with the North Fork of San Onofre Canyon (Service 1999, Marine Corps 2005, Brehme et al. 2006). Recent surveys have documented arroyo toads in all

portions of the watershed where they were previously known to occur (Service 1999, Marine Corps 2005, Brehme et al. 2006).

Threats specific to this population: Potential threats to the arroyo toad in the San Onofre watershed include predation by non-native aquatic species, habitat degradation due to invasion by non-native plants, loss of habitat due to development, and impacts associated with military training. Surveys on MCBCP have documented a negative correlation between the presence of non-native predators (fish, bullfrogs, and crayfish) and arroyo toads (Brehme et al. 2006). Arroyo toads are persisting in the watershed under current conditions, but non-native predators are likely to remain an ongoing threat. There are patches of *Arundo* throughout much of the watershed. However, the Marine Corps implements an active program to control *Arundo* throughout MCBCP, so this threat is being effectively managed.

Within the San Onofre Creek watershed on MCBCP, there have been limited impacts from development in the upland environment and negligible permanent impacts in breeding habitat since the listing of the arroyo toad. Impacts to arroyo toads associated with military training are limited in accordance with the Riparian BO, RTRs, and the MCBCP INRMP.

Overall, development within arroyo toad habitat and potential training activities on MCBCP are limited in accordance with the Riparian BO, RTRs, and the MCBCP INRMP. Monitoring of toad populations and habitat management are also implemented on MCBCP consistent with the Riparian BO and the INRMP.

Santa Margarita River Basin, San Diego and Riverside Counties: Arroyo toads have been found in the Santa Margarita River mainstem and its tributaries including: De Luz Creek, Roblar Creek, Sandia Creek, Temecula Creek, Arroyo Seco Creek, and on the Santa Rosa Plateau in a tributary of Cole Creek. MCBCP contains about 7 percent of the Santa Margarita watershed (Marine Corps 2007) including arroyo toad locations along the lower half of the Santa Margarita River, the lower part of De Luz Creek, and Roblar Creek (Brehme et al. 2004). Occupied habitat in the Santa Margarita River extends northeast of MCBCP onto Naval Weapons Station Seal Beach Detachment Fallbrook (Brehme et al. 2004). Arroyo toad locations in Riverside County include an isolated location on the Santa Rosa Plateau along Cole Creek (Regional Conservation Authority 2005) and stretches of Temecula Creek (AMEC 2001, Helix 2004), Arroyo Seco Creek (U.S. Geological Survey (USGS) 2000), and Wilson Creek (Haase, pers. comm. 2009) upstream of Vail Lake. New arroyo toad locations in the Santa Margarita River watershed have been documented since the arroyo toad was listed.

Threats specific to this population: Potential threats to the arroyo toad in the Santa Margarita River watershed include predation by non-native aquatic species; habitat degradation due to invasion by non-native plants; loss of habitat and changes in hydrology due to development; impacts associated with military training; and recreational activities, such as off-road vehicle use.

The lower Santa Margarita River has perennial flow, which allows for some breeding of toads during even the driest years, but also augments the persistence of non-native invasive predators (bullfrogs, fish, and crayfish) (Brehme et al. 2006). Therefore, non-native predators in the Santa Margarita River are more widely distributed and are likely causing a greater impact to arroyo

toad populations than non-native predators in the other coastal drainages (Brehme et al. 2006). The Marine Corps plans to implement a non-native predator control program on the lower Santa Margarita River in 2009, but it is not clear whether this effort will be funded over the long term.

The Marine Corps implements an ongoing program to control *Arundo* throughout MCBCP, so this threat is being effectively managed on the base. In the late 1990's, the Marine Corps implemented the Santa Margarita River Flood Control and Basilone Bridge Replacement Project, which permanently impacted about 81.9 ac (33.1 ha) of arroyo toad breeding and adjacent upland habitat, and a large number of arroyo toads (Service 1998a, 1998b). The Marine Corps has also implemented a few smaller projects in upland habitat along the Santa Margarita River and DeLuz Creek. We are currently unaware of any major construction projects planned within or adjacent to arroyo toad breeding habitat in the Santa Margarita River watershed. Training related impacts in the watershed are currently limited, consistent with the Riparian BO, INRMP, and RTRs.

Potential threats in the upper Santa Margarita River watershed upstream of Vail Lake in Riverside County include non-native predators; sand and gravel mining; loss of habitat and changes in hydrology due to development; and habitat degradation due recreation, such as off-road vehicle use (USGS 2000, Helix 2004, Service 2004b). There are scattered locations of non-native plant species in the upper portion of the watershed, but the survey reports from these drainages have documented primarily native riparian habitat (USGS 2000, AMEC 2001, Helix 2004).

San Luis Rey River Basin, San Diego County: Arroyo toads have been consistently observed at multiple locations throughout the San Luis Rey River Basin during Service protocol surveys conducted in association with development projects. However, we do not have specific information regarding the status of these populations. Arroyo toad occurrences within the San Luis Rey River Basin include portions of the lower and middle San Luis Rey River, including sections of Keys and Pala Creeks. Arroyo toads have also been documented in the upper San Luis Rey River above Lake Henshaw, including portions of Barker Valley and Agua Caliente Creek. These populations are small, disjunct, and occur at high elevations. The majority of occupied arroyo toad habitat within the San Luis Rey River Basin occurs on private lands; however, large toad populations and high quality arroyo toad habitat have been documented on both the Pala and Rincon Indian Reservations. In 2001, approximately 143 arroyo toads were observed on the Rincon Indian Reservation (unpublished report from Varanus Biological Services, Inc 2001).

Threats specific to this population: Threats to the arroyo toad within the San Luis Rey River Basin include non-native predators, development, grazing, and groundwater pumping. The removal of non-native predators (e.g., bullfrogs), has been implemented as a conservation measure for development projects occurring within and adjacent to arroyo toad habitat within the San Luis Rey River Basin; however, there is not a large-scale non-native predator removal project in place currently. In addition, portions of the San Luis Rey River and the adjacent uplands have been acquired and preserved in perpetuity as mitigation for development projects that impacted arroyo toad habitat. Although management plans have been developed for some of the preserved arroyo toad habitat within the San Luis Rey River Basin to ensure that the preserved habitat remains suitable for the arroyo toad in perpetuity, these plans generally do not

include a detailed monitoring component. In addition, no basin-wide management or monitoring specific to the arroyo toad occurs within this Basin.

San Dieguito River/Santa Ysabel Creek Basin, San Diego County: Arroyo toads have been found in Guejito Creek, Santa Maria Creek, Pamo Valley (Temescal Creek), San Pasqual Valley, Santa Ysabel Creek, and Witch Creek. The San Dieguito River has two major dams, Lake Hodges and Lake Sutherland, which have eliminated some historical habitat in the basin through flooding, lack of sediment deposition, and hydrologic changes. Despite the presence of these dams, there are still extensive stretches of suitable habitat remaining in the above-mentioned creeks. The flow of the river is intermittent and the riverbed upstream from tidal influence is often dry (Madden-Smith et al. 2005).

Arroyo toads have been consistently observed at multiple locations throughout the San Dieguito River/Santa Ysabel Creek Basin during Service protocol surveys conducted in association with development projects. However, we do not have specific information regarding the size or health of these populations. Arroyo toad occurrences within the San Dieguito River/Santa Ysabel Creek Basin include portions of Santa Maria Creek, Guejito Creek, and Santa Ysabel Creek. Based on information provided in protocol survey reports from 2003 to 2008, arroyo toads were observed at 5 locations in Santa Ysabel Creek, 5 locations in Santa Maria Creek, 11 locations in Guejito Creek, and 3 locations in San Dieguito River (unpublished 10(a)(1)(A) survey reports submitted to the U.S. Fish and Wildlife Service from 2003-2008). No arroyo toad designated critical habitat occurs within the San Luis Rey River Basin.

Threats specific to this population: Threats to the arroyo toad within the San Dieguito River/Santa Ysabel Creek Basin include non-native predators, dams, and development. The removal of non-native predators (e.g., bullfrogs), has been implemented as a conservation measure for development projects occurring within and adjacent to arroyo toad habitat within the San Dieguito River/Santa Ysabel Creek Basin; however, there is not a large-scale non-native predator removal project in place currently. No basin-wide management or monitoring specific to the arroyo toad occurs within this Basin.

San Diego River Basin, San Diego County: Arroyo toads were found in 1923 in the San Diego River Basin at Lakeside, and later in San Vicente Creek. These locations are now inundated by reservoirs. Arroyo toads are present above El Capitan Lake to the mouth of Cedar Creek and above San Vicente Reservoir. The San Diego River runs through rural, suburban and urban lands and discharges just south of Mission Bay (Madden-Smith et al. 2005). During USGS 2002 and 2003 focused surveys for arroyo toads (Madden-Smith et al. 2005), arroyo toads were detected at the San Vicente Creek site (two adults and two tadpoles) during nocturnal surveys but not at the Mission Trails Regional Park, Kumeyaay Lake site.

Threats specific to this population: Due to lack of survey data, we do not know the status of threats to this population.

Sweetwater River Basin, San Diego County: The Sweetwater River runs through rural, suburban and urban lands and has two major dams forming Loveland Reservoir and Sweetwater Reservoir. In 1930, arroyo toads were discovered in the Sweetwater River near Dehesa. Since then, arroyo

toads have been collected and observed on the main Sweetwater River east of Loveland Reservoir (Service 1999). Arroyo toads were last detected at this site in 1998 (Madden-Smith et al. 2005). Recent changes upstream of Loveland Reservoir may have caused degradation of the arroyo toad habitat in this site, with an increase in vegetation cover and an increasingly muddy substrate (Madden-Smith et al. 2005). Arroyo toads have also been observed in Cuyamaca State Park, in Viejas Valley Creek, and in Peterson Creek. A population of arroyo toads also occurs in Sloan Canyon on private property previously owned by Vulcan Minerals, Inc.

Threats specific to this population: Arroyo toads have not colonized the high or good quality habitat upstream or downstream from this location, likely because the intervening terrain has been disturbed and hydrologically altered due to the operation of Loveland Dam (Madden-Smith et al. 2005).

Otay River Basin, San Diego County: Arroyo toads were initially discovered in the Otay River Basin in 1930; however, the construction of Upper and Lower Otay Lakes have eliminated some habitat. During the 2002 and 2003 focused surveys for arroyo toads conducted by the U.S. Geological Survey (USGS) (Madden-Smith et al. 2005), arroyo toads were not detected at any of the five nocturnally surveyed sites, which include locations in Rancho Jamul Ecological Reserve, Hollenbeck Canyon, Dulzura Creek, Sycamore Canyon, and Otay Valley Regional Park. The USGS also conducted habitat assessments at 10 sites and found that 2 contained good quality arroyo toad habitat (Sycamore Canyon and Otay Valley Regional Park); the other 8 survey sites contained either marginal or poor quality habitat.

Threats specific to this population: Due to lack of data, we do not know the status of threats to this population.

San Felipe Creek Basin, San Diego County: Arroyo toads were observed in 1950 in the “Country Club at Borrego” (Service 1999). The status of this population is currently unknown and should be verified.

Vallecitos Creek Basin, San Diego County: A single record exists consisting of three tadpoles that were collected in 1954 (Service 1999). The status of this population is currently unknown and should be verified.

Tijuana River-Cottonwood Creek Basin, San Diego County and Baja California, Mexico: Arroyo toads have been found in several drainages in the basin including Pine Valley, Noble, Cottonwood, Kitchen, Potrero, and Morena Creeks and Scove Canyon. The watershed contains three major dams, the Morena Dam and Barrett Dam on Cottonwood Creek in the United States and the Rodriguez Dam in Mexico. The Tijuana River is highly polluted by industrial runoff and waste from Mexico (Madden-Smith et al. 2005). During the 2002 and 2003 focused surveys for arroyo toads conducted by the USGS (Madden-Smith et al. 2005), arroyo toads were detected at the Cottonwood-Marron Valley site; in 2002, 14 adult arroyo toads were observed and in 2003, 5 adults, 2 toadlets, and 1 tadpole were observed. The Tecate Creek/Tijuana River site was not nocturnally surveyed due to safety concerns related to illegal immigrant traffic and water quality; however, upland habitat on the north side of the site was searched for migrating or foraging adult arroyo toads but none were observed.

Since the time of listing, arroyo toads have been observed within Campo Creek. Service protocol surveys were conducted in approximately 2.2 ac (0.89 ha) of Campo Creek, immediately north of the U.S.-Mexican international border, as part of BLM's International Fuel Break project. During protocol surveys conducted on June 25, 2008, four adult males were detected vocalizing within and adjacent to Campo Creek. No arroyo toad designated critical habitat occurs within Campo Creek. In addition, currently no monitoring or management specific to the arroyo toad occurs within Campo Creek.

Threats specific to this population: Due to lack of data, we do not know the status of threats to this population.

Desert Recovery Unit

Little Rock Creek Basin, Los Angeles County: Arroyo toads in this Basin were originally found in 1970 at Joshua Tree Campground near the upper end of Little Rock Reservoir, Angeles National Forest. By 1996, the toads appeared to be restricted to a 3-mi (4.8-km) stretch of stream habitat above Little Rock Reservoir and numbered approximately 20 adults. In 2007, the invasive weed yellow sweetclover (*Melilotus officinalis*) was removed from occupied arroyo toad habitat to reduce vegetative cover in the sandy beach areas along Little Rock Creek and improve habitat conditions for the arroyo toad (USFS 2007b).

Threats specific to this population: Arroyo toads in Little Rock Creek are threatened by non-native species, including crayfish and bullfrogs, and recreational activities such as hiking, fishing, boating, waterplay and occasional OHV use (Service 1999). Portions of Little Rock Creek have been closed by the Angeles National Forest to protect the arroyo toad.

Mojave River Basin, San Bernardino County: Since 1999, arroyo toad populations appear to be restricted to the West Fork of the Mojave River, Little Horsethief Creek, and the lower and middle portions of Deep Creek and Kinley Creek on the San Bernardino National Forest. Only the Deep Creek occurrence appears to have been considered known occupied habitat at the time of listing (70 FR 19590 and 59 FR 64859).

Along the western base of the San Jacinto Mountains, arroyo toads occur in Bautista Creek and along the San Jacinto River (Service 2005a). The San Jacinto River watershed covers much of central and western Riverside County. There are historical records of arroyo toads in the San Jacinto River Basin, but at the time of listing and when the recovery plan was prepared, arroyo toads were thought to be extirpated from this area (Service 1999). Arroyo toads were re-discovered in the San Jacinto River and Bautista Creek, a major tributary, in 2000 (Brown et al. 2001). Arroyo toads observed on Bautista Canyon are primarily on USFS lands in the San Bernardino National Forest. The arroyo toad observation in San Jacinto River was in a private inholding in the San Bernardino National Forest.

Threats specific to this population: Documented threats to arroyo toads in the San Jacinto River watershed include recreation impacts such as horseback riding and off-highway vehicles, and road mortality, as Bautista Canyon Road parallels Bautista Canyon. In addition, development

could occur within private inholdings along the San Jacinto River. Arroyo toad observations in Bautista Canyon are primarily within Forest Service lands, so there is little development pressure, and future activities will be conducted consistent with the San Bernardino National Forest Management Plan. Private inholdings along Bautista Canyon and San Jacinto River are targeted for conservation under the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP).

No arroyo toads were detected during USGS surveys at Cajon Wash in 2001, 2002, 2003, or 2004, although they were last documented there in 2000 and arroyo toad habitat is still present (Hitchcock et al. 2004a). Several large fires in the area have made arroyo toads difficult to detect but surveys conducted by the USFS have confirmed arroyo toad presence (Backlin, *in litt.* 2009).

Other locations in Mojave River Basin include:

Little Horsethief Creek— a total of 30 arroyo toads were documented over the course of three USGS surveys in 2004 (Hitchcock et al. 2004a).

Mojave Forks Dam – arroyo toads were not found in the USGS survey reach; however, several toads were photo-documented in a section of the creek just west of the designated survey area (Hitchcock et al. 2004a).

Cleghorn/Silverwood Lake – a single arroyo toad was found in the 2004 USGS survey in the same general location as in 2003 (Hitchcock et al. 2004a). Until 2003, arroyo toads had not been reported from the Cleghorn/Silverwood Lake area since just after the reservoir was formed in 1972.

Deep Creek Hot Springs – arroyo toads were detected in the USGS survey of Deep Creek Hot Springs in 2003 (Hitchcock et al. 2004b).

Whitewater River Basin, Riverside County: In 1992, a small population of arroyo toads was found in the Whitewater River, 2 to 3 mi (3.2 to 4.8 km) north of Interstate 10 (Patten and Myers 1992). The current status of arroyo toads in the Whitewater River Basin is poorly known. A small population of arroyo toads, consisting of three specimens, was observed and photographed in the Whitewater River Basin in 1992 (Patten and Myers 1992). However, no arroyo toads were detected in surveys conducted in the Whitewater Canyon during the 2000, 2001, and 2003 breeding seasons (Jones and Stokes, *in litt.* 2000; Brown and Fisher 2002; Hitchcock et al. 2004b). In August 2003, there was an unconfirmed identification of an arroyo toad tadpole near where the Colorado River Aqueduct crosses the river (Bloom, *in litt.* 2003).

Threats specific to this population: Arroyo toads in the Whitewater River Basin are threatened by off-highway vehicular traffic and hydrologic alterations. Since beginning operation, a trout farm operation has been the major threat to the Whitewater Canyon population (Brown and Fisher 2002). The trout farm operation has been diverting water from an approximate 2-mi (3.2-km) stretch of the original streambed course via a diversion canal for over 70 years, leaving no breeding habitat and minimal habitat for daily activity within the channel drained by the water

diversion (Hitchcock et al. 2004b). Additionally, the amount and quality of natural water flows downstream have been compromised by the trout farm operations. In low-rainfall years, a majority of the water flow was siphoned into the diversion canal, leaving little or no natural water flow in the downstream river channel. In moderate-to-high rainfall years, high velocity flows bypassed the diversion channel and scoured out excess sediment that had accumulated in the river channel, which may have resulted in an increased sediment load deposited downstream. Furthermore, water diverted by the trout farm was used for trout production and fishing and then released back into the main channel without any filtering or cleaning process, thus potentially compromising the water quality in the downstream natural river channel. The potential for trout to escape from the trout farm into the main water channel was not documented; however, trout are abundant in the stream system and may pose a substantial threat to arroyo toad recruitment because they may eat tadpoles (Brown and Fisher 2002).

In 2006, the Wildlands Conservancy purchased the trout farm and ceased farming operations. Under ownership of the Wildlands Conservancy, the former trout farm will be used as an interpretive center. Over time, the dams used to create the trout farm ponds will be allowed to blow out during high rainfall years with high velocity flows, thereby allowing for passive restoration of the natural river channel and unrestricted waterflow throughout this portion of the Whitewater River. With the closing of the trout farm, it is anticipated that the above-described threats to the arroyo toad would be eliminated and that over time there would be an increase in the amount of suitable arroyo toad habitat within the Whitewater River. Currently, no management or monitoring specific to the arroyo toad occurs within the Whitewater River Basin.

Pinto Wash Basin, Imperial County: A small population of 50 juvenile arroyo toads was found here in 1992 (Service 1999). The site is located at the base of the canyon at the 500-ft (152 m) elevation, near the San Diego-Imperial County lines in the Jacumba (In-Ko-Pah Mountains) Wilderness Study Area. The status of this population is currently unknown and should be verified.

San Bernardino National Forest (SBNF): The USFS has identified about 1,500 ac (607 ha) of occupied arroyo toad habitat on the SBNF. About 896 ac (363 ha) of arroyo toad designated critical habitat occurs on the SBNF including the San Jacinto River Basin Unit (Unit 9) and the Upper Santa Ana River/Cajon Wash Unit (Unit 20) (70 FR 19562).

Threats specific to this population: Recreational activities, road use and road maintenance (70 FR 19590) are the primary threats to arroyo toads on SBNF lands. The Little Horsethief Creek population is threatened by gold prospecting activities as well (Service 1999). The SBNF has acquired an additional 68 ac (27.5 ha) of arroyo toad habitat in Bautista Canyon (Service 2005b). Off-highway vehicle use in the Mojave Forks area has been identified as a factor contributing to the near extirpation of toads downstream from Rancho Las Flores. Roads in the area, especially Highway 173 at the Horsethief Canyon crossing, pose a danger to arroyo toads during movement between Rancho Las Flores and upstream areas. In addition, arroyo toad breeding habitat has been severely altered by beaver dams at the Rancho Las Flores site (Ramirez 1999). The dams disrupt normal stream flow by impounding water and inundating breeding habitat, while encouraging the growth of riparian vegetation and favoring non-native species. The deep beaver

pools provide habitat for a number of non-native species that are detrimental to the continued existence of the toad.

Cleveland National Forest (CNF): Several small populations of arroyo toads occur on the CNF and surrounding areas. Most populations occur near the CNF boundary, with the bulk of prime breeding habitat often lying just off national forest land (Service 2005b). This is the case at the Sweetwater River; the upper San Diego River; Santa Ysabel Creek and associated lower reaches of Temescal Creek (Pamo Valley); and at Cottonwood Creek, which includes the lower reaches of Kitchen, Morena, and Potrero Creeks. Other occupied drainages include: San Mateo Creek; San Juan Creek; and the upper forks of the San Luis Rey River (above Lake Henshaw), including Agua Caliente Creek. All these areas were known to be occupied at the time of listing (70 FR 19590). Since listing, the arroyo toad was found in Los Alamos Creek in 1999 and Silverado Canyon in 2005 on the CNF (Winter, U.S. Forest Service, pers. comm. 2005; Carlsbad Fish and Wildlife Office, unpublished data). One population predominantly on national forest land occurs along Pine Valley Creek and several of its tributaries (Service 2005b). The USFS identifies about 8,000 ac (3,237 ha) of arroyo toad occupied habitat on the CNF (Service 2005b). No arroyo toad designated critical habitat occurs on the CNF.

Threats specific to this population: Threats to the arroyo toad on the CNF include off-highway vehicle use; recreation; campgrounds at upper San Juan Creek, upper San Luis Rey River, and Cottonwood Creek; road use and maintenance; non-native species; and grazing.

APPENDIX B

EFFECTS OF DAM CONSTRUCTION AND OPERATION TO ARROYO TOAD HABITAT

Salinas River Basin, Monterey and San Luis Obispo County: Although the original distribution of arroyo toad habitat in this area is not well known, construction of the Santa Margarita Dam on the Salinas River initially destroyed and altered suitable arroyo toad habitat. Two tributaries to the Salinas River, the Nacimiento River and the San Antonio River, are also dammed. Below the Nacimiento Dam, the river travels east until it joins the Salinas River at Camp Roberts, Monterey County. The San Antonio River, which feeds Lake San Antonio, flows several miles to the northeast. We do not have information on how flow releases from these dams have affected potential arroyo toad habitat.

Sisquoc River, Santa Maria River Basin, Santa Barbara County: The Sisquoc River is not dammed.

Santa Ynez River Basin, Santa Barbara County: Construction of the Gibraltar Reservoir on the Santa Ynez River inundated about 2 miles (mi) (3.2 kilometers (km)) of apparently suitable toad habitat, and flow regulation since the 1920s has eliminated toad habitat for about 5 to 9 river mi (8 to 14 km) downstream. Also on the Santa Ynez River, Juncal Dam and water diversions from Alder Creek and some unnamed creeks have inundated the area downstream from Juncal Campground and eliminated toad habitat.

Santa Clara River Basin, Ventura and Los Angeles County: The Sespe River is not dammed. On Piru Creek, the construction of Santa Felicia Dam to form Piru Lake in the 1950's and Pyramid Dam to form Pyramid Lake in the 1970's eliminated much of the arroyo toad's historic range. Arroyo toads are now restricted to short segments above each of the two lakes. Toads are also found on Castaic Creek for about 2 mi (3.2 km) below Castaic Dam, as well as for about 1 mi (1.6 km) above Lake Castaic.

Los Angeles River Basin, Los Angeles County: The sandy terrace habitat in Big Tujunga Canyon has been periodically scoured away by scheduled dam releases from Big Tujunga Canyon Dam.

Little Rock Creek Basin, Los Angeles County: As a result of dam construction and operation, arroyo toads appear to be restricted to a 3-mi (4.8-km) stretch of stream habitat above Little Rock Reservoir.

Mojave River Basin, San Bernardino County: Arroyo toads have been nearly eliminated between Victorville and the Mojave Forks Dam. Arroyo toads were once common throughout portions of the West Fork Mojave and the area now occupied by Silverwood Lake (Service 1999). Construction of the lake removed habitat where many arroyo toads were formerly observed and collected (Service 1999). Until 2003, arroyo toads had not been reported from the Cleghorn/Silverwood Lake area since just after the lake was formed in 1972. Toads are still

expected to occasionally disperse upstream towards the reservoir; however, the dam and reservoir pose an insurmountable barrier to further upstream movement.

Whitewater River Basin, Riverside County: At Whitewater Canyon, water has been diverted out of the main channel and up onto the terraced slope or underground, leaving no breeding habitat and minimal habitat for arroyo toad daily activity in the area.

Santa Ana River Basin, Orange and Riverside Counties: Arroyo toads in Baker Canyon and Silverado Canyon were restricted to a 6-mi (9.6-km) section of stream above Santiago Reservoir (constructed in 1920), but there have been no recent sightings and the population may have been extirpated.

San Luis Rey River Basin, San Diego County: The Henshaw Dam and Lake Henshaw occur on the San Luis Rey River. Above the lake, there are significant populations of arroyo toad in the West Fork, North Fork, and Agua Caliente Creek in several small, disjunct, populations at these high-elevation areas (Stephenson and Calcarone 1999). Factors affecting the ecological integrity of this area include surface and groundwater extraction on private lands above Lake Henshaw. The San Luis Rey River below Lake Henshaw is regulated by water releases from the dam (Stephenson and Calcarone 1999). We are awaiting updated information on how flow releases from the dam have affected potential or suitable arroyo toad habitat downstream (Ramirez, Cadre Environmental, pers. comm. 2009).

San Dieguito River/Santa Ysabel Creek Basin, San Diego County: The San Dieguito River has two major dams, Lake Hodges and Lake Sutherland, which have eliminated some historical habitat in the basin through flooding, lack of sediment deposition, and hydrologic changes; however, there are still extensive stretches of suitable habitat remaining in the above-mentioned creeks.

San Diego River Basin, San Diego County: There are four major dams: El Capitan on the San Diego River, and San Vicente, Lake Jennings and Cuyamaca on its tributaries. Arroyo toads are found in several stretches of riparian woodland above El Capitan Lake (Stephenson and Calcarone 1999). We do not have information on how flow releases from these dams have affected potential or existing arroyo toad habitat downstream.

Sweetwater River Basin, San Diego County: The Sweetwater River has two major dams forming Loveland Reservoir and Sweetwater Reservoir. Arroyo toads have not colonized the high or good quality habitat upstream or downstream from Sloan Canyon because the intervening terrain has been disturbed and hydrologically altered due to the operation of Loveland Dam (Madden-Smith et al. 2005).

Otay River Basin, San Diego County: Arroyo toads were initially discovered in the Otay River Basin in 1930; however, the construction of Upper and Lower Otay Lakes in 1919 has eliminated some arroyo toad habitat.

Tijuana River-Cottonwood Creek Basin, San Diego County and Baja California: Pine Valley and Cottonwood Creeks are adjacent drainages that come together at Barrett Dam that forms

Barrett Lake. Both have high-quality riparian habitat and populations of arroyo toads. Stream flows on Cottonwood Creek are regulated by dams at Morena and Barrett Lake (Stephenson and Calcarone 1999). We do not have information on how flow releases from these dams have affected potential or existing arroyo toad habitat, although invasive non-native species such as bullfrogs and sunfish occur downstream.

APPENDIX C

CONSERVATION MEASURES AND MANAGEMENT PLANS

U.S. Forest Service Land Management Plans

- Since the listing of the arroyo toad, the U.S. Forest Service (USFS) has adopted additional guidance to protect arroyo toads. In 2005, we issued non-jeopardy biological and conference opinions (Service 2005b) that addressed the revised Land Management Plans (LMPs) for the four southern California national forests (Los Padres, Angeles, San Bernardino, and Cleveland). These plans included strategic direction for land use zoning and design standards for projects so that new activities would be neutral or beneficial to arroyo toads. Also, expansion of existing facilities or new facilities would focus recreational use away from occupied arroyo toad habitat. Specific guidelines from the revised Land Management Plans include (1) Standards and guidelines with measures to protect arroyo toad habitat that are incorporated into projects for managing vegetation, soil, water, and riparian areas; (2) identification of the arroyo toad as a Management Indicator Species to be used to track the health of aquatic habitat; (3) specific requirements for monitoring and monitoring activities that may affect arroyo toad habitat; (4) a five-step project screening process to minimize impacts to riparian arroyo toad habitat; and (5) guidelines for use of retardant and foams in aquatic environments to minimize the impacts of these chemicals to the arroyo toad and its habitat during fire suppression activities (Service 2005b).

U.S. Forest Service Conservation and Recovery Actions

- Los Padres National Forest (LPNF): LPNF has taken steps toward conservation and recovery of the arroyo toad since it was listed in 1994 (Cooper *in litt.* 2009). LPNF has conducted intensive surveys over the past 10 years to better understand the distribution of arroyo toads and impacts to the species from forest management. The following campgrounds have been closed to protect arroyo toad habitat: Hardluck Campground on the middle Piru Creek, Blue Point Campground on the lower Piru Creek, and Beaver Campground and Lion Campground on Sespe Creek. LPNF has rerouted trails and closed roads in arroyo toad habitat. Snowy Trail on the Mount Pinos Ranger District was re-routed out of the riparian habitat to protect arroyo toad habitat in Piru Creek. The Agua Blanca Trailhead and Trail were re-routed away from Sespe Creek. Hiking trail crossings in the Sisquoc River were surveyed for potential impacts to arroyo toads in some areas (no impacts detected), and interpretive signs were placed in four campgrounds along the Sisquoc River. In addition to closing Blue Point and Hardluck Campground access roads, Camuesa Road was closed to public access to protect arroyo toad habitat near Mono and Indian Creeks. Administrative access by USFS personnel is also restricted during the breeding season unless a biologist surveys the road crossings first. LPNF consulted with the Service on low water road crossings in arroyo toad habitat, and the Service issued a programmatic biological opinion (1-8-97-F-33) (Service 2000b).

LPNF has kept the Sisquoc Grazing Allotment vacant for approximately 10 years due to concerns about impacts to arroyo toads and other sensitive riparian species (Cooper *in litt.* 2009). The Service recently completed section 7 consultation with the USFS on the Piru and Canton Canyon allotments that contained provisions to minimize impacts to arroyo toad habitat. Removing non-native species in arroyo toad habitat has also been undertaken by LPNF. USFS staff and volunteers conduct annual tamarisk removal along portions of Piru Creek and the Sisquoc, Santa Ynez Rivers, and Sespe Creek to protect and restore arroyo toad habitat. Other arroyo toad conservation efforts by the LPNF include restricting placer mining on Piru Creek to protect aquatic habitat, including arroyo toad habitat, and minimizing the impacts of fire response to arroyo toads and riparian habitat.

The Service recently made an unpleasant discovery at Beaver Campground. While the LPNF has closed Beaver Campground to camping activities, they have unfortunately designated it as a shooting area where the public can go for target practice. During a recent visit, the closed campground area a complete disaster. Trash and debris including broken bottles, clay pigeons, and rifle shell casings of all calibers and types littered the ground in the thousands (Dellith, U.S. Fish and Wildlife Service, pers. ob., 2009). The trash and debris extend down into Beaver Creek where lead and other toxins from targets and shell casings can enter the water and impact arroyo toads. Service staff also believes that the noise from so much rifle fire is a disturbance to arroyo toads and can potentially attract predators to the area (Dellith, U.S. Fish and Wildlife Service, pers. ob., 2009).

- Cleveland National Forest (CNF): The CNF has taken several measures to reduce or eliminate threats to arroyo toads. The CNF has installed stream crossings in some areas (e.g., Morena Road, Orosco Ridge Road, and Pine Valley Creek) to help prevent direct and indirect impacts of off-highway vehicles to the arroyo toad (Service 2005b). The CNF has also installed signs and closures to help control recreational use (Service 2000a). In 2004, 2 mi (3.21 km) of unauthorized roads that were affecting arroyo toad habitat in Noble Creek were permanently closed (Service 2005b). The CNF has formally excluded grazing from some arroyo toad habitat within current allotments including 12,112 ac (4,901 ha) centered around riparian areas (Service 2005b). Areas with arroyo toad habitat within Santa Ysabel, Pine Valley, and Morena Creeks were excluded from grazing (Service 2001). The only streamside area still subject to grazing on the CNF is Pine Valley Creek (Service 2005b). In addition, a forage utilization standard has been established for grazing to help protect the arroyo toad (Service 2001). The Lower San Juan Picnic Area has been permanently closed (Service 2005b) to help protect arroyo toad habitat along San Juan Creek. The CNF has been implementing measures to minimize impacts due to use of recreation residences in the San Juan and Pine Valley Creek areas, including the replacement of septic systems, public education, and the removal of non-native vegetation (Service 2003a). The CNF has also acquired an additional 232 ac (94 ha) of arroyo toad habitat at Hook Ranch on Cottonwood Creek (Service 2005b) that will now be protected and will not be available for grazing or OHV use.

Integrated Natural Resource Management Plans (INRMPs) on Military Lands

The INRMP is a planning document that guides the management and conservation of natural resources in areas under a military installation's control. These plans must provide for fish and wildlife management; fish and wildlife habitat enhancement or modification; wetland protection, enhancement, and restoration where necessary to support fish and wildlife; and enforcement of applicable natural resource laws. We consult with the military on the development and implementation of INRMPs for installations with federally listed species.

- Marine Corps Base Camp Pendleton (MCBCP): In 1995, the Marine Corps completed formal section 7 consultation on the Programmatic Activities and Conservation Plans in Riparian and Estuarine/Beach Ecosystems on Marine Corps Base, Camp Pendleton (Riparian BO) (Service 1995). In accordance with the Riparian BO, the Marine Corps programmatically avoids and minimizes the impacts to riparian habitat caused by their activities on MCBCP (e.g., military training, maintenance, infrastructure development). In addition, the Marine Corps has agreed to manage other threats to the arroyo toad on MCBCP. The Marine Corps and the Service are currently in formal consultation to develop programmatic measures to avoid and minimize the impacts of Marine Corps activities on the arroyo toad and other federally listed species in upland habitats on MCBCP; pending completion of this formal consultation, the Marine Corps has incorporated standard avoidance and minimization measures into their Range and Training Regulations (RTR) (Marine Corps 2002) and INRMP (Marine Corps 2007) to protect arroyo toads in upland habitats. Management measures that provide conservation benefits to the arroyo toad according to this plan include (but are not limited to) the following: (1) Eliminating non-native, invasive species (e.g., *Arundo donax*) on the installation and off the installation in partnership with upstream landowners to enhance ecosystem value; (2) providing viable riparian corridors and promoting connectivity of native riparian habitats; (3) maintaining natural floodplain processes and areal extent by avoiding and minimizing further permanent loss of floodplain habitats; (4) maintaining to the extent practicable stream and river flows needed to support riparian habitat; (5) monitoring and maintaining groundwater levels and basin withdrawals to avoid loss and degradation of habitat quality; (6) restoring areas to their original condition after disturbance, such as following project construction or fire damage; and (7) promoting increased arroyo toad populations in watersheds through perpetuation of natural ecosystem processes and programmatic instruction application for avoidance and minimization of impacts (Marine Corps 2007, Appendix C, pp. C5–C8). Although not all impacts to arroyo toads on MCBCP have been avoided, loss of arroyo toads and their habitat on MCBCP is believed by the Service to have been reduced to a level capable of sustaining the current population size and distribution of arroyo toads on MCBCP.
- Fort Hunter Liggett Military Reservation (FHL): The FHL INRMP was completed in 2005, followed by a revised version in 2007, to address conservation and management of its natural resources, including conservation measures for the arroyo toad (U.S. Army Reserve Command 2007). The INRMP is FHL's adaptive plan for managing natural resources to support and be consistent with its military mission while protecting and

enhancing the biological integrity of lands under its use. The plan identifies management protection measures for the arroyo toad that include: (1) monitoring the population status of arroyo toads on the base; (2) reducing public and military vehicles in sandy riverine habitat, particularly during the breeding season for the arroyo toad; (3) minimizing adverse effects to arroyo toads from roads and borrow sites; (4) investigating the arroyo toad's use of upland areas, including habitat characteristics of preferred upland habitat, movements, and use of rodent burrows; (5) identifying threats posed by noxious weeds and reducing noxious weeds; (6) identifying and reducing threats to arroyo toad breeding habitat posed by non-native beavers in the San Antonio River; (7) reducing bullfrogs; (8) evaluating current management goals and actions and adapting them to meet species management requirements; and (9) integrating species management and conservation with FHL training and maintenance activities.

Habitat Conservation Plans (HCPs)

Conservation agreements with non-Federal landowners (HCPs, safe harbor agreements, other conservation agreements, easements, and State and local regulations) enhance species conservation by extending species protections beyond those available through section 7(a)(2) consultations. Building partnerships and promoting voluntary cooperation of landowners are essential to our understanding the status of species on non-Federal lands, and necessary for us to implement recovery actions such as reintroducing listed species and restoring and protecting habitat.

- **Western Riverside Multiple Species Habitat Conservation Plan (MSHCP):** The MSHCP is a regional plan that addresses development and conservation in western Riverside County. The MSHCP includes areas identified for development and a 9,695-acre (3,923 ha) Conservation Area consisting of lands that are or will be conserved. In addition, specific areas outside the Conservation Area will be surveyed for arroyo toad prior to development, and if arroyo toads are found, they will be avoided or a plan will be developed to fully offset project-related impacts to the toad. Under the MSHCP, arroyo toads will be subject to impacts associated with development of 7,905 ac (3,199 ha) (39 percent) of potential (i.e., modeled habitat - based on a mathematical habitat model as opposed to direct observation) habitat that are outside of the MSHCP Conservation Area and outside of the survey area for the arroyo toad. Large areas of upland habitat will be added to the MSHCP Conservation Area in several important areas, including the area surrounding upper Temecula Creek and its tributaries and the upland habitat surrounding Bautista Creek and the San Jacinto River. In addition, conserved habitat for arroyo toad will be connected to other existing areas of conserved habitat through preservation of creeks and rivers and associated riparian habitat in every case where a potential connection exists.

Along with conserving the great majority of known arroyo toad populations in the Plan Area, the MSHCP provides for the monitoring and management of these populations. Management activities described in the MSHCP that would benefit the arroyo toad include control of non-native plant and animal species and management of activities with

the potential to negatively impact arroyo toads, such as flood control, farming, mining, and recreation. However, MSHCP funding for these activities has been limited to date.

- Southern Orange County Habitat Conservation Plan (Southern Orange HCP): The Southern Orange HCP addresses development and conservation of arroyo toad populations on private lands in the San Juan Creek and San Mateo Creek watersheds. Under the Southern Orange HCP, the majority of modeled arroyo toad habitat including almost all breeding habitat on Rancho Mission Viejo lands, will be conserved and managed under the Southern Orange HCP. Also under the Southern Orange HCP, up to 402 ac (163 ha) (37 percent) of modeled arroyo toad habitat in the San Juan Creek watershed in the plan area will be impacted by development. The remaining 672 ac (272 ha) (63 percent) of modeled habitat, including almost all breeding habitat, will be conserved. In the San Mateo Creek watershed, up to 40 ac (16 ha) (6 percent) of modeled arroyo toad habitat in the plan area will be impacted by development, and the remaining 650 ac (263 ha) (94 percent), including all breeding habitat, will be conserved. In addition to conserving the existing populations, the Southern Orange HCP provides for the monitoring and management of these populations. Management activities anticipated to benefit the arroyo toad include control of non-native plant and animal species and control of activities with the potential to negatively impact arroyo toads, such as flood control, grazing, and recreation.

APPENDIX D

THE DECLINING AMPHIBIAN POPULATIONS TASK FORCE FIELDWORK CODE OF PRACTICE

1. Remove mud, snails, algae, and other debris from nets, traps, boots, vehicle tires, and all other surfaces. Rinse cleaned items with sterilized (*e.g.*, boiled or treated) water before leaving each study site.
2. Scrub boots, nets, traps, and other types of equipment used in the aquatic environment with 70 percent ethanol solution or a bleach solution of one-half to one cup of bleach in one gallon of water and rinse clean with sterilized water between study sites. Avoid cleaning equipment in the immediate vicinity of a pond, wetland, or riparian area.
3. In remote locations, clean all equipment with 70 percent ethanol or a bleach solution, and rinse with sterile water upon return to the lab or a "base camp." Elsewhere, when laundry facilities are available, remove nets from poles and wash (in a protective mesh laundry bag) with bleach on a "delicate" cycle.
4. When working at sites with known or suspected disease problems, or when sampling populations of rare or isolated species, wear disposable gloves and change them between handling each animal. Dedicate separate sets of nets, boots, traps, and other equipment to each site being visited. Clean and store them separately at the end of each field day.
5. Safely dispose of used cleaning materials and fluids. Do not dispose of cleaning materials and fluids in or near ponds, wetland, and riparian areas; if necessary, return them to the lab for proper disposal. Safely dispose of used disposable gloves in sealed bags.
6. When amphibians are collected, ensure the separation of animals from different sites and take great care to avoid indirect contact (*e.g.*, via handling or reuse of containers) between them or with other captive animals. Do not expose animals to unsterilized vegetation or soils which have been taken from other sites. Always use disinfected and disposable husbandry equipment.
7. If a dead amphibian is found, place it in a sealable plastic bag and refrigerate (do not freeze). If any captured live amphibians appear unhealthy, retain each animal in a separate plastic container that allows air circulation and provides a moist environment from a damp sponge or sphagnum moss. For each collection of live or dead animals, record the date and time collected, location of collection, name of collector, condition of animal upon collection, and any other relevant environmental conditions observed at the time of collection. Immediately contact the Ventura Fish and Wildlife Office at (805) 644-1766 for further instructions.

The Fieldwork Code of Practice has been produced by the Declining Amphibian Populations Task Force with valuable assistance from Begona Arano, Andrew Cunningham, Tom Langton, Jamie Reaser, and Stan Sessions.

For further information on this Code, or on the Declining Amphibian Populations Task Force, contact John Wilkinson, Biology Department, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK.

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**U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW**

Arroyo Toad (*Bufo californicus*)

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No Change

Review Conducted By: Della Snyder-Velto

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office

Approve Diane K. Nae Date 7/31/09

Cooperating Field Supervisor, U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office

Approve _____ Date _____

Assistant Regional Director, U.S. Fish and Wildlife Service, Region 8

Approve M. P. 7 Date 8/17/09