PETITION TO LIST THE JEMEZ MOUNTAINS SALAMANDER *(Plethodon neomexicanus)* UNDER THE U.S. ENDANGERED SPECIES ACT

Photo: National Park Service (Chris Judson)

In the Office of Endangered Species
U.S. Fish and Wildlife Service
United States Department of Interior

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Executive Summary

WildEarth Guardians hereby petitions the U.S. Fish and Wildlife Service (FWS) to list the Jemez Mountains salamander (*Plethodon neomexicanus*) under the Endangered Species Act (ESA). The Petitioned species is one of only three salamanders that exist in New Mexico.[1] The Jemez Mountains salamander is the most imperiled of the three and has long been recognized as at risk within its narrow range in the north-central area of the state. In the 1980s the greatest threat to populations of Jemez Mountains salamanders and their habitat was identified as logging. Logging on the Santa Fe National Forest (SFNF), where this species primarily resides, has long been known to threaten this species. The primary threats the species currently faces are climate change, stand-replacing fires, and salvage logging.

Climate change is likely an increasing threat to the Jemez Mountains salamander, given the importance of moist soils to this animal, which may suffer from habitat drying in times of drought. In addition, warmer springs and summers, earlier snowmelt, and increased drought can result in increased forest fire severity, frequency, and duration, to the detriment of the Petitioned species.

The risk of stand-replacing fires on National Forest lands has increased over the last century due to fire-suppression policies. This has resulted in unnatural and excessive fuel loads which have increased the risk of fire in the Jemez Mountains salamander's habitat. Since 1996, three large, intense, stand-replacing fires have occurred within Jemez Mountains salamander habitat. Approximately 100 square miles burned within Jemez Mountains salamander habitat. The total known range of the Jemez Mountains salamander is only 400-470 square miles, making the area affected by fire approximately equal to one-quarter of the salamander's habitat. Of the 100 square miles affect by the three fires, 30 square miles burned with high intensity. While the Jemez Mountains salamander has existed in a habitat in which fires are a natural phenomenon, high intensity fires are not natural in this area. High-intensity fire directly kills individual salamanders and causes long-term degradation and destruction of the salamander's microhabitat, as well as kills its prey.

An indirect consequence of forest fires and their perceived threat are salvage logging, slash removal, and forest thinning treatment projects. While not all of these activities constitute a direct threat to the Jemez Mountains salamander, many proposals for these projects have not considered the viability of the Jemez Mountains salamander or its habitat as a high priority. After two of the major stand replacing fires, salvage logging sales were proposed. The preferred actions listed in the biological evaluations directly impacted habitat categorized as "Essential." Some mitigation measures were considered but the priority of these sales placed monetary return over individual salamander survival or habitat conservation.

[1]The other two salamanders in New Mexico are the tiger salamander *(Ambystoma tigrinum)* and the Sacramento Mountain salamander *(Aneides hardii)* (Degenhardt et al. 1996).

Other identified threats to the Jemez Mountains salamander and its habitat are a direct result of human activities, including use and construction of roads and dams. Within the last 15 years these activities have been allowed and approved within the Jemez Mountains salamander's habitat by state and federal agencies. The project of greatest concern is the improvement and realignment of State Highway 126, Forest Highway 12, Cuba-La Cueva Road. Construction of this project began in 2006. Portions of road construction and specific areas of road realignment were known to occur in areas with populations of Jemez Mountains salamanders. It was determined that construction in these areas would cause direct of mortality salamanders and destruction of habitat. The specific subpopulation was considered important as it is exists(ed) on the westernmost periphery of the salamander's range. Purposes given for improving and realigning this road included the need to increase vehicle capacity, increase the driving pleasure of recreationists, and move the road from a community of homes that are mostly inhabited during summer months.

While disease and predation have not been shown to cause high mortality rates in the Jemez Mountains salamander, a pathogen known to have caused mass die-offs in other amphibian populations was collected from a Jemez Mountains salamander in 2002.

The Jemez Mountains salamander lacks adequate regulatory protection to prevent its extinction. While state-level protections have increased, federal protections have decreased. In 1975 the Jemez Mountains salamander was listed as Threatened by the state of New Mexico due to the salamander's restricted distribution. It was uplisted to Endangered in 2006. In 1991, the New Mexico Department of Game and Fish (NMDGF), U.S. Forest Service (USFS), and FWS signed a Memorandum of Agreement (MOA) concerning the species. This interagency agreement was supposed to provide protection for the salamander and committed to the production of a complete management plan within a 3-year time period. By 1994 a management plan had been drafted but was not yet final. In late 2000, almost nine years after the signing of the MOA, the Comprehensive Management Plan (CMP) for the salamander was finalized. In 2004, the CMP was incorporated into the SFNF Forest Plan as required by the MOA. However, the CMP and Forest Plan have been inadequate in preventing logging and other land uses that destroy the salamander's habitat.

Even before the CMP was finalized, FWS issued a negative finding for a petition to list the salamander under the ESA in 1992. The reasoning for the negative finding was that a management plan for the salamander would provide protection for the species' habitat. While the Jemez Mountains salamander was classified as a Federal Category 2 candidate species as of 1994, in 1996, FWS eliminated all Category 2 and 3 species from the candidate list (61 FR 7596-7613). The Petitioned species is therefore not currently a candidate for ESA listing.

Given the multitude of threats facing the salamander and the lack of adequate regulatory protections to prevent its extinction, WildEarth Guardians hereby petitions for a rule to list the Jemez Mountains salamander (*Plethodon neomexicanus*) as threatened or endangered within its historic range in New Mexico under ESA.

Introduction

The Jemez Mountains salamander is endemic to north-central New Mexico and is considered a relict species. This is a small, lungless salamander, in the family Plethodontidae and is found only in the mesic forested habitat of the Jemez Mountains. In contrast to many amphibians, the Jemez Mountains salamander employs terrestrial eggs to reproduce but like other amphibians is a poikilotherm, and its body temperature fluctuates with that of the environment. The Jemez Mountains salamander has an extremely narrow critical thermal range, which makes this species highly susceptible to environmental fluctuations. The Jemez Mountains salamander, like all lungless salamanders, must breath through cutaneous respiration, which requires the salamander's skin to remain moist. Moisture also plays a very important role in reproduction for this terrestrial salamander, particularly for critical stages in mating and hatching of young.

Within the Jemez Mountains range, *Plethodon neomexicanus* has a limited distribution. The total distribution of this salamander is estimated to consist of 400– 484 square miles (650-780 square kilometers). Although some estimates put the known distribution of this species at as little as 200-250 square miles (320-400 square kilometers). This species exists in fragmented populations in small areas of mixed coniferous forest. Densities have been found to be approximately $0.05/m^2$ in areas where preferred microhabitat is present. The Jemez Mountains salamander's preferred microhabitat is characterized by relatively high-humidity soils with a specific rock structure that contains deep, igneous subsurface rock. Litter depth, overstory cover, pH, soil temperature, lichen/moss occurrence, and decay state and moisture content of logs have been demonstrated as important factors in the presence or absence of salamander populations.

More than 90% of known populations of the Jemez Mountains salamander are concentrated on federal lands managed by the SFNF. Six fragmented populations have been identified within these lands. These areas are considered "Essential" habitat by the 2000 CMP for the Jemez Mountains salamander, which was signed by FWS, USFS, and NMDGF in 2000. The "Essential" habitat consists of 30,510 acres, and 8,280 acres of "Priority Survey" area which is considered to contain suitable habitat in 2000, but had not been comprehensively surveyed for the presence of Jemez Mountains salamanders. An additional 108,100 acres were identified as "Survey" zones. Other small populations exist outside of the SFNF on National Park Service, Department of Energy, and Tribal lands.

As a nocturnal and subterranean species, it is difficult to estimate population size, abundance and density for the Jemez Mountains salamander. It is estimated that the total population within the Jemez Mountains range does not exceed 10,000 individuals. In areas of preferred habitat, studies have shown some subpopulations to consist of anywhere from 25 – 120 individuals. In other areas, subpopulations of Jemez Mountains salamanders have been measured at less than ten individuals. Densities, in areas with preferred microhabitat, have been approximated to be $0.05/m^2$.

Threats to the existence of this species have been identified since the mid 1970s. These threats include loss of individuals through collection of specimens, fragmentation and/or loss of populations through road-building, logging, slash removal, activities that affect rock structure, and non-natural fire. These threats are exacerbated by the salamander's restricted distribution. Jemez Mountains salamanders are known to have very small home ranges (approximately 8 m^2) and cannot travel large distances. Within suitable habitat it may be able to travel approximately 3 km but if the habitat is unsuitable this distance decreases to 1 km or significantly less depending upon the habitat. Therefore, fragmentation of habitat can cause considerable harm within a subpopulation. The Jemez Mountains salamander is also extremely sensitive to changes within its microhabitat, as noted previously and may experience high mortality events when micro- and/or macro-habitat conditions are drastically changed.

Regulatory mechanisms exist regarding populations of Jemez Mountains salamanders and its habitat but they are inadequate to protect its extinction. Multiple documents have been written and amended which provide guidelines for the management of the Jemez Mountains salamander and its habitat. These documents include an MOA (1991), CMP (2000), and amendment to the SFNF Forest Plan (2004). The MOA and CMP have proven to be unenforceable vis-à-vis SFNF's permitting of logging, particularly salvage logging. While the state of New Mexico affords state-listed status to the Jemez Mountains salamander, those protections do not extend to habitat, which is the primary threat to this species. In addition, federal and state actions have not adequately addressed the threats of either catastrophic wildfire or climate change on the salamander.

This petition documents the overwhelming scientific evidence that the Jemez Mountains salamander warrants protection under the ESA. This species has been reduced and fragmented through direct loss of individuals and habitat destruction. This petition also demonstrates that existing regulatory mechanisms do not provide adequate protection for this species or its habitat. These factors serve as the basis for proceeding with listing the Jemez Mountains salamander as an Endangered or Threatened species under the ESA.

Endangered Species Act Implementing Regulations

Section 424 of the regulations implementing the Endangered Species Act (50 C.F.R. § 424) is applicable to this petition. Subsections that concern the formal listing of the Jemez Mountains salamander as an Endangered or Threatened species are:

> 424.02 (d) "Critical habitat" means "(1) the specific areas within the geographical area currently occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (i) essential to the conservation of the species and (ii) that may require special management considerations or protection..."
>
> 424.02 (e) "Endangered species" means a species that is in danger of extinction throughout all or a significant portion of its range."

> "Threatened species" means a species that "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C § 1532(20)).
>
> 424.11(c) "A species shall be listed…because of any one or a combination of the following factors:
>
> 1. The present or threatened destruction, modification, or curtailment of habitat or range;
> 2. Overutilization for commercial, recreational, scientific, or educational purposes;
> 3. Disease or predation;
> 4. The inadequacy of existing regulatory mechanisms; and
> 5. Other natural or manmade factors affecting its continued existence."

All of the factors under 50 C.F.R. § 424.11(c) and ESA Section 4 (16 U.S.C. § 1533(a)(1)) have threatened or may threaten the persistence of the Jemez Mountains salamander. Disease (factor 3) has not currently been shown to have caused mortality in this species but there is a threat of a mass mortality event if a known pathogen continues to be found with Jemez Mountains salamander populations and its habitat.

Petitioner

WildEarth Guardians is a non-profit environmental organization whose mission is to protect and restore wildlife, wild places, and wild rivers in the American West. In fulfilling this mission, WildEarth Guardians has worked to conserve species that face high levels of imperilment, especially those who play important umbrella and keystone functions within their ranges. The Jemez Mountains salamander is one such species. As an amphibian this species is sensitive to environmental changes. This characteristic of amphibians makes them particularly valuable as indicator species, especially as studies have shown that survival of many amphibian species are strongly dependent upon factors that can be influenced by human activities (Frisbie and Wyman 1991; Blaustein et al. 1994; Blaustein and Wake 1995; Sugalski and Claussen 1997; Demaynadier and Hunter 1998). Because of their abundance, total biomass and role in food chains, amphibians are ecological significant members of their communities (Griffiths 1996). The Jemez Mountains salamander is therefore a high priority species for WildEarth Guardians.

Prior History of Species Under ESA

Dr. James R. Dixon petitioned the Jemez Mountains salamander for listing under the ESA on February 13, 1990. Dixon's petition pointed to threats to the salamander including: low population numbers; increasing logging; soil disturbance, dessication, and erosion; and threats from a proposed mine expansion. On July 30, 1990, FWS issued a positive 90-day finding (55 FR 38342). However, on February 11, 1992, FWS decided that the salamander did not warrant ESA listing. Its decision was based on the 1991 MOA which, the FWS asserted, removed the threat of habitat destruction and the future Jemez

Mountains Salamander Plan (57 FR 11459). Courts have routinely found that FWS cannot depend on speculative and unenforceable conservation plans to deny species listing. In addition, FWS's negative petition finding did not address the threat of collection or of habitat destruction on non-SFNF lands. As it turns out the salamander plan (called the CMP) was not finalized until 2000, eight years after the negative petition finding. As this Petition demonstrates in the Threats section below, the MOA and CMP have been inadequate in preventing destruction of salamander habitat.

While FWS classified the Jemez Mountains Salamander as a Federal Category 2 candidate species as of 1994 (59 FR 58982), in 1996, FWS eliminated all Category 2 and 3 species from the candidate list (61 FR 7596-7613).

Classification and Nomenclature

Common Name

The common name for *Plethodon neomexicanus* (Stebbins and Riemer 1950) is Jemez Mountains salamander. There are no separate subspecies relating to this species.

Taxonomy

The species was first identified in the early 1900s and initially labeled as *Spelerpes multiplicatus* (currently *Eurycea multiplicata*) (Altenbach and Painter 1998). It wasn't until 1950 that *P. neomexicanus* was rediscovered and named as a distinct species. The Jemez Mountains salamander is a lungless salamander of the family Plethodontidae. This is the largest family of salamanders and encompasses 60% of known living salamander species. This family includes approximately 240 species within 30 genera (NMDGF 2000c). Of the genus *Plethodon*, approximately 55 species occur in North America (USGS 2006). Systematic studies show that the Jemez Mountains salamander is not closely related to any other species as it does not group with other *Plethodon* lineages (Degenhardt et al. 1996; Mahoney 2001). *P. neomexicanus* is considered a basal species within the western plethodontids (Mahoney 2001).

Table 1. Taxonomy of Jemez Mountains Salamander.

Kingdom	Animalia
Phylum	Vertebrata
Class	Amphibia
Order	Caudata
Family	Plethodontidae
Genus	*Plethodon*
Species	*neomexicanus*

Description

Coloring

Degenhardt et al. (1996) describe the Jemez Mountains salamander's coloring as:

> .. uniformly dark brown above, with occasional fine gold stippling dorsally. The venter is sooty gray, being lighter on the chin and on the underside of the tail.

The only similar species in New Mexico is the Sacramento Mountain salamander (*Aneides hardii*). The two species are easily distinguished based on geography. The Sacramento Mountain salamander is restricted to high elevations in the Capitan, White and Sacramento Mountains in south-central New Mexico (Otero and Lincoln Counties) at elevations of 9000 ft (2743 m). In contrast, the Jemez Mountains salamander is only found within portions of the Jemez Mountains range in north-central New Mexico (Sandoval, Rio Arriba and Los Alamos Counties) at elevations above 7,200 ft (2900 m) (Degenhardt et al. 1996).

Lengths

The average length of 296 specimens collected between 1992 and 1994, was 82.3 mm (30.9 – 134.4 mm) (Degenhardt et al. 1996). About half of the Jemez Mountains salamander's length consists of its tail (NMDGF 1988).

Dimorphism

Females are larger than males at sexual maturity. Sexually mature males average 55.2 mm snout-vent-length (SVL) (47-63mm) while sexually mature females average 56.2 mm SVL (49-67 mm). In sexually mature males, the head may be slightly wider than the body. The mental glands of males are not evident (Degenhardt et al. 1996). Juveniles are aquatic with gills.

Distinctive traits

The body is long and slender with 18-20 costal grooves, with 7.5-8.5 costal grooves between the toe tips of adpressed limbs. Over 50% of specimens have four phalanges, with the fifth being much reduced, projecting just slightly beyond the foot (Brodie and Altig 1967; Degenhardt et al. 1996).

Range distinctions

The Jemez Mountains salamander's range is restricted to the Jemez Mountains range in north-central New Mexico (Figure 1). The salamander has only been found in portions of Los Alamos, Sandoval, and Rio Arriba Counties (Degenhardt et al. 1996). In the mountains of these counties, the Jemez Mountains salamander exists in six fragmented

populations (called "Essential" by the CMP for the Jemez Mountains salamander) with additional smaller populations found in the surrounding forests (Figure 2). The tiger salamander (*Ambysoma tigrinum*), is the only other salamander that overlaps in habitat with the Jemez Mountains salamander. These two species are easily distinguished from one another based on morphological characteristics and habitat needs (NMDGF 2006b).

Figure 1. Jemez Mountains salamander range map. Source: ARMI National Atlas for Amphibian Distributions; USGS 2006.

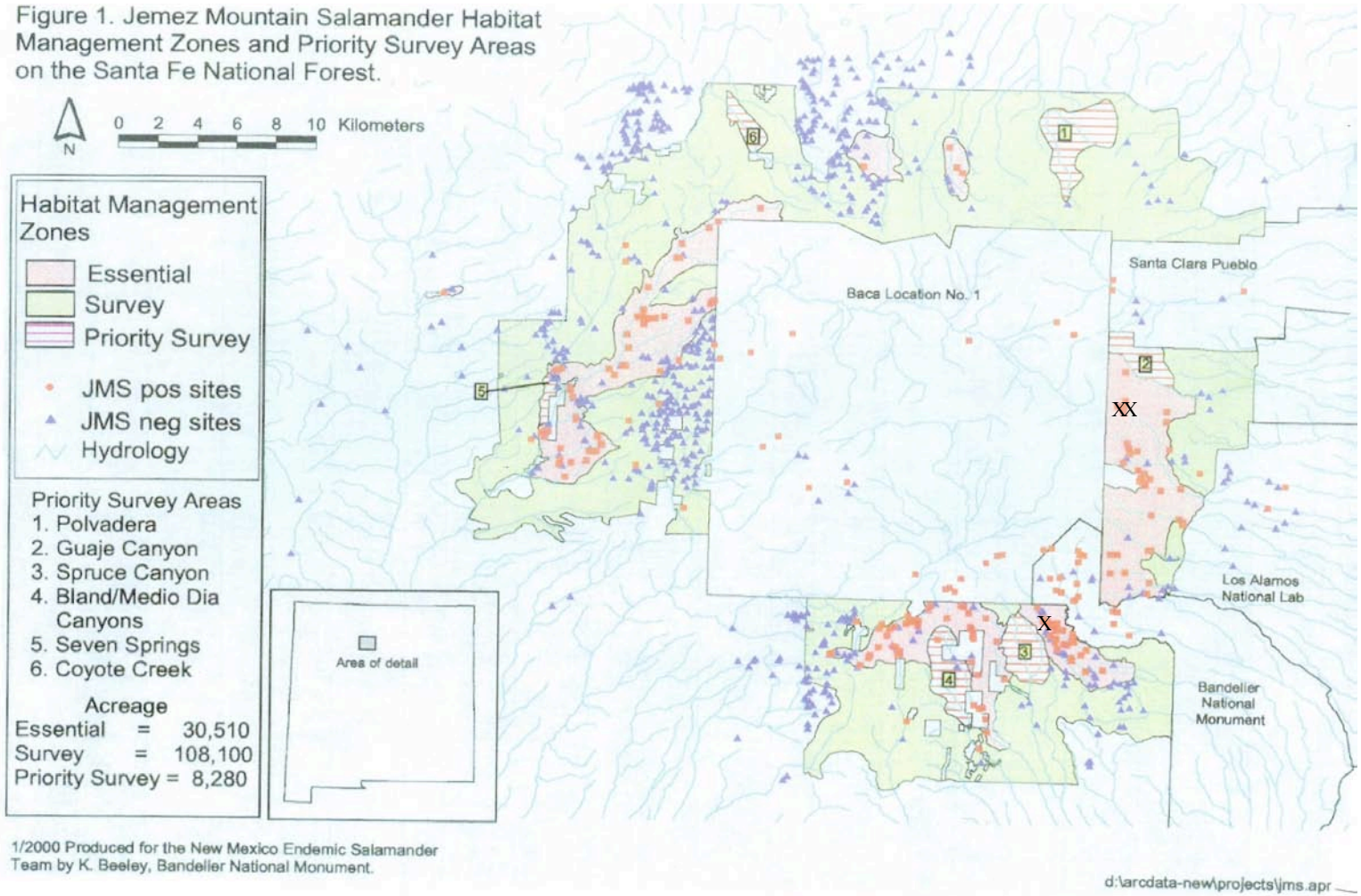

Figure 2. Jemez Mountains salamander Habitat Management Zones and Priority Survey Areas on the Santa Fe National Forest. Source: 2000 Cooperative Management Plan. "X"s mark sites of permanent activity plots.

Geographic Distribution: Historic and Current

The Jemez Mountains salamander is a relict species, endemic to north-central New Mexico and has a limited distribution within the Jemez Mountains range. As noted above, this species exists in fragmented populations. The CMP delineated these fragmented populations into six major zones of distribution within an approximately 650-780 square kilometer area (NMDGF 1994b; NMEST 2000b) (Figure 2). These six populations are identified as Essential Zones (critical habitat) and consist of 30,510 acres of SFNF land. Additional Priority Survey (8,280 acres) and Survey (108,100 acres) areas are identified in the CMP as potential salamander habitat that required further survey to obtain a comprehensive assessment of the population status of the Jemez Mountains salamander. To date a complete assessment of the population within the Essential Zone, Priority Survey and Survey Zones has not been completed and the total population of the Jemez Mountains salamander remains unknown as does the total area of suitable habitat.

It does not appear that the geographic distribution of this species has changed over the past century. Historic and current surveys have only found salamanders in Los Alamos, Sandoval, and Rio Arriba Counties (Reagan 1967; Degenhardt 1974; NMEST 2000b). Although the historic and current distribution of this species has not likely changed it is evident that some of the fragmented populations have declined or have been extirpated within the species' limited range (NMEST 2000a; NMDGF 2000c; Cummer et al. 2004).

Life History

Habitat requirements

A low-elevation, semiarid environment surrounds the Jemez Mountains, confining the Petitioned species to this mountain range. The Jemez Mountains are a volcanic field which covers an area approximately 19 by 22 miles (30 by 35 km) and contains the Valles Caldera. The Valles Caldera is generally characterized by large open meadows and resurgent, forested domes (Self et al. 1986). The slopes of the Valles Caldera provide the most contiguous habitat for the Jemez Mountains salamander (Cummer et al. 2002). This salamander's preferred microhabitat is characterized by relatively high-humidity soils with specific rock structure that contain deep, igneous, subsurface rock (NMDGF 1994a; NMDGF 2000b). The Jemez Mountains salamander is locally common in areas where essential microhabitat exists (Degenhardt et al. 1996).

The Jemez Mountains salamander is restricted to upper montane mixed coniferous forests at high elevations. The coniferous forest habitat is dominated by Douglas fir, blue spruce, Engelmann spruce, and white fir. Deciduous components include occasional quaking aspen, Rocky Mountain maple, New Mexico locust, oceanspray, and various shrubby oaks. Ponderosa pine stands predominate at lower elevations, particularly on south-facing slopes. Within the sub-alpine forest association Engleman spruce, Douglas fir, and white fir are the most common trees. The salamander shows a significant

preference for areas with high densities of large fir and all size classes of spruce (Ramotnik and Scott 1988a).

The Jemez Mountains salamander prefers steep slopes at elevations above 7,200 feet (2200 – 2900 m) within loose rocky soils (Ramotnik and Scott 1988a; Degenhardt et al. 1996). Old, stabilized talus slopes are an important type of cover for this species, especially those with a good covering of damp soil and plant debris (NMDGF 1988; Ramotnik and Scott 1988a). Salamanders are difficult to find on south-facing slopes, and a steep slope is one of the most useful variables in determining the occurrence of this salamander (Ramotnik and Scott 1988a). It is thought that the soils of steep slopes contain more interstitial spaces than do shallower slopes. These soils may be less compacted than those of more gentle slopes due to the combined effects of gravity and movement of water and soil. As a consequence of a steep slope and the underlying volcanic rock, characteristic of the Jemez Mountains, are spaces within the matrix of rocky soil. These spaces may provide refugia for salamanders during inhospitable times (Ramotnik and Scott 1988a).

In these habitats, salamanders spend much of their time below the surface, including under rocks and in fallen logs. Salamanders are rarely observed on the surface. When it is observed it is encountered under bark, surface litter, or logs. Ramotnik and Scott (1988a) observed 96% of salamanders as occurring among coarse woody debris (68%), rocks (27%), and fine woody debris (1%). The difficulties in traversing the terrain salamanders inhabit along with the low probability of sighting salamanders at the surface make this a difficult species to monitor.

Behavior

The Jemez Mountains salamander spends the majority of its life underground and is nocturnal. Like all plethodontids, this salamander lacks lungs and instead obtains oxygen directly through mucous membranes of the mouth and throat and through its skin. The skin is very thin and must be moist for respiration to occur. Surface activity depends on favorable air temperatures and moisture, as desiccation is quickly fatal. Although *P. neomexicanus* rarely leaves the shelter of rotted logs or rocks it can travel short distances overland in darkness with the presence of sufficient moisture (Degenhardt et al. 1996).

Daily and seasonal activity patterns of the Jemez Mountains salamander are primarily governed by temperature and moisture (Ramotnik and Scott 1988a). The thermal preferendum of this species is 12.4°C (54.3°F) (NMDGF 2004). As poikilothermic animals, with no control over their body temperatures except possibly through behavioral means, the salamander's body temperature varies with the temperature of the immediate environment. Individuals will retreat underground during dry periods and will be active on the surface only on wet nights (Carey 1987). The critical thermal maximum for this species is 33.5°C (92.3°F) (Whitford 1968).

Dispersal

The Jemez Mountains salamander is neither a long distance nor local migrant (NatureServe 2006). Plethodontid home ranges tend to be very small, on the order of a few meters to a few dozen meters in diameter (Welsh and Lind 1992; Marvin 2001). The inferred minimum extent of habitat use for plethodontids is 1 km, but on occasion dispersing plethodontids may travel several hundred meters (NMDGF 2006b). Studies on the Jemez Mountains salamander have shown its home range to average 8 m^2 and vary from 1-20 m^2 (Ramotnik 1988b).

The separation distance for this species varies depending on the presence and extent of suitable and/or unsuitable habitat. The separation distance for suitable habitat is 3 km. This reflects the limited movements of these salamanders, tempered by their tendency to occur throughout patches of suitable habitat and the likely low probability that two locations separated by a gap of less than a few kilometers of suitable habitat would represent independent occurrences over the long term (NatureServe 2006). The separation distance for this species within and between unsuitable habitat is 1 km. This is considerably less than the 3 km separation distance for suitable habitat. Barriers can also create separation between suitable habitat. These separation barriers include busy highways, especially with high traffic volume at night; major rivers or lakes, and other inappropriate habitat that the salamanders cannot traverse, such as dry open fields (Ramotnik and Scott 1988a; NMDGF 2006b).

Food Habits

The Jemez Mountains salamander is a carnivore that forages mainly at night. The majority of the salamander's diet consists of insects but can also include small invertebrates. Diet studies have shown the following distribution of prey items: ants 77%, lepidopteran larvae 18%, beetle larvae 13%, mycetophilid flies 10%, staphylinid beetles, 8%, pseudoscorpions, tenebrionid beetles, tipulid flies and termites 5% each, and annelid worms, mites, carabid beetles and snails 3% each (Reagan 1972). In a study by Reagan (1972), a greater variety of prey items were found in late summer than earlier in the season. This is believed to be due to the greater availability of prey items during late summer rather than a change in dietary preferences.

Population density

The Jemez Mountains salamander is locally common in areas where essential microhabitat is present. In occupied areas on SFNF lands, the mean population density found on transects was 3/100m^2 (N = 28) (Ramotnik and Scott 1988a). In another study conducted by the NMDGF, permanent activity plots were developed to monitor salamander populations (NMDGF 2000c). Activity Plots are 2500 m^2 or ¼ hectare (Figure 2). Over a seven-year period, only two of these plots had sufficient recapture data to compute population size. On the DomeSL plot the estimated population varied from ~45 to ~100 (Figure 3, Table 2). The Posos activity plot had an estimated number of ~25 to ~ 120 individuals (Figure 3, Table 2). The density of salamanders for these and

other locations was estimated to be about 500/hectare (0.05/m^2) (Table 1) (NMDGF 2000c). Populations of ≤ 10 individuals have been found on other areas of SFNF land and on property owned by Santa Clara Pueblo, Los Alamos National Laboratory, and Bandelier National Monument (NMEST 2000b). The total adult population size for the Jemez Mountains salamander is unknown but likely exceeds 10,000 (NatureServe 2006).

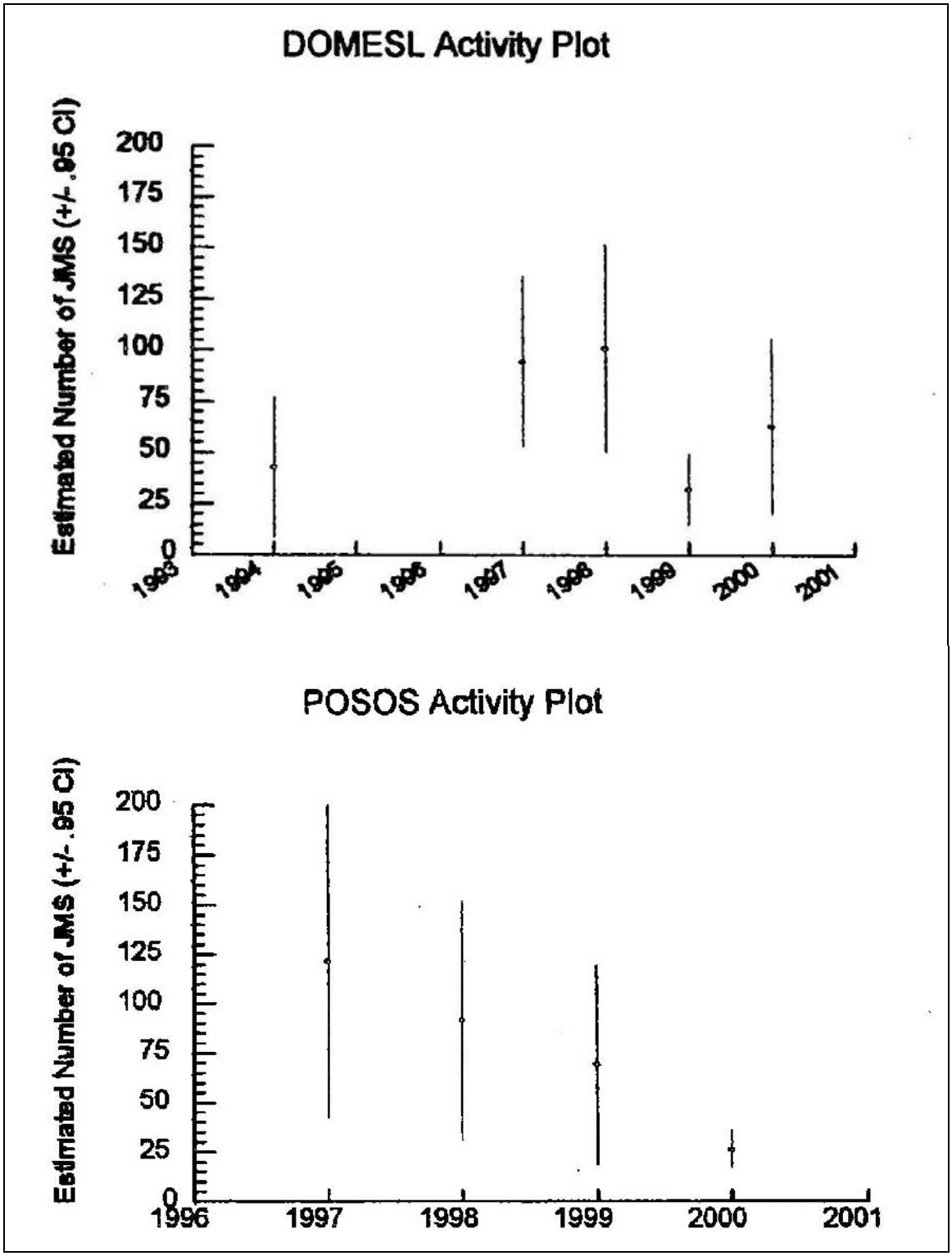

Figure 3. NMDGF permanent activity plots. Source: NMDGF 2000c.

Table 2. Estimated population size and population statistics for Jemez Mountains salamanders on DOME SLOPE and POSOS Activity Plots from 1997-2000. Population size was estimated using the Peterson method (Seber 1982, cited in NMDGF 2000c). Each Activity Plot is 2500 m^2 or ¼ hectare (NMDGF 2000c).

Activity Plot Year	Population Estimate on Activity Plot	Population estimate per hecatare (per acre)	Standard Error (Population Estimate)	Lower 95% Confidence Interval	Upper 95% Confidence Interval
DOME SLOPE					
1997	94.3	377 (153)	20.8	52.8	135.9
1998	101	404 (164)	25.2	50.5	151.5
1999	32.3	129 (52)	8.6	15	49.5
2000	63	252 (102)	21.5	20.1	105.9
POSOS					
1997	121.4	485 (197)	39.2	43	199.8
1998	91.5	366 (148)	30.3	31	152
1999	69	267 (112)	25.1	18.8	119.2
2000	26.4	106 (43)	4.7	17	35.8

Of note is that collection of salamanders, especially at the type locality, may drastically impact survey findings as well as lead to localization extinction of the species.

Demography and Reproduction

Sexually mature males average 55.2 mm SVL, while sexually mature females average 56.2 mm SVL (Degenhardt et al. 1996). Females reach sexual maturity around three years of age and lay eggs every other year (Behler and King 1979). Through examination of gonads it was determined that individuals under 50 mm SVL are juveniles (Brodie and Altig 1967).

Extensive research on the reproduction of *P. neomexicanus* was conducted by Williams (1976, 1978). The following information is taken from these studies. Based on ova diameter, two reproductive classes of *P. neomexicanus* are discernable. In Class I, females do not lay eggs during the current summer. These females average 7.7 maturing eggs with about four in each ovary. In Class II, females are considered gravid. They mate and oviposit their eggs by the beginning of the next active season (June – September). The number of maturing eggs average 7.8, with equal numbers in each ovary. It is believed, but has not been demonstrated, that a third class of females may be present. These individuals are presumed to be underground with their egg clutches. They move into Class I during the next summer.

Males begin spermatogenesis during late fall with the formation of secondary spermatogonia. Differentiation to primary spermatogonia begins in early June and continues through August. Spermatids are formed from mid-July to mid-September and spermatozoa form in late August. The entire testes are full by early fall.

Mating takes place in July and August. Oviposition is believed to occur during the spring but may take place between August and the following spring. Females oviposit every other year and only gravid animals take part in mating (NMDGF 1988). Courtship and egg deposition for this species has not been observed in their natural habitat. There is no aquatic larval sate as these salamanders exhibit direct development of terrestrial eggs (Behler and King 1979; Ramotnik 1988b). Although it has not been observed, it is likely that eggs are laid beneath the soil surface in interstitial spaces between fractured rocks, in rotted root channels, or in the burrows of rodents or large invertebrates. Hatching begins in early August. Juveniles (18-20 mm SVL) have been found active on the surface as early as mid to late July. These salamanders may represent the approximate size at hatching (Degenhardt et al. 1996).

Size class and distribution data collected between 1992-1999 show the percent size class (nonreproductive vs. reproductive) distribution by year is near 50/50 or 75/25. It has been shown that fire and logging can change this distribution by reducing reproduction or survivorship among juvenile salamanders (Scott and Ramotnik 1992; NMEST 2000b; NMDGF 2000c).

Hibernation

The Jemez Mountains salamander can hibernate and aestivate. Salamanders likely remain below the surface throughout most of the year and are active on the surface from June-August during summer rains (Stebbins 1985).

Mortality

Little is known about the natural survival and mortality rates for this species. Habitat loss and degradation are the main causes of mortality for the Jemez Mountains salamander. Data on predation rates for this species is limited. Disease has yet to be shown as a significant source of mortality but recent findings suggest there may be cause for concern.

Habitat degradation and loss

The Jemez Mountains salamander is sensitive to changes in its microhabitat and is extremely vulnerable to desiccation and changes in soil characteristics including compaction, increases in pH, and loss of water content. Changes in habitat that concern this species are caused by slash removal, fire suppression, fire salvage operations, and/or direct effects of fire, such as removal of canopy, loss of surface habitat, and elimination of prey items (Ramotnik and Scott 1988a). Any activity which removes forest canopy, disrupts rock structure, and/or decrease surface humidity has potential to cause mortality in this species (NMDGF 1994a).

Although clear cutting and logging have declined within the last decade, salvage operations after forest fires and thinning in Wildland Urban Interfaces (WUIs) continue to occur on U.S. Forest Service land (USFS 1996c; NMEST 2000b; USFS 2001; USFS

2003c). Scientists have found that salvage logging poses significant ecological harms and can be quite harmful to amphibians (Corn and Bury 1999; DellaSala 2006; Reeves et al. 2006).

Roads create an extensive separation barrier for this species by fragmenting the habitat. Habitat fragmentation makes immigration and emigration to and from suitable and unsuitable habitat difficult if not impossible for this species (NatureServe 2006). As stated previously, the separation distance for the Jemez Mountains salamander within suitable habitat is 3 km, whereas, within unsuitable habitat the separation distance decreases to 1 km. Travel within unsuitable habitat is so difficult for this salamander that the actual separation distance may be measured in meters. Fragmentation greatly reduces the ability of this species, which already exists in six isolated areas, to persist. This is especially true if habitat in one of the six Essential Zones becomes degraded.

Whereas pumice mining in Jemez Mountains salamander habitat is not a direct threat, associated haul roads and other support activity adversely affect individuals (NMEST 2000b). Dams can also destroy suitable habitat, by use of heavy machinery and can result in flooding of suitable terrestrial habitat (NMEST 2002c).

Chemical use within the Jemez Mountains salamander habitat can create a caustic environment within soil matrixes. Fire retardant is used to suppress wildfires. Until 2004, the USFS allowed fire retardant to be used that was known to contain levels of cyanide lethal to fish. Millions of gallons of retardant are applied annually nationwide. For example, during 2006, 31.3 million gallons of retardant were applied.[2] Fire suppression can therefore have a toxic effect on the Petitioned species.

In addition, insecticides are used in the forest to prevent tree loss and can cause harm to the microenvironment of the salamander. The New Mexico Department of Game and Fish (NMDGF 1988) stated that "Tree loss due to disease may also contribute to the problem of habitat degradation, although the spraying of toxic chemicals to prevent this can be equally as threatening to these salamanders."

Predation

The only observed predator of adult Jemez Mountains salamanders, is the western garter snake (*Thamnophis elegans*) (Degenhardt et al. 1996). This snake is found to be abundant in the habitat of *P. neomexicanus* and may often prey on this salamander.

Disease

One the biggest threats facing amphibians world-wide is the disease Chytridiomycosis, caused by the chytrid fungus (*Batrachochytrium dendrobatidis*) (Carey et al. 2003). The fungus can cause sporadic deaths in some amphibian populations and 100% mortality in others. In the past 15 years, this disease has been implicated in the mass die-offs and

[2]U.S. Forest Service. 2007. Environmental assessment for aerial application of fire retardant. Released October 2007. Available at: http://www.fs.fed.us/fire/retardant/index.html.

species extinctions of frogs around the world (DEH 2004). In New Mexico this fungus is suspected of contributing to the decline and possible extirpation of the boreal toad (*Bufo boreas*) (Muths, Green et al. 2000). Until 2005, this fungus was considered restricted to aquatic habitats (Longcore, Pessier et al. 1999). However, in 2005, a biological sample was taken from an individual *P. neomexicanus*, a terrestrial salamander, and found to be infected with *B. dendrobatidis*. This not only presents a great risk to terrestrial amphibians but is now a direct threat to the Jemez Mountains salamander as this disease has the potential to cause large mortality events.

Historic and Current Population Status & Trends

The total population within the salamander's entire range is unknown but is likely to exceed 10,000 ((NatureServe 2006). Known locations of Jemez Mountains salamanders have increased over decades due to more frequent and intensive surveys. In 1967, seven localities of Jemez Mountains salamander were known (Reagan 1967). In 1974, ten localities were known and another thirteen were added after surveys were conducted, totaling twenty-three localities (Degenhardt 1974). All of these locations were on SFNF lands. Of the twenty-three locations, salamanders were abundantly found in seventeen sites.

By 1999, surveys for the Jemez Mountains salamander had been conducted at 633 sites considered to contain suitable habitat. They were detected at 122 of the survey areas. Of the 122 sites, 76 of the sites had observations of 1-5 salamanders. In 27 of these 76 sites only one salamander was located (NMDGF 1999b). In 1999, the NMEST stated that "Populations are small and isolated populations are possibly declining" (NMEST 1999). As noted previously, Jemez Mountains salamander populations and the habitat they encompass were categorized into three zones by the CMP (NMEST 2000b) (Figure 2). These zones are the Essential Zone (30,510 acres), Priority Survey Zone (8,280 acres) and Survey Zone (108,100). The Essential Zone comprises the densest populations of salamanders but exists as six fragmented and isolated areas. Salamanders have been found in both Priority Survey and Survey Zones but require more detailed surveys to determine exact populations.

Survey results for this species can vary dramatically from year to year and between locations. In 2002, ten searches for *P. neomexicanus* were conducted at seven locations on the Valles Caldera National Preserve (VCNP) (Cummer et al. 2002). The Jemez Mountains salamander was found at one of these locations. In 2003, 34 searches, totaling 100-person-hours (much more time than the typical surveys of 2 person-hours), were conducted for the Jemez Mountains salamander on the VCNP (Cummer, Christman et al. 2004). The species was found during 11 of the 34 surveys (31%). Eight of the surveys were conducted at "historic" locations, where salamanders had been previously observed. Salamanders were only observed at one of these eight historic locations and they were also observed at 10 new locations. During the 2003 VCNP surveys, a total of 74 salamanders were observed, with 46 of these salamanders observed in two locations. At sites where *P. neomexicanus* were observed, salamanders observed per locality ranged from 1–26.

Due to the variation in known locations throughout the many decades and differences in observed individuals within areas, it is difficult to determine population size and therefore, changes in population trends. Salamander detection is highly variable, as this species is secretive, subterranean, and only active during specific environmental conditions. When a site is surveyed and found to be absent of salamanders it does not unequivocally indicate this species is not present (Cummer 2003; Everrett 2003; Ramotnik 2003). Researchers have tried to determine what habitat characteristics best predict the presence of these salamanders (Trippe and Haarman 1996; NMDGF 2000c).

Although it is difficult to determine changes in population trends, stand re-placing wildfires and associated salvage operations are known to cause declines in Jemez Mountains salamander populations (Painter 2000b; Borg 2001). Since 1996, three major stand replacing wildfires have occurred within Jemez Mountains salamander habitat: Dome (April/May 1996), Cerro Grande (May 2000), and the BMG/Lakes (June 2002 and August 2002 respectively). A total of 64,019 acres burned with 38% of the burned acreage (24,118 acres) experiencing a high severity burn (Table 3). Within the Cerro Grande fire itself, of the total 30,510 acres of Essential Zone, 4,989 (16%) were within the fire perimeter and 1,741 acres experienced moderate to high mortality of all vegetation (Team 2000) (Figures 4 and 5). This is 37% of the designated Essential Zone habitat that occurs east of the VCNP (Team 2000). Either salvage operations or thinning treatment were proposed and/or conducted after each of these fires. The areas proposed and/or affected by these operations totaled 7,152 (5%) acres of known or potential Jemez Mountains salamander habitat (Table 4 and 5). A total of 16.2% (4,963 acres) of salvage operations were proposed/conducted in Essential Zone (Table 5) (Figure 4).

Land ownership

More than 90% of the populations of the Jemez Mountains salamander are believed to occur on lands administered by the SFNF (NMDGF 2006b). The land delineated by the CMP to have known and potential populations of Jemez Mountains salamanders totals 146,790 acres (Figure 2), all of which the SFNF administers.

Additional populations are found on lands owned by Santa Clara Pueblo (Tribal), Bandelier National Monument (National Park Service), VCNP (National Park Service), and Los Alamos National Laboratory (Department of Energy). The VCNP was previously privately owned and known as Baca Location No. 1. Surveys conducted through 2000 determined the existence of small populations (fewer than ten individuals per site) on these lands located outside of the SFNF (Figure 2) (NMEST 2000b).

Identified Threats to the Petitioned Species: Criteria for Listing

The Jemez Mountains salamander meets all five criteria for listing under the ESA:

1. Present and threatened destruction, modification, and curtailment of habitat and range;
2. Overutilization of habitat for commercial and recreational purposes;
3. Disease;
4. The inadequacy of existing regulatory mechanisms; and
5. Other natural or manmade factors affecting its continued existence.

As Petitioner demonstrates in this section, multiple threats cause the Jemez Mountains salamander to face endangerment or extinction. Activities conducted or permitted by the USFS are a primary threat and are covered by both Factor 1 (habitat loss and degradation) and Factor 4 (inadequacy of regulatory mechanisms).

I. Present and Threatened Destruction, Modification, or Curtailment of Habitat or Range.

Habitat loss and fragmentation

Habitat loss has been implicated as a significant cause of imperilment for 85% of the species listed under the ESA and is the single greatest threat to biodiversity in the United States (Wilcove et al. 1993; 1998). Habitat loss, degradation, and fragmentation of suitable habitat are the primary threats to the persistence of the Jemez Mountains salamander. The main threat and cause of Jemez Mountains salamander habitat loss is extensive stand-replacing fires and their associated salvage operations (Figure 4). Other activities such as road building, dam construction, trail construction, and mining are additionally destructive and cumulatively lead to a need to list this species under the ESA (Klingel 2003).

The CMP for the Jemez Mountains salamander, which was further ratified by the signing of the Conservation Agreement for the Jemez Mountains salamander between and among New Mexico Department of Game and Fish, USDA Forest Service and US Fish and Wildlife (USFS 2000; NMEST 2000b), states that Category 1 activities are generally considered detrimental to salamanders and their habitat. These activities include:

a) Ground disturbance such as excavation, churning, compaction, or any activity that reduces interspaces and subsurface channels.
b) Vegetation modification to the extent that ground surface microclimate is made drier or otherwise altered through increased exposure to sun and wind.

c) Suppression of populations of ants and other surface-dwelling invertebrates, which are primary prey of Jemez Mountains salamander.

Specific actions that are believed to result in adverse effects to salamander habitat and are considered Category 1 activities include but may not be limited to the following:

- Road construction and realignment
- Major road reconstruction
- Mining
- Borrow pits
- Biocide application
- New facility construction (e.g. dams, stock tanks, Jemez National Recreation Area facilities)
- Logging, salvage harvest
- Thinning, which may include fuelwooding and other small product sales (also included in Category 2 activities, below)
- Prescribed burns (also included in Category 2 activities, below)

The CMP describes Category 2 activities as activities that may result in temporary degradation of habitat quality or may have short-term adverse effects to the salamander, but are necessary for the long-term health of the ecosystem and ultimately necessary for the persistence of the species. These activities include:

- Thinning
- Prescribed burning
- Prescribed natural fire

The CMP states that, "to conduct ecosystem management and assure sustainable forest health in the Essential Zone areas, this plan acknowledges that some habitat-altering activities such as prescribed burns and understory thinning may be appropriate, even though such actions may impact individual salamanders and their habitat" (NMEST 2000b).

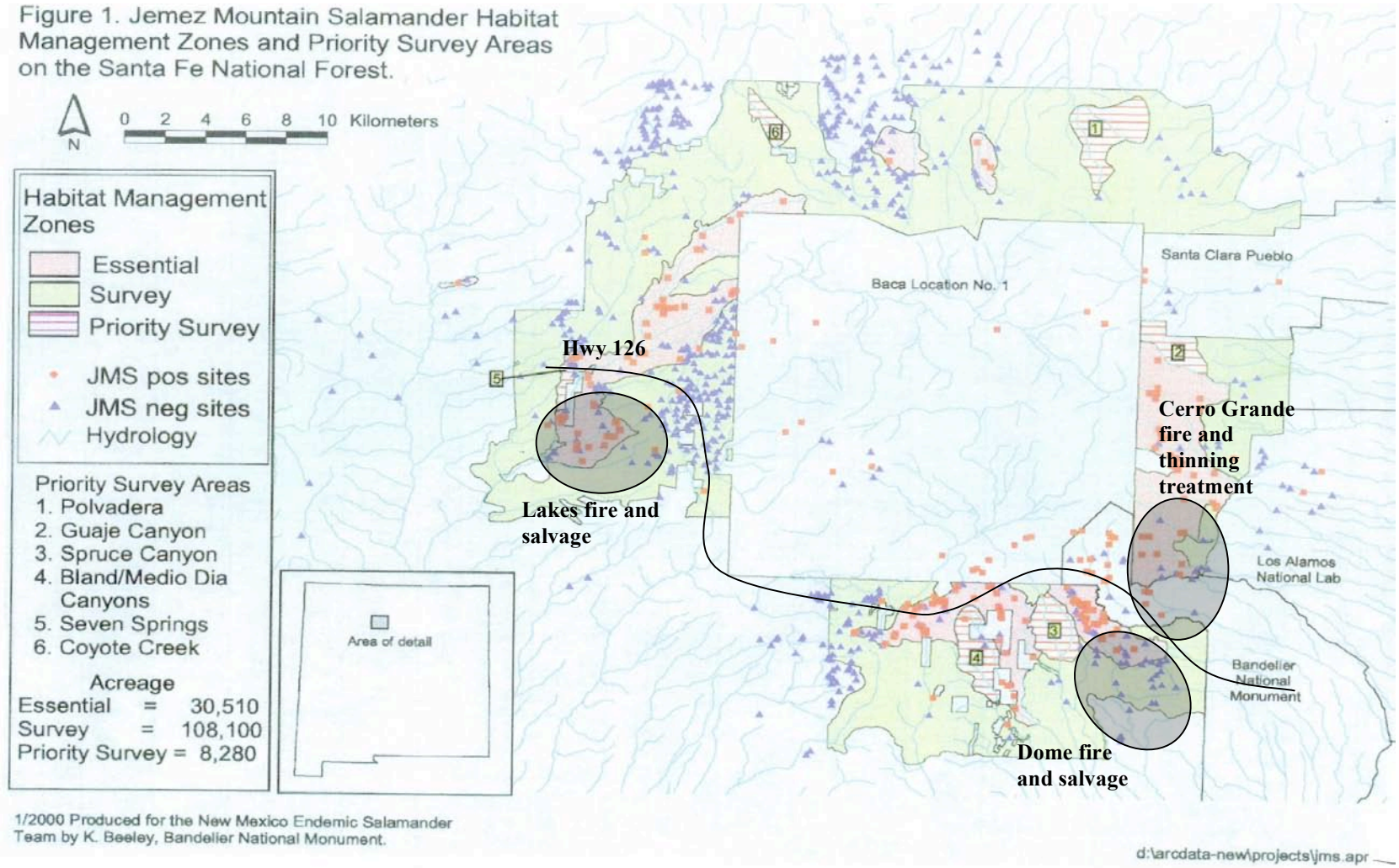

Figure 4. General locations of fires, salvage proposals, thinning treatments and road construction affecting Jemez Mountains salamander habitat. Images not drawn to scale. Source: Bandelier National Monument 2000, NMEST.

Loss of habitat and population viability due to fire

The Jemez Mountains salamander has persisted through significant changes in climate and vegetation and is best adapted to conditions characteristic of older, mature forests. During the last century, direct and indirect fire suppression has resulted in unnatural and excessive fuel loads which have increased the risk of fire in this salamander's habitat (NMEST 2000b). Although the Jemez Mountains salamander has endured natural wildfires, current conditions pose a great risk as large, intense, stand-replacing wildfires are now common. These fires can and do greatly alter substantial areas of Jemez Mountains salamander habitat. The CMP states that, "Currently, the greatest threat to this species is thought to be the potential for extensive stand-replacing fires (NMEST 2000b)."

Effects of stand-replacing fires are measured in the severity of burn. Low-intensity fires result in the removal of all or part of the duff layer with little effect to the grasses, forbs, shrubs and trees. Low to moderate burn intensity areas have 1,000 hours of fuels remaining on the ground and live tree canopies overhead (BAER 2000). In moderate burn intensity areas, the fire kills between 10-70% of vegetation and areas of high burn intensity experience 90-100% mortality of all vegetation.

High-severity burns negatively affect salamander populations in a variety of ways. Prey species richness, diversity and abundance are lost during high-severity burns and populations of prey species may take anywhere from five to ten years to recover (McCullough et al. 1998; Malmström 2006). Salamanders are poikilothermic and depend on environmental conditions to regulate body temperature. High-severity surface fires and crown-burning fires increase soil temperature. Such fires reduce litter depth and remove canopy cover. This results in an increased duration of high soil temperatures (NMEST 2000b; Everrett 2003). The soil temperature of high-severity burn sites often exceeds the "critical thermal maximum" of 33.5 C, as described by Whitford (1968), for the Petitioned species (Cummer 2003). A high-severity burn impacts a variety of soil physical and chemical properties that affect the salamander's microhabitat, including the loss or reduction of structure and soil organic matter, reduced soil porosity, and increased soil pH. These changes also result in various indirect impacts, one of which is increased hydrophobicity (water repellency). The consequence of this is decreased water infiltration and therefore a decrease in moisture available to the salamander in its underground habitat (Bruhjell and Tegart 2001). As stated above, the Jemez Mountains salamander relies on a moist environment for cutaneous respiration. These environmental changes, especially those that tend towards dryness, can cause mortality (Williams 1972).

Since 1996, three large, intense, stand-replacing fires have occurred in Jemez Mountains salamander habitat (Table 3) (Figure 4). A total of 18,783 acres burned with high intensity. The Burned Area Emergency Rehabilitation Team (BAER) stated that, "Due to the severe habitat degradation resulting from the Cerro Grande Fire, Jemez Mountains salamanders may not survive in these areas. The areas of high fire intensity and vegetation mortality will likely be unsuitable salamander habitat for many decades"

(BAER 2000). The BAER report was informed by comments from the New Mexico Endemic Salamander Team (NMEST) and stated the following as effects of fire that would directly and negatively impact the Jemez Mountains salamander (BAER 2000; NMEST 2000a):

- Loss of forest canopy resulting in decreased humidity of terrestrial and subterranean habitat
- Loss of microhabitat including downed logs, leaf litter and duff, and the upper soil horizon
- Loss of ability to recolonize areas due to large-scale habitat destruction
- Dehydration of salamanders as they emerge from underground retreats and contact abnormally xeric surface conditions
- Siltation of interstitial spaces following precipitation
- Decreased penetration of moisture into subterranean microenvironments, especially areas with hydrophobic soils and high burn severity
- Dehydration and loss of invertebrate prey could result in physiological stress, reduced population viability, and reproductive potential

The BAER report also states:

> It is expected that the cumulative effect of the above will result in the direct short-term mortality of a significant portion of Jemez Mountains salamander populations which occurred in the areas of the Cerro Grande Fire. Loss of populations will likely be very long-term because of the species inability to recolonize distant areas (BAER 2000).

Similar fire conditions were observed during the Dome and BMG/Lakes fires, and the impact on the Jemez Mountains salamander and its habitat was therefore likely the same.

Table 3. Stand-replacing fires in Jemez Mountains salamander habitat. Sources: USFS 1996b; USFS 1996c; BAER 2000; USFS 2003c. Key: USNF = United States National Forest, BNM = Bandelier National Monument, LANL = Los Alamos National Laboratories, Pueblo land = Santa Clara and San Ildefonso.

Fire	Date	Total Acreage (land owners)	High severity	Moderate severity	Low severity
Dome	April-May 1996	12,000 (USNF) 4,500 (BNM) Total = 16,500 (includes no burn areas)	3,165 ac	3,490 ac	2,865 ac
Cerro Grande	May 2000	6,927 (Pueblo land) 25,601 (USNF) 828 (BNM) 7,402 (LANL) Total = 42,878	14,728 ac	3,578 ac	24,572 ac
BMG/Lakes	June/August 2002	4,641 (USNF)	890 ac	unknown	unknown
Totals		64,019	18,783	unknown	unknown

Fire suppression and rehabilitation activities in Jemez Mountains salamander habitat resulted in habitat degradation (BAER 2000). The BAER's 2000 report notes:

> Effect of fire suppression: Jemez Mountains salamanders require a specific set of subterranean and terrestrial microhabitat conditions for activity. The microhabitat must be moist enough for cutaneous respiration. The soils and the rock structure must be friable enough to allow for movement deep into the soil column to escape high surface temperatures and low humidity. The habitat must be variable enough to support an abundant invertebrate prey base. Impacts of the following fire suppression activities may negatively affect the microhabitat suitability:
>
> - Potential release of contaminants from fire retardant
> - Development of hand lines and bulldozer lines for fire containment
> - Mop up of smoldering logs and stumps that may be potential post-fire habitat for salamanders and their prey
> - Burn out operations that further eliminate vegetation and degrade habitat
>
> Effect of rehabilitation actions: Certain actions that may be taken to restore the habitat to pre-fire conditions and prevent the loss to life and property may have adverse effects on Jemez Mountains salamander populations and their ability to recolonize impacted areas. Such actions may include:
>
> - Reseeding of fibrous-rooted, non-native grasses
> - Use of heavy equipment to restore fire lines and roads
> - Road construction and culvert installation to prevent flooding

- Extensive use of matting to control erosion may prevent salamander vertical movement

During the Cerro Grande fire, suppression activities included the construction of 16 miles of hand line (5-10 foot trenches) and 39 miles of dozer line as well as construction of safety zones. At least 289 acres of Los Alamos National Laboratory lands were ignited as backfires as well as areas west of the town of Los Alamos. A total of 135,800 gallons of fire retardant was released. Thirty-two miles of unimproved roads were improved and 44 miles of gravel roads were used, and some vegetation removal occurred within 100 feet of either side of the roads (BAER 2000) (Figure 5).

Although the level of direct mortality that resulted from the three high-intensity fires and fire suppression activities is unknown, the impact of high-intensity burning in the Essential Zone provides a good estimate of the loss in population numbers and decrease in viability for this species. One of the six fragmented populations of Jemez Mountains salamanders exists east of the VCNP (Baca Ranch) (Figure 2). This population was effected during the Cerro Grande fire. A total of 16% of the Jemez Mountains salamander Essential Zone was within the fire perimeter and 14.5% (4,226 acres) of this Essential Zone area burned with moderate- to high-intensity (Klingel 2000a; 2000b) (Figures 4 and 5). The impact of high-intensity fires as well as fire suppression resulted in the direct loss of individuals and populations and the long-term degradation of the microhabitat upon which remnant surviving salamanders must rely. After the Cerro Grande fire, the BAER report and the NMEST reiterated that "Loss of habitat from unnatural stand replacing fire is considered the greatest threat to survival of the species" (BAER 2000; NMEST 2000a).

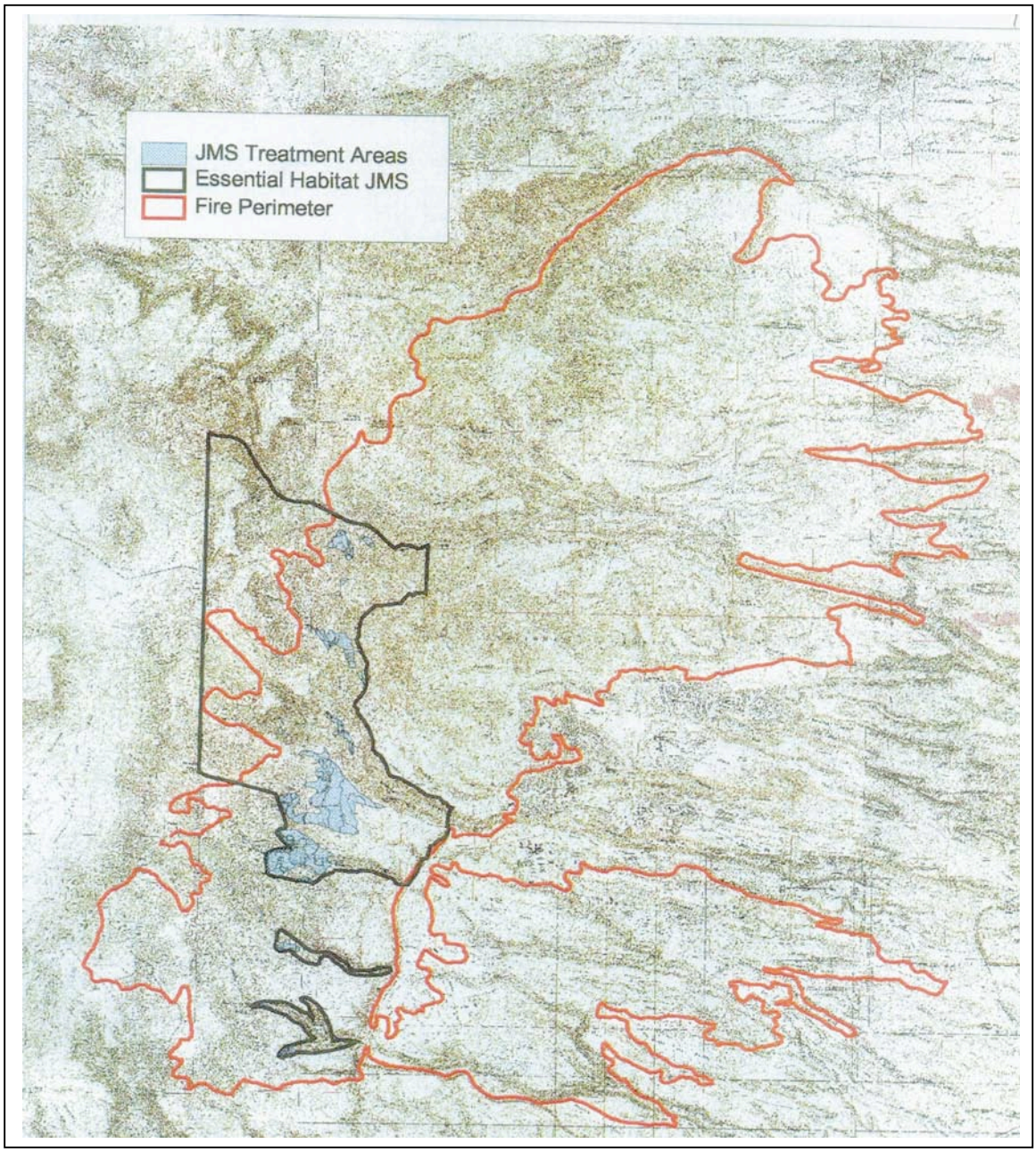

Figure 5. Cerro Grande fire perimeter and Jemez Mountains salamander Essential habitat. Source: FOIA response from USFS.

Habitat degradation due to salvage operations

Logging and clearcutting have long been known to negatively impact salamander populations and were considered to be the greatest threat to the species prior to the implementation of the MOA (1991) (Ramotnik 1984; Ash and Bruce 1994; Petranka 1994; Ash 1997; Cole, McComb et al. 1997; Demaynadier and Hunter 1998; Messere and Ducey 1998; Sattler and Reichenbach 1998; Ash and Pollock 1999; Herbeck and Larsen 1999; Petranka 1999; NMEST 2000b; Borg 2001). In a study conducted by Ramotnik (1988b), Jemez Mountains salamanders were not found on sites that were logged 10-14 years previously. While the USFS has reduced the amount of logging occurring on its lands in the range of the Petitioned species, salvage logging projects authorized by USFS (USFS 1996b; Watson 2002; USFS 2003c) can harm the Jemez Mountains salamander and its habitat. These logging activities are condoned as salvage operations in which the stated rationale is to "recover the timber value of fire-killed trees" (USFS 2003c).

After the Dome (1996) and the BMG/Lakes (2003) fire, timber salvage operations were proposed in Jemez Mountains salamander habitat as well as thinning treatments in salamander habitat affected by the Cerro Grande Fire (2000) (Tables 4 and 5; Figures 4-8). Salvage operations and thinning are considered Category 1 activities in the CMP and are only to occur in the "Essential Zone (in occupied or unoccupied habitat) provided they are designed to meet the management objective." The management objective stated in the CMP is "the conservation and sustainability of the Jemez Mountains salamander and its habitat." A total of 7,152 acres (4.8 %) of timber salvaged was proposed in Jemez Mountains salamander known and potential habitat (Table 4). Of the 7,152 acres, 4,963 (16.2%) acres were considered to be in the Jemez Mountains salamander Essential Zone (Table 4). The 7,152 acres of proposed salvage in Jemez Mountains salamander habitat was 97% of the total areas proposed to be salvaged. Sixty-nine percent of areas proposed to be salvaged was in Jemez Mountains salamander Essential Zone habitat (Table 5).

Table 4. Acres of timber to be salvaged/thinned in Jemez Mountains salamander Essential and survey zones habitat. Total Jemez Mountains salamander potential and known habitat = 146,890; Essential Zone = 30,510; Survey/Priority Zone = 116,380. Source: NMEST 2000b.

Fire	Jemez Mountains salamander habitat salvage	% Essential, Survey and Priority Zone habitat	Essential Zone salvage	%	Survey/ Priority Zone salvage	%
Dome	2,200 ac	1.4%	500 ac	1.6%	1,700 ac	1.4%
Cerro Grande*	4,279 ac	2.9%	4,279 ac	14.0%	0	0
BMG/Lakes	890 ac	0.6%	184 ac	0.6%	489 ac	0.4%
Total	7,152 ac	4.8%	4,963 ac	16.2%	2,189 ac	1.8%

*Thinning treatment consisting of removal of snags and slash

Table 5. Salvage/thinning operations proposed after occurrence of stand-replacing fires. Sources: USFS 1996b; Watson 2002; USFS 2003c.

Fire	Salvage acreage	Acreage in Jemez Mountains salamander habitat	Percent in Jemez Mountains salamander habitat	Acreage Essential Zone habitat	Percent Essential Zone	Acreage Survey/priority Zone habitat	Percent Survey/ priority Zones
Dome	2,200 ac	2,200 ac	100%	500 ac	23%	1,700 ac	77%
Cerro Grande*	4,279 ac	4,279	100%	4,279	100%	0	0
BMG/ Lakes	890 ac	673 ac	76%	184 ac	21%	489 ac	55%
Totals	7,369 ac	7,152 ac	97%	4,963	69%	2,189	31%

*Thinning treatment consisting of removal of snags and slash

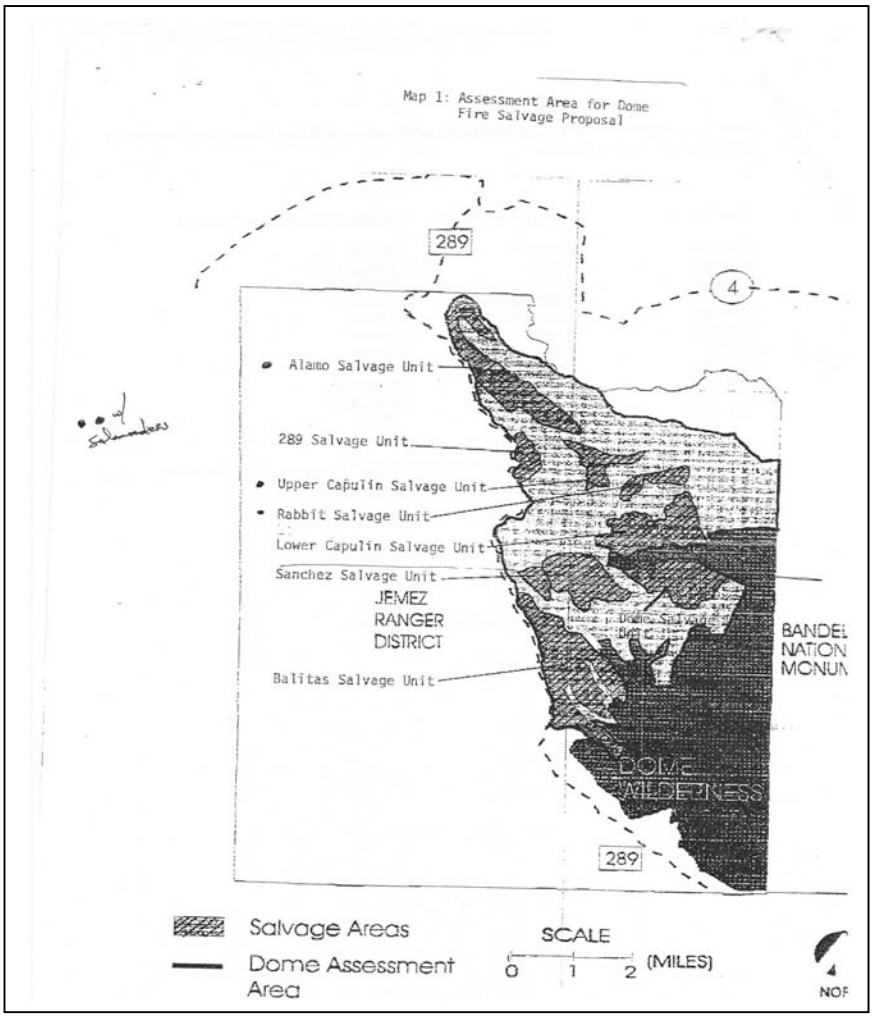

Figure 6: Dome fire area and salvage sale area. Source: USFS 1996b.

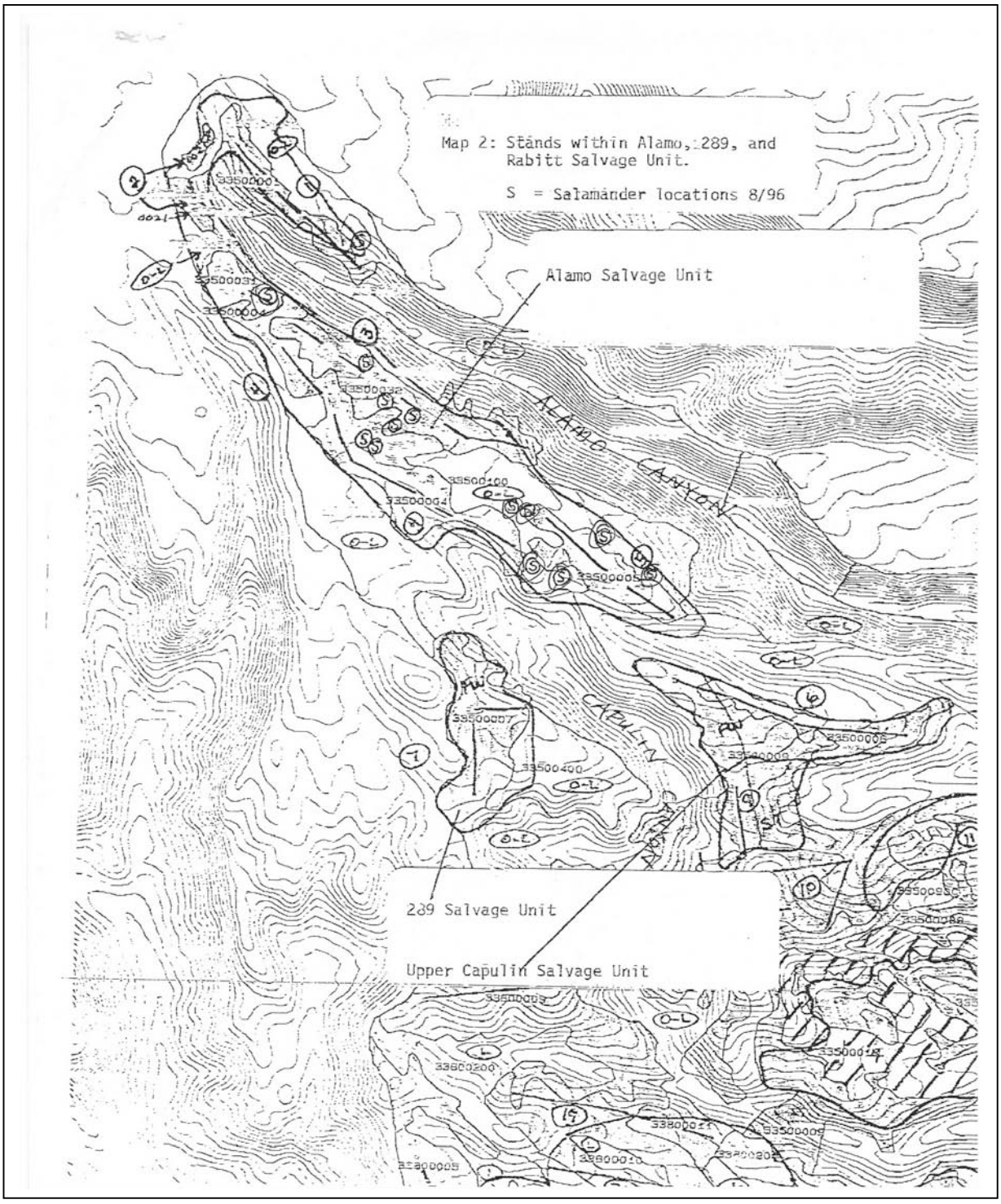

Figure 7. Dome salvage treatment areas with salamander observations. Source: USFS 1996a.

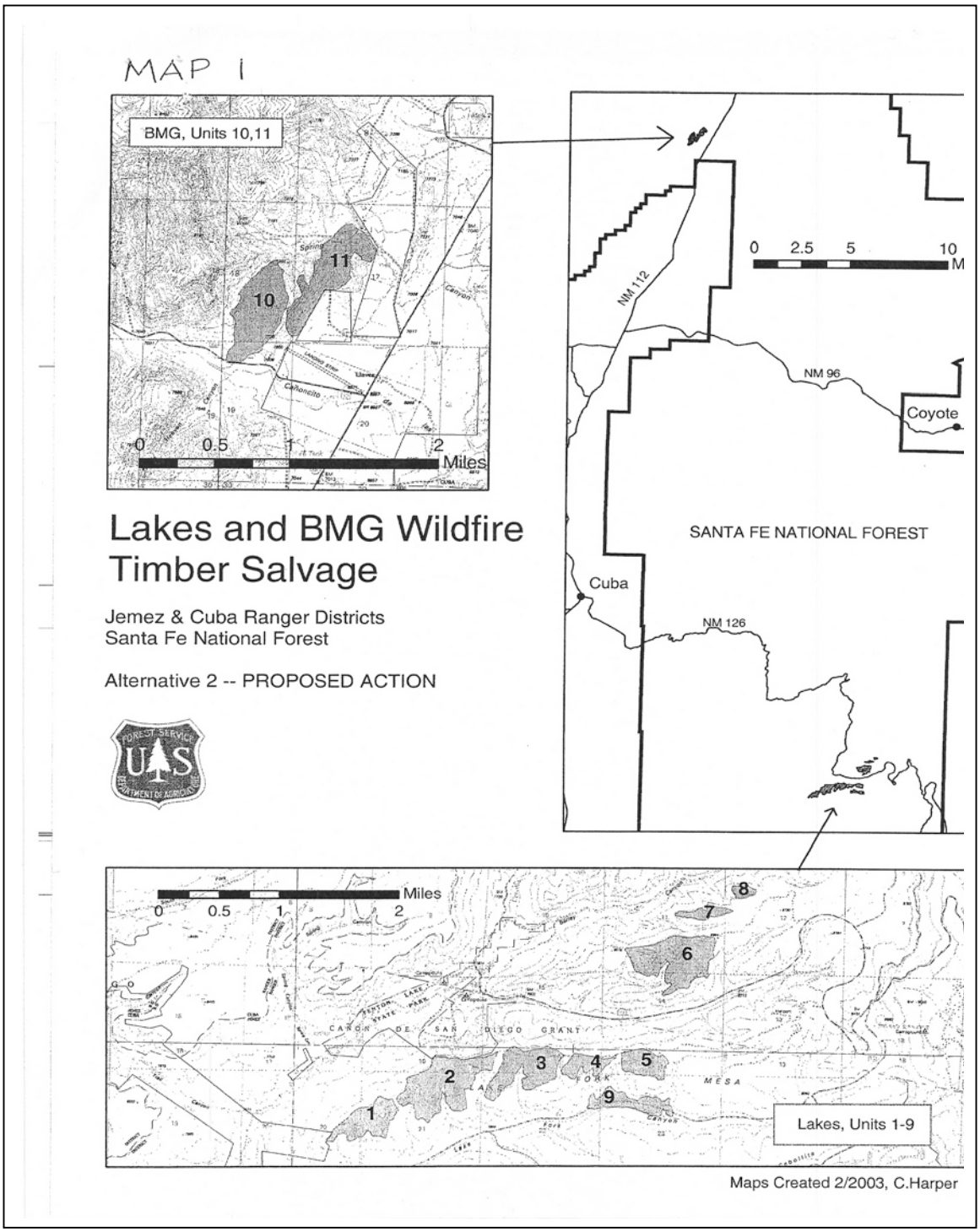

Figure 8. Lakes Fire salvage sale. Salamander locations in Units 6, 7, and 8. Source: USFS map created February 2003.

Fragmentation and loss of habitat due to road and trail building

The CMP lists roads as a potential and known threat to the Petitioned species (NMEST 2000b). It states,

> Road construction through or adjacent to Jemez Mountains salamander populations will have negative effects. Depending upon the project, direct take associated with road building may fragment populations and cause significant loss or declines of individuals within limited areas. High volume vehicular traffic or heavy equipment could also cause excessive vibration resulting in settling of the subsurface rock and elimination of the interstitial spaces necessary for Jemez Mountains salamander to reach subterranean retreats.

Although roads are a known threat to Jemez Mountains salamander populations, they continue to be constructed and/or reopened in salamander habitat. During the Dome fire (1996), five miles of roads were reopened. These roads had been closed since 1978 when the area was designated as "roadless" (NPS 2001). In the Cerro Grande fire (2000), 32 miles of roads were improved, 44 miles of gravel roads were used and vegetation was removed within 100 feet on either side of the roads (BAER 2000). The removal of vegetation on either side of a roadway further increased the destruction of salamander habitat and increased unsuitable habitat through which salamanders would have difficulty traversing in attempts to find refuge. Although roads used for salvage operations proposed for the Cerro Grande (2000) and BMG/Lakes (2003) were not in areas designated as roadless, heavy equipment would have been necessary for salvage operations and to maintain roads: "standard road maintenance would occur as necessary for road used by logging trucks to ensure proper drainage, reduce erosion and facilitate safe public access" (BAER 2000). The CMP directly states that the use of heavy equipment on roads would result in a threat to the Jemez Mountains salamander.

<u>State Highway 126, Forest Highway 12, Cuba-La Cueva Road</u>

Prior to 1996 the Federal Highway Administration (FHWA), in conjunction and coordination with the USFS, started the National Environmental Protection Agency (NEPA) process to conduct a project to improve and realign State Highway 126 (Hwy 126), also called Forest Highway 12 or the Cuba-La Cueva Road. The preliminary, draft and final environmental impact statement (EIS) identified the preferred alternative as Alternative B, to reconstruct and pave the road (FHWA 1996; FHWA 1997; FHWA 2001). These documents also identified the preferred realignments, which were located at Seven Springs and Rito Penas Negras Crossing.

During the EIS process a biological evaluation (BE) for the impact of this construction on the Jemez Mountains salamander was written. The BE was written in 1996 after the preferred alternatives identified in the preliminary EIS were established. The BE determined that reconstruction, paving and realignment of portions of Hwy 126 "may impact individual JMS, but is not likely to result in a trend toward federal listing or a loss

in species viability." This BE does not appear to have been informed by comments from the NMEST. The NMEST was approached on October 16th, 1996 with project information and the BE was written December 23rd 1996 (USFS 1996d; USFS 1998). It does not appear that NMEST comments where extensive or comprehensive until 1997-1998 (USFS 1998).

NMEST comments indicated that the Seven Springs realignment would be detrimental to a localized population. NMEST suggested that the alignment be moved west of the proposed location. NMEST also indicated that a road construction site in Calaveres Canyon, Lake-fork, would be detrimental to Jemez Mountains salamander populations and would impact a permanent salamander study site. A third construction site, in upper Telephone Canyon, was identified as existing in a "Probable (Priority)" habitat.

In 1998, the BE was revised. This BE stated that it provided the additional information request by the NMEST and further considered the likely direct and indirect impacts to the Jemez Mountains salamander and its habitat from the Hwy 126 project (USFS 1998). The BE also stated that it blended in elements of the MOA (1991) and drafts of the CMP (1994 and 1998). Salamander presence/absence surveys were conducted along the project area in 1994, 1996 and 1997. Jemez Mountains salamanders were documented to occur within 0.25 miles of the project alignment in localized areas.

The "Impacted habitat" described in this BE included 6.2 and 2.6 miles of the project alignment within "Essential" and "Probable (Priority)", respectively, as per the 1998 CMP draft habitat categories (USFS 1998). An additional 1.3 miles of the project alignment served as a boundary between "Essential" and "Probable (Priority)" habitat. The "Analysis of Impact" statement in the BE concluded that the preferred alternative (Alternative B: reconstruct and pave, including preferred alignments) would remove the forest canopy and cause ground disturbance in suitable or potential Jemez Mountains salamander habitats. The project would also cause sub-surface vibrations and the removal of downed-log habitats. Construction activities in suitable habitat would likely lead to mortality of individual salamanders that would occur within a 24 acres area of ground disturbance. The area of ground disturbance would occur in approximately 18 acres of "Essential" and 6 acres of "Probably (Priority)" habitat as per the 1998 CMP draft (USFS 1998). The BE findings that the paving and reconstruction of Hwy 126 "may impact individual JMS, but is not likely to result in a trend toward federal listing or a loss in species viability" did not change from 1996 to 1998.

Although the conclusion of the BE did not change, the FHWA agreed to analyze adjustments to the project suggested by the NMEST (FHWA 1999). The NMEST had suggested that the Seven Springs realignment (by-pass) be shifted as well as Lake-Fork construction. The FHWA concluded that such changes would be unfeasible, causing visual impacts, increased maintenance, destruction of other habitat and be aesthetically unpleasing (FHWA 1999). In 2000, the NMEST continued internal discussion on the project to decide if they should concede to the alternative given by the FHWA or attempt to convince the FHWA to use existing right-of-ways or a modification thereof (NMEST 2000d). One NMEST member responded by stating "I do not support the realignment

around Seven-Springs. I prefer to see them [FHWA] work essentially within the existing right of way corridor" (NMEST 2000e).

In 2000, after the CMP had been signed and agreed upon by the USFWS, USGS, USFS and NMDGF, a formal letter was sent from the NMEST to the FHWA responding to a solicitation for comments regarding road realignments (NMEST 2000c). The letter states that the road construction along the proposed Seven-Springs bypass was a Category 1 Management Action. Concerns were: 1) the direct loss of Jemez Mountains salamanders and occupied habitat through road construction activities, including soil compaction and vibration; and 2) the fragmentation of an isolated and peripheral Jemez Mountains salamander population and the resultant loss of gene flow.

As per the Lake-Fork construction, the NMEST expressed the opinion that this construction is also a Category 1 Management Action. It stated that road construction in this area raised immediate concerns:

1) direct loss of Jemez Mountains salamanders and occupied habitat from heavy equipment usage, especially from vibrating compactors during road-bed construction
2) direct loss of Jemez Mountains salamander and occupied habitat from the continued vibration produced by heavy vehicular traffic during routine use of the roadway.
3) The CMP contains specific language to prohibit habitat altering activities on established research plots

The letter states that highway construction and related activities should not occur in habitat known to be occupied by Jemez Mountains salamanders, and populations of Jemez Mountains salamanders should not be fragmented by road construction. These concerns where also stated by the NMDGF (NMDGF 1997; 2000e). Although the NMDGF officially stated that they neither supported nor opposed the project they stated that the project would have a negative effect to area wildlife and habitats, inevitably causing immeasurable impacts and placing increased demands upon wildlife and habitats (NMDGF 2000e). They therefore requested funding to implement mitigation projects. Petitioners are unaware if funding was granted for this request (NMDGF 2000e).

In 2001 the FHWA finalized the EIS for the paving and reconstruction of Hwy 126 (FHWA 2001). In this EIS the preferred alternative was still to pave and reconstruct Hwy 126. With one small exception, the EIS did not provide any mitigation or changes to plans that would directly or indirect effect Jemez Mountains salamander populations or their habitat. Efforts were shown to avoid affecting research plots in the Lake-Fork construction area (FHWA 2001; NMEST 2002a). The EPA reviewed the final EIS and in 2002 had no further comments (EPA 2002). In 2006, paving and reconstruction of Hwy 126 began (FHWA 2007). A contract was awarded to Twin Mountain Construction II Company in August of 2006 for construction within areas of Jemez Mountains salamander occupied habitat including construction of the Seven-Springs realignment (FHWA 2007). This work was sanctioned unanimously by the New Mexico State Game

Commission which approved the "execution and delivery of right-of-way, temporary construction, and construction maintenance easements to the New Mexico Department of Transportation to facilitate the relocation and improvement of Hwy 126" (NMDGF 2006c). This was despite the NMDGF's recognition of significant impacts on the Petitioned species: "If allowed to proceed as planned, the expansion and paving of NM Hwy 126 will negatively impact a small population of salamanders as the preferred route will completely bisect a rock outcropping known to be occupied by Jemez Mountains salamander" (NMDGF 2000a). As recently as 2006 construction through "improvement" of New Mexico Highway 126 (NM-126) has occurred in Jemez Mountains salamander Essential habitat.

The main rationales given for improving and realigning Hwy 126 were commercial and recreational purposes. One purpose included the need to increase vehicle capacity because the USFS was constructing new camping and recreational facilities. The subsequent rationale was the need to provide for safe travel with the increase of vehicles and a "need" to increase the driving pleasure of the prospective recreationalists. Other purposes included decreased environmental degradation, reduction in maintenance needs, and creation of a by-pass for the Seven Springs community. The Seven Springs community had complained that recreationalists were trespassing on their property and that moving the road would reduce trespassing. Although one of the stated purposes for the Hwy 126 project was to reduce maintenance needs, the state of New Mexico considered an agreement to continue to maintain the portion of Hwy 126, which became a county road with realignment, within the Seven Springs community (USFS 1998).

Trail construction, while not as intensively destructive as road construction or road maintenance, nonetheless impacts the Jemez Mountains salamander and it habitat. Trail construction is considered a Category 1 activity by the CMP (NMEST 2000b; 2001). Salvage operations require the use of skid trails and landings. Skid trails and landings are essentially roads and clear areas constructed for the use of skidders and storage of timber. While it is unknown exactly how many acres of skid trails and landings were proposed/constructed during the salvage/thinning operations of 1996, 2000 and 2003, the Dome salvage operation proposed to disturb approximately 150 acres through skid trails and landings (USFS 1996a). The Dome salvage area was half the area proposed for thinning after the Cerro Grande fire. The thinning area proposed after the Cerro Grande fire was entirely within known Jemez Mountains salamander habitat (Table 3). In 2001 the USFS constructed approximately 4 kilometers of trail using a bulldozer in occupied Jemez Mountains salamander habitat (NMEST 2001). The NMEST was not notified of this action until it was completed and was only aware of the construction due to a letter received from the Sangre de Cristo Audubon Society (NMEST 2001).

High-intensity fires, fire suppression, salvage operations, and road/trail construction have decreased populations of Jemez Mountains salamanders. This has occurred through direct mortality due to fire, loss and degradation of habitat and direct take due to construction activities. Loss and degradation of habitat also creates patches of unsuitable habitat. This increases isolation and fragmentation of subpopulations of Jemez Mountains salamanders (NMEST 2000b). As discussed previously, Jemez Mountains

salamanders have a small home range of 8 m^2 on average and are known to be restricted in their ability to immigrate and find refuge, especially within and between unsuitable habitat (Ramotnik 1988b; NatureServe 2006).

II. Overutilization for commercial, recreational, scientific, or educational purposes

While scientific and research activities are intended to collect data to be used to help conserve and manage Jemez Mountains salamanders and their habitat, these activities can be harmful to populations and habitat. Although collection of Jemez Mountains salamanders for museum specimens has been curtailed due to the CMP, New Mexico no longer protects state-listed species from collection (Klingel 1999). There is a long history of collection of these salamanders and such activities have likely reduced populations in localized areas (NMEST 2000b) (Table 6). A high-grade survey protocol was developed to search for Jemez Mountains salamanders. This protocol requires a 2 person-hour search. In this technique likely cover objects (rocks, bark and decayed logs) are searched for salamanders (NMEST 2000b). This technique can destroy habitat and continual searches in the same habitat have been shown to result in a decrease in salamander populations (NMDGF 2000c).

Table 6. Collection of Jemez Mountains salamanders. Source: NMDGF 1999.

Decade	Number of salamanders	Percent of Total Collections
1910-19	3	< 1%
1940-49	22	2 %
1950-59	32	3 %
1960-69	519	53 %
1970-79	222	23 %
1980-89	82	8 %
1990-99	97	10 %
Total	**977**	

III. Disease

As discussed previously, the chytrid fungus is responsible for world-wide amphibian declines, die-offs, and possible extinctions (Klingel 2000c). The fungus is now known to occur not only in aquatic amphibian species but also within the Petitioned species, which is terrestrial.

Prior to 2005 there was no documentation of this disease occurring in the Jemez Mountains salamander, although during surveys in 2003, a single specimen tested positive for the presence of a different fungus, *Cladosporium spp*. Whether the *Cladosporium spp.* fungus caused an infection in the specimen or was a superficial fungus was not determined (Muths et al. 2000; Green et al. 2002; Carey et al. 2003). In 2005, a gravid female tested positive for the chytrid fungus (Cummer et al. 2004). This is the first reported incidence of the chytrid fungus in a strictly terrestrial species and indicates that the fungus can survive in terrestrial habitats. This is the most current data

and research on this disease. It is not know what effects the fungus will have on the Jemez Mountains salamander, but given the capacity of this disease to cause large mortality events, the threat to populations of Jemez Mountains salamanders is great.

IV. Inadequacy of Existing Regulatory Mechanisms

The Jemez Mountains salamander is imperiled throughout its range. Although federal and state agencies have signed agreements to afford protection to this species, the conservation measures in those agreements have failed to result in stabilizing or increasing populations and it is believed that Jemez Mountains salamander populations have decreased (Cummer et al. 2005). The lack of federal protection for this species has resulted in more isolated and fragmented populations. Crucial habitat has been threatened multiple times and in certain instances was destroyed or degraded due to human actions.

Although regulatory documents include the MOA (USFS 1991), the Forest Plan and its amendments regarding federally threatened and endangered species and USFS sensitive species (USFS 1987; USFS 2004), the CMP (NMEST 2000b), and the Conservation Agreement between and among the USFS, USFWS and NMDGF (USFS 2000), the USFS continues to pursue activities which have destructive consequences for populations of the Jemez Mountains salamander and the habitat it requires (Tables 4 and 5). The central problem is that the MOA, or the CMP, have no legal authority for enforcement. For example, the NMEST can make suggestions to USFS, but there is no legal standing in the MOA that they have to follow the NMEST's recommendations.

While the CMP clearly states that Category 1 activities threaten the persistence of the Jemez Mountains salamander and that Category 2 activities, while at times necessary, are also detrimental to individuals and their habitat, these activities have continued to be conducted and/or proposed within the Essential Zone and Priority Survey Zone, under supervision of the US Forest Service. Cumulatively they have resulted in the decline of Jemez Mountains salamander subpopulations and added to large-scale destruction of suitable habitat.

Species status history state, federal, national and global status ranks and listings

As discussed previously, in 1992 the species the species was found not to warrant ESA listing based on the signing of the 1991 MOA (57 FR 11459). At that time the species was listed as threatened by the state of New Mexico. The species was reclassified in 1996 to a Federal Species of Concern, which provides no protection or triggers for federal listing. In 1997, the Global Heritage Program ranked the salamander with a G2 status (rare/imperiled). During this same year the New Mexico Heritage Program listed the Jemez Mountains salamander with an S2 ranking (imperiled), a rank it continues to hold. In 1999 the New Mexico State legislature removed protection for state-threatened species from take (Klingel 1999). Beginning in 2000 NMDGF and members of the NMEST began discussing the need to have the Jemez Mountains salamander uplisted

from state threatened to endangered (NMDGF 2000a; Klingel 2000c; NMDGF 2000c). This discussion preceded the BMG/Lakes fire and proposed salvage operation, a further threat. Reasoning for the need to uplist the status of the Jemez Mountains salamander included the cumulative effect of the Dome fire, Cerro Grande fire, expansion of Hwy 126, mining and dam activities, some of which were conducted without NMEST input (Klingel 2000c). In 2004, New Mexico uplisted the Jemez Mountains salamander from threatened to endangered (Table 7) (NMDGF 2000a).

Table 7. Global, federal, and state rankings for the Jemez Mountains salamander.

Agency	Status	Most recent year status was updated
NM State	Endangered	2004(NMDGF 2006a) (uplisted from threatened)
IUCN Red list	Near Threatened	2004
Heritage Global	G2- Rare/Imperiled throughout entire range	2001
USFS	Sensitive (Region 3)	2000
BLM	Sensitive (NM State Office)	2000
NM Natural Heritage	S2 – Imperiled	1997
USFWS	Species of Concern	1996

Although there are interagency agreements concerning the protection of Jemez Mountains salamander (Table 8), no Federal policies or laws exist that enforce measures to protect and conserve the Jemez Mountains salamander (NMDGF 2000a; Klingel 2003; Armijo 2004). The stated purpose of the 1991 MOA was "to conserve this species and its historic, occupied and potential habitat on the Santa Fe National Forest" (USFS 1991). Subsequent to the MOA, the purpose of the CMP was to remove or reduce threats to the Jemez Mountains salamander on lands administered by the USFS and ensure long-term viability of the Jemez Mountains salamander through the maintenance and protection of historic, occupied, and potential habitat (NMEST 2000b). The purpose of the CMP was also to form the basis of the Conservation Agreement. The objective of a Conservation Agreement was to remove and/or reduce threats to a species or its habitat (USFS 2000). Although these documents exist and the CMP was amended into the USFS Forest Plan, still no enforcement mechanisms or assurances for Jemez Mountains salamanders exist; nor is there oversight for the protection of this species on Department of Interior, Department of Energy, or private lands (Armijo 2004; USFS 2004).

Table 8. State and federal documents developed to manage Jemez Mountains salamander populations and their habitat.

Document	Year	Agencies
Forest Plan	1987	USFS
Memorandum of Agreement	1991	NMDGF, USFWS, USFS
New Mexico Endemic Salamander Team Initiated	1991	NMDGF, USFWS, USGS, USFS

Cooperative Management Plan	2000	NMDGF, USFWS, USGS, USFS
Conservation Agreement	2000	NMDGF, USFWS, USFS
Amendments to Forest Plan incorporating Conservation Agreement	2004	USFS

There has been a very slow response to projects and management plan comments regarding the Jemez Mountains salamander (NMEST 1999). A letter to the NMEST from the USFWS states that the NMEST was established in 1988 (NMEST 1999). In May of 1991 under the MOA, the NMEST was formalized and the stated purpose for this team "was to develop and implement a Jemez Mountains salamander Management Plan (Plan). The objective of this team and the supporting documents was to conserve this species and its historic, occupied and potential habitat on the Santa Fe National Forest" (USFWS 1999). The MOA stated that the objective was to finalize a management plan within three years from the date of the agreement. When unanimously approved by the parties of the agreement, the management plan was to be incorporated into the USFS Forest Plan (USFS 1991).

The Plan was not completed in 3 years, but in fact took nearly a decade. In 1999 the USFWS requested the management plan be finalized and implemented but it was not until January of 2000, that the CMP for the Jemez Mountains salamander was actually finalized (NMEST 2000b). This was almost 10 years after the MOA had been signed stating that a management plan was necessary to provide strong mechanisms for the conservation of this species. It was another 4 years after the CMP had been signed that the USFS amended its Forest Plan to reflect the CMP (NMEST 1999; USFWS 1999).

In two documented instances the USFWS has used the potential of the CMP and the ability to revise the CMP, to deny listing of the Jemez Mountains salamander as a Threatened or Endangered species under the ESA (USFS 2004). In 1992, a negative 12-month finding said the listing of the Jemez Mountains salamander under the ESA was "not warranted," based on the belief that the signing of the MOA by USFWS, USFS and NMDGF would remove the threat of salamander habitat being adversely affect by forest management practices because the Management Plan (eventually the CMP) would be final in 1994 (USFWS 1992; USFWS 2001). However, the MOA does not actually require any of these agencies to follow the recommendations of the CMP.

In 2000, the NMDGF submitted a performance report for the project entitled "Status of Endemic New Mexico Salamanders" (USFWS 1992; Altenbach and Painter 1998). This report recommended that, "The legal status and the level of protection currently afforded the Jemez Mountains salamander needs to be re-assessed." A list of reasons why this should occur followed the recommendation and are detailed in NMDGF (2000c). The USFWS responded to this recommendation saying they believed "the NMEST should meet to discuss these issues and whether the conservation agreement should be revised. It is likely that the conservation agreement can still provide an approach to manage and conserve this species (NMDGF 2000c)." FWS also used the MOA as a basis to reclassify

the Jemez Mountains salamander from a Category 1 candidate species to a Category 2 species (USFS 1991; NMDGF 2006b).

From their inception, these agreements and management plans lacked the ability to enforce their own directives to remove or reduce threats to the Jemez Mountains salamander on lands administered by the USFS, and to ensure long-term viability of the Jemez Mountains salamander through the maintenance and protection of historic, occupied, and potential habitat. These agreements and management plans also did not provide legal enforcement authority to the NMEST. Recommendations from the NMEST to mitigate effects of activities with a negative impact on individuals, populations, and habitat of the Jemez Mountains salamander, can and are easily dismissed when the USFS deems the recommendations to not be feasible or considers other issues to be of greater concern (USFWS 2001). Before the CMP was finalized, personnel from the NMDGF had stated that the CMP "…is primarily a suggestion of what should be done, not what will be done…as written, the plan largely depends on agency good will, circumvents the intent of the MOA, and does not ensure protection for the species" (NMDGF 2001; USFS 2003c). These good-will agreements do not have the necessary power to regulate activities conducted by the USFS, private landowners or other federal and/or state agencies and are not a substitute for federal ESA protection.

In 2004, the Federal District court confirmed the assertion that the MOA, CMP, Conservation Agreement and amended Forest Plan were non-binding in regards to providing protection for the Jemez Mountains salamander. The court case concerned the Lakes/BMG timber sale and the salvage operations in Units 6-8 which consisted Mexican spotted owl habitat and were also within the Jemez Mountains salamander Essential Zone. On the issue of the Jemez Mountains salamander, the judge stated that she was limited from granting relief regarding this species because it was not listed under the ESA (NMEST 1999). The judge also found that:

> For purposes of analyzing Defendants' compliance with National Forest Management Act (NFMA), the Court assumes for purposes of analysis that the management considerations listed in the "Cooperative Management Plan for the Jemez Mountains salamander on Lands Administered by the Forest Service" (Cooperative Management Plan) are binding on the USFS to the extent that they have been incorporated into the Forest Plan for the Santa Fe National Forest. [FS-AR 30.] Nevertheless, the Court determines that Plaintiffs do not succeed on the merits of their claim with respect to any duty that NFMA may impose on the USFS regarding compliance with this Cooperative Management Plan (Armijo 2004).

In this decision, logging was enjoined in unit 6, as a nesting pair of federally listed Mexican spotted owls was observed. Logging was allowed to continue in units 7 and 8, which were part of the Jemez Mountains salamander Essential Zone. The court's decision clearly indicates that the MOA, CMP, Conservation Agreement and amendment to the Forest Plan provides no policies or regulations to protect the Jemez Mountains salamander or the habitat they require.

Lack of protection from habitat degradation

Any activities which remove forest canopy, disrupt rock structure and/or decrease surface humidity within Jemez Mountains salamander habitat threaten the persistence of this species. Such activities include salvage operations and thinning treatments and are considered Category 1 activities by the CMP (NMEST 2000b). The CMP set up guidelines that require any Category 1 activities to be coordinated with the NMEST, as the team is composed of experts in the field of salamander biology and ecology. However, there are no federal or state policies which require NMEST recommendations to be enforced. Although the USFS requested comments from the NMEST regarding proposed salvage/thinning operations, NMEST-recommended alternatives and mitigation measures were only occasionally or partially implemented. Neither the CMP nor NMEST recommendations can be enforced by law (Armijo 2004). The following are examples of how the USFS disregarded the CMP and/or recommendation of the NMEST.

Dome Fire (1996)

The Dome Fire Salvage Sale biological evaluation (Dome Fire BE) proposed removal of snags and collection of firewood in high and moderately burned areas in approximately 1,350 acres of Jemez Mountains salamander habitat, even though the SFNF Plan stated that the priority for this area was wildlife protection (Figures 4, 6 and 7) (NMEST 1994; USFS 1996c; NMEST 2000b). The effect determination was that the "proposed actions may impact individual Jemez Mountains salamanders, but is [sic] not likely to result in a trend toward federal listing or loss in viability." This decision was made after the NMEST received maps of potential salvage units and snag data tables and met with representatives of the NMEST to discuss the preliminary proposed actions. The decision by the USFS was not subject to administrative appeals due to a 1995 law which prohibited appeals to timber sales with the Forest Service (Easthouse 1996; Santa Fe New Mexican 1996).

In October of 1996 the NMEST and the NMNHP communicated strong concerns that this timber sale would negatively impact populations of the Jemez Mountains salamander and degrade its habitat (Allen 1996; NMEST 1996; NMNHP 1996; Wilson 1996). The NMNHP (1996) stated,

> The Jemez Mountains salamander is endemic to the Jemez Mountains, so its viability over the long term is principally the responsibility of the Santa Fe National Forest. Therefore, particular attention should be paid to the cumulative effects of this and other resource management projects in these mountains. Cumulative effects should be thoroughly addressed. A few units or parts of units targeted for salvage or fuelwood removal apparently were not surveyed in 1996 or earlier. They must be surveyed prior to proposed actions. The salamander is highly sensitive to drying and depends on woody debris and rocks for adequate moisture. Therefore, removal of snags can significantly impact this species, which is difficult to

> detect, and may have been missed in some surveys. Retention of high snag diversity should be considered further.

An NMEST member stated (Allen 1996),

> …since Jemez Mountains salamander populations on the most marginal sites are the hardest to detect while being the most sensitive to negative effects from salvage induced habitat degradation there remains a significant risk that proposed salvage operations will have negative impacts on some salamander populations.

In a scathing letter of dissent against the BE conclusion, Wilson (1996), an NMEST member, stated,

> The proposed Dome salvage sale violates the direction of the Santa Fe Forest Plan for this Management Area and the EA (environmental assessment) presented to the Team (NMEST) violate the NEPA act both because such a large removal of large forest structure (biggest trees) cannot be considered insignificant (Finding of no significant impact FONSI) and because no Cumulative Impact Analysis of large structure (big trees) removal is presented. The proposed sale also contradicts the USFS expressed intent of "Ecosystem Management."

Extensive comments from the NMEST (1996) included concern over the adequacy of information provided to the NMEST for review, including the untimely fashion in which information was provided, worries that surveys protocol was not followed, especially regarding that fact that surveys were conducted in sub-optimal weather. The NMEST stated that their primary concern was whether the recommended survey protocol was followed and whether all harvest units in potential salamander habitat received adequate survey coverage. They stated,

> What is known of the biology of these salamanders clearly indicates that salvage logging is likely to have adverse effects. The crown fires that severely damaged vegetation and coarse woody debris in the proposed salvage units degraded salamander habitat by reducing live canopy and dead ground covers. Removal of big trees will further degrade Jemez Mountains salamander habitat quality and slow recovery to forest conditions. Use of heavy equipment and the skidding of logs would cause additional direct impacts (compaction and disruption) to the surface and near-surface soil/wood/rock/root channels and structures that salamanders utilize. For this reason, the NMEST supports and recommends compliance with the existing Memorandum of Agreement for the Conservation of the Jemez Mountains Salamander (MOA) and Forest Plan guidelines that exclude logging and fuelwooding from occupied Jemez Mountains salamander habitat.

The NMEST comments state that they do not agree with the effect determination that impacts to the habitat in proposed salvage units are insignificant or discountable.

The NMEST (1996) was also of the opinion that the biological evaluation and the environmental impact statement for the Dome salvage sale lacked adequate information to fully assess the proposed actions on Jemez Mountains salamander. It said the proposed units contain large portions of moderate-intensity burn and that many of those areas were likely to recover from fire impacts, but the number of "dying" trees that were proposed for harvest was not provided. The NMEST said that removal of some unknown component of live trees, under the presumption that they will soon die, adds additional risk to Jemez Mountains salamander habitat through to probability of removing trees which would live, citing data showing detailing survival rates of ponderosa pine. The NMEST was of the opinion that by removing some number of live trees, the microhabitat would be further degraded (as noted above) and seed sources would be removed, slowing the return to forest conditions (which are better for Jemez Mountains salamander than open grassland).

The NMEST (1996) recommended that the USFS reevaluate what trees would be harvested in potential salamander habitat (based on the above information) and that if there was a reasonable probability for a tree to survive, it would be left. It requested detailed cutting prescriptions and marking guidelines to be presented for each proposed salvage unit in order to assess ecological effects on salamander habitat. The NMEST said that the numbers provided in the BE for snags remaining were not very meaningful in assessing the impacts of the proposed project on salamander habitat. In addition, the NMEST said that the conclusion in the BE that "ample" snags would remain available in salvaged areas, was not supported and there was no discussion of the change in habitat conditions from before and after burn and how it was determined (from a salamander perspective) what constitutes an "ample" number of snags.

The absence of adequate information on proposed fuelwood activities was also a concern, relative to potential effects on salamander habitat. The NMEST requested further clarification on whether or not the commercial salvage units would be opened to fuelwood collection after the harvest was completed. They were concerned about how fuelwood areas would be controlled and monitored, to ensure that adequate levels of dead and down woody material would remain. One question was what trees and logs would be left in the units and how public cutting would be controlled, as well as the number of years these areas be left open and how off-road vehicular traffic would be prevented.

The NMEST comments further critiqued the BE and proposed actions of the Dome salvage sale by stating that analysis of survey data through 1995 showed that salamanders can occur at elevations as low as 6,900 feet, on southwest aspects and in ponderosa pine forests and although salamander habitat quality generally declines from north to south (largely due to climatic gradients), all of the salvage units north of Capulin Canyon (and the Sanchez proposed fuelwood area to the south) contain potential and actual salamander habitat (Figures 6 and 7). It said that some rocky drainage slopes are likely to have potential salamander habitat. The NMEST noted that while the USFS made substantive

efforts to survey occupancy in most of the harvest units, the NMEST was concerned that one year of surveys was not be adequate to confirm non-occupancy. The probability of finding salamanders using the protocol set forth in the MOA and used by the USFS during its BE is a function of weather conditions and number of salamanders present. The relationships can't be quantified and the NMEST did not have knowledge of other factors which could cause salamanders to remain below ground and undetected. The NMEST commented that as habitat quality declines, Jemez Mountains salamander populations likely become smaller and patchier in distribution and extra search effort in only optimum weather conditions would be expected to be necessary to find any occupants. The NMEST said it was not at all clear that single inventories were adequate to determine occupancy on marginal Jemez Mountains Salamander sites. They were also concerned that some key areas were not inventoried at all.

The NMEST stated their concern that salamander populations which may occur in proposed salvage units were already been stressed by fire-induced habitat changes including great reductions in effective cover and in the arthropod food supply; therefore the NMEST recommended that additional measures be taken to mitigate impacts. In selected areas they recommend leaving 6-12 of the largest remaining trees/acre (where available) to maintain existing potential habitat and provide future linkage corridors and said Douglas fir snags should be favored and the trees should be left in pockets (groups) where possible. *Id*.

The NMEST recommended additional surveys be completed in the southern part of the Upper Capulin unit and the Sanchez fuelwood unit prior to implementation of any harvest activities in these areas. Until it was shown that salamanders are unlikely to occur in these units, it must be assumed that there could be detrimental effects on salamanders. *Id*.

The Dome salvage sale was not only advocated by the USFS but also by U.S. Senator Jeff Bingaman (Santa Fe New Mexican 1996). The salvage sale was never conducted due to threats from environmental advocacy groups to press legal action and the release of a scientific publication detailing the negative effects of timber salvage. *Id*. These actions would have required the USFS to write an Environmental Impact Statement (Beschta, Frissell et al. 1995; Hitt 2007). In the time that this would have taken, the ponderosa pine, which degrades quickly, would have lost its value as timber (Hitt 2007). Although ultimately timber was not salvaged, it does not appear that any concerns or recommendations from the NMEST or NMNHP had been incorporated into the final salvage sale decision. *Id*.

Cerro Grande Fire (2000)

In 2002 the USFS and NPS proposed to thin approximately 1,733 acres of SFNF lands, 467 acres of Bandelier National Monument land and 408 acres of Los Alamos National Laboratory land, under the Valle II environmental assessment (EA). This treatment was proposed in 1998 and reviewed by the NMEST in 2000 before the Cerro Grande occurred. In 2002, the treatment area consisted of moderate (168 acres) and low/unburned (1,503) areas within the footprint of the Cerro Grande fire. The entirety of

the Valle II project was within the area designated as Essential Zone under the Jemez Mountains salamander CMP (Figures 4 and 5).

In general the treatment prescriptions for ponderosa pine and ponderosa pine/mixed conifer forest types within the project area included:

1) Thinning from below live trees and cutting dead trees to 40 trees per acre (TPA) within the wildland urban interface (WUI)
2) Thinning from below live trees and cutting dead trees to 60-100 TPA outside of the WUI
3) No removal of live trees and dead snags greater than 16" DBH
4) Ground fuels would be removed to app 10-15 tons/acre (15 tons per acre is equal to 4-6 logs of 12-14" dbh) in all treatment areas
5) Provide firewood and vigas for public collection
6) Lop and scatter remaining slash
7) Prescribed fire for slash piles in winter and broadcast burning
8) On National Forest lands treatment will occur a max of 300' from roads (Camp May and American Spring) and 150' from trails. Treatments on NPS lands would occur up to 400' from St Rd 4
9) Pp. 3-12 state that several historic records for Jemez Mountains salamander occur in the project area and that a 2001 survey of the project area resulted in several new locations. The Valle II EA proposed to protect Jemez Mountains salamander by allowing no thinning, firewood collecting, or prescribed burning in occupied habitat during the summer rainy season and additional vehicle restrictions on the Pipeline Road

Before the Cerro Grande fire the NMEST supported the Valle II treatment but requested:

1) USFS, USFWS, and NMDGF cooperate in developing long-term studies to investigate post-fire (low-to-moderate intensity prescribed broadcast burns) habitat trends and Jemez Mountains salamander persistence
2) Additional 2-hr high-grade searches be conducted in un-surveyed areas prior to project implementation
3) Ground-disturbing activities be precluded in occupied habitat during the summer monsoon season (1 July – Sept 30)
4) Further consultation and coordination with the NMEST and USFS to develop a complete inventory on salamander localities on the project site map, and further discussion regarding final design and implementation of the project.

In an April 2001 memo from the USFS to the NMEST, the USFS committed to following these guidelines:

1) Un-surveyed areas: between 1 July and 30 September, no equipment or ground disturbance in Essential salamander habitat. This would apply to fuel break development, thinning, and other treatments. Tree felling and lopping would be allowed.

2) Surveyed areas: No seasonal restriction would apply in areas that are surveyed and determined to be unoccupied.
3) Occupied salamander areas within fuel break (WUI) areas: Based on survey results USFS would delineate occupied salamander areas. Snags would be felled and Forest Plan guidelines for downed logs would be followed (5/ac for mixed conifer, 3/ac for ponderosa pine).
4) Occupied salamander areas in other treatments: thinning and prescribed burning could occur in occupied salamander areas, and USFS would meet forest plan standards for snags (3/ac in ponderosa and 2/ac in mixed conifer) and downed logs.
5) Removal of wood material, including fuelwood collection: Removal of snags or downed logs would not be allowed in occupied salamander habitat. Based on survey data, FS would identify/mark occupied areas on the ground and project planning implementation maps. Salamander areas accessible by fuelwood gatherers would be marked as closed to fuelwood gathering.

In 2002 a member of the NMEST authored a memo which raised questions regarding the Valle II treatment project (Watson 2002). The memo cited a 2001 study which supported the concern that logging is a great threat to boreal salamanders in New Mexico. The study found that logging had a significant impact on the Sacramento Mountain salamander abundance and juvenile body condition on south-facing slopes; that logged sites had significantly fewer substrates with cool optimal temperatures; and that random substrate samples from logged sites, but not forested sites, were significantly warmer than those used by salamanders (Borg 2001; Watson 2002). Additional concerns raised in the memorandum were:

- Unburned, lightly and moderately burned areas may be critical as refugia for surviving populations fragmented by the Cerro Grande fire and as source populations for recolonization of severely burned areas once conditions allow.
- How will proposed fuel treatments (outside the WUI) effect cover, surface and subsurface humidity and temperature, microhabitat conditions and prey availability.
- The Valle II project did not restrict fuelwood collection in Jemez Mountains salamander occupied habitat.
- The Jemez Ranger District states that all snags must be dropped in fuelbreak (WUI) areas, but the Valle II EA stated that they will be kept to meet Forest standards.
- It appears that some of the Jemez Mountains salamander habitat improvement projects (large Douglas fir falling) approved by the Cerro Grande fire BAER Team fall within the Camp May Road Treatment Unit B. The memo asked for assurances that these areas will not be adversely treated.
- The memo asked whether slope can be used to effectively determine the potential for Jemez Mountains salamander occurrence. Valle II treatments outside of the WUI proposed to treat stands on slopes no steeper than 30%.
- The memo asked about the feasibility of requesting that additional downed logs and or snags be left outside of the WUI.

The NMEST said that the impact to the Jemez Mountains salamander populations resulting from the Cerro Grande fire was of great concern (Borg 2001). Much of the salamander's habitat burned and preliminary data analysis from three studies suggested a downward population trend. The NMEST stated, "Therefore, the remaining moderately burned and unburned habitat patches are of great importance to the short-term and long-term persistence of the Jemez Mountains salamander" (NMEST 2002b). The BAER (2000) report also stated that Jemez Mountains salamander may still persist within severely burned areas of the Cerro Grande fire where salamanders had previously occurred but were likely severely stressed due to disruption of preferred habitat (downed logs, bark), loss of forest canopy resulting in decreased humidity, and increased temperature of terrestrial and subterranean habitat, reduction or loss of invert prey, and siltation of interstitial spaces used to move to the surface. Information provided through FOIA requests does not indicate whether further mitigation steps were taken for the Valle II project to consider the cumulative impact the Cerro Grande fire and the Valle II treatment, but it is known that the funding requested for Jemez Mountains salamander habitat rehabilitation and monitoring after the Cerro Grande fire was not provided (NMEST 2002b).

BMG/Lake Fires (2003)

The Lakes and BMG wildfire timber salvage project was a controversial timber sale and resulted in federal litigation (Figures 4 and 8) (Johnson 2000; Armijo 2004). The USFS proposed to salvage approximately 890 acres in 11 units of the 4,641 acres that burned in the BMG and Lakes wildfires (Armijo 2004). The agency stated that more than 90% of the trees proposed for salvage would fall below 17" in diameter at breast height (dbh) averaging between 11-14 dbh. Approximately 73% of the fire-killed trees proposed to be harvested were ponderosa pine, 16% Douglas fir, and the remaining 11% white fir, limber pine, and spruce. The EA stated:

> The proposed salvage activities in the Lakes wildfire, primarily on Sandoval Ridge could cause disturbance to Jemez Mountains salamander habitat or inadvertently kill individual salamanders if they are present on the surface during salvage operations. The Jemez Mountains salamander is designated as a sensitive species. Salvage units in the Lakes wildfire are within potential salamander habitat and units 6-8 are within the Essential survey zone. Removing most of the fire-killed trees (snags) in these units would reduce the number of large down logs available for salamander habitat in the future.

Even though the NMEST recommended Alternative 3 and had strong reservations about the negative effects the proposed salvage sale would have on Jemez Mountains salamander populations and habitat, and the EA itself acknowledged the threats posed by the salvage project, the preferred alternative (Alternative 2) was still carried out. Some, but not all, mitigation measures recommend by the NMEST were incorporated into the final timber salvage sale guidelines. Members of the NMEST had multiple concerns over the Lakes/BMG salvage sale and the preferred Alternative 2. These included, for

example, the lack of immediate creation of habitat by downing a few trees and/or slicing off rounds, removal of 90% of trees and its effect on the microhabitat, species composition of remaining trees and its effect on long-term habitat, and the survey protocol to determine salamander occupancy on salvage units (USFS 2003c).

One of the biggest issues of the NMEST regarding the timber sale in Jemez Mountains salamander habitat was making sure sufficient ground cover was left (Cummer 2003). The NMEST stated that sufficient habitat meant leaving mixed conifers, but not aspen, and leaving large enough pieces so that they did not dry out quickly, thus ensuring the presence of some long-term habitat components. NMEST members were unsure if leaving 10-15 tons/acre of down and wood material as detailed in the EA would be sufficient. A calculation showed that if the project left 6.4 snags/acre or 10% of the trees, and that these trees were 20" dbh Douglas fir trees that are 100' tall (a conservative estimate), that converts to 2.45% of ground being covered by trees that could be utilized by salamanders. It was stressed that this would be an "OVERESTIMATE" of what was proposed (Ramotnik 2003). Research had found that salamanders occupied areas with an average of 25% of the ground covered by downed trees. The timber salvage sale would leave ground cover that was a full order of magnitude off, also assuming that the trees (composition) left would be used (preferred) by Jemez Mountains salamander (Everett 2003). NMEST members recommended that more wood should be left for Jemez Mountains salamander, especially Douglas fir. This recommendation was not incorporated into the final EA.

The NMEST was concerned about the details regarding whether the composition of trees left (10%) would be suitable Jemez Mountains salamander habitat. They were disconcerted because, aside from the specified Douglas fir over 20" dbh, which were believed to be few, the majority of remaining trees would likely be aspen, which are not used by Jemez Mountains salamanders (Ramotnik 2003). The NMEST was of the opinion this could result in the extirpation of salamander populations in those areas as aspens are not optimal nor preferred cover for Jemez Mountains salamander (Cummer 2003; Ramotnik 2003). NMEST members were unsure if leaving "10-15 tons/ac of down and wood material" would be sufficient but believed that leaving mostly mixed conifers would be better than leaving mostly aspen and other non-conifers and leaving some large sections is preferable to leaving only small sections. While the final EA stated that clumps of trees would be left, it did not address the composition of tree species that would remain or if trees would be felled at the time of the sale or left to fall on their own.

The NMEST stated that the removal of 90% of existing trees would likely increase erosion and soil temperature, change canopy cover, and cause soil compaction due to heavy equipment (Everett 2003). An NMEST member stated "There is no doubt that this sale will decrease canopy cover in the area, which in turn will most likely affect soil moisture, temperature and pH. Although it is hard to put a number on how much this may affect Jemez Mountains salamander, it is almost certain that this could have direct effects on salamander populations." *Id*. Even though dead trees do not provide the same kind of canopy cover as live trees, they provide some shading. The NMEST stated that retaining as much overstory as possible was preferable for salamanders as it would slow

down the rate that the understory and ground cover dry out and surface temperatures rise. *Id*. The NMEST also stated that "it was unwise (if we are concerned about the persistence of these populations) to remove additional canopy cover to a mere 10% on the already decimated landscape" (Ramotnik 2003).

The BMG/Lake Salvage EA stated that the Lakes Fork Mesa Unit would be field-reviewed to determine suitability for Jemez Mountains salamander. If the units were deemed unsuitable habitat they would be cleared for salvage with no seasonal restrictions, and snag retention would follow the Forest Plan (220/100 ac (10" dbh or >)) in areas determined to contain suitable habitat (units in the Lake Fork Mesa area (1-5,9)). Lake Fork Mesa was considered (units 1-5,9) to be potential Jemez Mountains salamander habitat (Cummer 2003). The NMEST reviewed these harvest units and determined they contain potential habitat, and that surveys should be conducted during prime survey time. If no Jemez Mountains salamander were found, the units were to be cleared for salvage with no seasonal restriction and snag retention would follow the Forest Plan.

NMEST members strongly disagreed with this portion of the proposal because salamander detection is highly variable even during "prime survey" time (USFS 2003). One member stated that "I cannot reiterate enough if salamanders are not found during 2 person-hour survey, it does not mean they are not there" (Cummer 2003). The NMEST also stated that suitable habitat does not explicitly mean that salamanders have to currently occupy the area but they could occupy the area under the right conditions or at the right time. For example, the area could become a "sink" to salamanders if a nearby occupied site endured a catastrophic event or the area could serve as a corridor connecting two occupied habitats surrounded by unsuitable habitat. Suitable habitat can have biological potential at a later time (Everrett 2003). It was recommended that a pre-treatment 2 person-hour presence/absence survey should be conducted for every 20 acres within each treatment unit and that surveyors should select optimum habitat for surveys within each 20-acre plot based on known preferred habitat of Jemez Mountains salamander (Ramotnik 2003). If Jemez Mountains salamander were found within a 20-acre sub-unit the entire unit, it was recommended that the unit should receive the full range of mitigation stipulations designed for occupied sites. These recommendations were not incorporated into the decision for this sale.

One of the main arguments against the preferred Alternative 2 was based on the Jemez Mountains salamander CMP. The CMP states that Category 1 activities may occur throughout the Essential Zone provided they are designed to meet the management objective of conservation and sustainability of the Jemez Mountains salamander and its habitat. The NMEST (2003b) pointed out that, "Actions that adversely impact the Jemez Mountains salamander will not generally be conducted within the Essential Zone; however, activities may be considered that are designed to develop sustainable habitat for long-term maintenance of Jemez Mountains salamander populations." The CMP states that ecosystem management plans will include goals for the perpetuation and conservation of Jemez Mountains salamander populations. It provides "guidance for the conservation and management of sufficient habitat to maintain viable populations of the

species. Management objectives are to: "remove or reduce threats to Jemez Mountains salamander on lands administered by the Forest Service; ensure long-term viability through the maintenance and protection of historic, occupied and potential habitat; and use adaptive management as needed to modify the actions taken to conserve the species" (NMEST 2003b). The CMP provides flexibility for Category 1 activities to occur within the Essential Zone but clarifies that any activities "should be for a unique situation and should provide opportunity to gather additional info on the impacts of habitat disturbance on Jemez Mountains salamander populations" (Everett 2003; NMEST 2003a).

During these discussions surrounding the Lakes/BMG timber salvage sale previous NMEST member Jon Klingel, who helped to author the CMP, submitted the following declaration. This declaration reiterates the majority of comments provided by the NMEST group which had been commenting on the timber sale:

> I believe that salvage logging in this area (Essential Zone) is likely to cause irreparable harm to an important local salamander population. I believe it is important to conserve every population of this geographically isolated and relatively immobile species of lungless salamander…I believe that salvage logging, which the CMP considers to be generally detrimental to salamanders, is inconsistent with the management objective of the CMP and will adversely impact salamanders and their habitat in the project area. This is contrary to the requirements of the CMP which only allows activities in the salamanders' Essential Zone that result in the development of sustainable habitat…I believe that removing logs form the site with heavy equipment will adversely affect he salamander and its habitat and is therefore contrary to the CMP. *See* Declaration of Jon Klingel (USFS 2003b).

Regardless, in the USFS's Decision Rationale it states that the staff "discussed whether no action was the best management to rehabilitate the salamander habitat" and stated that they developed a list of "ideal management activities" (USFS 2004). The Rationale further states that, "it is our belief that Alternative 2 comes closest to meeting the "ideal management for Jemez Mountains salamander." The NMEST disagreed with this and stated that they were unsure whether Alternative 2's proposed mitigations would be best for maintenance of Jemez Mountains salamander populations (USFS 2003c). In the portion of the EA that discusses environmental consequences of each proposed alternative, regarding Alternative 3, states that "by eliminating salvage logging units on Sandoval Ridge and in the BMG area units 6-8,10,11 this alternative would slightly reduce potential disturbance effects to PETS (Protected, Endangered and Threatened Species) species or their suitable habitats" (USFS 2003a). The alternative chosen by the USFS in this salvage sale contained actions did not support the maintenance and ensure the long-term viability of this species or provide opportunities to gather information on impacts of habitat disturbance on Jemez Mountains salamander populations. Rather, it placed more emphasis on monetary concerns.

The NMEST and NMDGF both supported Alternative 3, which was developed to address key wildlife issues by eliminating timber salvage on Units 6, 7, and 8 on Sandoval Ridge

to avoid potential impacts to a known Jemez Mountains salamander population in the Essential Zone (USFS 2003b). The issue for the Jemez Mountains salamander and the NMEST was whether timber salvage would be beneficial, neutral, or detrimental to the long-term perpetuation of Jemez Mountains salamander after a stand-replacing fire has occurred. The NMEST felt unsure enough about the effects of the actual timber removal process on Sandoval Ridge where Jemez Mountains salamander were known to occur that they felt Alternative 3 was the most protective. A more conservative alternative had been offered that would not salvage stands in known occupied habitat but this alternative was not official considered (NMDGF 2003).

Similarly, the NMEST's rationale for choosing Alternative 3 was that in the absence of information on how salvage operations would affect Jemez Mountains salamander, this alternative would likely have the least amount of impact on the salamander (NMEST 2003a). This statement was amended in that, an NMEST team member articulated that, if a friendlier wildlife alternative existed, NMEST would have likely chosen it (USFS 2003b).

The USFS chose to implement its preferred alternative to conduct salvage logging operations in all units even though NMDGF continued to express concern over logging in unit 6 (NMEST 2003a; Watson 2003). However, instead of 90% of the trees proposed for salvage falling below 17" dbh, a letter to prospective bidders stated that the trees being offered for sale in Jemez Mountains salamander Essential Zone habitat on Sandoval Ridge average 14" dbh with ponderosa pine averaging 17.1" dbh (NMDGF 2004). Logging was conducted in units 6-8 until a judge enjoined further logging in unit 6 due to the presence of the Mexican spotted owl (Armijo 2004). Logging continued to be allowed in units 7 and 8. As discussed previously, the judge noted her ability to provide protection for the Jemez Mountains salamander was limited because it was not a federally listed species. Her opinion states that the Forest Plan governs the actions of the USFS and there are no regulations to enforce NMEST recommendations over that Plan. *Id*.

It is in fact clear that the USFS is authorizing salvage sales in salamander habitat for commercial reasons that disregard the imperiled status of this species. Proposals for timber salvage/thinning treatments after each of the three intense forest fires occurred within potential and occupied Jemez Mountains salamander habitat, with a total of 7,152 acres of timber proposed to be salvaged (Table 5). After the Dome fire and BMG/Lakes fires, the commercial use of dead/dying trees was used as the rationale to conduct salvage operations in Jemez Mountains salamander habitat.

The objectives stated for salvage operations after the Dome fire were (USFS 1996b):

Social/human
- Provide firewood to local users
- Develop multi-sized feasible salvage sales for small and large mills

Economics
- Salvage fire killed timber soon, before economic loss to decay

- Develop an economically feasible salvage sale proposal

> Salvaging this material would provide forest wood products to meet local and regional demands…through the sale of wood products, revenues would be collected to reforest the more productive forest sites.

The salvage proposal estimated "Approximately 3-4 million board feet of merchantable material" would be available for sale as well as 850 cords of firewood (USFS 1996b).

Similarly, the thinning treatment proposal after the Cerro Grande fire (2000) included providing firewood and vigas for public collection (Watson 2002), and the BMG/Lakes salvage proposal (2003) stated the need for action was (USFS 2003c):

> …to recover the timber value of fire-killed trees while protecting other resource values. Specific objectives include contributing to the regional economy of northern New Mexico by providing forest-based and wood-products manufacturing jobs, and providing citizens with the opportunity to gather wood-products such as post and poles, firewood, biomass, vigas and latillas both for resale and personal use.

The EA also stated:

> Another aspect of the existing situation is the fact that over the past decade, the level of timber harvest on national forest lands has significantly declined, thereby reducing timber related employment, wood products and associated socioeconomic benefits to northern New Mexico.

The preferred alternative chosen by the USFS for the BMG/Lakes fire salvage, was:

> The analysis shows that this alternative best addresses the purpose and need to recover the value of fire killed trees, as well as meets the SFNF Forest Plan goal to contribute to the economic and social needs of the people of northern New Mexico.

Approximately 4 million board feet were estimated to be available for timber sale (USFS 2003c). The alternative (Alternative 3) recommended by the NMEST would have dropped five units from the total of eleven units and would have decreased the available timber by 2 million board feet.

State policies inadequate

Although the New Mexico Wildlife Conservation Act (WCA) of 1974 declared that native wildlife found to be threatened or endangered should be managed to maintain and, to the extent possible, enhance their numbers, there are no regulatory or funding mechanisms to support or enforce the WCA. A document from the NMDGF, the agency imbued with the responsibility of the WCA, stated,

> The State of NM has failed to provide protection for the species (Jemez Mountains salamander) or its habitat. The species is state-listed threatened but the legislature removed protection for this category and state-listing provides no protection for habitat (Klingel 1999).

At the time of this document the Jemez Mountains salamander was listed as threatened. It was then uplisted to endangered based on recommendations from the NMEST and NMDGF (NMDGF 2000d).

As discussed in an earlier section, the paving and construction of Hwy 126 directly impacted populations and habitat of the Jemez Mountains salamander. The State Game Commission, a part of the New Mexico Department of Game and Fish, provided easements and received financial reimbursement for construction of this highway (NMDGF 2006c).

Lack of funding

In salamander studies funded from 1984-1999, the state received approximately $100,000 from the federal government (Armijo 2004). This averages out to approximately $7,000 and ranged from $5,000-9,250 within any given year for studies which included but were not limited to reproduction, habitat preferences, environmental variables effective to determine salamander presence, food habits, movement and home range, population estimates and trends, growth rates, age structure, effect of forest fires, and effects of logging (NMEST 1999). While these funds supported the projects, volunteers were also required to complete the work. The project narrative for the "Status of Endemic New Mexico Salamanders" segment 8, states that, "completion of this project has required an enormous amount of fieldwork and administrative support. Scores of volunteers from LANL, NPS, USFS, USGS, NMDGF, UNM, NMNHP, USFWS and the private sector helped with field work" (NMDGF 1999a; NMDGF 2000c). A letter from NMNHP details a total of $2,264 in costs absorbed by their program and by personnel to assist in efforts to study the Jemez Mountains salamander (NMDGF 2000c).

In response to the Cerro Grande Fire, the NMDGF requested funding to conduct monitoring of Jemez Mountains salamander and their prey species as well as conduct felling of Douglas firs to provide emergency habitat restoration. The total budget requested for a three year project was $156,675 (NMNHP 1999). Felling of logs began but was stopped due to lack of funding. Funding was never provided for Jemez Mountains salamander monitoring nor monitoring of its prey species (BAER 2000). After the 2003 Lakes/BMG Fires the USFS suggested that the salvage logging would provide an opportunity for an administrative study. NMDGF responded that opportunities had been proposed in the past for these kinds of studies but fell through (Johnson 2000; Painter 2000a; NMEST 2000a; Klingel 2000d; USFS 2001).

Non-USFS projects have also impacted the salamander and regulatory mechanisms have been inadequate in addressing them. For instance, the State Hardrock Mining

Commission approved a mine extension over a mile from the original mine in the Jemez Mountains (El Cajete Mine) without any assessment or consideration from the Jemez Mountains salamander (NMDGF 2006c). Dams were also constructed by the Los Alamos National Laboratories in potential salamander habitat without any assessments or considerations for the salamander (Klingel 2000b; LANL 2002).

In short, while the Jemez Mountains salamander is considered a federal Species of Concern, this status only suggests that the impact of projects on this species should be considered in environmental and biological assessments. Protection or mitigation measures are not required. The salamander CMP and MOA have not been effective in protecting the salamander and its habitat. The NMEST cannot enforce any of its recommendations. New Mexico has listed the species as Endangered but provides no regulations which either protect the populations or its habitat. Populations of Jemez Mountains salamanders are located on Bureau of Indian lands, Los Alamos National Laboratory lands, and within the Valles Caldera National Preserve, and there are no state or federal regulations providing specific protections for the Jemez Mountains salamander or its habitat on these lands.

V. Other Natural or Man-made Factors Affecting the Jemez Mountains Salamander's Continued Existence

Fire suppression

As exemplified by the three high severity forest fires occurring since 1996, the Jemez Mountains' forests are at risk from the threat of catastrophic wildfires. Although fire is a natural disturbance within the Jemez Mountains salamander's habitat, previous fire regimes (frequent, widespread, surface fires and mixed surface/patchy crown fires) that characterized this landscape effectively ceased in the late 1800s. This was due to the reduction of fine fuels through livestock grazing followed by active fire suppression (USFS 2003b).

The CMP states that livestock grazing and fire suppression

> …resulted in significant changes in the structure and composition of most forests in the Jemez Mountains. The number of trees per acre in small size classes has increased by 100 times over historic forest densities on many sites. Woody fuels have greatly increased and extensive ladder fuels have developed. Many herbaceous understory species have been shaded out by denser tree canopies and caused the buildup of thick mats of needle litter and other woody debris. Less fire-resistant (but more shade-tolerant) tree species increasingly dominate forest stands. All of these changes have greatly increased the risk of extensive, stand-replacing, crown fires in large areas of Jemez Mountains salamander habitat.

The CMP further states that,

> All available evidence indicates that the last century or more of fire suppression in the Jemez Mountains is a unique event during the Holocene. When combined with the knowledge that the past 22 years has also been a period of unprecedented tree growth in the Southwest due to an unusual string of wet El Nino events, it is logical to infer that more biomass is growing in the forests of the Jemez Mountains today than at any other time in the last 8,000 years. Human related forest changes present increasing risks of stand-destroying crown fires of unprecedented scale that are outside of the range of natural condition with which the Jemez Mountains salamanders evolved.

Effects of Chemicals

Chemical use within the Jemez Mountains salamander's habitat can create a caustic environment within the soil matrixes of its habitat. For example, fire retardant is used to suppress wildfire within salamander habitat. Until 2004, the USFS allowed fire retardant to be used that was known to contain levels of cyanide lethal to fish. During an average year, tankers dropped 15 million gallons of retardant nationwide. Insecticides are used to prevent tree loss in forests and can cause harm to the microenvironment of the salamander. NMDGF (1988) has noted that, "Tree loss due to disease may also contribute to the problem of habitat degradation, although the spraying of toxic chemicals to prevent this can be equally as threatening to these salamanders."

Climate change

Climate change is likely an increasing threat to the Jemez Mountains salamander, given the importance of moist soils to this animal, which may suffer from habitat drying in times of drought. In addition, climate change impacts such as warmer springs and summers, earlier snowmelt, and increased forest fire severity, frequency, and duration, could all harm the Petitioned species.[3]

An April 2008 report by The Nature Conservancy and Wildlife Conservation Society on climate change effects in New Mexico found that the Jemez Mountains is one of the state's areas to have experienced the greatest warming since 1991. In fact this area had

[3]Climate change impacts in New Mexico are documented in Floyd (2006) and Enquist & Gory (2008). Discussion of climate change impacts in the southwestern U.S. can be found at: Intergovernmental Panel on Climate Change. 2001. IPCC Special Report on The Regional Impacts of Climate Change An Assessment of Vulnerability. See http://www.grida.no/climate/ipcc/regional/index.htm; U.S. Global Change Research Program. 2000. US National Assessment of the Potential Consequences of Climate Variability and Change. See Sector: Water Resources at http://www.usgcrp.gov/usgcrp/nacc/water/default.htm; Smith, S.J., A.M. Thomson, N.J. Rosenburf, R.C. Izaurralde, R.A. Brown, and T.M.L. Wigley. 2005. Climate Change Impacts for the Conterminous USA: An Integrated Assessment - Part 1. Scenarios and Context. Climatic Change 69 (1): 7-25; Seager, R., M. Ting, I. Held, Y. Kushnir, J. Lu, G. Vecchi, H. Huang, N. Harnik, A. Leetmaa, N. Lau, C. Li, J. Velez, and N. Naik. 2007. Model projections of an imminent transition to a more arid climate in southwestern North America. Science 316: 1181-1184; National Science & Technology Council, Committee on Environment & Natural Resources. 2008. Scientific Assessment of the Effects of Global Change on the United States at http://www.climatescience.gov/Library/scientific-assessment/Scientific-AssessmentFINAL.pdf. Issued May 2008.

the highest climate exposure ranking of any area statewide. The report further cited the Jemez Mountains salamander as a drought-sensitive species (Enquist & Gory 2008).

Requested Designation

WildEarth Guardians hereby petitions the U.S. Fish and Wildlife Service under the Department of Interior to list the Jemez Mountains salamander *(Plethodon neomexicanus)* as an Endangered or Threatened species pursuant to the Endangered Species Act. This listing action is warranted, given the historical and continued degradation of suitable habitat and the decline and likely extirpation of localized Jemez Mountains salamander populations. The Jemez Mountains salamander is threatened by all five of the factors which FWS must consider in assessing whether a species qualifies for listing under the ESA. As such, we request expeditious listing of the Jemez Mountains salamander as a Threatened or Endangered Species under the ESA.

Critical habitat

Because loss and degradation of habitat is a leading threat to this species, Petitioner requests that critical habitat be designated for the Jemez Mountains salamander concurrent with ESA listing.

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