BEFORE THE SECRETARY OF INTERIOR

PETITION TO LIST THE AMARGOSA TOAD (*BUFO NELSONI*) AS A THREATENED OR ENDANGERED SPECIES UNDER THE ENDANGERED SPECIES ACT

CENTER FOR BIOLOGICAL DIVERSITY and

PUBLIC EMPLOYEES FOR ENVIRONMENTAL RESPONSIBILITY

February 26, 2008

Notice of Petition

Dirk Kempthorne, Secretary
Department of the Interior
1849 C Street, N.W.
Washington. D.C. 20240

Steve Thompson, Regional Director
U.S. Fish and Wildlife Service,
California and Nevada Region
2800 Cottage Way
Sacramento, CA 9582

PETITIONERS

Lisa T. Belenky, Staff Attorney
The Center for Biological Diversity
1095 Market Street, Suite 511
San Francisco, CA 94103
ph: (415) 436-9682 ext 307
fax: (415) 436-9683

Daniel R. Patterson
Ecologist and Southwest Director
Public Employees for Environmental Responsibility (PEER)
738 N. 5th Ave, #210
Tucson, Arizona 85705
520.906.2159

Submitted this 26th day of February, 2008

Pursuant to Section 4(b) of the Endangered Species Act ("ESA"), 16 U.S.C. §1533(b), Section 553(3) of the Administrative Procedures Act, 5 U.S.C. § 553(e), and 50 C.F.R. §424.14(a), the Center for Biological Diversity and Public Employees for Environmental Responsibility hereby petition the Secretary of the Interior, through the United States Fish and Wildlife Service ("USFWS"), to list the Amargosa toad (*Bufo nelsoni*) as a threatened or endangered species and to designate critical habitat to ensure its recovery.

The Center for Biological Diversity ("Center") is a non-profit, public interest environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law. The Center has over 40,000 members throughout the United States. The Center and its members are concerned with the conservation of endangered species, including the Amargosa toad, and the effective implementation of the ESA.

Public Employees for Environmental Responsibility ("PEER") is a national, non-profit corporation based in Washington, D.C. with chapters throughout the United States. PEER represents current and former federal and state employees of land management, wildlife protection, and pollution control agencies who are frustrated by the failure of governmental agencies to enforce or faithfully implement the environmental laws entrusted to them by Congress. PEER's members rely on PEER to advocate on behalf.

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SUPPORTING MATERIALS FOR THE LISTING OF AMARGOSA TOAD AS A FEDERALLY ENDANGERED SPECIES

I. EXECUTIVE SUMMARY

The Amargosa toad (*Bufo nelsoni*) warrants listing as endangered under the Endangered Species Act (ESA) of 1973, as amended. The Amargosa toad is presently restricted to a 10-mile (16-kilometer) stretch of the Amargosa River and interconnected spring systems in the Oasis Valley in Nevada. The species is found in riparian areas, springs, and adjacent desert uplands. Less than 20 breeding populations have been found near the Amargosa River and surrounding springs in the Bullfrog Hills in the Oasis Valley in Nye County, Nevada. Remaining habitat contains about 8,440 acres of riparian and adjacent upland habitat which faces imminent decline due to numerous impacts including increased water extractions, flood control projects, grazing, pollution, increased housing and urban development, and increased off-road vehicle use.

The principle threat to the species and the cause of its present reduced state is habitat destruction, degradation, and fragmentation due to urban, residential, and recreational development. Other threats include the introduction of nonnative predators, and ground disturbance or vegetation removal, for example from grading, grazing, and off-road driving; water diversions, river and spring channelization, flood-control activities, road kill, collecting, inadequate regulatory mechanisms, and the elevated extinction risks common to greatly reduced populations. In December of 2006, the US Bureau of Land Management (BLM), Tonopah Field Station announced to the public in newspapers and public meetings that 5,740 acres of public lands along the Amargosa River would be put up for competitive auction in January of 2008 (following guidelines in BLM 1997 and detailed in BLM 2005). See Beatty looks to sell BLM property, Pahrump Valley Times, March 15, 2006 (http://www.pahrumpvalleytimes.com); map at page 8 below.

If the planned sale occurs or other sales of BLM lands along the riparian corridor occur, water extractions, flood control, and urban and housing developments affecting the Amargosa toad will increase many-fold and will likely cause extirpation of some populations and risks causing extinction of the species as a whole in the wild. We find these threats, especially the imminent, irreversible impact of complete habitat destruction by urban development, constitute immediate and significant threats to the Amargosa toad, warranting Federal protection.

Although voluntary conservation measures have been in effect for the past 8 years, the threats to the Amargosa toad have not diminished because of continuing pressures seeking urban development, mining, grazing, water over-use, off-road vehicle use, and the lack of control of exotic plants and animals.

USFWS has jurisdiction over this petition. This petition sets in motion a specific process, placing definite response requirements on USFWS. Specifically, USFWS must issue an initial finding as to whether the petition "presents substantial scientific or

commercial information indicating that the petitioned action may be warranted." 16 U.S.C. §1533(b)(3)(A). USFWS must make this initial finding "[t]o the maximum extent practicable, within 90 days after receiving the petition." Id. Petitioners need not demonstrate that listing is warranted, rather, Petitioners must only present information demonstrating that such listing may be warranted.

While Petitioners believe that the best available science demonstrates that listing the Amargosa toad as endangered is in fact warranted, there can be no reasonable dispute that the available information indicates that listing the species as either threatened or endangered may be warranted. As such, USFWS must promptly make a positive initial finding on the petition an commence a status review as required by 16 U.S.C. § 1533(b)(3)(B). Because of extraordinary imminent threats to its continued existence, a prompt decision on ESA listing is required in order to ensure sufficient protections are timely put in place so that the species is not rendered extinct or beyond recovery before listing takes place.

II. INTRODUCTION AND BACKGROUND OF STATUS AND CONSERVATION EFFORTS

The Amargosa toad (*Bufo nelsoni*) is an amphibian endemic to the Oasis Valley in Nye County, Nevada within the Mojave Desert. The historic range of the species is believed to be limited to a 16 kilometer reach of the Amargosa River and its associated riparian corridor, adjacent springs and outflow wetland systems, and isolated springs in the surrounding hills. Long-term population trends are not known for this species, however mark/recapture studies have been conducted to establish population baselines at representative sites across the known range of the toad. Because the distribution of the species is so limited, and the riparian areas which are significantly important to the species are subject to negative modification from mostly human-induced causes, the Amargosa toad has been given a ranking of G1G2, S1S2 by the Nevada Natural Heritage Program, a designation of global imperilment. The Amargosa toad is also identified as a Nevada Bureau of Land Management Sensitive Species. In 1977, the US Fish and Wildlife Service (USFWS) included the toad as a Category 2 candidate species for listing under the Endangered Species Act (ESA) and it remained in candidate status until elimination of the existing category rankings by the USFWS in 1996. A petition for emergency listing of the toad as "Endangered" was filed with the USFWS in September 1994 by the Biodiversity Legal Foundation of Boulder, Colorado. The USFWS issued a 90-day finding on the petition on March 23, 1995 (60 FR 15280) and issued a 12 month finding of not warranted on March 1, 1996 (61 FR 8018) based on additional information on the species collected through intensified survey effort and the implementation of conservation activities.

In October, 2000, management agencies and researchers formed the Amargosa Toad Working Group (ATWG) and voluntarily committed resources to develop a conservation agreement (NDOW 2000). The group includes the town of Beatty, Bureau of Land Management, Nevada Department of Wildlife, University of Nevada at Reno,

Nevada Natural Heritage Program, The Nature Conservancy, U.S. Fish and Wildlife Service, Nye County Department of Natural Resources. The goals of the agreement are:

1. To identify and eliminate threats to the continued existence of the species or substantially minimize those threats which can not be completely eliminated.

2. To maintain habitats on key parcels through implementation of proposed actions to protect, restore and enhance toad habitat.

3. To continue population monitoring and investigate the natural history of the toad to provide the basis for management actions.

4. To experimentally test various methods of habitat manipulation and monitor the effectiveness of these methods on key parcels.

While the conservation agreement looks promising on paper, several problems have arisen, primarily due to the participating agencies not following through with their commitments. For example, in December of 2006, the US Bureau of Land Management (BLM), Tonopah Field Station announced to the public that 5,740 acres of public lands along the Amargosa River would be put up for competitive auction in January, 2008. This land contains important riparian and upland habitat for the Amargosa toad and the loss of this habitat will undermine toad conservation efforts and lead to further declines in the species and possibly extinction. Moreover, development of adjacent lands that the sale is intended to promote, will further threaten the continued existence of the Amargosa toad by increasing direct, indirect, and cumulative impacts to the toad and to its habitat. This action contradicts BLM's stated commitment to voluntary conservation efforts through the Amargosa Toad Working Group.

The booming growth of the Southwest and cities such as Las Vegas has created an interest in land sales in surrounding communities such as Beatty, leading to a surge in the land sales in the Oasis Valley area. Proposals that have already been made for large-scale developments would use enough water to lower water tables, increase runoff and siltation of the River and springs, and destroy essential upland habitat negatively impacting the toad. The Master Plan committee of the Town of Beatty has publicly stated that water for only 3,000 people is estimated to exist in the area but plans are in the works for housing for an unsustainably high number of residents in the area. The current population of Beatty fluctuates around 1,000.

Exotic pest species that compete with or predate the toad have sustained their large numbers despite some efforts to eradicate them, and the threat from these exotics has only increased. Overgrazing of livestock, habitat damage by feral burro herds, off-road vehicle activity within toad habitat, flood control projects, and potential pollution are past and current problems for the toad.

These threats as well as the developmental demands on the fragile Oasis Valley have created a need to seek increased protection for the Amargosa toad.

III. NATURAL HISTORY AND BIOLOGY

A. Description

The Amargosa toad is a member of the family Bufonidae which includes North American true toads. Adult males typically are 42-68 mm snout-vent length, females typically 46-89 snout-vent length (NDOW 2000). The dorsal body of the toad has three paired rows of tubercles with brown center coloration. The back has black speckling or asymmetrical spots. Background coloration ranges from almost black to brownish or buffy olive and may vary considerably among individual toads in the same population. A light yellow mid-dorsal stripe occurs along the backbone. The parotids are tawny to olive. The ventral parts are whitish or pale olive with scattered black spots that merge above the legs to form the appearance of "pants". The inner metacarpal tubercle tends to very large. Males tend to be smaller, reaching 3 to 4 inches (75 to 90 mm) while females may reach 3.5 to 5 inches (90 to 120 mm). *Bufo nelsoni* has a narrower head, longer snout, reduced webbing on the feet, and shorter limbs than the similar Western toad (*Bufo boreas*); when adpressed against the sides of the body the elbows and knees do not meet in *B. nelsoni* (Stebbins 1985, Wright and Wright 1949).

B. Distribution

Historic information on the breeding habitat of Amargosa toads is very limited. Toads in Oasis Valley were first identified and described in 1891 (Stejneger 1893). The original distribution of the Amargosa toad is unknown, and is assumed to be from Springdale along the Oasis Valley vicinity south to the Amargosa River channel a few kilometers south of the town of Beatty, as well as isolated springs in the Bullfrog Hills foothills (NDOW 2000), based on limited historic information and sight records. In May 1939 Albert Wright traveled from Beatty to Springdale ranch and found larvae in two or more shallow muddy pool 2 to 8 inches deep, with weedy vegetation; a few adult toads were found in or on the edges of them (Wright and Wright 1949).

In the 1980s Stebbins (1985) found Amargosa toad populations at Springdale and Indian Springs. Since then these two subpopulations have gone extinct.

In surveying the Oasis Valley in 2001 Jones (2004) found *Bufo nelsoni* at the following 12 sites:

1. Spring runoff cattle-grazed marshes in the river bed at the crossing of Fleur de Lis Road.

2. The Torrance property (currently Torrance Ranch Preserve owned by The Nature Conservancy). Springs, marshes, and ephemeral river flow are present.

3. The Mullin property at Oleo Road, which forms a complex with Torrance and the Goss Springs area.

4. Goss Springs, privately owned land with industrial and residential use (the Spicer-Greenspun property), Boiling Pot Road, with cattle grazing, and 10 ponds from springs, irrigated meadows, irrigation ditches, and ephemeral meadow pools.

5. Crystal Springs with four seeps or springs on Bureau of Land Management (BLM) land off Pioneer Road. Water from the Harlan/Keal site is pumped to a small pond, and other surface water is present at the springs/seeps.

6. The Parker property. A former cattle and horse ranch with four springs, ponds, irrigation ditches, and former irrigated alfalfa fields, as well as marshes and the Amargosa River channel (ephemeral). The 400 acre ranch is currently owned by The Nature Conservancy, with a 6 acre inholding of private property on a conservation easement.

7. Amargosa River north of town, with ephemeral flow washes, pools, and marshes. BLM managed.

8. Amargosa River in Beatty next to the Stagecoach Hotel and Casino. The river channel has been modified here for flood prevention, and contains small areas of marsh, ephemeral pools, and perennial pools.

9. Amargosa River in Beatty by the Phoenix Motel. This section of river flows perennially.

10. Upper Amargosa River Narrows. A one kilometer stretch of river south of Beatty with ephemeral flow, marsh, and some persistent pools. BLM managed.

11. Lower Amargosa River Narrows. A perennial portion of river flow through a dense riparian forest. BLM managed.

12. Simandle (2006) also found toads at the springs within the property of Angels Ladies Brothel three miles north of town, adjacent to the Amargosa River.

13. Roberts Field, south of Springdale in Oasis Valley, with springs and marshes. NDOW (2000) specifies this as a toad site with unclear status and reproductive potential. Private property.

14. Revert Springs, privately owned spring and outflow marsh within one kilometer east of Beatty. NDOW (2000) lists the site as unclear status and reproductive potential for toads.

15. Younghans property, privately owned springs in northern Oasis Valley. NDOW (2000) lists the site as unclear status and reproductive potential for toads. Cattle grazing present. Owner is cooperative with the toad conservation efforts.

16. Coffer Ranch, privately owned cattle ranch in the far northern end of Oasis Valley along the Amargosa River with springs and marshes. Unclear toad habitat potential.

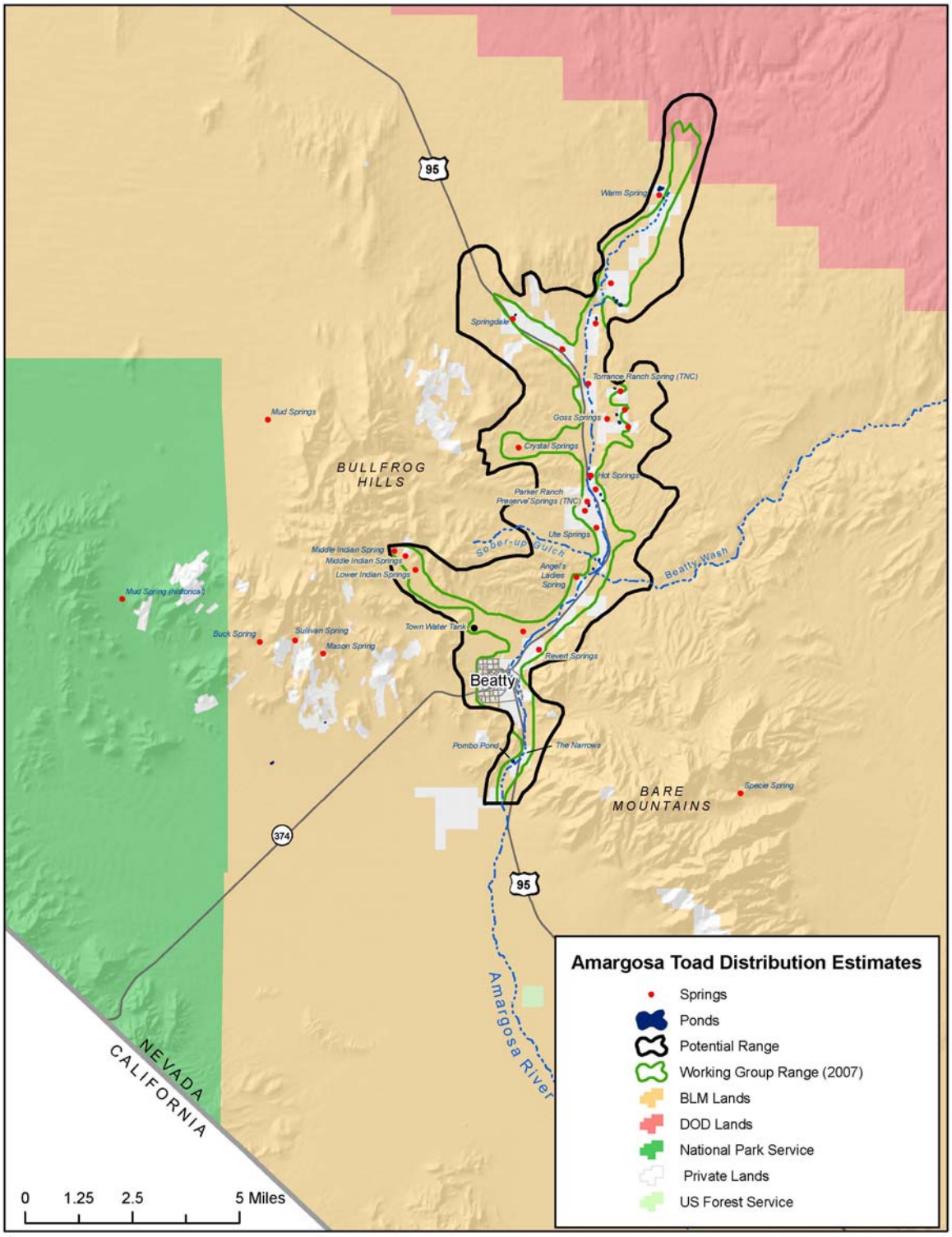
17. Springdale. Springs and marshes in a northwestern branch of Oasis Valley. Extinct.

18. Lower Indian Springs. Isolated spring in the Bullfrog Hills several miles north of Beatty. Extinct.

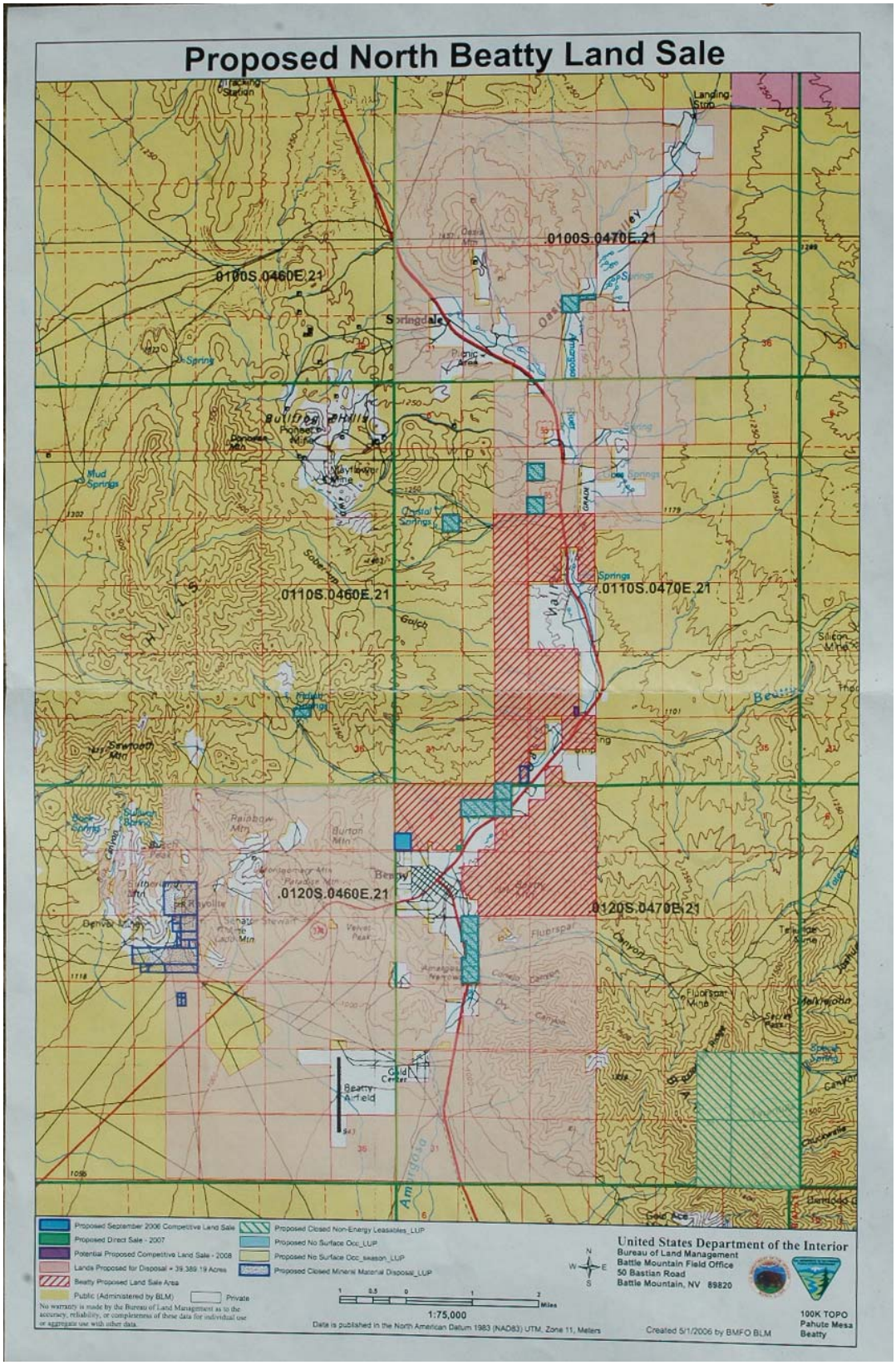
Some other areas of potential toad breeding habitat have not been surveyed by NDOW (2000) due to access difficulties.

In 2007 the Amargosa Toad Working Group distributed a map showing the range of the Amargosa toad, including breeding areas and migration corridors (Amargosa Toad Working Group 2007). That map provided a conservative estimate of toad distribution based on existing surveys and included an estimated 8,440 acres as the entire range of the Amargosa toad.

The ATWG map did not include migration and dispersal upland habitat used by the toad apparently because no studies had been done to identify these important habitat areas. Petitioners provide the following map indicating both the ATWG habitat estimate and another habitat estimate including estimated migration and dispersal upland habitat.



Map showing the distribution of the Amargosa toad potential range including essential upland habitat to about 4,000 feet elevation (larger black polygon) compared to the range estimated by the Amargosa Toad Working Group in 2007 determined mostly by following valley contours (smaller green range polygon).



BLM Map of Proposed North Beatty Land Sale

C. Population Estimates

In 1958 J. M. Savage (1959) observed thousands of toads in a single day on or near the Amargosa River when studying toads in Nevada. Savage and Schuierer (1961) found "several hundred" individuals of *Bufo nelsoni*.

During the 1980s surveys were carried out by Altig (1981), Maciolek (1983), and Altig and Dodd (1987): adults were observed at three surveyed sites, one of which recruited no metamorphs or juveniles in 1981; in 1983 adults and larvae were found at very few localities.

By 1993 Hoff (1994) estimated the entire population at only 30 adult toads. Conflicting surveys by the Nevada Division of Wildlife (NDOW) over approximately 40% of the riparian habitat of Oasis Valley, however, during this period found 190 individuals (Clemmer 1995, Heinrich 1995).

NDOW began annual surveys in 1997. Surveys conducted in May, June, and July 1998 identified a total of 655 individual adults (Stein 1999). In 1999 NDOW captured as many as 1,431 adults, producing population estimates as high as 4,697 plus or minus 715 individuals (Stein et al. 2000). But dramatic population reductions were seen in Crystal Springs between 1997 and 2003 using mark-recapture estimates (Simandle 2006: 40). Genetic bottlenecks were found in several populations (Crystal Springs, Goss Springs, River at Beatty, and Parker), possibly indicating population reductions to very small numbers of breeding individuals in the recent past (ibid.: 40, 80).

An intensive mark and recapture survey using PIT tags began at various sites throughout the Oasis Valley in 1998. These surveys resulted in estimates for groups or complexes of survey sites using the computer program MARK. Valley-wide, the population estimates over the years 1998 to 2004 have ranged from 1,774 to 2,401 toads (Jones and Tracy 2004). A population of about 2,000 has similarly been estimated more recently by Nevada Division of Wildlife (Simandle 2006: 14).

To date, comprehensive baseline population and trend information have not yet been published for the Amargosa toad.

D. Genetics

Recent genetic analyses suggest that there are at least four phylogentic groups of western toads that are or may eventually be recognized as separate species (Goebel 1996). Toads in southern Wyoming, Colorado, and New Mexico are geographically isolated from the northern Wyoming, Idaho, and Montana populations, currently named as Boreal toads (*Bufo boreas boreas*). These populations have proven to be genetically differentiated and probably represent independently evolving lineages or species (Goebel 1996). The southern Utah group and the southwestern group (southern Nevada, southern California) are also recognized as geographically isolated and genetically distinct

populations (Goebel 1996). California toads are named as *Bufo boreas halophilus*, while Oasis Valley toads (*B. nelsoni*) in Nevada are genetically isolated and distinct (ibid.).

Genetically the Goss Springs/Mullin/Torrance complex was found to be indistinguishable. The other breeding sites show significant genetic differentiation (Simandle 2006: 38). Simandle et al. (2006) found that 16 microsatellite loci for *Bufo nelsoni* were polymorphic (4 to 10 alleles per locus); three loci in Oasis Valley were significantly out of Hardy-Weinberg equilibrium, apparently explained by small populations in fragmented habitats.

E. Life Cycle

The breeding season for the Amargosa toad begins in mid-February, and may extend into July in some places. Rarely larvae have been found in October and November (NDOW 2000). Cold night-time temperatures may delay breeding except in thermal spring areas. Jones (2004) found 82% of clutches were oviposited from February 27 to March 23 in the 2001 season. She located 166 oviposition sites that year.

Congregations of toads occur at breeding sites. Males make a short series of chirps during the breeding season. In amplexus the male holds the female with his forelimbs aided by thickened nuptial pads on the innermost digits. Amplexus lasts until all eggs are deposited. Males may amplex more than one female during the breeding season, and females may disperse immediately after egg-laying.

Eggs are deposited in masses extruded in two strings in shallow water. A female may lay up to 6,000 eggs in a single clutch, the ova black and 1.5 to 1.7 mm in diameter, encased in a gelatinous sheath. Toads require relatively open water that persists long enough for the tadpoles to metamorphose into toadlets and leave the water. Toads preferentially oviposit in shallow water with no flow and little to no emergent vegetation (Jones 2004).

The eggs typically develop into larvae (tadpoles) within one to two weeks, but as quickly as three days in thermal waters (NDOW 2000). Tadpoles metamorph into immature toads in about 4 to 8 weeks, or faster in thermal waters – development is highly variable depending on water temperature and site conditions (Jones 2004). Larvae are blackish with silvery speckles, and have rounded tail tips, tail fins translucent, and grow from a hatching size of 6 mm to about 40 mm. Larvae feed on algae, decaying plant material, and organic detritus that is suspended in the water column or on the substrate. Larvae may aggregate into large groups extending over many square meters if enough habitat is available. Larvae may be washed downstream if a current is present. Mortality may be very high, but recruitment estimates have not been made. Predation and early desiccation of breeding wetlands may destroy entire populations.

Immature toads (metamorphs or toadlets) refers to the first two years of the life of a juvenile toad, with a snout-vent length of 44 mm or less (Altig 1981). They prefer to seek cover in dense vegetation and animal burrows. Juvenile mortality is usually high.

Adult mortality is lower, and adults may live 9 to 12 years (estimated from Boreal toad studies, in Keinath and McGee 2005). Sexual maturity in *Bufo exsul* and *B. boreas* is attained at 2 to 3 years, and may be similar for *B. nelsoni*. Maintaining stable adult survival is critical to prevent population extinctions in species with such demographic patterns. For Boreal toads, increasing the survivorship of young female toads was critical to creating a healthy overall population. Populations with high numbers of large fertile females were able to tolerate stochastic fluctuations in egg production (ibid.). Minimum viable populations of adults therefore need to be maintained.

Amargosa toads may be active any time of the year when temperatures above –2 degrees C occur. Activity increases when humidity levels rise. Adult toad peak foraging time is at night along water edges and adjacent upland areas. Toads eat invertebrates including spiders, scorpions, ants, harvester ants, wasps, beetles, crane flies, Muscid flies, deer flies, grasshoppers, stink bugs, water striders, damsel flies, mosquitoes, mites, and snails. They use their sticky tongue to grab prey items in a sit-and-wait predator strategy. Olfactory cues may be used. During the day, Amargosa toads typically take shelter in burrows, debris piles, under logs or rocks, or in dense vegetation.

Radiotelemeterd adults showed home range sizes of 800 to 16,000 square meters (mean 5,952 square m) (8,611.9 to 172,240 square feet, mean 64,073.3 square ft) at Torrance and the Amargosa River Narrows, with no difference between males and females (Jones 2004). In July movements were greater and in December movements were less. Daily movements were greatest in the week following a rain. Movements increased in May through September. Toads were found closest to water in February, March, and April (observed to remain within 50 m of water). From May into September radiotelemetered toads moved farther from water (to 400 m), with females moving greater distances than males (ibid.). Rare movements occur over much longer distances, of 900m between breeding sites across uplands (Stein et al. 2000), and of one kilometer along the river in late spring and summer (Hoff 1996). Migration events during rains are not always confined to riparian corridors (Jones 2004), and reports exist of toads moving over upland ridges.

Predators of toads include Ravens, White-faced ibises, Great egrets, Snowy egrets, Great-blue herons, Red-tailed hawks, Red-shouldered hawks, Spotted sandpipers, Robins, Badgers, Crayfish, and Bass.

F. Habitat

Today this species occupies the riparian areas of the ephemeral Amargosa River, and associated springs in the Oasis Valley. This unique group of springs and wetlands lies between Oasis Mountain to the north and the Bare Mountains to the south, in the upper reaches of the 150-mile-long Amargosa River. Wetlands are rare features of the northern Mojave Desert, and each one is geographically isolated and has endemic species and unique natural communities. Surface water in this exceedingly arid desert region provides concentrations of rich and biologically diverse communities, as normal rainfall in the basins fluctuates around 3 to 5 inches per year.

Hydrology in the region is complex, the Oasis Valley lying within the Great Basin carbonate rock groundwater province, where rainwater recharge occurs from western Utah and eastern Nevada, and flows in a broad area toward the southwest through limestone fault blocks, fractured volcanic rocks, and alluvial fills. Local mountain ranges of metamorphic and volcanic rocks block or direct groundwater flow. Over many tens of thousands of years this groundwater eventually reaches the Death Valley area in California (Thomas et al. 1986).

Oasis Valley is contained within the Central Death Valley Subregion groundwater flow system which encompasses 15,800 square miles in southwestern Nevada and eastern California. In this region water emerges on the surface as point sources (seeps and springs) and broad diffuse discharge areas (playas and salt flats). These surface waters are rare in this region, and include Sarcobatus Flat, Oasis Valley, Ash Meadows, and former Pahrump wetlands in Nevada, and Shoshone-Tecopa wetlands, Saratoga Springs, and Death Valley playas and basin springs in California. For example, in this region wetlands make up only 0.3% of Death Valley National Park (8,900 of 3,367,000 acres) (Threloff 1998).

In addition, an important site of local groundwater recharge lies in the Pahute Mesa, within the Nevada Test Site, and hydrological studies have traced groundwater flow southwest through a half-graben basin filled with alluvial sediments and Tertiary volcanic tuffs and breccias into the Oasis Valley. Two major aquifers exist in this basin to the immediate north of Oasis Valley, in the northern range of the toad: an unconfined alluvial aquifer and a confined welded tuff aquifer. The two aquifers pinch out in the southwest, forcing water to the surface and creating springs. The alluvial aquifer continues south as the narrow Amargosa River channel alluvium. The many faults in the Oasis Valley create both pathways and barriers to groundwater flow. In some places intersecting faults create avenues for upwelling of water from the aquifers. Other springs have unique pathways for spring origination: for example, Bailey's Hot Springs is apparently connected to a deep east-striking fault that feeds it relatively warm waters (Fridrich et al. 1999). Depth to groundwater in the dry Fortymile Wash area adjacent to Yucca Mountain (about 20 miles to the southeast of Oasis Valley) is as deep as 160 m (530 feet) (DOE 2002), while groundwater over much of the Amargosa River channel is as shallow as 1 m (3 feet).

Downstream along the Amargosa River are several important wetland habitats that are inhabited by several federally threatened and endangered species. Ash Meadows National Wildlife Refuge approximately 50 miles south in the Amargosa River drainage protects the Ash Meadows pupfish, Warm Springs pupfish, Devils Hole pupfish, and Ash Meadows speckled dace. Further south along the Amargosa River in Inyo County, California, lies the Amargosa Canyon Area of Critical Environmental Concren (BLM) where the endemic Amargosa vole has been found. The river ends in the Badwater area of Death Valley, in Death Valley National Park. Thus the Amargosa is one of the longest partly underground rivers in the southwest deserts, and one of only a few in the Mojave Desert. That end in basins, the other being the Mojave River.

In the Oasis Valley, Amargosa toads occupy wetlands classified as Riverine, Lacustrine, and Palustrine. In the wetland habitat classification system of Cowardin et al. (1979), Amargosa toads occupy aquatic bed, streambed, unconsolidated shore, emergent wetland (persistent and non-persistent vegetation), scrub-shrub wetland, and forested wetland. Some adult toad activity occurs in urbanized environments within the town of Beatty, from the river area.

Toads use three types of habitat during the year: 1) breeding wetlands, 2) summer ranges, and 3) winter hibernacula.

Breeding habitat is shallow water, with eggs found in water 1.5 to 22.5 cm deep (mean 6.5 cm) (Jones 2004). Most sites have no flow, although flow up to 0.14 m/second were recorded (ibid.). Pond edges, pools of streams, flooded marshes and meadows, ephemeral pools, springs, and artificial impoundments are used. Thermal springs are also used, as well as alkaline waters. Females deposit eggs in shallow calm waters to maximize thermal effects of solar warming or warm-spring water temperatures, allowing eggs to mature faster to hatching than ambient waters would normally allow. Substrates are fine-grained silt or sand, with gravel, cobble or rock much less used by the toads (Jones 2004).

Breeding wetlands may be 100% devoid of vegetation, or include such plants as pondweeds (*Chara, Ceratophyllum*), Saltgrass (*Distichlis spicata),* Creeping wildrye (*Leymus triticoides*), Great Basin wildrye*(Leymus cineres),* Scratchgrass (*Muhlenbergia asperifolia*), Common reed (*Phragmites australis),* Alkali bluegrass (*Poa secunda* ssp. *juncifolia),* Alkali sacaton *(Sporobolus airoides),* Rabbitsfootgrass (*Polypogon monspeliensis),* Bermudagrass (*Cynodon dactylon),* Bulrush (*Scirpus americanus, S. maritimis, S. acutus*), Spikerush (*Eleocharis* spp.), Rush (*Juncus* spp.), and Cattail (*Typha domingensis*).

These toads are adapted to "dynamic, disturbance-dependent ecological systems" (Simandle 2006: 43), such as flood events that create new breeding pools or scour old pools; floods may even facilitate movements of toads between sites. Small amounts of disturbance help to keep breeding pools open and adequate for toad breeding. Excessive growth of emergent aquatic vegetation such as cattails and bulrush can impede toad breeding by closing in surface water. Low amounts of grazing by livestock or feral burros that is not persistent can sometimes benefit toads by reducing vegetation, although hand-cutting can also accomplish this. Desiccation is a significant threat to tadpole survival (Jones 2004).

Summer areas occupied by the toads after breeding include a variety of wet and dry habitats: Rubber rabbitbrush (*Chrysothamnos nauseosus*) thickets; saltbush habitats with, *Atriplex polycarpa, A. canescens*, *A. lentiformis,* and *A. parryi*; riparian forests of Fremont cottonwood (*Populus fremontii*), Goodding willow (*Salix gooddingii*), Narrow-leaf willow (*S. exigua*), Honey mesquite (*Prosopis glandulosa*), and Screwbean mesquite (*P. pubescens*); dry sand-gravel washes with Cheesebush (*Hymenoclea salsola*); upland desert scrub dominated by Creosote (*Larrea tridentata*), Bursage (*Ambrosia dumosa),*

Nevada ephedra (*Ephedra nevadensis*), and Budsage (*Artemisia spinescens*). Adult boreal toads have been observed spending up to 90% of their life in upland terrestrial habitats (Jones et al. 2000), and this needs to be studied for the similar Amargosa toad. Toads will occupy flat as well as sloped ground. Shrub habitats may be important for cover and thermoregulation. Following metamorphosis, immature toads migrate away from water and use moist vegetated terrestrial habitats; in the hot summer months they may remain close to water or in habitats with moist substrates.

Winter hibernacula may be in rodent burrows: Pocket gopher (*Thomomys bottae*) and White-tailed antelope ground squirrel (*Ammospermophilus leucurus*), debris piles, large fallen woody debris, or under rocks. More than one toad may share a hibernaculum. Boreal toad hibernacula have been found 1 to 2.5 mile from the nearest water (Bartelt and Peterson 1997, Keinath and McGee 2005), and this needs to be studied for Amargosa toads.

Landscapes surrounding the breeding habitats are as important for the survival of toads as the breeding habitat itself, as has been shown for Boreal toads (Keinath and McGee 2005). They require a mosaic of wetland and upland habitats for survival.

G. Population Dynamics

According to Simandle (2006), Amargosa toads exist as a metapopulation, meaning a non-contiguous set of local populations that may interact on occasion by migration. The Amargosa toad exists in five subpopulations. These subpopulations may undergo natural extirpation-recolonization dynamics, so that conservation strategies must take into account migration corridors and dispersal routes as well as breeding habitat. Habitat destruction that increases habitat patch isolation and fragmentation can be detrimental to the overall toad population. "...Occupied habitat, unoccupied suitable habitat and intervening habitat that may be occasionally used during infrequent migration events must all be considered conservation priorities" (Simandle 2006: 42). Jones (2004: 51) stated that: "The use of habitat away from standing water by toads varies seasonally. Thus, habitat management for this sensitive species should include protection of upland habitat as well as riparian habitat." These corridors are important to the conservation of the toad, as they increase the colonization of habitat patches and permit recolonization of empty patches. Unlike species with contiguous populations, species that exist as a metapopulation will often contain empty habitat and corridors as the subpopulations do not interact with each other equally; yet these empty corridors will be important during dispersal events and recolonization movements. Conservation strategies for metapopulations should include the acquisition of empty habitat or corridor habitat (Simandle 2006).

Home range sizes did not differ between male and female toads. Distances moved by individuals varied by sex and month of the year. Movements were significantly larger after rain. The frequency of animal movements declined during the fall and winter. The relative distance toads were found relative to water differed by gender, with males observed closer to water than females. Toads were usually found less than 50 m from the

water (Jones and Tracy 2004). But occasional observations of Amargosa toads dispersing into dry upland desert scrub habitats hundreds of meters from wetlands during warm rainy nights indicates that more research needs to be done on the rare but important migration events through less suitable habitat. “We do not know the extent to which Amargosa toads occupy upland habitats, how far or frequently they travel away from standing water, or under which conditions toads might migrate to distant sites” (Jones 2004: 44). Better range mapping needs to be carried out during infrequent storm events and moist years such as El Nino events. Boreal toads (*Bufo boreas boreas)* females were found to disperse 2.4 km away from breeding ponds in linear movements, possibly to access foraging sites (Bartelt 2000). Boreal toads moved approximately 6 miles between two small populations in Rocky Mountain National Park (Corn et al. 1997).

Two alternative metapopulation models conceivably explain the distribution of *Bufo nelsoni*: the nonequilibrium model and patchy population model (Harrison 1991, Harrison and Taylor 1997). In a nonequilibrium model, a species is undergoing a region-wide decline because recolonization is not keeping pace with extinction or perhaps dispersal between sites does not currently occur at all. Thus, long-term fragmentation of habitat results in little or no dispersal among habitat patches, and extinctions accumulate over time. In a patchy population model dispersal among patches is sufficiently frequent so that extinctions virtually never occur, and the system effectively consists of a single large population occupying many habitat patches or a complex of several such populations. This model is consistent with findings that the frequency of patch occupancy is high and that occupancy is determined primarily by local habitat quality and patch size rather than the spatial distribution of patches relative to each other. The model requires that dispersal among patches is frequent. Movement distances of 2.6 km have been observed for temperate-zone *Bufo* species (Sinsch 1992, Dodd 1996). The limited data on *Bufo* movements may greatly underestimate the potential dispersal distance of the species.

Marsh and Trenham (2001) argued that long-distance dispersal of amphibians is notoriously difficult to detect, such that amphibian dispersal abilities are considerably larger than observed movements. Conceivably, such dispersal events could occur during extended El Nino/Southern Oscillation events that occur at intervals of many years to decades (Andrade and Sellers 1988). During exceptionally moist years, pools, seeps, springs, and streams can form in otherwise dry areas, and flooding may facilitate downstream dispersal. For *Bufo punctatus,* patch isolation metrics and connectivity of drainage channels indicates a possible “patchy population” model, implying frequent dispersal among patches to recolonize local extinctions. Dispersal distances of many kilometers are implied (Bradford et al. 2004), and similar dispersal distances may apply to Amargosa toads, which have been less studied.

Simandle (2006) took genetic samples from 20 Amargosa toads in 1999 and 2000 from seven sites and amplified 16 microsatellite loci from the DNA. Analyses suggested that inbreeding was uncommon, and that mating was not random among the subpopulations. Greater movements were indicated between the Goss Springs site, Oleo Road site, and Torrance site. Three individuals from the Goss Springs or Torrance sites were likely to be first-generation migrants from Crystal Springs. One individual from the Parker site was a

likely first-generation migrant from the River population at Beatty. Genetic evidence of movements from Parker to Crystal Springs and Goss Springs was also found. Recent genetic bottlenecks were indicated at Crystal Springs and the River site through the town of Beatty. Migration rates were estimated to be relatively low and asymmetric: a higher migration rate occurred from Crystal Spring to the Goss Springs/Mullin/Torrance complex than in the opposite direction. Theoretical migration rate estimates were lower between other sites, such as 10.8 individuals per generation from Parker to the Brothel and 7.0 individuals per generation from the Brothel to the River site (maximum likelihood estimates)(ibid: 81).

Stein et al (2000) found evidence of toad movements between isolated habitat patches.

IV. PRESENT OR THREATENED DESTRUCTION, MODIFICATION, OR CURTAILMENT OF HABITAT OR RANGE

Section 4 of the Act and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act (16 U.S.C. 1531 et seq.) set forth the procedures for adding species to the Federal lists. The Service may determine a species to be endangered or threatened due to one or more of the five factors described in section 4(a)(1) of the Act. These factors (A through G) and their application to the Amargosa toad are as follows: The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range Cumulative habitat loss and degradation of the existing habitat as a result of development (including grading, soil disturbance, removal of vegetation), ground-water pumping, and recreation are the major threats to the continued existence of the toad.

A. Habitat Destruction and Fragmentation

Simandle (2006: 14) noted that *Bufo nelsoni* "has an exceedingly small geographic range and small population size for a terrestrial vertebrate species, and almost its entire range is impacted by the activities of humans, thus making it particularly vulnerable to extinction."

Of the approximately 8,440 acres of total toad habitat estimated from the Amargosa Toad Working Group map (2007), about 3,690 acres are privately owned (43%). Another 3,380 acres (41%) are located in Bureau of Land Management (BLM) land disposal area for potential development, 1,370 acres (16%) of toad habitat is located in non-disposal BLM land. Land fully protected for the toad amounts to an estimated 700 acres (8%) of the private land holdings in Oasis Valley.

Both wetlands and uplands need to be protected for Amargosa toad habitat, as use varies seasonally, and uplands provide significant foraging and migration corridor habitat during rainy periods. Because the toads exist as a metapopulation network, infrequent movements of toads are of great importance to the species as a whole (Jones 2004). Habitat destruction reduces patch areas, while fragmentation increases patch isolation, both leading to increased extirpation risk and possible adverse genetic effects. The toad faces continuing loss and fragmentation of its habitat and range. NDOW (2000) states:

"Lowering of the water table from increased groundwater use for municipal, agricultural or industrial purposes could seriously impact the limited habitat available to the toad. Beyond direct impacts from development of water sources and spring habitats, changes in water use patterns and physical alterations of habitats in the riverine corridor may affect habitat connectivity and migration corridors dependent on seasonal/ephemeral habitats."

Past adverse habitat impacts:

1. Development of a municipal water well at Indian Springs has lowered the water table and impacted that site negatively.

2. Flood control projects and channelization in Beatty along the Amargosa River may have negatively impacted toad populations there. Washes and their vegetation that provide habitat for the toad are adversely impacted by development activities, in Beatty and surroundings, resulting in loss of wash area and increased channelization. Development also increases short-term flood severity by increasing the speed and volume of runoff. Toad mortality from flood events, if adults/larvae are present in washes, would likely result from injury, deep burial, drowning, or being washed downstream out of habitat. Channelization of washes, in addition to facilitating development of adjoining habitats with known value for the toad, raises flood water levels and increases flow rates and turbulence during high flows, making it less likely that toads would survive in the remaining channel.

3. Ranching water diversions, alfalfa irrigation ditches, stock ponds and irrigation ponds, as well as recreation ponds, have been built since the early 1900s, greatly modifying riverine and spring habitats in Oasis Valley. Water diversions have cause toad larva mortality in Oasis Valley. Portions of the Amargosa River may have become dewatered from overuse by the human population, decreasing toad habitat and connectivity (NDOW 2000).

4. Feral burro destruction of vegetation and surface water fouling at springs such as Lower Indian Springs. Fences have not been maintained, and some have been cut by people intending to help the burros access water.

5. Livestock overgrazing, trampling of wetlands, and chronic long-term use of Oasis Valley toad habitats by introduced ungulates, with no removal during toad breeding seasons.

6. Fencing of some springs and marshland that reduces natural disturbance, leading to an abnormal build-up of dense emergent aquatic vegetation and decline in open water for toad breeding. Prehistoric wildfire, Indian burning, flooding, and low-level grazing by native ungulates such as Bighorn sheep, Mule deer, Pronghorn antelope, and possibly Bison in wet climatic phases, in the more distant past probably kept many wetlands more open. This must now be done with machinery, with hand tools, or with carefully controlled livestock grazing and control burning. The balance of keeping enough

vegetation for cover and foraging and enough open water for breeding has been disrupted during the last 100 years.

7. Vandalism at springs, such as garbage dumping, tree destruction, pollution of water bodies.

8. Construction of US Highway 95 fragmented much toad breeding and movement corridor habitat.

Development impacts from items 1 to 8 above are ongoing within the toad's range.

The following projects are formally proposed within toad habitat of Oasis Valley:

1. Yucca Mountain Project, Caliente Corridor Railroad

US Department of Energy proposes to build the nation's high level nuclear waste dump at Yucca Mountain, 30 miles south of Beatty. A railroad would be constructed to carry nuclear waste across Nevada. Part of this route would cut through the upper Amargosa River near the Coffer Ranch. This would disturb approximately 20 acres of toad habitat, potentially disrupt water flow and possible accidents could expose toads to high level nuclear waste.

2. Reward Mine

Canyon Resources proposes to build a gold strip-mine 10 miles south of Beatty on 287 acres. Canyon Resources Corporation proposes to open a new gold mine near Beatty, Nevada that will disturb a total of 287 acres in a five to ten year period. The project will consist of an open pit, heap leach pad and ponds, mine dumps, a rock crushing facility, office area, access and haulage roads, and a water well with pipeline. The area is not known toad habitat, but mining operations will require a substantial amount of water. Water withdrawn from the Amargosa River south of Oasis Valley has the potential to create a "cone" effect that could potentially lower water upstream that is critical for toad survival (Zimmerman 1990).

3. US Bureau of Land Management Land Disposal

In 1997, the US Bureau of Land Management (BLM) identified 39,000 acres of public land for disposal along the Oasis Valley which contains almost all of the toad habitat that occurs on public lands along the Amargosa River. (USDI , Bureau of Land Management, October 1997). Although BLM has admitted that this decision must be reconsidered to take in to account the conservation status of the Amargosa toad, they had a competitive land auction of 40 acres on August 22, 2007. The 40 acres sold were considered to be a migration corridor to connect subpopulations of toads from the Amargosa River to Indian Springs (Simandle, pers. communication, 2007). The buyer of the land proposes to build a large housing development on this 40 acres. Out of the estimated 8,440 acres of total Amargosa toad habitat (Amargosa Toad Working Group 2007), approximately 3,380 acres of this are included in BLM's land disposal proposal.

In January, 2006, a developer requested that the Bureau of Land Management (BLM) auction off 5,740 acres north of Beatty. This land contains wetlands and migration corridors that are essential to toad survival. Although this proposal has raised several objections from local citizens, environmental groups as well as academic and agency biologists, BLM has still not resolved this issue a continues to insist on selling this land. (William Fisher, former field supervisor, Tonopah Field Station, pers. communication) BLM's continued insistence to dispose of as much land as possible and refusal to follow their commitment to the Conservation Agreement identify their management practices as a major threat to the survival of the Amargosa toad. The BLM's proposed land disposals contrast with its stated commitments to conserve the toad. In the 2000 Amargosa Toad Conservation Agreement to BLM has made the following commitment: "design and implement habitat protection, enhancement and creation projects (improve breeding and hiding habitat) to benefit the Amargosa toad and their habitat with consideration of other multiple uses". In BLM's 1997 Tonopah Resource Management Plan BLM states that it will "protect, restore, enhance and expand habitat of species identified as threatened, endangered or Nevada BLM sensitive species. Nowhere in either of these documents does BLM state that they plan on disposing of Amargosa toad habitat to private ownership (UDSI Bureau of Land Management 1997).

BLM has also failed to live up to its agreement to nominate/designate all Amargosa toad habitat on lands administered by the BLM as Areas of Critical Environmental Concern (ACEC) or provide a comparable level of conservation through alternative processes.

4. Private Land Development: Roughly 3,690 acres of toad habitat occurs on private lands (based on Amargosa Toad Working Group 2007 map). Much of this land has been used for livestock grazing in the past. Many land owners have sold their property to real estate investors. Many of the new buyers have expressed interest in subdividing properties for mostly housing developments and some commercial ventures. Large scale developments would need to use excessive water from the Amargosa River. If such developments were to take place, water levels could drop, causing a significant decline in toad populations. Potential developments include a housing development in Robert's Field, a shooting range near Torrance Ranch, a high scale resort and casino by the airport, A motel and resort near Pombo's Pond, a golf course near Revert Spring and a truck stop north of Beatty.

5. Local Government's Development Plans: On December 20th, 2000, Nye County Commissioners approved Nye County Resolution No. 2005-55-titled "A Resolution in Support of the Public Sale of Certain Disposable Lands North of Beatty, Nevada." This and other documents identify a "need to sell public lands to develop housing for employees of the proposed Yucca Mountain Project as well as "accommodate overflow growth from the communities of Las Vegas and Pahrump, Nevada. Nowhere in these documents does the county attempt to develop the potential of "ecotourism" which could enhance the economy as well as protect environmental resources.

In 2000, the Beatty Habitat Committee created the Beatty Habitat and Trails Project. This plan was created for development of a greenbelt through Beatty along the

Amargosa River in Oasis Valley. The project is meant to enhance tourism in Beatty and protect the Amargosa toad, and other species, through a Recreation and Public Purposes Lease from the BLM, but the BLM is now reneging on the plan to issue this lease. Nye County Commissioners have done little to show their support for this project.

6. Rhyolite development plans: Rhyolite is a large ghost town located 5 miles southwest of Beatty. BLM and Nye County have indicated the need for water, including the possible building of a pipe to extract water out of Indian Springs, leading to further drawdown of the water table at that site.

These projects would destroy over 84 percent of the remaining 8,440 acres of toad habitat if in the future the majority of private lands and proposed BLM disposal lands were modified or developed in such a way that eliminated toad habitat. BLM has failed to identify and evaluate Amargosa/Oasis ACEC Nomination area for inclusion in their Land Use Plan Amendment (1997), as requested by Nevada Division of Wildlife (NDOW 2000). BLM has also failed to initiate planning for habitat enhancement projects at Wild Burro Seep (1998) and Upper Cave Spring (Lower Indian Spring) (1999). The Town of Beatty and Nye County have failed to cooperate in local community coordination to pursue development of a riparian greenbelt through Oasis Valley.

B. Flood Control and Water Extractions

Flood control projects in the past and discussed for the future at Beatty Town Advisory Board public meetings include scraping emergent aquatic vegetation and cottonwood tree saplings from the Amargosa River bed in Beatty especially where the river is crossed by the highway 95 bridge. These activities may destroy both toads and approximately 6 acres of habitat, including breeding pools.

Little research has been done on the impacts of development and well-drilling on Oasis Valley groundwater and spring flows. The State of Nevada allows residential domestic water rights to be exempt from permits as long as water extraction does not exceed 1,800 gallons per day. Homeowners, however, cannot be required to cease pumping. All surface water in Nevada is claimed and fully committed, and groundwater resources are approaching full commitment in southern and western Nevada, according to the Nevada Natural Resources Status Report (http://dcnr.nv.gov). All the large commercial water allotments in Oasis Valley are bought up, but can be sold, thus raising the possibility of future consolidation for large development projects such as housing subdivisions or golf courses.

As an example of regional problems with water extraction, development and groundwater pumping in the Pahrump Valley began with well drilling in 1910. By 1916, 28 wells pumped an estimated 1,477 gallons per minute from Manse Spring and 2,100 gpm from Bennetts Spring. An estimated 530,000 acre-feet of water was pumped from this aquifer between 1962 and 1975. These springs ceased to flow by 1975, causing the extinction of the endemic Pahrump Ranch poolfish and Raycraft Ranch poolfish (Threloff 1998).

C. Environmental pollution

Pesticide uses or toxins may threaten the toad. The toads may be particularly sensitive to chemicals that are absorbed through the skin in aquatic habitats, as they have highly a vascularized epidermis which easily absorbs many chemicals. Effects may be lethal or sub-lethal, causing hormonal imbalances that interfere with reproduction, physical and behavioral abnormalities, and decreased disease resistance. NDOW (2000) lists point and non-point pollution into the Amargosa River as problems for toad conservation. Potential spraying for West Nile Virus has been discussed for the Beatty area recently, and the pesticides used may be highly deleterious to toads.
Heavy metals released from mine tailings may make breeding waters toxic to toads (Keinath and McGee 2005).

A long term threat from radiation poisoning of groundwater in Oasis Valley is currently being studied because various faults allow connection between the Amargosa River alluvial groundwater flow with the welded tuff aquifer to the north; the welded tuff aquifer extends northward to Pahute Mesa and includes areas used for atomic testing before the 1990s (Fridrich et al. 1999).

D. Livestock Grazing

Currently about 80% of the Oasis Valley is subject to cattle grazing, other livestock grazing, and grazing by feral burro herds. Many springs away from the valley are also grazed and trampled by wild burros. Trampling of eggs, larvae, and adult phases of toads has been documented in the Oasis Valley due to both cattle and feral burro use of wetlands for grazing and watering. Grazing during toad breeding destroys many eggs and larvae. Adults have been occasionally found trampled by cattle. More study needs to be done on the effects of long-term grazing in toad habitat, but NDOW (2000) reports that "although periodic grazing may be useful to maintain appropriate vegetation communities, intense or unregulated use by livestock and wild burros can result in decreased water quality and habitat suitability, increased trampling hazards, and accelerated seasonal drying and soil compaction." Hydrologic changes from stock pond development may also be an issue of concern.

E. Roads, Trails, and Races

Direct impacts due to collision have occurred, killing adult toads as they move over terrestrial habitats. Interstate Highway 95 cuts through the middle of toad wetlands through much of the Oasis Valley, and numerous side roads, both paved and dirt, are present. Increased urbanization would raise the number of roads present. Road maintenance of highways could have lethal effects to toads, and toad habitat enhancement projects have not occurred along the highway.

Off-road vehicle activity has been increasing around the Beatty area on dirt roads and across desert surfaces. NDOW (2000) discusses intense OHV use of riparian corridors that has decreased habitat quality or loss of riparian habitats, as well as direct mortality of

toads. New roads have been created as recently as 2007, for example, by the Terrible's 200 Las Vegas to Reno Race, part of which enters a wash well within toad dispersal habitat and 0.25 km from a toad breeding pond near Pioneer.

F. Global Warming and Ozone Thinning

Global warming effects may increase droughts and further limit breeding habitat for the toads, as well as decrease the quality of terrestrial foraging habitat (IPCC 2001). The impacts of climate change have already been documented on other species in the region including on the American pika and desert dwelling bighorn sheep (Beever 2003, Epps 2004).

Increased UV-B radiation due to thinning of the atmospheric ozone layer has caused Boreal toads in Oregon to have weakened immune systems and thus higher mortality due to otherwise innocuous micro-organisms (Blaustein et al. 1994). These possible stressors on Amargosa toads have not yet been studied, but should be taken into account as they may lower the viability of the remaining populations.

G. Increased Isolation and Inbreeding

Elements of risk that are higher in very small populations include: (1) chance demographic effects (e.g., skewed sex ratios, high death rates or low birth rates); (2) the effects of genetic drift (random fluctuations in gene frequencies) and inbreeding (mating among close relatives); and (3) deterioration in environmental quality. Genetic drift and inbreeding may lead to reductions in the ability of individuals to survive and reproduce (i.e., reductions in fitness) in small populations. In addition, the lower genetic variation present in small populations makes a species less able to persist through future environmental challenges.

Having only few population locations and restricted habitat also makes the Amargosa toad susceptible to extinction or extirpation from all or a portion of its range due to chance events such as fire, flood, drought, or disease. An intense flood of the Amargosa River in 1969 destroyed bridges and parts of US Highway 95 above and below Beatty; toads living within the narrow floodplain here were likely extirpated (Simandle 2006: 40).

The low reproductive output of female toads makes protecting habitat for adults through their first year crucial to the survival of the population as a whole (Keinath and McGee 2005).

V. OVERUTILIZATION FOR COMMERCIAL, RECREATIONAL, SCIENTIFIC, OR EDUCATIONAL PURPOSES

Although scientific research activities may impact the Amargosa toad to some extent, there is no evidence that this impact has had significant negative consequences on studied populations.

VI. DISEASE OR PREDATION

A. Disease

Chytrid fungus (*Batrachochytrium dendrobatidis*) is a pathogen that has caused mass mortality in amphibians in California, Arizona, Colorado, Wyoming, Central and South America, and Australia (Daszak et al. 1999). It is a parasitic fungus that attacks the skin and keratin of adult frogs and toads after metamorphosis. It has not been found in Amargosa toads, but should be watched for as a concern as it has damaged isolated populations of *Bufo boreas* (Keinath and McGee 2005). Severe declines have occurred among Yosemite toads (*B. canorus*) and Mountain yellow-legged frogs (*Rana muscosa*) in California, and populations of Black toad (*B. exsul*) in adjacent Inyo County, California, are at high risk from infection due to the potential spread of fungal spores in mud from human shoes and cattle hooves (Parris 2006). Spores can survive at least 7 weeks in water (Johnson and Speare 2003).

B. Native predators

Native predators have not been determined to be problematic at this time.

C. Exotic Species Non-native predators

In the mid-1980's, crayfish *(Procambarus clarkii)* were introduced to the Oasis Valley, and they have expanded into spring and riparian systems inhabited by Amargosa toads. Attempts to eradicate or control this non-native crustacean have been mostly unsuccessful. Crayfish consume eggs and larvae of the toad. Jones (2004) found crayfish in 7 of the 11 sites she surveyed.

Introduced fish species include Largemouth bass (*Micropterus salmoides*) released by anglers into local water bodies such as springs and stock ponds for sport, often without permission from land-owners. They predate all life stages of toads. Predatory Black bullhead catfish (*Ictalurus melas)* occurs at one public land waterbody and may occur with other Ictalurid species at an unknown number of sites on private lands. Mosquito fish (*Gambusia affinis*), have been regularly released into wetlands for insect control purposes, and are found through the above-ground portions of the Amargosa River that flow more or less permanently, as well as in several spring systems in the Oasis Valley such as Torrance and Parker. Jones (2004) found non-native trout in 2001 in a small pond at Crystal Springs.

Bullfrogs (*Rana catesbeiana*) have been introduced in many wetlands of the Oasis Valley, and the adults prey on all stages of the toad life cycle; bullfrog larvae also prey on toad eggs and larvae. Jones (2004) found bullfrogs in 7 of the 11 sites she surveyed.

Wild burros, another non-native species found throughout the valley, trample wet areas and foul the water due to their year-round presence and high long-term impacts on marsh

wetlands and springs. At Indian Springs the vegetation has been severely impacted by burros grazing and trampling, and the very small amount of surface water (<6m square) has been completely trampled. A fence was built to protect the spring in the early 2000s, but has been left to disrepair and burros have broken in to access the water.

Introduced tamarisk or saltcedar *(Tamarisk chinensis)*, and Russian olive *(Elaeagnus angustifolius*) are invasive trees that has become established along stretches of the Amargosa River and springs. In areas where saltcedar has become a dominant canopy species, the desert riparian ecosystem may be converted to a system unsuitable for native trees and herbs, potentially reducing the insect prey base for the toads as well as decreasing microhabitats. Tamarisks may also use more water than native species.

Despite some efforts by NDOW, The Nature Conservancy, and interested private land-owners, exotic predators and competitors such as crayfish, mosquitofish, and bullfrogs have not been eradicated from many important breeding wetlands and continue to be a serious threat to toad survival.

VI. INADEQUACY OF EXISTING REGULATORY MECHANISMS

Existing regulatory mechanisms have been ineffective at preventing the decline of the Amargosa toad and mitigating many principal threats to the species.

A. Amargosa Toad Conservation Agreement

The Amargosa Toad Conservation Agreement (ATCA) is a multi-agency/entity voluntary effort to conserve Amargosa toads and their habitat. Formed in October 2000, management agencies, conservation groups, researchers, and the public voluntarily committed resources to develop a conservation agreement in order to avoid Endangered Species Act listing for the toad. The group includes the town of Beatty, Bureau of Land Management, Nevada Department of Wildlife, University of Nevada at Reno, Nevada Natural Heritage Program, The Nature Conservancy, U.S. Fish and Wildlife Service, and Nye County Department of Natural Resources.

The goal of the agreement is stated as:

"This conservation agreement (Agreement) and attached conservation strategy (Strategy) for the Amargosa toad, *Bufo nelsoni*, have been developed to expedite conservation measures needed for the continued existence of the species for the identified 10-year implementation period. The Agreement will provide guidance and a framework for implementation of cooperative long-term conservation actions to benefit the included species. The Strategy is intended to provide conservation measures during an interim 2-year period, during which time a long-term management plan will be developed. Cooperators signatory to this Agreement have committed to specific conservation actions which will identify and reduce or eliminate threats to the species, and maintain and enhance a properly functioning ecosystem for the Amargosa toad and other indigenous species of Oasis Valley" (NDOW 2000).

Because of its voluntary nature, implementation of these conservation measures are subject to failure. As outlined by the cooperators of the Amargosa Toad Conservation Agreement managers have failed to successfully implement most strategies for the toad.

The primary strategies recommended by the ACTA and the current status of each are outlined below:

Protect Amargosa toads and their habitat on public lands through implementation of land-use controls that minimize adverse effects to the Amargosa toad.
BLM has failed to consider the habitat needs of Amargosa toad and Oasis Valley speckled dace in its management plans. See B., below.

Other public land uses are similarly not considering Amargosa toad use and protection. Pending as of December 2007, Nevada Department of Transportation obtained permission from BLM to dig an 80 barrow pit on public land adjacent to Amargosa River in The Narrows (Environmental Assessment for Material Site Number NY 08-06 Expansion). This pit is within a half mile of lower density toad breeding habitat. The future pit would be in drier upland desert that could potentially be feeding and dispersal habitat. The Environmental Assessment does not acknowledge a reasonable buffer zone to main Amargosa toad habitat, including breeding habitat. NDOW agreed to the barrow pit construction without study of the area for toad presence or the potential for future erosion into breeding waters.

Conserve toad habitat on non-Federal lands that the ATWG has determined essential for long-term survival of the toad and co-occurring species.
To date 700 acres have been purchased by The Nature Conservancy, but this is a fraction of the toad habitat as a whole. Other privately-owned toad habitat is subject currently to grazing, OHV use, mining, and unknown levels of potential pollution.

Develop and implement empirically proven techniques to improve toad habitat through manipulations.
Many habitat improvement projects have failed, and have actually increased the number of exotic species. The Nature Conservancy, while having successes in eliminating exotic species at places such as Crystal Spring, has acknowledged in meetings that other wetland systems contain high numbers of crayfish, bullfrogs, and mosquitofish, as at Parker Ranch Preserve.

Complete studies to understand the life history and ecological requirements for the Amargosa toad.
Two university studies have been accomplished since 2000, but much more ecological data needs to be collected about migration and dispersal, climatic change impacts to toads, dietary needs, interactions with other species, impacts of cattle grazing and wild burros, habitat studies, disease, and pollutant effects. To date no baseline population estimates nor trends have been published. The Amargosa Toad Working Group has

published maps that continue to ignore important upland feeding habitat and dispersal corridors.

Develop and implement control methods for non-natives as appropriate.
Tamarisk and Russian olives are still abundant on most private lands and BLM lands. Although efforts have been made to eradicate pest species, crayfish, bullfrogs, and non-native fish numbers are still very high on many important breeding sites, greatly depressing toad recruitment.

Involve and educate the local community on the conservation efforts of the Amargosa toad and Oasis Valley ecosystem.
Attempts have been made in local community meetings to educate the public, however, opposition and misinformation from Nye County and Beatty officials has at times overshadowed many of these efforts. The Beatty Town Advisory Board voted in September 2007 to eliminate their Habitat Committee. In 2000, the Beatty Habitat Committee developed the Beatty Habitat Trails Project, a greenbelt through Beatty along the Amargosa River in Oasis Valley in southwestern Nevada. The project was meant to enhance tourism in Beatty and protect the Amargosa toad, but now is stalled. The University of Nevada at Reno website (www.amargosatoad.org) that was created to serve as a mechanism to disperse progress reports to interested parties has been offline since 2007.

Maintain cooperator involvement and responsibility through the ATWG and implementation of the Agreement and management plan when developed. Provide semi-annual assessments of progress towards implementing actions identified in this Agreement to the ATWG by all signatories, for distribution to cooperators and interested parties.
The general public does not easily have access to any reports or assessments, which have been in the form of meeting minutes. More widely circulated and announced publications should be made available.

Research the historic ecological condition of the Oasis Valley and incorporate findings in design of habitat projects as appropriate.
The Nature Conservancy and UNR have conducted information gathering about the historical ecology of the Oasis Valley, but have not been able to integrate these findings successfully into practical management in ways that increase toad populations or preserve habitat.

Obtain sufficient funding to implement the commitments made in the Agreement.

Determine baseline groundwater levels and fluctuation cycles, and water quality conditions. Periodically measure these parameters to determine if water use and availability are changing over time.
The responsible cooperators implementing many of these criteria for toad conservation have not been effective, and the toad remains in danger of substantial habitat loss and

local extirpations due to unattended threats to the Oasis Valley. Although many of the Conservation Agreement goals of the other criteria may have been met, these objectives are not sufficient to provide the toad with the protection necessary for current and upcoming threats. Although certain efforts have been made, this voluntary program has largely failed to protect toad habitat and increase toad populations as far as is known.

B. BLM Management of Public Lands and Sensitive Species

BLM has not taken Amargosa toad habitat into serious consideration when managing its public lands. On August 22, 2007, 40 acres of upland habitat in potential toad dispersal habitat was auctioned off to a developer who plans on building housing on it in the future. BLM did not consider the possible effects of connectivity between Amargosa River wetland and Indian Springs, which has the potential for toad recolonization. The 5,740 acres slated for disposal and auction in prime toad habitat occurs in the Resource Management Plan's Beatty disposal area which consists of 39,389.19 acres (BLM 2005). Management decisions have been based on the Tonopah Resource Management Plan (RMP) of October 1997 (BLM 1997), which does not mention the Amargosa toad. The Amargosa toad is listed as a Nevada BLM Sensitive Species, which under the RMP requires BLM to "manage to maintain or increase current populations of these species" (BLM 1997: 9), and to prevent "the need to list any of these species as threatened or endangered" (BLM 1997: 28). The Oasis Valley speckled dace is also a Nevada BLM Sensitive Species. BLM has failed to nominate or designate any Areas of Critical Environmental Concern in toad or dace habitats or provide a comparable level of conservation through alternative processes. A habitat conservation plan to include the Oasis Valley has not been developed. BLM continues to maintain plans for land disposal to interested private developers that include prime toad habitat. As well as ignoring its duties under FLPMA, BLM has failed to take its commitment to the Amargosa toad seriously with its proposal to sell off portions of wetland and upland habitat.

In addition, the RMP states that all streamside riparian areas, springs, seeps, and wet meadows shall be managed for proper functioning, and if deteriorating, shall be managed for an improving trend (BLM 1997: 10). Spring grazing exclosures have not been maintained by BLM at Indian Springs for over 4 years since being cut and trampled.

Off highway vehicle recreation and access are allowed next to Oasis Valley during the Vegas to Reno OHV race, which is held at the end of summer annually. Approximately every other year the race uses a desert track on the west side of Oasis Valley that passes within one quarter mile of Crystal Springs. Crystal Springs is important as one of the few toad breeding wetlands free of exotic predators, yet BLM allows vehicles to race near the fence of this habitat. The actual race uses a wash adjacent to the spring (which may potentially be used as upland toad habitat and for underground burrow use) along the wash during the race. BLM usually does not enforce OHV exclusion from riparian areas in Oasis Valley.

C. Nevada State Law Protections

The State of Nevada classifies the Amargosa toad as a protected amphibian protection through the statute NAC 503.075. Nevada protects certain sensitive species under Nevada Division of Wildlife (NDOW) guidelines. The Amargosa toad is a Nevada special status species, and NDOW manages it using the ATCA, and thus as state cooperators in the agreement the management is failing to fully protect the toad as outlined above. NDOW can only work with private landowners on a voluntary basis. Further protections extended to protected amphibians include the following statutes: NRS 504.295 prohibits the possession of live wildlife unless licensed to do so; NRS 503.597 prohibits unauthorized movement of wildlife within the state of Nevada; NAC 503.090 provides that no open season shall be designated for species of resident wildlife classified as protected; and NAC 503.093 requires a license, permit or authorization to capture, kill or possess protected wildlife. The Amargosa toad was classified as a protected amphibian by action of the Nevada Board of Wildlife Commissioners in 1998, under authority of NAC 503.075. These statutes are inadequate to protect toad habitat from destruction or degradation, and populations from decline.

The Nevada Natural Heritage Program ranks the Amargosa toad as a Global and State species "imperiled due to rarity or other demonstrable factors,: although these carry no weight of law; private land owners may volunteer to help manage and protect these species.

VIII. OTHER NATURAL AND ANTHROPOGENIC FACTORS

As noted above, although studies specific to the Amargosa toad have not yet been undertaken, global warming and the likely changes in local climatic conditions may be a significant anthropogenic factor threatening the long-term survival of the species.

IX. CRITICAL HABITAT

The ESA mandates that, when the USFWS lists a species as endangered or threatened, the agency generally must also concurrently designate critical habitat for that species. Section 4(a)(3)(A)(i) of the ESA states that, "to the maximum extent prudent and determinable," the USFWS:

> shall, concurrently with making a determination . . . that a species is an endangered species or threatened species, designate any habitat of such species which is then considered to be critical habitat . . . .

16 U.S.C. § 1533(a)(3)(A)(i); *see also id.* at § 1533(b)(6)(C). The ESA defines the term "critical habitat" to mean:

> i. the specific areas within the geographical area occupied by the species, at the time it is listed . . . , on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and

> ii. specific areas outside the geographical area occupied by the species at the time it is listed . . . , upon a determination by the Secretary that such areas are essential for the conservation of the species.

Id. at § 1532(5)(A).

Petitioner expects that USFWS will comply with this unambiguous mandate and designate critical habitat concurrently with the listing of the Amargosa toad. We believe that all current and historic riparian and upland habitat utilized by the species for breeding, shelter, movement, and foraging meet the criteria for designation as critical habitat and must therefore be designated as such.

X. CONCLUSION

Petitioners have carefully assessed the best scientific information available regarding the past, present, and future threats faced by the species, and have determined that the Amargosa toad is imminently in danger of extinction throughout all of its range. We are concerned about the Amargosa toad because of the extremely small number and reduced distribution of populations, rapid development and habitat loss, habitat fragmentation, and significant decrease in its habitable range in and around Beatty, Nevada. This species is threatened by the following factors: habitat destruction, degradation, and fragmentation due to urban, residential, and recreational development; ground disturbance or vegetation removal, for example from grading, ripping, or off-road driving; impacts from ground-water pumping, channelization, collecting, road kill, grazing, inadequate regulatory mechanisms, and the elevated extinction risks common to greatly reduced populations. These factors could severely impact the Amargosa toad by killing individuals, reducing or degrading available habitat, reducing and further fragmenting already small populations, and interfering with reproduction. Because of its limited range and population this species is also vulnerable to chance demographic, genetic, and environmental events. The combination of few breeding populations, small range, and little remaining habitat within the range makes the species highly susceptible to extinction due to urban development and random events such as drought, disease, or other occurrences. The proposed land sales by BLM of wetland and adjacent upland habitat poses an immanent and immediate threat to the Amargosa toad.

The Amargosa toad meets the Endangered Species Act's definition of Endangered and warrants protection under the Endangered Species Act. Petitioners believe that Threatened status would not accurately reflect the diminished status and the threats to this species; the species warrants listing as Endangered. However, should the secretary disagree with this assessment, at a minimum the Amargosa toad certainly meets the criteria for Threatened.

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