AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

FEDERAL REGISTER

Vol. 77 Wednesday,
No. 177 September 12, 2012

Part IV

Department of the Interior

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Proposed Endangered Status for the Jemez Mountains Salamander and Proposed Designation of Critical Habitat; Proposed Rule

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R2–ES–2012–0063; 4500030114]

RIN 1018–AY24

Endangered and Threatened Wildlife and Plants; Proposed Endangered Status for the Jemez Mountains Salamander and Proposed Designation of Critical Habitat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list the Jemez Mountains salamander as an endangered species under the Endangered Species Act of 1973, as amended (Act); and propose to designate critical habitat for the species. In total, approximately 90,789 acres (36,741 hectares) are being proposed for designation as critical habitat in Los Alamos, Rio Arriba, and Sandoval Counties, New Mexico.

DATES: We will accept comments received or postmarked on or before November 13, 2012. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES** section, below) must be received by 11:59 p.m. Eastern Time on the closing date. We must receive requests for public hearings, in writing, at the address shown in the **ADDRESSES** section by October 29, 2012.

ADDRESSES: You may submit comments by one of the following methods:

(1) *Electronically:* Go to the Federal eRulemaking Portal: *http://www.regulations.gov.* In the Search box, enter FWS–R2–ES–2012–0063, which is the docket number for this rulemaking. You may submit a comment by clicking on ''Comment Now!''.

(2) *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R2–ES–2012–0063; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

We request that you send comments only by the methods described above. We will post all comments on *http://www.regulations.gov.* This generally means that we will post any personal information you provide us (see the Public Comments section below for more information). The coordinates or plot points or both from which the maps are generated are included in the administrative record for this critical habitat designation and are available at *http://www.fws.gov/southwest/es/NewMexico/, http://www.regulations.gov* at Docket No. FWS–R2–ES–2012–0063, and at the New Mexico Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**). Any additional supporting information that we may develop for this critical habitat designation will also be available at the above locations.

FOR FURTHER INFORMATION CONTACT: Wally Murphy, Field Supervisor, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, 2105 Osuna NE., Albuquerque, NM 87113; by telephone 505–346–2525; or by facsimile 505–346–2542. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800–877–8339.

Executive Summary

Purpose of the Regulatory Action

Under the Act, a species or subspecies may warrant protection through listing if it is an endangered or threatened species throughout all or a significant portion of its range. On September 9, 2010, we published a 12-month finding stating that listing the Jemez Mountains salamander (*Plethodon neomexicanus*) under the Act was warranted, but precluded by other listing priorities (75 FR 54822). In that document we explained that the species currently faces numerous threats of high magnitude, and, therefore, qualifies for listing. This rule reassesses all available information regarding status of and threats to the salamander.

Under the Act, a species may be determined to be an endangered or threatened species based on any of five factors: (1) The present or threatened destruction, modification, or curtailment of its 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. We have determined that the Jemez Mountains salamander meets the definition of an endangered species due to three of these five factors.

Summary of the Major Provisions of the Regulatory Action in Question

This document consists of: (1) A proposed rule to list the Jemez Mountains salamander (*Plethodon neomexicanus*) as an endangered species; and (2) a proposed rule for designation of critical habitat for the Jemez Mountains salamander.

We will obtain opinions from knowledgeable individuals with scientific expertise to review our technical assumptions, analysis, adherence to regulations, and whether or not we had used the best available information. These peer reviewers will analyze our methods and conclusions and provide additional information, clarifications, and suggestions to improve the final listing and critical habitat rule. As a result, we will make a final determination as to whether the Jemez Mountains salamander is an endangered or threatened species, and designate critical habitat as appropriate, in the final rule. For this rule, we propose to list the Jemez Mountains salamander as an endangered species and propose to designate approximately 90,789 acres (36,741 hectares) of critical habitat in Los Alamos, Rio Arriba, and Sandoval Counties, New Mexico.

SUPPLEMENTARY INFORMATION: This document consists of: (1) A proposed rule to list the Jemez Mountains salamander (salamander) as an endangered species; and (2) a proposed critical habitat designation for the salamander.

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from the public, other concerned governmental agencies, Native American tribes, the scientific community, industry, or any other interested parties concerning this proposed rule. We particularly seek comments concerning:

(1) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to this species and regulations that may be addressing those threats.

(2) Additional information concerning the historical and current status, range, distribution, and population size of this species, including the locations of any additional populations of this species.

(3) Any information on the biological or ecological requirements of the species, and ongoing conservation measures for the species and its habitat.

(4) Current or planned activities in the geographic areas occupied by the species and possible impacts of these activities on this species.

(5) Any information on impacts to the species resulting from fire management practices, severe wildfire, forest composition and structure conversions,

post-fire rehabilitation, other forest management practices (including salvage logging, building of roads and trails, and recreational use).

(6) The reasons why we should or should not designate habitat as ''critical habitat'' under section 4 of the Act (16 U.S.C. 1531 *et seq.*) including whether there are threats to the species from human activity, the degree of which can be expected to increase due to the designation, and whether that increase in threat outweighs the benefit of designation such that the designation of critical habitat may not be prudent.

(7) Specific information on:

(a) The amount and distribution of Jemez Mountains salamander habitat;

(b) What areas that are currently occupied and contain features essential to the conservation of the species that should be included in the designation and why;

(c) Special management considerations or protection that may be needed in critical habitat areas we are proposing, including managing for the potential effects of climate change; and

(d) What areas not occupied at the time of listing are essential for the conservation of the species and why.

(8) Land use designations and current or planned activities in the subject areas and their possible impacts on proposed critical habitat.

(9) Information on the projected and reasonably likely impacts of climate change on the Jemez Mountains salamander and proposed critical habitat.

(10) Any foreseeable economic, national security, or other relevant impacts of designating any area that may be included in the final designation; in particular, any impacts on small entities or families, and the benefits of including or excluding areas that exhibit these impacts.

(11) Whether any specific areas we are proposing for critical habitat designation should be considered for exclusion under section 4(b)(2) of the Act, and whether the benefits of potentially excluding any specific area outweigh the benefits of including that area under section 4(b)(2) of the Act.

(12) The appropriateness of the methodology used for delineating the proposed critical habitat (including any data that might help further refine these areas).

(13) The likelihood of adverse social reactions to the designation of critical habitat and how the consequences of such reactions, if likely to occur, would relate to the conservation and regulatory benefits of the proposed critical habitat designation.

(14) Whether we could improve or modify our approach to designating critical habitat in any way to provide for greater public participation and understanding, or to better accommodate public concerns and comments.

Please note that submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is a threatened or endangered species must be made ''solely on the basis of the best scientific and commercial data available.''

You may submit your comments and materials concerning this proposed rule by one of the methods listed in the **ADDRESSES** section. We request that you send comments only by the methods described in the **ADDRESSES** section.

If you submit information via *http://www.regulations.gov*, your entire submission—including any personal identifying information—will be posted on the Web site. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov.* Please include sufficient information with your comments to allow us to verify any scientific or commercial information you include.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov*, or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Previous Federal Actions

In December 1982, we published a notice of review classifying the salamander as a Category 2 species (47 FR 58454, December 30, 1982). Category 2 status included those taxa for which information in the Service's possession indicated that a proposed listing rule was possibly appropriate, but for which sufficient data on biological vulnerability and threats were not available to support a proposed rule.

On February 21, 1990, we received a petition to list the Jemez Mountains salamander as threatened. Subsequently, we published a substantial 90-day finding, indicating that the petition contained sufficient information to suggest that listing may be warranted (55 FR 38342; September 18, 1990). In the Candidate Notice of Review (CNOR) published on November 21, 1991, we announced the salamander as a Category 1 species with a ''declining'' status (56 FR 58814). Category 1 status included those species for which the Service had on file substantial information regarding the species' biological vulnerability and threat(s) to support proposals to list them as either an endangered or threatened species. The ''declining'' status indicated decreasing numbers, increasing threats, or both.

On May 30, 1991, the Service, the U.S. Forest Service (USFS), and the New Mexico Department of Game and Fish (NMDGF) signed a Memorandum of Agreement outlining actions to be taken to protect the salamander and its habitat on the Santa Fe National Forest lands, including the formation of a team of agency biologists to immediately implement the Memorandum of Agreement and to develop a management plan for the species. The management plan was to be incorporated into the Santa Fe National Forest Plan. On April 3, 1992, we published a 12-month finding that listing the salamander was not warranted because of the conservation measures and commitments within the Memorandum of Agreement (57 FR 11459). In the November 15, 1994, CNOR, we included the salamander as a Category 2 species, with a trend status of ''improving'' (59 FR 58982). A status of ''improving'' indicated those species known to be increasing in numbers or whose threats to their continued existence were lessening in the wild.

In the CNOR published on February 28, 1996, we announced a revised list of animal and plant taxa that were regarded as candidates for possible addition to the List of Endangered and Threatened Wildlife and Plants (61 FR 7596). The revised candidate list included only former Category 1 species. All former Category 2 species were dropped from the list in order to reduce confusion about the conservation status of those species, and to clarify that the Service no longer regarded them as candidates for listing. Because the Jemez Mountains salamander was a Category 2 species, it was no longer recognized as a candidate species as of the February 28, 1996, CNOR.

In January, 2000, the New Mexico Endemic Salamander Team (NMEST), a group of interagency biologists representing NMDGF, the Service, the U.S. Geological Survey, and the Santa

Fe National Forest, finalized a Cooperative Management Plan for the Jemez Mountains salamander on lands administered by the Santa Fe National Forest (Cooperative Management Plan), and the agencies signed an updated Conservation Agreement that superseded the Memorandum of Agreement. The stated purpose of the Conservation Agreement and the Cooperative Management Plan was to provide for the long-term conservation of salamanders by reducing or removing threats to the species and by proactively managing their habitat (NMEST 2000 Conservation Agreement, p. 1). In a Decision Notice and Finding of No Significant Impact for the Forest Plan Amendment for Managing Special Status Species Habitat, signed on December 8, 2004, the Cooperative Management Plan was incorporated into the Santa Fe National Forest Plan.

On October 15, 2008, we received a petition dated October 9, 2008, from WildEarth Guardians requesting that we list the Jemez Mountains salamander as either an endangered or threatened species under the Act, and designate critical habitat. On August 11, 2009, we published a 90-day finding that the petition presented substantial information that listing the salamander may be warranted and that initiated a status review of the species (74 FR 40132). On December 30, 2009, WildEarth Guardians filed suit against the Service for failure to issue a 12-month finding on the petition (*WildEarth Guardians* v. *Salazar*, No. 09–1212 (D.N.M.)). Under a stipulated settlement agreement, we published a 12-month finding on September 9, 2010, that listing the salamander as either an endangered or threatened species was warranted but precluded by higher priority actions (75 FR 54822). This rule constitutes our proposal to list the Jemez Mountains salamander as an endangered species and our proposal to designate critical habitat.

Proposed Endangered Status for the Jemez Mountains Salamander

Background

Species Information

The salamander is uniformly dark brown above, with occasional fine gold to brassy coloring with stippling dorsally (on the back and sides) and is sooty gray ventrally (underside). The salamander is slender and elongate, and it possesses foot webbing and a reduced fifth toe. This salamander is a member of the family Plethodontidae, is strictly terrestrial, and does not use standing surface water for any life stage. Respiration occurs through the skin, which requires a moist microclimate for gas exchange.

Taxonomy and Species Description

The Jemez Mountains salamander was originally reported as *Spelerpes multiplicatus* (=*Eurycea multiplicata*) in 1913 (Degenhardt *et al.* 1996, p. 27); however, it was described and recognized as a new and distinct species (*Plethodon neomexicanus*) in 1950 (Stebbins and Riemer, pp. 73–80). No subspecies are recognized.

The Jemez Mountains salamander is one of two species of plethodontid salamanders endemic (native and restricted to a particular region) to New Mexico: The Jemez Mountains salamander and the Sacramento Mountains salamander (*Aneides hardii*). Unlike most other North American plethodontid salamanders, these two species are geographically isolated from all other species of *Plethodon* and *Aneides.*

Distribution

The distribution of plethodontid salamanders in North America has been highly influenced by past changes in climate and associated Pleistocene glacial cycles. In the Jemez Mountains, the lack of glacial landforms indicates that alpine glaciers may not have developed here, but evidence from exposed rocky areas (felsenmeers) may reflect near-glacial conditions during the Wisconsin Glacial Episode (Allen 1989, p. 11). Conservatively, the salamander has likely occupied the Jemez Mountains for at least 10,000 years, but this could be as long as 1.2 million years, colonizing the area subsequent to volcanic eruption.

The salamander is restricted to the Jemez Mountains in northern New Mexico, in Los Alamos, Rio Arriba, and Sandoval Counties, around the rim of the collapsed caldera (large volcanic crater), with some occurrences on topographic features (e.g., resurgent domes) on the interior of the caldera. The majority of salamander habitat is located on federally managed lands, including the USFS, the National Park Service (Bandelier National Monument), Valles Caldera National Preserve (VCNP), and Los Alamos National Laboratory, with some habitat located on tribal land and private lands (NMEST 2000, p. 1). The VCNP is located west of Los Alamos, New Mexico, and is part of the National Forest System (owned by the U.S. Department of Agriculture), but run by a nine-member Board of Trustees: the Supervisor of Bandelier National Monument, the Supervisor of the Santa Fe National Forest, and seven other members with distinct areas of experience or activity appointed by the President of the United States (Valles Caldera Trust 2005, pp. 1–11). Prior to Federal ownership in 2000, the VCNP was privately held. The species predominantly occurs at an elevation between 7,200 and 9,500 feet (ft) (2,200 and 2,900 meters (m)) (Degenhardt *et al.* 1996, p. 28), but has been found as low as 6,998 ft (2,133 m) (Ramotnik 1988, p. 78) and as high as 10,990 ft (3,350 m) (Ramotnik 1988, p. 84).

Movements, Home Range, and Dispersal

Ramotnik (1988, pp. 11–12) used implanted radioactive wires in polyethylene tubing to track 9 individual salamanders for durations between 2 days and 6 weeks, monitoring their movements every 1 to 3 days, and two salamanders were tracked every 2 hours throughout a 12-hour period. Ramotnik (1988, p. 27) reported individual distances salamanders moved between consecutive observations ranged from 0 to 108 ft (0 to 13 m) and that 73 percent of recorded movements were less than 3.3 ft (1 m). In 59 of 109 observations, salamanders did not move. When the zero-distance movements were excluded from analysis, the average distance salamanders moved was 7.8 ft (2.4 m), with the greatest movement of 43 ft (13 m) (Ramotnik 1988, p. 28). Ramotnik (1988, p. 32) also estimated the home range of six salamanders with these data and reports the average home range was 86 square feet (ft^2) (8.0 square meters (m^2); males had a larger home range (137 ft^2 (12.7 m^2)) than females (78 ft^2 (7.2 m^2)). The individuals that had larger home ranges (greater than 54 ft^2 (5.0 m^2)) were often found returning to the same cover object; whereas individuals with home ranges less than 54 ft^2 (5 m^2) rarely returned to the same spot (Ramotnik 1988, p. 32). While these data are limited because small sample size, they provide some information on the relatively small movements made by individuals and their relatively small home range.

In another well-studied terrestrial salamander, the red-backed salamander (*Plethodon cinereus*), there is conflicting evidence regarding its dispersal abilities. Some information suggests this salamander exhibits small movements, even across multiple years, consisting primarily of small home ranges and with little movement among cover objects. However, there is other evidence of moderate-distance homing ability, greater movement during colonization events, and an estimated range expansion of 262 ft (80 m) per year over the last 18,000 years (Cabe *et*

al. 2007, p. 54). Cabe *et al.* 2007 (pp. 53–60) measured gene flow of red-backed salamanders across a continuous forested habitat as an indicator of the salamander's dispersal. They suggested that gene flow and dispersal frequency were normally low, indicating that red-backed salamanders generally do not move much, but under certain circumstances, they might disperse farther than normal. These unique conditions occur when the population density of red-backed salamanders is so high in a given area that the habitat is saturated with them, and there is a resultant reduction in breeding success, and other, less densely populated habitat is available (Cabe *et al.* 2007, p. 53). The Jemez mountains salamander is likely similar to other terrestrial salamanders, where dispersal distance and frequency is generally low, but some individuals may make moderate dispersal movements into available habitat.

In the 12-month finding for the Jemez Mountains salamander (75 FR 54822; September 9, 2010), we divided known salamander distributional data into five units (Unit 1-Western; Unit 2-Northern; Unit 3-East-South-Eastern; Unit 4-Southern; and Unit 5-Central), to provide clarity in describing and analyzing the potential threats that may differ across the species' range. However, for this rule, we are no longer using these units as reference, because we did not want to cause confusion with the critical habitat units.

Habitat

The strictly terrestrial Jemez Mountains salamander predominantly inhabits mixed-conifer forest, consisting primarily of Douglas fir (*Pseudotsuga menziesii*), blue spruce (*Picea pungens*), Engelman spruce (*P. engelmannii*), white fir (*Abies concolor*), limber pine (*Pinus flexilis*), Ponderosa pine (*P. ponderosa*), Rocky Mountain maple (*Acer glabrum*), and aspen (*Populus tremuloides*) (Degenhardt *et al.* 1996, p. 28; Reagan 1967, p. 17). The species has occasionally been found in stands of pure Ponderosa pine and in spruce-fir and aspen stands, but these forest types have not been adequately surveyed. Predominant understory includes Rocky Mountain maple (*Acer glabrum*), New Mexico locust (*Robinia neomexicana*), oceanspray (*Holodiscus sp.*), and various shrubby oaks (*Quercus spp.*) (Degenhardt *et al.* 1996, p. 28; Reagan 1967, p. 17). Salamanders are generally found in association with decaying coniferous logs, and in areas with abundant white fir, Ponderosa pine, and Douglas fir as the predominant tree species (Ramotnik 1988, p. 17; Reagan 1967, pp. 16–17). Salamanders use decaying coniferous logs (particularly Douglas fir logs) considerably more often than deciduous logs, likely due to the physical features (e.g., blocky pieces with cracks and spaces) that form as coniferous logs decay (Ramotnik 1988, p. 53). Still, the species may be found beneath some deciduous logs and excessively decayed coniferous logs, because these can provide aboveground habitat and cover (Ramotnik 1988, p. 53).

Biology

The Jemez Mountains salamander is strictly terrestrial, does not possess lungs, and does not use standing surface water for any life stage. Respiration occurs through the skin, which requires a moist microclimate for gas exchange. Substrate moisture through its effect on absorption and loss of water is probably the most important factor in the ecology of this terrestrial salamander, as it is in other strictly terrestrial salamander species (Heatwole and Lim 1961, p. 818). The Jemez Mountains salamander spends much of its life underground and can be found above ground when relative environmental conditions are warm and wet, which is typically from July through September; but occasional salamander observations have been made in May, June, and October. Relatively warm and wet environmental conditions suitable for salamander aboveground activity are likely influenced by snow infiltration and summer monsoon rains. When active above ground, the species is usually found under decaying logs, rocks, bark, moss mats, or inside decaying logs or stumps.

The salamander's subterranean habitat appears to be deep, fractured, subterranean rock in areas with high soil moisture (NMEST 2000, p. 2) where the geologic and moisture constraints likely limit the distribution of the species. Soil pH (acidity or alkalinity) may limit distribution as well. It is unknown whether the species forages or carries on any other activities below ground, although it is presumed that eggs are laid and hatch underground. Salamander prey from aboveground foraging is diverse in size and type, with ants (Hymenoptera, Formicidae), mites (Acari), and beetles (Coleoptera) being most important (most numerous, most voluminous, and most frequent) in the salamander's diet (Cummer 2005, p. 43). Cummer (2005, pp. 45–50) found that specialization on invertebrate species was unlikely, but there was likely a preferential selection of prey categories (ants, mites, and beetles).

The aboveground microhabitat (under or inside cover objects) temperature for 577 Jemez Mountains salamanders ranged from 43 to 63 degrees Fahrenheit (°F) (6.0 to 17.0 degrees Celsius (°C)), with an average of 54.9 °F (12.7 °C) (Williams 1972, p. 18). Significantly more salamanders were observed under logs where temperatures are closest to the average temperature (54.5 °F (12.5 °C)) than inside logs where temperatures deviated the most from the average temperature (55.9 °F (13.3 °C)) (Williams 1972, p. 19).

Sexual maturity is attained at 3 to 4 years in age for females and 3 years for males (Williams 1976, pp. 31, 35). Reproduction in the wild has not been observed; however, based on observed physiological changes, mating is believed to occur above ground between July and August (Williams 1976, pp. 31–36). Based on examination of 57 female salamanders in the wild and 1 clutch of eggs laid in a laboratory setting, Williams (1978, p. 475) concluded that females likely lay 7 or 8 eggs every other year or every third year. Eggs are thought to be laid subterranean the spring after mating occurs (Williams 1978, p. 475). Jemez Mountains salamanders have direct-developing eggs, whereby fully formed salamanders hatch from the eggs. The lifespan of the salamander in the wild is unknown. However, considering the estimated lifespan of other similar terrestrial plethodontid salamanders and the above reproductive information, we believe that the lifespan of this species is likely greater than 10 years.

Status of the Species

A complete overview of the available survey data and protocols for the Jemez Mountains salamander is reported in the 12-month finding for the salamander (75 FR 54822; September 9, 2010). In summary, we have approximately 20 years of salamander survey data that provide detection information at specific survey sites for given points in time. The overall rangewide population size of the Jemez Mountains salamander is unknown because surveys tend to be localized (approximately 200 m by 200 m areas (256 ft by 256 ft), and we cannot meaningfully relate these data to the demographics of the species. Additionally, like most plethodontid salamanders, monitoring population size or trends of the Jemez Mountains salamander is inherently difficult because of the natural variation associated with the species' behavior (Hyde and Simons 2001, p. 624). For example, when the species is underground, they cannot be detected. Therefore, the probability of detecting a

salamander is highly variable and dependent upon the environmental and biological parameters that drive aboveground and belowground activities (Hyde and Simons 2001, p. 624). Given the known bias of detection probabilities and the inconsistent survey effort across years, population trends and population size estimates using existing data cannot be made accurately.

Despite our inability to quantify population size or trends for the salamander, these qualitative data (data that are observable, but not measurable) provide information for potential inferences. Based on these inferences, we believe that the persistence of the salamander may vary across the range of the species. For example, in some localities where the salamander was once considered abundant or common, the salamander is now rarely detected or has not been recently detected at all (New Mexico Heritage Program 2010a and b, spreadsheets). There also appears to be an increase in the number of areas where salamanders were once present, but have not been observed during more recent surveys (New Mexico Heritage Program 2010a and b, spreadsheets). Alternatively, there are two localities on the VCNP where the salamander continues to be relatively abundant, compared to most other recent detections (Redondo Border located in the central portion of the VCNP, and on a slope in the northeast portion of the VCNP). Still, the number of individuals found at these 2 localities is far less than other historical reports including the report in which 659 individuals were captured in a single year in 1970 and 394 of those individuals were captured in a single month (Williams 1976, p. 26). Currently, there is no known location where the number of salamanders observed is similar to that observed in 1970.

Overall, some of the localized survey areas appear to be unchanging (survey results with similar numbers of salamanders through time during the period in which environmental conditions for salamander aboveground activity is warm and wet, which is typically from July through September). However, in other areas, particularly along the western and southern sides of the range, the number of salamanders observed during surveys appears to be decreasing or the number of surveys resulting in no detections at all are increasing (fewer or no salamanders observed for the same survey effort, while environmental conditions for salamander aboveground activity is considered optimal) (New Mexico Heritage Program 2010a and b, spreadsheets). An assessment of population trends using these data would not be accurate, unless we could demonstrate that these limited data are representative of the overall population. We expect that detecting overall trends will be difficult for this species, given data limitations, the cost of comprehensive surveys, and the likelihood of natural, annual, and spatial variations.

In summary, the available data cannot be used to estimate population size or trends in the rangewide abundance of the salamander. Although we lack specific long-term population and trend information, available data and qualitative observations of salamanders suggest that the species is more difficult to find during surveys. Even though we are not able to estimate population trends, the number of surveys resulting in no salamander detections is increasing. Because we have limited data regarding the status of the species or population trends, we specifically request this information.

Summary of Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on any of the following five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination. Each of these factors is discussed below.

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

The principal threats to the habitat of the Jemez Mountains salamander include historical fire exclusion (the act of preventing fire) and suppression (the act of putting out fire) and severe wildland fires; forest composition and structure conversions; post-fire rehabilitation; forest and fire management; roads, trails, and habitat fragmentation; and recreation.

Fire Exclusion, Suppression, and Severe Wildland Fires

In the Jemez Mountains, over 100 years of fire suppression and fire exclusion (along with livestock grazing and other stressors) have altered forest composition and structure, and increased the threat of wildfire in Ponderosa pine and mixed-conifer forests (Belsky and Blumenthal 1997, p. 318). Fire has been an important process in the Jemez Mountains for at least several thousand years (Allen 1989, p. 69), indicating that the salamander coexisted with historical fire regimes. Frequent, low-intensity surface fires and patchy, small-scale, high-intensity fires in the Jemez Mountains historically maintained salamander habitat. These fires spread widely through grassy understory fuels, or erupted on very small scales. The natural fire intervals prior to the 1900s ranged from 5 to 25 years across the Jemez Mountains (Allen 2001, p. 4). Dry mixed-conifer forests burned on average every 12 years, whereas wet mixed-conifer forests burned on average every 20 years. Historically, patchy surface fires within mixed-conifer forests would have thinned stands and created natural fuel breaks that would limit the extent of fires. Still, in very dry years, there is evidence of historical fires occurring across entire watersheds, but they did not burn with high severity over entire mountain sides (Jemez Mountains Adaptive Planning Workshop Session II Final Notes 2010, p. 7). Aspen stands are evidence of historical patchy crown fires that represent the relatively small-scale, stand-replacing fires that have historically occurred in the Jemez Mountains, which are also associated with significantly dry years (Margolis *et al.* 2007, p. 2236).

These historical fire patterns were interrupted in the late 1800s through the elimination of fine fuels, as a result of livestock overgrazing and historical managed fire suppression. This interruption and exclusion of fire promoted the development of high forest stand densities with heavy accumulations of dead and downed fuel, and growth of ladder fuels (the dense mid-story trees that favor development of crown fires) (Allen 2001, pp. 5–6). In fact, past fire exclusion activities in this area converted historically low- to moderate-severity fire regimes with small, patchy fires to high-severity, large-scale, stand-replacing fires that have the potential to significantly destroy or degrade salamander habitat (USFS 2009a, pp. 8–9). The disruption of the natural cycle of fire and subsequent accumulation of

continuous fuels within the coniferous forests on south- and north-facing slopes has increased the chances of a severe wildfire affecting large areas of salamander habitat within the Jemez Mountains (e.g., see USFS 2009a, 2009b).

In recent years, prescribed fire at VCNP has been limited, with only one burn in 2004 that was described as creating a positive vegetation response (ENTRIX 2009, p. 97). A prescribed fire plan is expected to be developed (ENTRIX 2009, p. 97), because there is concern for severe wildland fires to occur (Parmenter 2009, cited in Service 2010). The planned Scooter Peak prescribed burn between the VCNP and Bandelier National Monument is a fuel-reduction project in occupied salamander habitat, but is small in scale (approximately 960 acres (ac) (390 hectares (ha)) (ENTRIX 2009, p. 2). Although future thinning of secondary growth may partially reduce the risk of severe wildland fires in areas, these efforts are not likely at a sufficient geographical scale to lessen the overall threat to the salamander.

The frequency of large-scale, high-severity, stand-replacing wildland fires has increased in the latter part of the 20th century in the Jemez Mountains. This increase is due to landscape-wide buildup of woody fuels associated with removal of grassy fuels from extreme year-round livestock overgrazing in the late 1800s, and subsequent fire suppression (Allen 1989, pp. 94–97; 2001, pp. 5–6). The majority of wildfires over the past 20 years have exhibited crown fire behavior and burned in the direction of the prevailing south or southwest winds (USFS 2009a, p. 17). The first severe wildland fire in the Jemez Mountains was the La Mesa Fire in 1977, burning 15,400 ac (6,250 ha). Subsequent fires included the Buchanon Fire in 1993 (11,543 ac (4,671 ha)), the Dome Fire in 1996 (16,516 ac (6,684 ha)), the Oso Fire in 1997 (6,508 ac (2,634 ha)), the Cerro Grande Fire in 2000 (42,970 ac (17,390 ha)), and the Lakes Fire Complex (Lakes and BMG Fires) in 2002 (4,026 ac (1,629 ha)) (Cummer 2005, pp. 3–4). Between 1995 and 2010, severe wildland fires have burned about 36 percent of modeled or known salamander habitat on USFS lands (USFS 2009, p. 1). Following the Cerro Grande Fire, the General Accounting Office reported that these conditions are common in much of the western part of the United States turning areas into a ''virtual tinderbox'' (General Accounting Office 2000, p. 15).

In 2011, the Las Conchas Fire burned 150,590 ac (60,942 ha) in the Jemez Mountains, and, until the 2012 Whitewater Complex Fire in southwestern New Mexico, Las Conchas was New Mexico's largest wildfire to date (USFS 2011a, p. 1). The Las Conchas Fire burned approximately 17,780 ac (7,195 ha) of modeled or known salamander habitat in the east, south, and southeastern part of its range. This demonstrates that the threat of severe wildland fires to salamander habitat remains high, due to tons of dead and down fuel, overcrowded tree conditions leading to poor forest health, and dense thickets of small-diameter trees. There is a 36 percent probability of having at least one large fire of 4,000 ac (over 1,600 ha) every year for the next 20 years in the southwest Jemez Mountains (USFS 2009a, p. 19). Moreover, the probability of exceeding this estimated threshold of 4,000 ac (1,600 ha) burned in the same time period is 65 percent (USFS 2009a, p. 19). As an example of the severe fire risk, the Thompson Ridge-San Antonio area in the western portion of the salamander's range has extensive ladder fuels and surface fuels estimated at over 20 tons per acre, and the understory in areas contains over 800 dense sapling trees per acre within the mixed-conifer and Ponderosa pine stands (USFS 2009a, pp. 24–25). The canyon topography aligns with south winds and steep slopes, making this area highly susceptible to crown fire (USFS 2009a, pp. 24–25). Moreover, we found that the risk of burning is not eliminated following severe wildfires. Some areas that previously burned during the 2000 Cerro Grande Fire burned again during the 2011 Las Conchas Fire.

Increases in soil and microhabitat temperatures, which generally increase with increasing burn severity, can have profound effects on salamander behavior and physiology and can, therefore, influence their ability to persist subsequent to severe wildland fires. Following the Cerro Grande Fire, soil temperatures were recorded under potential salamander cover objects in geographic areas occupied by the salamander (Cummer and Painter 2007, pp. 26–37). Soil temperatures in areas of high-severity burn exceeded the salamander's thermal tolerance (the temperature that causes death) (Spotila 1972, p. 97; Cummer and Painter 2007, pp. 28–31). Because widespread dry conditions are an important factor contributing to the occurrence of severe wildfire, when severe wildfire occurs, most salamanders are likely protected in subterranean habitat and are not killed directly from wildfire. However, even in moderate and high-severity burned areas where fires did not result in the death of salamanders, the microhabitat conditions, such as those resulting from the Cerro Grande Wildfire, would limit the timing and duration that the salamanders could be active above ground (feeding and mating). Moreover, elevated temperatures lead to increases in oxygen consumption, heart rate, and metabolic rate, resulting in decreased body water (the percentage of water in the body) and body mass (Whitford 1968, pp. 247–251). Physiological stress from elevated temperatures may also increase susceptibility to disease and parasites. Effects from temperature increases are discussed in greater detail under Factor E, below.

Severe wildland fires typically increase soil pH, which could affect the salamander. In one study of the Jemez Mountains salamander, soil pH was the single best indicator of relative abundance of salamanders at a site (Ramotnik 1988, pp. 24–25). Sites with salamanders had a soil pH of 6.6 (± 0.08) and sites without salamanders had a soil pH of 6.2 (± 0.06). In another species of a terrestrial plethodontid salamander, the red-backed salamander (*Plethodon cinereus*), soil pH influences and limits its distribution and occurrence as well as its oxygen consumption rates and growth rates (Wyman and Hawksley-Lescault 1987, p. 1823). Similarly, Frisbie and Wyman (1991, p. 1050) found the disruption of sodium balance by acidic conditions in three species of terrestrial salamanders. A low pH substrate can also reduce body sodium, body water levels, and body mass (Frisbie and Wyman 1991, p. 1050). Changes in soil pH following wildfire could impact the salamander, either by making the habitat less suitable, or through physiological stress.

Including the Santa Fe National Forest, the existing risk of wildfire on the VCNP and surrounding areas is uncharacteristically high and is a significant departure from historical conditions over 100 years ago (VCNP 2010, p. 3.1; Allen 1989, pp. ii–346; 2001, pp. 1–10). Several regulatory attempts have been made to address and correct the altered ecological balance of New Mexico's forests resulting from a century of fire suppression, logging, and livestock grazing. Congress enacted the Community Forest Restoration Act to promote healthy watersheds and reduce the threat of large, high-intensity wildfires; insect infestation; and disease in the forests in New Mexico (H.R. 2389, Public Law 106–393). The subsequent Omnibus Public Land Management Act, also called the ''Forest Landscape Restoration Act'' (Title, IV, Public Law III–II, 2009), established a national program that encourages ecological,

economic, and social sustainability and utilization of forest restoration byproducts to benefit local rural economies and improve forest health. As a result, the Santa Fe National Forest and partners prepared the Southwest Jemez Mountains Landscape Assessment designed to reduce the threat of severe wildland fire in the western and southern part of the salamander's range over the next 10 years (USFS 2009, p. 2).

In 2011, this Collaborative Forest Landscape Restoration project was selected and is eligible for up to $4 million per year to restore approximately 210,000 ac (85,000 ha) of forest in the southwestern Jemez Mountains (USFS 2011b, pp. 1–2), but a lack of matching funds may limit the geographical extent of this project. Moreover, this project will not effectively address the short-term risk of severe wildland fire to the species because treatments are anticipated to be implemented slowly, over a decade or more, and will likely not begin in salamander habitat until at least 2013. Finally, it is unknown whether the proposed treatments will effectively reduce the risk of severe wildfire to the salamander or its habitat without causing additional harm to the species, because measures to minimize impacts will be experimental and have not yet been developed. We believe that this risk of wildfire is one of the most significant threats facing this species, and projects attempting to reduce the threat of wildland fire will need to be implemented over a large part of the landscape before significant risk reduction for the salamander is achieved. For these reasons, we conclude that the overall risk of severe wildland fire will not be significantly reduced or eliminated on USFS lands, National Park Service lands, the VCNP, or surrounding lands in the future.

Since 1977, these severe wildland fires have significantly degraded important features of salamander habitat, including removal of tree canopy and shading, increases of soil temperature, decreases of soil moisture, increased pH, loss or reduction of soil organic matter, reduced soil porosity, and short-term creation of hydrophobic (water-repelling) soils. These and other effects limit the amount of available aboveground habitat, and the timing and duration when salamanders can be active above ground, which negatively impacts salamander behavior (e.g., maintenance of water balance, foraging, and mating) and physiology (e.g., increased dehydration, heart rate and oxygen consumption, and increased energy demands). These negative impacts are greater for hatchlings and juvenile salamanders because, relative to their body mass size, they have a greater skin surface area than larger salamanders, and thus have greater rates of water and gas exchange over their skin surface. Survivorship of hatchlings and juveniles is likely reduced from the effects of extensive stand-replacing wildland fires.

For these reasons, severe wildland fires have led to a reduction in the quality and quantity of the available salamander habitat rangewide, reducing the survivorship and fecundity of the salamander rangewide. The USFS concludes, and we concur, that habitat loss from extensive, stand-replacing wildland fire is a threat to the salamander (USFS 2009c, p. 1), and these effects will likely continue into the future, because areas that have not burned in the past 15 years are still at extremely high risk, and areas that have experienced severe wildfires in the last 15 years have degraded habitat that continues to adversely affect the salamander. We consider the reduction in the quality and quantity of habitat from extensive stand-replacing wildland fire to be a significant threat to the species, because this threat is rangewide and affects salamander behavior, physiology, and reproductive success. Therefore, we believe that severe wildland fire has substantially impacted the salamander and its habitat, and this trend is expected to continue throughout its range in the future, unless and until projects attempting to reduce the threat of wildland fire are effectively implemented over a large part of the landscape in the Jemez Mountains which includes the habitat of the salamander.

Forest Composition and Structure Conversions

Changes in forest composition and structure may exacerbate severe wildland fires and are, therefore, considered a threat to the salamander. In addition, changes in forest composition and structure may threaten the salamander by directly altering soil moisture, soil temperature, soil pH, relative humidity, and air temperature. While it is possible that increased canopy could provide additional shading, and thus lower air and soil temperatures, and reduce soil moisture loss, it is presumed that any minor gains from a slightly more closed canopy would be lost as a result of the increase in demand for water that would be required for evapotranspiration by an increased number of small-diameter trees, which in turn would lead to increased drying of the soil. Limited water leads to drought-stress in trees, and an increase in susceptibility of trees to burning, insect infestations, and disease. This is especially true on south-facing slopes, where less moisture is available or during times of earlier snowmelt. Reduced soil moisture may also influence soil temperature and relative humidity.

Reduced soil moisture disrupts other aboveground activities of salamanders (e.g., foraging and mating), because salamanders must first address moisture needs above all other life functions (Heatwole and Lim 196, p. 818). Additionally, ecological changes resulting from forest composition changes could result in altered prey availability; however, we do not know if such changes would affect the salamander. The type and quantity of vegetation affects soil pH, and thus could also affect the salamander. Overall, the degree of cascading ecological impacts from shifts in forest composition and structure is currently unknown; however, alteration of forest composition and structure contribute to increased risk of forest die-offs from disease and insect infestation throughout the range of the salamander (USFS 2002, pp. 11–13; 2009d, p. 1; 2009a, pp. 8–9; 2010, pp. 1–11; Allen 2001, p. 6). We find that the interrelated contributions from changes in vegetation to large-scale, high-severity wildfire and forest die-offs are of a significant magnitude across the range of the species (e.g., see ''Fire Exclusion, Suppression, and Severe Wildland Fires'' section, above), and, in addition to continued predicted future changes to forested habitat within the range of the species, are threats to the salamander.

Preliminary data collected from the VCNP indicates that an increase in the amount of tree canopy cover in an area can decrease the amount of snow that is able to reach the ground, and can ultimately decrease the amount of soil moisture and infiltration (Enquist *et al.* 2009, p. 8). On the VCNP, 95 percent of coniferous forests have thick canopy cover with heavy understory fuels (VCNP 2010, pp. 3.3–3.4; USFS 2009a, p. 9). In these areas, snow accumulates in the tree canopy over winter, and in the spring can quickly evaporate without reaching or infiltrating the soil. Relatively recent increases in canopy cover, resulting from changes in forest composition and structure caused by historical management and fire suppression, could be having significant drying effects on salamander habitat. In summary, existing and ongoing changes in forest composition and structure are interrelated to the threat of severe wildland fire and may also directly

affect habitat suitability by altering soil moisture, soil temperature, soil pH, relative humidity, and air temperature. Therefore, forest composition and structure conversions resulting in increased canopy cover and denser understory pose threats to the salamander now and are likely to continue in the future.

Post-fire Rehabilitation

Post-fire management practices are often needed to restore forest dynamics (Beschta *et al.* 2004, p. 957). In 1971, USFS was given formal authority by Congress for Burn Area Emergency Rehabilitation (BAER) (Robichaud *et al.* 2000, p. 1) and integrated the evaluation of fire severity, funding request procedures, and treatment options. Treatment options implemented by USFS and BAER teams include hillslope treatments (grass seeding, contour-felled logs, mulch, and other methods to reduce surface runoff and keep post-fire soil in place, such as tilling, temporary fencing, erosion control fabric, straw wattles, lopping, and scattering of slash) and channel treatments (straw bale check dams, log check dams, rock dams, and rock cage dams (gabions)) (Robichaud *et al.* 2000, pp. 11–21). Rehabilitation actions following the Cerro Grande fire in salamander habitat included heavy equipment and bulldozer operation, felling trees for safety reasons, mulching with straw and placement of straw bales, cutting and trenching trees (contour felling and securing on slope), hand and aerial seeding, and aerial hydromulch (wet mulch with fertilizer and seed) (USFS 2001, p. 1). Rehabilitation actions following the Las Conchas Fire included road protections (removal of culverts, installation of trash racks and drainage dips); hand and aerial seeding; mulching; and removal of trees at ancestral communities (USFS 2011a, pp. 7–9; USFS 2012, pp. 1–3).

In many cases, rehabilitation actions can have further detrimental impacts on the Jemez Mountains salamander and its habitat beyond what was caused by the fire, but the USFS has made efforts to minimize such impacts (USFS 2012, pp. 1–3). For instance, following the Las Conchas Fire, rehabilitation actions in the Jemez Mountains salamander's habitat that is categorized as ''Essential'' according to the Jemez Mountains Salamander Management Plan or categorized as an ''Occupied Stand'' by the USFS were limited to small scales and included: an estimated 4.3 ac (1.7 ha) of habitat being impacted for road protections, 7.5 ac (3.0 ha) were seeded and mulched (for archeological site protection and Nordic ski trail protection), 150 ac (60.7) were disturbed for hazard tree removal (cutting trees that could be dangerous by falling onto a roadway), and 3.25 ac (1.3 ha) of bulldozer line was rehabilitated with slash placement or seeding (USFS 2011a, pp. 7–9; USFS 2012, pp. 1–3).

Some post-fire rehabilitation actions may be beneficial for the salamander. For example, contour felling can slow erosion and, in cases where aboveground rocks are not present or present in low numbers, the felled logs can also provide immediate aboveground cover. Following the Cerro Grande Fire, the BAER Team recommended felling large-diameter Douglas fir logs and cutting four disks off each log (rounds) to provide immediate cover for salamanders before summer rains (Interagency BAER Team 2000, p. 87; USFS 2001, p. 1). Similar recommendations were made after the Las Conchas Fire (BAER Survey Survey Specialist Report, 2011, p. 3). We believe these actions would benefit the salamander immediately post-fire, but these actions have not been implemented and still need to be tested. Still, some post-fire treatments (e.g., grass seeding, heavy equipment operation, bulldozing, tilling, hydromulching, mulching, erosion control fabrics, and removal of aboveground rocks to build rock dams) likely negatively impacted the salamander.

The most common BAER treatment has been grass seeding dropped from aircraft (Robichaud *et al.* 2000, p. 11; Peppin *et al.* 2010, p. 574). Nonnative grasses have typically been seeded because they are fast-growing and have extensive fibrous roots (Robichaud *et al.* 2000, p. 11); however, in more recent years, efforts have been made to use native plant species, but their use is often limited by high cost and inadequate availability (Peppin *et al.* 2010, p. 574). Overall, seeding with grass is relatively inexpensive, and has been reported to rapidly increase water infiltration and stabilize soil (Robichaud *et al.* 2000, p. 11). However, Peppin *et al.* (2010, p. 573) concluded that post-wildfire seeding in western U.S. forests does little to protect soil in the short-term, has equivocal effect on invasion of nonnative species, and can have negative effects on native vegetation recovery. Nevertheless, nonnative grasses from post-fire rehabilitation efforts have created thick mats that are impenetrable to the salamander, because the species has short legs and cannot dig tunnels. The existing spaces in the soil fill with extensive roots, altering the subterranean habitat in a manner that is unusable to the salamander. We are aware of areas that burned with moderate and high severities in the Dome Fire (eastern and southeastern part of its range), where these thick mats of grass resulting from rehabilitation still persist, and salamanders are no longer found there. It is possible that native grasses could have the same effect, because the goal of the rehabilitation effort is to stabilize the soil with quick-growing fibrous roots.

Additionally, grass seed mixtures can also contain fertilizer that is broadcast over large areas of habitat (e.g., hydromulch used in post-fire treatments for the Cerro Grande Fire). Fertilizers can contain nitrate, which is toxic to amphibians at certain levels (Rouse *et al.* 1999, p. 799). Finally, how mulching with straw post-fire affects the salamander remains unknown, but could have significant adverse effects if there is widespread use and the mulch creates an impenetrable layer or alters the microecology in the upper layers of the soil and at the soil's surface. While the effects to salamanders from seeding with nonnative grasses, use of fertilizers, or mulch application have not been specifically studied, these actions, alone or in combination, have likely caused widespread adverse impacts to the salamander. To reduce adverse effects to the salamander resulting from post-fire rehabilitation efforts following the Las Conchas Fire, efforts were made to avoid seeding in most salamander areas (USFS 2011c, p. 9), and avoiding salamander habitat was a specific criterion for grass seeding and mulching actions (USFS 2012, p. 3). Because many common post-fire treatment actions have the potential to have significant, widespread adverse effects, we anticipate habitat alterations from wildfire and post-fire rehabilitation will continue to be a threat to the salamander localities from both past and future treatments.

In summary, some post-fire treatments, such as contour felling of logs and cutting and scattering rounds, may reduce some of the short-term effects of fire to the salamander and its habitat. However, most post-fire treatments negatively impact the salamander and its habitat in the long-term. Small-scale impacts could occur from removing rocks from habitat to build rock dams, and large-scale impacts include grass seeding and associated chemicals, and possibly mulching. We conclude that while the effects of high-severity, stand-replacing wildfire are the most significant threat to the salamander and its habitat, actions taken following wildfires are also a threat to the salamander's habitat,

and are expected to continue in the future.

Fire Use

Fire use includes the combination of wildland fire use (the management of naturally ignited wildland fires to accomplish specific resource management objectives) and prescribed fire (any fire ignited by management actions to meet specific objectives) applications to meet natural resource objectives (USFS 2010b, p. 1). Fire use can benefit the salamander in the long term by reducing the risk of severe wildland fires and by returning the natural fire cycle to the ecosystem. Alternatively, other practices, such as broadcast burning (i.e., conducting prescribed fires over large areas), consume ground litter that helps to create moist conditions and stabilize soil and rocky slopes. Depending on time of year, fire use can also negatively impact the salamander when the species is active above ground (typically from July to September). However, the wet conditions required for salamander aboveground activity are often not conducive to fire. Prescribed fire in the Jemez Mountains is often planned for the fall (when the salamanders are not active above ground), because low wind and increased moisture during this time allow more control, lowering chances of the fire's escape. Because fire historically occurred prior to July (i.e., premonsoon rains), the majority of fires likely preceded the salamander's aboveground activity. Prescribed fires conducted after September, when salamanders typically return to their subterranean retreats, would be similar to a natural fire regime in the spring, with low direct impacts because most salamanders are subterranean at that time. However, it is unknown what the indirect impacts of altering the time of year when fire is present on the landscape have on the salamander and its habitat.

Other activities related to fire use that may have negative impacts to the salamander and its habitat include digging fire lines, targeting the reduction of large decaying logs, and using flares and fire-retardant chemicals in salamander habitat. Some impacts or stressors to the salamander can be avoided through seasonal timing of prescribed burns and modifying objectives (e.g., leaving large-diameter logs and mixed canopy cover) and by modifying fire management techniques (e.g., not using flares or chemicals) in salamander habitat (Cummer 2005, pp. 2–7).

As part of the Southwest Jemez Restoration Project proposal, the Santa Fe National Forest has set specific goals pertaining to salamander habitat, including reduction of the risk of high-intensity wildfire in salamander habitat, and retention of a moisture regime that will sustain high-quality salamander habitat (USFS 2009a, p. 11). The Santa Fe National Forest intends to minimize impacts to salamander habitat and to work towards recovery of the salamander (USFS 2009, p. 4), but specific actions or recommendations to accomplish this goal have not yet been determined. If the salamander's needs are not considered, fire use could make its habitat less suitable (warmer; drier; fewer large, decaying logs), and kill or injure salamanders that are active above ground. Alternatively, the salamander's habitat may benefit if seasonal restrictions and maintaining key habitat features (e.g., large logs and sufficient canopy cover to maintain moist microhabitats) are part of managing fire.

Given the current condition of forest composition and structure, the risks of severe wildland fire on a large geographic scale will take a long-term planning strategy. Fire use is critical to the long-term protection of the salamander's habitat, although some practices are not beneficial to the species and may be a threat to the salamander.

Fire Suppression Activities

Similarly, fire suppression activities may both protect and negatively impact the salamander and its habitat. For example, fire suppression actions that occurred in salamander habitat during the Cerro Grande Fire included hand line construction and bulldozer line construction (digging fire breaks down to bare mineral soil), backfiring (burning off heavy ground cover before the main fire reached that fuel source), and fire retardant drops (USFS 2001, p. 1). Fire suppression actions in modeled salamander habitat on the Santa Fe National Forest following Las Conchas Fire included 1.2 miles (mi) (1.9 kilometers (km)) of bulldozer line, 0.6 mi (0.9 km) of hand line, 1.2 mi (1.9 km) of fire retardant drop, and 1.5 ac (0.6 ha) of areas cleared for three drop points and one Medivac area (USFS 2011d, pp. 1–2). Water dropping from helicopters is another fire suppression technique used in the Jemez Mountains, where water is collected from accessible streams, ponds, or stock tanks. By dropping surface water into terrestrial habitat, there is a significant increased risk of spreading aquatic pathogens into terrestrial habitats (see *C. Disease and Predation,* below).

The impacts of fire retardants and firefighting foams to the salamander are discussed under *E. Other Natural or Manmade Factors Affecting Its Continued Existence,* below. Fire suppression actions, including the use of fire retardants, water dropping, backfiring, and fire line construction, likely impact the salamander's habitat; however, the effects of habitat impacts from fire suppression on the salamander remain unknown, and, based on the information available at this time, we determine that fire suppression actions do not appear to be a threat to the salamander's habitat. These activities improve the chances of quick fire suppression, and thus fires would be relatively smaller in scale and could have fewer impacts than a severe wildland fire. Therefore, we do not find that fire suppression activities are a threat to the salamander's habitat, nor do we expect them to become a threat in the future.

Mechanical Treatment of Hazardous Fuels

Mechanical treatment of hazardous fuels refers to the process of grinding or chipping vegetation (trees and shrubs) to meet forest management objectives. When these treatments are used, resprouting vegetation often grows back in a few years and subsequent treatment is needed. Mechanical treatment is a fuel-reduction technique that may be used alone or in combination with prescribed fire. Mechanical treatment may include the use of heavy equipment or manual equipment to cut vegetation (trees and shrubs) and to scrape slash and other debris into piles for burning or mastication. Mastication equipment uses a cutting head attached to an overhead boom to grind, chip, or crush wood into smaller pieces, and is able to treat vegetation on slopes up to 35 to 45 percent, while generally having little ground impact (soil compaction or disturbance). The debris is left on the ground where it decomposes and provides erosion protection, or it is burned after drying out.

Mechanical treatment of hazardous fuels, such as manual or machine thinning (chipping and mastication), may cause localized disturbances to the forest structure or alter ecological interactions at the soil surface that can impact the salamander and its habitat. For example, removal of overstory tree canopy or ground cover within salamander habitat may cause desiccation of soil or rocky substrates. Also, a layer of masticated material could change microhabitat conditions making it unsuitable for salamanders (e.g., altering fungal communities or physically making it difficult for salamanders to move through).

Additionally, tree-felling or use of heavy equipment has the potential to disturb the substrate, resulting in destabilization of talus and compaction of soil, which may reduce subterranean interstices (spaces) used by salamanders as refuges or movement.

Activities that compact soil, alter ecological interactions at the soil surface, remove excessive canopy cover, or are conducted while salamanders are above-ground active would be detrimental to the salamander and its habitat. A masticator is one type of heavy machinery that can be used for mechanical treatment of fuels that could potentially compact the soil and leave debris altering the soil surface ecology. In one study at a different location, a masticator was operated on existing skid trails (temporary trails used to transport trees, logs, or other forest products) and did not increase soil compaction, because the machinery traveled on existing trails covered with masticated materials (wood chips, etc.), which more evenly distributed the weight of the machinery and reduced soil compaction (Moghaddas and Stephens 2008, p. 3104). However, studies in the Jemez Mountains and effects to soils there have not been conducted.

At this time, we do not have any specific information whether mechanical treatments, including mastication, negatively impact the salamander either through altering above ground habitat or soil compaction. We encourage research on these techniques if they are to be implemented in salamander habitat. If mechanical treatment and hazardous fuels activities are conducted in a manner that minimizes impacts to the salamander and its habitat, while reducing the risk of severe wildland fire, the salamander could ultimately benefit from the reduction in the threat of severe wildland fire and the improvement in the structure and composition of the forest. However, mechanical treatments could also pose a threat to the salamander and its habitat if conducted in a manner that degrades or makes habitat unusable to the salamander. Finally, if salamanders are active above ground, any of these activities could crush salamanders present. We are not aware of any specific large-scale mechanical treatments in salamander habitat; however, mastication is an option for treatments in the Southwest Jemez Restoration Project area. We request information on mechanical treatments that may occur in salamander habitat and how those treatments may affect the salamander and its habitat.

Forest Silvicultural Practices

Many areas of the landscape in the Jemez Mountains have been fragmented by past silvicultural practices (the care and cultivation of forest trees) including commercial (trees greater than 9 inches (in) (23 centimeteres (cm)) in diameter at breast height (dbh)) and precommercial (trees less than 9 in (23 cm) dbh) timber harvesting. Much of the forests of the Jemez Mountains lack large-diameter trees and have become overgrown with small-diameter trees. While salamanders still occupy areas where timber harvesting has occurred, the effects of past silvicultural practices continue to adversely affect the salamander and its habitat through the absence of large-diameter trees that, when they fall and decompose, provide high-quality aboveground habitat, through the contribution of high fuels increasing the risk of large-scale stand-replacing wildfire, and cascading effects on soil moisture and temperature.

From 1935 to 1972, logging (particularly clear-cut logging) was conducted on VCNP (ENTRIX 2009, p. 164). These timber activities resulted in about 50 percent of VCNP being logged, with over 1,000 mi (1,600 km) of 1960s-era logging roads (ENTRIX 2009, p. 164) being built in winding and spiraling patterns around hills (ENTRIX 2009, pp. 59–60). On the VCNP, 95 percent of forest stands contain dense thickets of small-diameter trees, creating a multi-tiered forest structure (VCNP 2010, pp. 3.3–3.4). This multi-tiered forest structure is similar to surrounding areas, and provides ladder fuels that favor the development of crown fires (as opposed to high-intensity, habitat-destroying ground fires) (Allen 2001, pp. 5–6; USFS 2009a, p. 10). Additionally, all forest types on the VCNP contain very few late-stage mature trees greater than 16 in (41 cm) dbh (less than 10 percent of the overall cover) (VCNP 2010, pp. 3.4, 3.6–3.23). The lack of large trees is an artifact of intense logging, mostly from clear-cutting practices in the 1960s (VCNP 2010, p. 3.4). Clear-cutting degrades forest floor microhabitats for salamanders by eliminating shading and leaf litter, increasing soil surface temperature, and reducing moisture (Petranka 1998, p. 16).

In a study comparing four logged sites and five unlogged sites in Jemez Mountains salamander habitat, Ramotnik (1986, p. 8) reports that a total of 47 salamanders were observed at four of the five unlogged sites, while no salamanders were observed on any of the logged sites. We do not know if salamanders actually occupied the logged sites prior to logging, but significant differences in habitat features (soil pH, litter depth, and log size) between the logged and unlogged sites were reported (Ramotnik 1986, p. 8). On the unlogged sites, salamanders were associated with cover objects that were closer together and more decayed, and that had a higher canopy cover, greater moss and lichen cover, and lower surrounding needle cover, compared to cover objects on logged sites (Ramotnik 1986, p. 8). Cover objects on logged sites were less decomposed and accessible by the salamanders, had a shallower surrounding litter depth, and were associated with a more acidic soil than were cover objects on the unlogged sites (Ramotnik 1986, p. 8). Based on the differences between logged and unlogged sites, we believe that logging can destroy or modify the Jemez Mountains salamander's habitat in such a way that it becomes uninhabitable or less suitable for the species.

Consistent with the findings of Ramotnik (1986, p. 8), deMaynadier and Hunter (1995; in Olson *et al.* 2009, p. 6) reviewed 18 studies and found that salamander abundance after timber harvest was 3.5 times greater on control (unlogged) areas than in clear-cut areas. Furthermore, Petranka *et al.* (1993; in Olson *et al.* 2009, p. 6) found that *Plethodon* abundance and richness in mature forest were five times higher than in recent clear-cut areas, and they estimated that it would take as much as 50 to 70 years for clear-cut populations to return to preclearcut levels. We do not know the amount of time it might take for Jemez Mountains salamanders to recover from habitat alterations resulting from clear-cut logging, particularly because of concurrent and ongoing factors affecting forest stand conditions (e.g., fire suppression, livestock grazing, changes in vegetation composition and structure).

The majority of Jemez Mountains salamander habitat has been heavily logged, which has resulted in changes in stand structure, including a paucity of large-diameter trees. This lack of large-diameter trees means that there is a limited source for future large, decaying logs that provide high-quality (e.g., relatively cool, high-moisture diurnal retreats) aboveground habitat. Ramotnik (1986, p. 12) reported that logs with salamanders were significantly larger and wetter than those without salamanders, and most salamanders were found in well-decomposed logs. In a similar plethodontid salamander, large logs provide refuge from warmer temperatures and resiliency from impacts that can warm and dry habitat (Kluber *et al.* 2009, p. 31). In summary,

there are less high-quality salamander habitat features and no material for future high-quality salamander habitat features in areas where large-diameter trees have been removed.

On the VCNP, only minor selective logging has occurred since 1972, and it is expected that some thinning of secondary growth forests will continue to occur to prevent severe wildfires. However, no commercial logging is proposed or likely in the foreseeable future (Parmenter 2009b, cited in Service 2010). Although commercial timber harvest on the Santa Fe National Forest has declined appreciably since 1988 (Fink 2008, pp. 9, 19), the effects from historical logging and associated roads will continue to be a threat to the salamander.

The historical clear-cut logging practices in the Jemez Mountains have likely led to significant habitat loss for the salamander. The cutting has contributed to current stand conditions (high fuels), and the forest lacks large-diameter trees for future high-quality aboveground cover objects. We believe that the effects from historical, clear-cut logging are currently affecting the salamander and its habitat, and will continue to do so in the future.

Salvage cutting (logging) removes dead, dying, damaged, or deteriorating trees while the wood is still merchantable (Wegner 1984, p. 421). Sanitation cutting, similar to salvage, removes the same kinds of trees, as well as those susceptible to attack from biotic pests (Wegner 1984, p. 421). Both types of cutting occur in the Jemez Mountains salamander's habitat, and are referred to as ''salvage logging.'' Salvage logging is a common management response to forest disturbance (Lindenmayer *et al.* 2008, p. 4) and, in the salamander's habitat, is most likely to occur after a forest die-off resulting from fire, disease, insects, or drought. The purposes for salvage logging in the Jemez Mountains have included firewood for local use, timber for small and large mills, salvage before decay reduces the economic value of the trees, creation of diverse healthy and productive timber stands, management of stands to minimize insect and disease losses (USFS 1996, p. 4), and recovery of the timber value of fire-killed trees (USFS 2003, p. 1). When conducted in the salamander's habitat, salvage logging can further reduce the quality of the salamander's habitat remaining after the initial disturbance, by removing or reducing the shading afforded by dead standing trees (Moeur and Guthrie 1984, p. 140) and future salamander cover objects (removal of trees precludes their recruitment to the forest floor), and by interfering with habitat recovery (Lindenmayer *et al.* 2008, p. 13).

Recent salvage logging within the range of the Jemez Mountains salamander occurred following the 2002 Lakes and BMG Wildfire. The USFS stated that mitigation measures for the Lakes and BMG Wildfire Timber Salvage Project would further protect the salamander and enhance salamander habitat by immediately providing slash and fallen logs (USFS 2003, pp. 4–5). Mitigation for the salvage logging project included conducting activities during winter to avoid soil compaction (as the ground is more likely to be frozen and hard at that time), and providing for higher snag retention (by leaving all Douglas fir trees (16 percent fire-killed trees) and 10 percent of other large snags) to provide future fallen log habitat (USFS 2003, p. 29). These mitigation measures were developed in consultation with NMEST in an effort to minimize impacts to the Jemez Mountains salamander from salvage logging; however, NMEST recommended that salvage logging be excluded from occupied salamander habitat because it was not clear that, even with the additional mitigations, it would meet the conservation objectives of the Cooperative Management Plan (NMEST 2003, p. 1).

The mitigation measures would likely benefit the salamander in the short term if conducted without salvage logging. It is not known if mitigation measures offset the impacts of salvage logging in salamander habitat; however, Lindenmayer *et al.* (2008, p. 13) reports that salvage logging interferes with natural ecological recovery and may increase the likelihood and intensity of subsequent fires. We believe that removal of trees limits the amount of future cover and allows additional warming and drying of habitat. The potential for large-scale forest die-offs from wildfire, insect outbreak, disease, or drought is high in the Jemez Mountains, which may result in future salvage logging in salamander habitat. We believe that salvage logging in salamander habitat further diminishes habitat quality and may be a determining factor of salamander persistence subsequent to forest die-off.

Some timber harvest activities likely pose no threat to the continued existence of the Jemez Mountains salamander. For example, removal of trees that may pose a safety hazard may have minimal disturbance to surrounding soils or substrates, especially if removal is conducted when the species is not active above ground (i.e., seasonal restrictions). This type of localized impact may affect a few individuals, but it is not likely to affect a population or be considered a threat. Likewise, precommercial thinning (removal of trees less than 9 in (23 cm) dbh or shrub and brush removal (without the use of herbicides) to control vegetation, and without disturbing or compacting large areas of the surrounding soils, likely could be conducted without adverse effects to the salamander or its habitat.

In summary of forest silvicultural practices, impacts from past commercial logging activities continue to have detrimental effects to the salamander and its habitat. These past activities removed large-diameter trees, altered forest canopy structure, created roads, compacted soil, and disturbed other important habitat features. These effects of historical logging include the warming and drying of habitat, and a paucity of large cover objects (decaying logs) that would have contributed to habitat complexity and resiliency. Salvage logging further diminishes salamander habitat subsequent to disturbance. Therefore, we conclude that the salamander continues to face threats from current forest silvicultural practices, including salvage logging. These actions are smaller in scale relative to the range of the species, and we are not aware of any proposals to salvage-log the large area of the Las Conchas burn area. However, the habitat-warming and drying effect of these actions may cause additional detrimental disturbance to habitat in areas burned by severe wildfire. We also conclude that the salamander continues to face threats resulting from the habitat-related effects of historical logging activities because high-quality, high-moisture retreats are presently fewer, and future opportunities for high-quality, high-moisture retreats will be extremely rare. Because all salamander life functions and activities are based on the individual's water balance, limiting opportunities for hydration affects all other aspects of survival and reproduction, greatly contributing to the risk of extinction. This significant threat is occurring now and will continue into the future.

Dams

Following the 2000 Cerro Grande Fire, water retention dams were constructed within potential salamander habitat to minimize soil erosion within burned areas (NMDGF 2001, p. 1; NMEST 2002, pp.1–2; Kutz 2002, p. 1). Because these types of structures were installed to slow erosion subsequent to wildfire, additional dams or flood control features could be constructed within salamander habitat in the future

following severe wildland fires. Some individual salamanders may be killed or injured by this activity; however, the impact to the species and habitat from construction of retention dams would be relatively minor. For this reason, we do not consider the construction of dams to currently be a significant threat to the salamander, nor do we expect dam construction to be a threat to the species in the future.

Mining

Pumice mining activities (e.g., Copar Pumice Company, the Copar South Pit Pumice Mine, and the El Cajete Pumice Mine) have been evaluated for impacts to the salamander (USFS 1995, pp. 1–14; 1996, pp. 1–3). Pumice mines are located within areas of volcanic substrate that are unlikely to support salamanders (USFS 2009c, p. 2). However, associated infrastructure from expansion of the El Cajete Mine, such as access roads and heavy equipment staging areas, may have the potential to be located in potential salamander habitat. Although no decision on authorizing the extension to the El Cajete Mine has been made (USFS 2009. p. 2), these activities would be small in scale and not likely considered a threat to the species, either currently or in the future.

Private (Residential) Development

In our 12-month finding (75 FR 54822; September 9, 2010), we found that residential development was a threat to the salamander, because we visually assessed salamander occurrences on a map and it appeared that private lands contained substantially sized, contiguous areas of salamander habitat, with the potential for future development. However, after conducting a GIS (Geographical Information System) analysis for this rule (see *Criteria Used To Identify Critical Habitat,* below), we found that only 3 percent (2,817 ac (1,140 ha) of the total modeled habitat are private lands, of which 719 ac (291 ha) include the Pajarito Ski area, where the habitat is already developed and unlikely to be suitable for the salamander in the long term (see Recreation, below). The remaining areas of private lands occur as noncontiguous scattered parcels. However, some private lands, as well as areas with salamander habitat on the Santa Fe National Forest, could be developed for private use (USFS 1997, pp. 1–4; USFS 1998, pp. 1–2).

Development can destroy and fragment the salamander's habitat through the construction of homes and associated infrastructure (e.g., roads, driveways, and buildings), making those areas unusable to salamanders and likely resulting in mortalities to salamanders within those areas. Furthermore, as the human population continues to increase in the Jemez Mountains, we believe development will likely continue to directly affect the salamander and its habitat in the future. These activities will likely be in the form of new housing and associated roads and infrastructure. Although we anticipate some loss and degradation of habitat from these activities, salamander habitat on private lands is smaller and more isolated than we thought prior to our GIS analysis. Moreover, we found very few salamander occurrences on private lands. For these reasons, we believe that private residential development has the potential to impact the salamander and its habitat, but does not constitute a significant threat to the species.

Geothermal Development

A large volcanic complex in the Jemez Mountains is the only known high-temperature geothermal resource in New Mexico (Fleischmann 2006, p. 27). Geothermal energy was explored for possible development on the VCNP between 1959 and 1983 (USFS 2007, p. 126). In July 1978, the U.S. Department of Energy, Union Oil Company of California (Unocal), and the Public Service Company of New Mexico began a cooperative geothermal energy project (USFS 2007, p. 126). The demonstration project drilled 20 exploratory wells over the next 4 years. One of the geothermal development locations was south of Redondo Peak on the VCNP, and the canyon in this area was occupied by the salamander (Sabo 1980, pp. 2–4). An Environmental Impact Statement analyzed a variety of alternatives, including placement of transmission towers and lines (U.S. Department of Energy cited in Sabo 1980, pp. 2–5). Nevertheless, the project ended in January 1982, because Unocal's predictions concerning the size of geothermal resources were not met. Out of the 40 wells drilled in the Valles Caldera in the Redondo Creek and Sulphur Springs areas, only a few yielded sufficient resources to be considered production wells (USFS 2007, p. 126). In some cases, these wells were drilled in the salamander's habitat and concrete well pads were built.

Although the geothermal resources are found within the range of the salamander in the Jemez Mountains, extraction of large quantities of hot fluids from these rocks has proven difficult and not commercially viable (USFS 2007, p. 127). As such, we are not aware of any current or future plans to construct large or small-scale geothermal power production projects within salamander habitat. Moreover, in 2006, the mineral rights on the VCNP were condemned, including geothermal resources (VallesCaldera.com 2010, p. 1). For these reasons, geothermal development does not present a current or future threat to the salamander.

Roads, Trails, and Habitat Fragmentation

Construction of roads and trails has historically eliminated or reduced the quality or quantity of salamander habitat, reducing blocks of native vegetation to isolated fragments, and creating a matrix of native habitat islands that have been altered by varying degrees from their natural state. Allen (1989, pp. 46, 54, 163, 216–242, and 302) collected and analyzed changes in road networks (railroads, paved roads, improved roads, dirt roads, and primitive roads) in the Jemez Mountains from 1935 to 1981. Landscape-wide road density increased 11.75 times, from 0.24 mi (0.38 km) of road per square mi (2.6 square km) in 1935, to 2.8 mi (4.5 km) of road per square mi (2.6 square km) in 1981, and in surface area of from 0.13 percent (610 ac; 247 ha) to 1.7 percent (7,739 ac; 3,132 ha) (Allen 1989, pp. 236–240). Allen (1989, p. 240) reports that of 5,246 mi (8,443 km) of roads in the Jemez Mountains in 1981, 74 percent were mapped on USFS lands (2,241 mi; 3,607 km) and private lands (1,646 mi; 2,649 km). These roads generally indicate past logging activity of USFS and private lands (Allen 1989 p. 236).

Ongoing effects of roads and their construction on the VCNP may exceed the effects of the timber harvests for which the roads were constructed (Balmat and Kupfer 2004, p. 46). The majority of roads within the range of the salamander are unpaved, and the compacted soil typically has very low infiltration rates that generate large amounts of surface runoff (Robichaud *et al.* 2010, p. 80). Increasing runoff, decreasing infiltration, and increasing edge effects (open areas along roads) has led to the drying of adjacent areas of salamander habitat.

The construction of roads and trails (motorized vehicle, bicycle, and foot trails) degrades habitat by compacting soil and eliminating interstitial spaces above and below ground. Roads are known to fragment terrestrial salamander habitat and act as partial barriers to movement (deMaynadier and Hunter 2000, p. 56; Marsh *et al.* 2005, p. 2004). Furthermore, roads and trails reduce or eliminate important habitat features (e.g., lowering canopy cover or

drying of soil) and prevent gene flow (Saunders *et al.* 1991, p. 25; Burkey 1995, pp. 527, 528; Frankham *et al.* 2002, p. 310; Noss *et al.* 2006, p. 219). Vehicular and off-highway vehicle (OHV) use of roads and trails can kill or injure salamanders. We consider the establishment of roads and trails to be a threat that will likely continue to impact the salamander and its habitat, increasing the risk of extirpation of some localities.

Road clearing and maintenance activities can also cause localized adverse impacts to the salamander from scraping and widening roads and shoulders or maintaining drainage ditches or replacing culverts. These activities may kill or injure individuals through crushing by heavy equipment. Existing and newly constructed roads or trails fragment habitat, increasing the chances of extirpation of isolated populations, especially when movement between suitable habitat is not possible (Burkey 1995, p. 540; Frankham *et al.* 2002, p. 314). Isolated populations or patches are vulnerable to random events, which could easily destroy part of or an entire isolated population, or decrease a locality to such a low number of individuals that the risk of extirpation from human disturbance, natural catastrophic events, or genetic and demographic problems (e.g., loss of genetic diversity, uneven male to female ratios) would increase greatly (Shaffer 1987, p. 71; Burkey 1995, pp. 527, 528; Frankham *et al.* 2002, pp. 310–324).

Terrestrial salamanders are impacted by edge effects, typically adjacent to roads and areas of timber harvest, because microclimate conditions within forest edges often exhibit higher air and soil temperatures, lower soil moisture, and lower humidity, compared to interior forested areas (Moseley *et al.* 2009, p. 426). Moreover, by creating edge effects, roads can reduce the quality of adjacent habitat by increasing light and wind penetration, exposure to pollutants, and the spread of invasive species (Marsh *et al.* 2005, pp. 2004–2005). Due to the physiological nature of terrestrial salamanders, they are sensitive to these types of microclimate alterations, particularly to changes to temperature and moisture (Moseley *et al.* 2009, p. 426). Generally, more salamanders are observed with increasing distance from some edge types, which is attributed to reduced moisture and microhabitat quality (Moseley *et al.* 2009, p. 426).

On the western part of the species' range, road construction on New Mexico State Highway 126 around the town of Seven Springs occurred in occupied salamander habitat in 2007 and 2008. Measures were implemented by the USFS to reduce the impact of these road construction activities on salamanders, including limiting construction to times when salamanders would not be active above ground (October through June) and felling of approximately 300 trees in the project area to replace large woody debris that was being used by the salamander but removed by the road construction. However, these measures only offered some protection for salamanders and their habitat outside the project footprint. The rerouting and construction of Highway 126 went through the middle of a large salamander population where 24 ac (9.7 ha) of salamander habitat were directly impacted by this project (USFS 2009c, p. 2). This project destroyed and made unusable the 24 ac (9.7 ha). Also, the project fragmented the occupied salamander habitat remaining outside of the 24-ac (9.7-ha) footprint, because the new road has a nearly vertical cut bank and salamanders will not be able to cross it. Continued maintenance of State Highway 126 in the future will likely involve the use of salts for road de-icing, and increase the exposure of adjacent areas to chemicals and pollution from vehicular traffic. Habitat fragmentation of and subsequent edge effects due to this road construction project have reduced the quality and quantity of salamander habitat in this part of its range.

In 2007, the NMEST concluded that impacts from OHVs and motorcycles were variable depending on their location relative to the salamander's habitat. Because the width of a trail is generally smaller than a road, canopy cover typically remains over trails. In some cases (e.g., flat areas without deeply cut erosion), the trails do not likely impede salamander movement. Alternatively, severe erosion caused by heavy trail use by motorcycles or OHVs in some places formed trenches approximately 2 ft wide by 2 to 3 ft deep (0.6 m wide by 0.6 to 0.9 m deep), which would likely prevent salamander movement, fragment local populations, and trap salamanders that fall into the trenches. Therefore, OHVs and motorcycles could severely impact the salamander's habitat.

On November 9, 2005, the USFS issued the Travel Management Rule that requires designation of a system of roads, trails, and areas for motor vehicle use by vehicle class and, if appropriate, by time of year (70 FR 68264). As part of this effort, the USFS inventoried and mapped roads and motorized trails, and is currently completing a Final Environmental Impact Statement to change the usage of some of the current system within the range of the salamander. The Santa Fe National Forest is attempting to minimize the amount of authorized roads or trails in known occupied salamander habitat and will likely prohibit the majority of motorized cross-country travel within the range of the species (USFS 2009c, p. 2; USFS 2010c p. 95). Nevertheless, by closing some areas to OHV use, the magnitude of impacts in areas open to OHV use in salamander habitat will be greater (NMEST 2008, p. 2). We acknowledge that some individual salamanders may be killed or injured by vehicles and OHVs and that OHV use impacts salamander habitat. However, we believe the Santa Fe National Forest is attempting to minimize impacts to the salamander and its habitat. Furthermore, we believe that the revised travel management regulations will reduce the impact of motorized vehicles on the salamander and its habitat by providing a consistent policy that can be applied to all classes of motor vehicles, including OHVs. We consider unmanaged OHV and motorcycle use to be a threat to the salamander, but with the implementation of the forthcoming management of motorized trails on the Santa Fe National Forest, the threat will be greatly reduced.

In summary, the extensive roads that currently exist in the Jemez Mountains have significantly impacted the salamander and its habitat due to the possible death and injury of salamanders; fragmentation and population isolation; habitat loss; habitat modification near road edges; and in some cases, increased exposure to chemicals, salts, and pollution. Roads associated with private development are most likely to be constructed or expanded in the future in the southern and eastern portions of the species' range, because this part of the species' range has the most private land. Also, new roads may also be constructed through Federal lands within the salamander's range, but such construction is unlikely because the Santa Fe National Forest is attempting to reduce roads and road usage in the Jemez Mountains. Roads and trails have significantly fragmented habitat and likely reduced persistence of existing salamander localities. Therefore, we consider roads, trails, and the resulting habitat fragmentation to be a threat to the Jemez Mountains salamander and its habitat now and in the future.

Recreation

The Jemez Mountains are heavily used for recreational activities that impact the species, including camping, hiking, mountain biking, hunting, and

skiing; OHV use is addressed above. Located in the southwestern Jemez Mountains is the Jemez National Recreation Area. The Jemez National Recreation Area comprises 57,650 acres (23,330 ha), and is managed by the U.S. Forest Service for the promotion of fishing, camping, rock climbing, hunting, and hiking. It is estimated that nearly 1.6 million people visit the Jemez National Recreation Area for recreational opportunities each year (Jemez National Recreation Area 2002, p. 2). Despite an existing average road density of approximately 2.5 mi (4.0 km) of road per square mi (2.6 square km) on the Jemez National Recreation Area, off-road use continues to occur, resulting in new roads being created, or decommissioned roads being reopened (Jemez National Recreation Area 2002, pp. 10–11).

Using current population and travel trends, the potential visitation demand on the VCNP is between 250,000 and 400,000 visits per year (Entrix 2009, p. 93). Of this projection, the VCNP is expected to realize 120,000 visitors per year by the year 2020 (Entrix 2009, p. 94). To put this in context, from 2002 to 2007 the VCNP averaged about 7,600 visitors per year (Entrix 2009, p. 13). Bandelier National Monument, which has a smaller proportion of salamander habitat relative to the Santa Fe National Forest or VCNP, attracts an average annual visitation of more than 250,000 people (Entrix 2009, p. 92). Fenton Lake State Park in the western part of the species' range also contains salamander habitat. The park received more than 120,000 visitors on its 70 ac (28 ha) containing hiking trails and a fishing lake (Entrix 2009, p. 92).

Campgrounds and associated parking lots and structures have likely impacted the salamander's habitat through modification of small areas by soil compaction and vegetation removal. Similarly, compaction of soil from hiking or mountain biking trails has modified a relatively small amount of habitat. The majority of these trails likely do not act as barriers to movement nor create edge effects similar to roads, because they are narrow and do not reduce canopy cover. However, similar to OHV trails, deeply eroded mountain bike trails could act as barriers and entrap salamanders.

The Pajarito Ski Area in Los Alamos County was established in 1957 and expanded through 1994. Ski runs were constructed within salamander habitat. A significant amount of high-quality habitat (north-facing mountain slopes with mixed-conifer forests and many salamander observations (New Mexico Heritage Program 2010a and b, spreadsheets) was destroyed with construction of the ski areas, and the runs and roads have fragmented and created a high proportion of edge areas. Nevertheless, surveys conducted in 2001 in two small patches of forested areas between ski runs detected salamanders (Cummer *et al.* 2001, pp. 1, 2). Most areas between runs remain unsurveyed. However, because of the large amount of habitat destroyed, the extremely small patch sizes that remain, and relatively high degree of edge effects and fragmentation, the salamander will likely not persist in these areas in the long term.

Adjacent to the downhill ski runs are cross country ski trails. These trails are on USFS land, but maintained by a private group. In 2001, trail maintenance and construction with a bulldozer was conducted by the group in salamander habitat during salamander aboveground activity period (NMEST 2001, p. 1). Trail maintenance was reported as leveling all existing ski trails with a bulldozer, which involved substantial soil disturbance, cutting into slopes as much as 2 ft (0.6 m), filling other areas in excess of 2 ft (0.6 m), widening trails, and downing some large trees (greater than 10 in (25 cm) dbh), ultimately disturbing approximately 2 to 5 ac (1 to 2 ha) of occupied salamander habitat (Sangre de Christo Audubon Society 2001, pp. 2–3). This type of trail maintenance, while salamanders were active above ground, may have resulted in direct impacts to salamanders, and further fragmented and dried habitat. We do not know if there are future plans to modify or expand the existing ski area.

The Jemez Mountains are currently heavily used for recreational activities, and, as human populations in New Mexico continue to expand, there will likely be an increased demand in the future for recreational opportunities in the Jemez Mountains. Therefore, we conclude that recreational activities are currently a threat to the salamander, and will continue to be a threat in the future.

Livestock Grazing

Historical livestock grazing contributed to changes in the Jemez Mountains ecosystem by removing understory grasses, contributing to altered fire regimes and vegetation composition and structure, and increasing soil erosion. Livestock grazing generally does not occur within salamander habitat, because cattle concentrate outside of forested areas where grass and water are more abundant. We have no information that indicates livestock grazing is a direct or indirect threat to the salamander or its habitat. However, small-scale habitat modification, such as livestock trail establishment or trampling in occupied salamander habitat, is possible. The USFS and VCNP manage livestock to maintain fine grassy fuels, and should not limit low-intensity fires in the future. Although some small-scale habitat modification is possible, livestock are managed to maintain a grassy forest understory. Therefore, we do not consider livestock grazing to be a current threat to the salamander's habitat, nor do we anticipate that it will be in the future.

Summary

In summary of Factor A, the salamander and its habitat experience threats from historical and current fire management practices; severe wildland fire; forest composition and structure conversions; post-fire rehabilitation; forest management (including silvicultural practices); roads, trails, and habitat fragmentation; and recreation. Because these threats warm and dry habitat, they affect all behavioral and physiological functions of the species, and ultimately reduce the survivorship and reproductive success of salamanders across the entire range of the species, greatly impacting the salamander and its habitat. Further, these significant threats are occurring now and are expected to continue in the future. We, therefore, determine that the present or threatened destruction, modification, or curtailment of habitat and range represents a current significant threat to the salamander, and will continue to be so in the future.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Between 1960 and 1999, nearly 1,000 salamanders were collected from the wild for scientific or educational purposes (Painter 1999, p. 1). The majority (738 salamanders) were collected between 1960 and 1979 (Painter 1999, p. 1). Since 1999, very few salamanders have been collected, and all were collected under a valid permit, issued by either NMDGF or USFS. This species is difficult to maintain in captivity, and we know of no salamanders in the pet trade or in captivity for educational or scientific purposes.

In 1967, salamanders were only known from seven localities (Reagan 1967, p. 13). Only one of these localities (the ''Type Locality'') was described as having an ''abundant salamander population'' (Reagan 1967, p. 8). The species was originally described using specimens collected from this

population, which is located the southern portion of the species' range (Stebbins and Reimer 1950, pp. 73–80). Many researchers went to this site for collections and studies. Reagan (1967, p. 11) collected 165 salamanders from this locality between 1965 and 1967, whereas Williams collected an additional 67 of 659 salamanders found at this locality in 1970 (1972, p. 11). The information regarding the disposition of the 659 salamanders in this study is unclear, and it is possible more of these individuals were collected. Nonetheless, an unspecified but ''large percentage'' of the nearly 1,000 collected salamanders was reported from the ''Type Locality'' (Painter 1999, p.1) and was deposited as museum specimens around the country. Although surveys have been conducted at this locality since the 1990s, no salamanders have been found, suggesting that salamanders in the area may have been extirpated from overcollection. We are not aware of any other localities where the species has been extirpated from overcollection. Nevertheless, it is possible that repeated collections of individuals can lead to extirpation. We believe this is no longer a threat, because collections are stringently regulated through permits issued by NMDGF and the USFS (see Factor D, below). Due to these measures, we do not believe that collection will be a threat in the future.

Survey techniques associated with scientific inquiries and monitoring the salamander can alter salamander habitat by disturbing and drying the areas underneath the objects that provide cover, and by destroying decaying logs as a result of searching inside them. Beginning in 2011, the Service, NMDGF, and other partners are hosting annual training workshops to train surveyors on techniques that will minimize adverse effects to salamanders and their habitat, including replacing cover objects as they were found and leaving part of every log intact; however, impacts will still occur. When surveys are dispersed and there are multiple intervening years, impacts are likely lessened; however, when a location is repeatedly surveyed, habitat quality is diminished. We are aware of a few locations that have received impacts from repeated surveys for demographic studies conducted by NMDGF, but those studies have since concluded (NMDGF 2000, p. 1). We are currently working with the NMDGF, the USFS, and other partners on a survey protocol testing the efficacy of artificial cover objects to further minimize impacts to the salamander and its habitat.

We do not have any recent evidence of threats to the salamander from overutilization for commercial, recreational, scientific, or educational purposes, and we have no reason to believe this factor will become a threat to the species in the future. Therefore, based on a review of the available information, we do not consider overutilization for commercial, recreational, scientific, or educational purposes to be a threat to the salamander now or in the future.

C. Disease or Predation

The amphibian pathogenic fungus *Batrachochytrium dendrobatidis* (*Bd*) was found in a wild-caught Jemez Mountains salamander in 2003 on the east side of the species' range and again in another Jemez Mountains salamander in 2010 on the west side of the species' range (Cummer *et al.* 2005, p. 248; Pisces Molecular 2010, p. 3). *Batrachochytrium dendrobatidis* causes the disease chytridiomycosis, whereby the *Bd* fungus attacks keratin in amphibians. In adult amphibians, keratin primarily occurs in the skin. The symptoms of chytridiomycosis can include sloughing of skin, lethargy, morbidity, and death. Chytridiomycosis has been linked with worldwide amphibian declines, die-offs, and extinctions, possibly in association with climate change (Pounds *et al.* 2006, p. 161).

In New Mexico, *Bd* has caused significant population declines and local extirpations in the federally threatened Chiricahua leopard frog (*Lithobates chiricahuensis*) (USFWS 2007, p. 14). It is also implicated in the decline of other leopard frogs and the disappearance of the boreal toad (*Bufo boreas*) from the State (NMDGF 2006, p. 13). Prior to the detection of *Bd* in the Jemez Mountains salamander, *Bd* was considered an aquatic pathogen (Longcore *et al.* 1999, p. 221; Cummer *et al.* 2005, p. 248). The salamander does not have an aquatic life stage and is strictly terrestrial; thus the mode of transmission of *Bd* remains unknown. It is possible that the fungus was transported by other amphibian species that utilize the same terrestrial habitat. Both the tiger salamander (*Ambystoma tigrinum*) and the boreal chorus frog (*Pseudacris maculata*) are amphibians that have aquatic life stages and share terrestrial habitat with the Jemez Mountains salamander. In California, *Bd* has been present in wild populations of another strictly terrestrial salamander since 1973, without apparent population declines (Weinstein 2009, p. 653).

Cummer (2006, p. 2) reported that noninvasive skin swabs from 66 Jemez Mountains salamanders, 14 boreal chorus frogs, and 24 tiger salamanders from the Jemez Mountains were all negative for *Bd.* Approximately 30 additional Jemez Mountains salamanders have been tested through 2010, resulting in the second observation of *Bd* in the salamander. Overall, sampling for *Bd* from Jemez Mountains salamanders has been limited and only observed on two salamanders. The observation of *Bd* in the salamander indicates that the species is exposed to the pathogen and could acquire infection; however, whether the salamander will get or is susceptible to chytridiomycosis remains unknown. Although *Bd* can be highly infectious and can lead to disease and death, the pathogenicity of *Bd* and amphibians varies greatly among and within amphibian species.

Bd may be a threat to the Jemez Mountains salamander, because we know that this disease is a threat to many other species of amphibians, and the pathogen has been detected in the salamander. Currently, there is a lack of sufficient sampling to definitely conclude that *Bd* is a threat, but the best available information indicates that it could be a threat, and additional sampling and studies are needed. We intend to continue monitoring for the prevalence of *Bd* in the salamander to determine if disease rises to a level of a threat to the salamander now or in the future, and we request information on any potential threat posed by disease to the Jemez Mountains salamander.

Indirect effects from livestock activities may include the risk of aquatic disease transmission from earthen stock ponds that create areas of standing surface water. Earthen stock tanks are often utilized by tiger salamanders, which are known to be vectors for disease (i.e., they can carry and spread disease) (Davidson *et al.* 2003, pp. 601–607). Earthen stock tanks can also concentrate tiger salamanders, increasing chances of disease dispersal to other amphibian species. Some tiger salamanders use adjacent upland areas and may transmit disease to Jemez Mountains salamanders in areas where they co-occur. However, we do not have enough information to draw conclusions on the extent or role tiger salamanders may play in disease transmission. The connection between earthen stock tanks for livestock and aquatic disease transmission to Jemez Mountains salamanders is unclear.

We are not aware of any unusual predation outside of what may normally occur to the species by predators such as snakes (Squamata), shrews (Soricidae), skunks (Mephitidae), black

bears (*Ursus americanus*), and owls (Strigiformes).

In summary, we have no information indicating that predation is a threat to the Jemez Mountains salamander now or in the future. Also, the best available information does not indicate that disease is a threat to the salamander's continued existence now, but it could be a threat in the future. However, additional sampling and studies are needed.

D. The Inadequacy of Existing Regulatory Mechanisms

State Regulations

New Mexico State law provides some protection to the salamander. The salamander was reclassified by the State of New Mexico from threatened to endangered in 2005 (NMDGF 2005, p. 2). This designation provides protection under the New Mexico Wildlife Conservation Act of 1974 (i.e., State Endangered Species Act) (19 NMAC 33.6.8) by prohibiting direct take of the species without a permit issued from the State. The New Mexico Wildlife Conservation Act defines ''take'' or ''taking'' as harass, hunt, capture, or kill any wildlife or attempt to do so (17 NMAC 17.2.38). In other words, New Mexico's classification as an endangered species only conveys protection from collection or harm to the animals themselves without a permit. New Mexico's statutes are not designed to address habitat protection, indirect effects, or other threats to these species, and one of the primary threats to the salamander is the loss, degradation, and fragmentation of habitat, as discussed in Factor A. There is no provision for formal consultation process to address the habitat requirements of the species or how a proposed action may affect the needs of the species. Because most of the threats to the species are from effects to habitat, protecting individuals, without addressing habitat threats, will not ensure the salamander's long-term conservation and survival.

Although the New Mexico State statutes require the NMDGF to develop a recovery plan that will restore and maintain habitat for the species, the Jemez Mountains salamander does not have a finalized recovery plan. The Wildlife Conservation Act (N.M. Stat. Ann. §§ 17–2–37–46 (1995)) states that, to the extent practicable, recovery plans shall be developed for species listed by the State as threatened or endangered. While the species does not have a finalized recovery plan, NMDGF has the authority to consider and recommend actions to mitigate potential adverse effects to the salamander during its review of development proposals. However, there is no requirement to follow the State's recommendations, as was demonstrated during the construction and realignment of Highway 126, when NMDGF made recommendations to limit impacts to the salamander and its habitat, but none of the measures recommended were incorporated into the project design (New Mexico Game Commission 2006, pp. 12–13) (see *A. Present or Threatened Destruction, Modification, or Curtailment of the Species' Habitat or Range* section, above).

Federal Regulations

Under the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 *et seq.*) and the National Forest Management Act of 1976 (16 U.S.C. 1600 *et seq.*), the USFS is directed to prepare programmatic-level management plans to guide long-term resource management decisions. Under this direction, the salamander has been on the Regional Forester's Sensitive Species List since 1990 (USFS 1990). The Regional Forester's Sensitive Species List policy is applied to projects implemented under the 1982 National Forest Management Act Planning Rule (49 FR 43026, September 30, 1982). All existing plans continue to operate under the 1982 Planning Rule and all of its associated implementing regulations and policies.

The intent of the Regional Forester's sensitive species designation is to provide a proactive approach to conserving species, to prevent a trend toward listing under the Act, and to ensure the continued existence of viable, well-distributed populations. The USFS policy (FSM 2670.3) states that Biological Evaluations must be completed for sensitive species and signed by a journey-level biologist or botanist. The Santa Fe National Forest will continue developing biological evaluation reports and conducting analyses under the National Environmental Policy Act (42 U.S.C. 4321 *et seq.*) for each project that will affect the salamander or its habitat. As noted above, the Santa Fe National Forest may implement treatments under the Collaborative Forest Landscape Restoration project that, if funded and effective, have the potential to reduce the threat of severe wildland fire in the southern and western part of the salamander's range over the next 10 years (USFS 2009c, p. 2). At this time, matching funding for the full implementation of the project is not certain, nor is it likely to address short-term risk of severe wildland fire. While the Regional Forester's sensitive species designation provides for consideration of the salamander during planning of activities, it does not preclude activities that may harm salamanders or their habitats on the Santa Fe National Forest.

In summary, while New Mexico Wildlife Conservation Act provides some protections for the salamander, specifically against take, it is not designed nor intended to protect the salamander's habitat, and one of the primary threats to the salamander is the loss, degradation, and fragmentation of habitat. Further, while NMDGF has the authority to consider and recommend actions to mitigate potential adverse effects to the salamander during review of development proposals, there is no requirement to follow these recommendations. With respect to Federal protections, the salamander has been on the Regional Forester's Sensitive Species List since 1990 (USFS 1990), but while this designation provides for consideration of the salamander during planning of activities, it does not prevent activities that may harm salamanders or their habitats on the Santa Fe National Forest.

E. Other Natural or Manmade Factors Affecting Its Continued Existence

Chemical Use

There is a potential for the salamander to be impacted by chemical use. Chemicals are used to suppress wildfire and for noxious weed control. Because the salamander has permeable skin, and breathes and carries out physiological functions with its skin, it may be susceptible if it comes in contact with fire retardants or herbicides. Many of these chemicals have not been assessed for effects to amphibians, and none have been assessed for effects to terrestrial amphibians. We do not currently have information that chemical use is a threat to the salamander. We request information on any potential threat posed by chemicals to the Jemez Mountains salamander.

Prior to 2006 (71 FR 42797; July 28, 2006), fire retardant used by the USFS contained sodium ferrocyanide, which is highly toxic to fish and amphibians (Pilliod *et al.* 2003, p. 175). In 2000, fire retardant was used in salamander habitat for the Cerro Grande Fire, but we have no information on the quantity or location of its use (USFS 2001, p. 1). While sodium ferrocyanide is no longer used by USFS to suppress wildfire, similar retardants and foams may still contain ingredients that are toxic to the salamander. Beginning in 2010, the USFS will begin phasing out the use of ammonium sulfate because of its toxicity to fish and replacing it with

ammonium phosphate (USFS 2009e, p. 1), which still may have adverse effects to the salamander. One of the ingredients of ammonium phosphate (a type of salt) appeared to have the greatest likelihood of adverse effects to terrestrial species assessed (birds and mammals) through ingestion (USFS/LABAT Environmental 2007, pp. 24–27), and in amphibians, salts can disrupt osmoregulation (regulation of proper water balance and osmotic or fluid pressure within tissues and cells). We do not currently have information that the chemicals in fire retardants or foams are a threat to the salamander. However, we will continue to evaluate whether these chemicals may be a threat to this species, and we request information on any potential threat posed by fire retardant chemicals to the Jemez Mountains salamander.

The USFS is in the process of completing an Environmental Impact Statement regarding the use of herbicides to manage noxious or invasive plants (Orr 2010, p. 2). Chemicals that could be used include 2,4,D; Clopyralid; Chorsulfuron; Dicamba; Glyphosate; Hexazinone; Imazapic; Imazapyr; Metasulfuron Methyl; Sulfometuron Methyl; Picloram; and Triclopyr (Orr 2010, p. 2). We reviewed the ecological risk assessments for these chemicals at *http://www.fs.fed.us/foresthealth/pesticide/risk.shtml,* but found few studies and data relative to amphibians. We found a single study for Sulfometuron Methyl conducted on the African clawed frog (*Xenopus laevis*) (an aquatic frog not native to the United States). This study resulted in alterations in limb and organ development and metamorphosis (Klotzbach and Durkin 2004, pp. 4–6, 4–7). The use of chemicals listed above by hand-held spot treatments or road-side spraying (Orr 2010, p. 2) in occupied salamander habitat could result in impacts to the salamander. Because of the lack of toxicological studies of these chemicals, we do not have information indicating that these chemicals pose a threat to the salamander. However, we will continue to evaluate whether these chemicals are a threat to the salamander, and we request information on any effects these chemicals may have on the Jemez Mountains salamander.

Climate Change

Our analyses under the Endangered Species Act include consideration of ongoing and projected changes in climate. The terms ''climate'' and ''climate change'' are defined by the Intergovernmental Panel on Climate Change (IPCC). ''Climate'' refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term ''climate change'' thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

Habitat drying affects salamander physiology, behavior, and viability; will affect the occurrence of natural events such as fire, drought, and forest die-off; and will increase the risk of disease and infection. Trends in climate change and drought conditions have contributed to temperature increases in the Jemez Mountains, with a corresponding decrease in precipitation. Because the salamander is terrestrial, constrained in range, and isolated to the higher elevations of the Jemez Mountains, continued temperature increases and precipitation decreases could threaten the viability of the species over its entire range.

Climate simulations of Palmer Drought Severity Index (PSDI) (a calculation of the cumulative effects of precipitation and temperature on surface moisture balance) for the Southwest for the periods of 2006–2030 and 2035–2060 show an increase in drought severity with surface warming. Additionally, drought still increases during wetter simulations because of the effect of heat-related moisture loss (Hoerling and Eicheid 2007, p. 19). Annual average precipitation is likely to decrease in the Southwest as well as the length of snow season and snow depth (International Panel on Climate Change (IPCC) 2007b, p. 887). Most models project a widespread decrease in snow depth in the Rocky Mountains and earlier snowmelt (IPCC 2007b, p. 891). Exactly how climate change will affect precipitation is less certain, because precipitation predictions are based on continental-scale general circulation models that do not yet account for land use and land cover change effects on climate or regional phenomena. Consistent with recent observations in climate changes, the outlook presented for the Southwest and New Mexico predict warmer, drier, drought-like conditions (Seager *et al.* 2007, p. 1181; Hoerling and Eischeid 2007, p. 19).

McKenzie *et al.* (2004, p. 893) suggest, based on models, that the length of the fire season will likely increase further and that fires in the western United States will be more frequent and more severe. In particular, they found that fire in New Mexico appears to be acutely sensitive to summer climate and temperature changes and may respond dramatically to climate warming.

Plethodontid salamanders have a low metabolic rate and relatively large energy stores (in tails) that provide the potential to survive long periods between unpredictable bouts of feeding (Feder 1983, p. 291). Despite these specializations, terrestrial salamanders must have sufficient opportunities to forage and build energy reserves for use during periods of inactivity. As salamander habitat warms and dries, the quality and quantity of habitat decreases along with the amount of time that salamanders could be active above ground. Wiltenmuth (1997, pp. ii–122) concluded that the Jemez Mountains salamanders likely persist by utilizing moist microhabitats and they may be near their physiological limits relative to water balance and moist skin. During field evaluations, the species appeared to be in a dehydrated state. If the species has difficulty maintaining adequate skin moisture (e.g., see Wiltenmuth 1997, pp. ii–122), it will likely spend less time being active. As a result, energy storage, reproduction, and long-term persistence would be reduced.

Wiltenmuth (1997, p. 77) reported rates of dehydration and rehydration were greatest for the Jemez Mountains salamander compared to the other salamanders, and suggested greater skin permeability. While the adaptation to relatively quickly rehydrate and dehydrate may allow the salamander to more quickly rehydrate when moisture becomes available, it may also make it more susceptible and less resistant to longer dry times because it also quickly dehydrates. Dehydration affects the salamander by increasing heart rate, oxygen consumption, and metabolic rate (Whitford 1968, p. 249), thus increasing energy demand, limiting movements (Wiltenmuth 1997, p. 77), increasing concentration and storage of waste products (Duellman and Trueb 1986, p. 207), decreasing burst locomotion (stride length, stride frequency, and speed) (Wiltenmuth 1997, p. 45), and sometimes causing death. Moisture-

stressed salamanders prioritize hydration over all else, thereby reducing salamander survival and persistence. Additional impacts from dehydration could include increased predation because burst locomotion is impaired (which reduces ability to escape) and increased susceptibility to pathogens resulting from depressed immunity from physiological stress of dehydration. Any of these factors, alone or in combination, could lead either to the reduction or extirpation of salamander localities, especially in combination with the threats of habitat-altering activities, as discussed under Factor A.

The IPCC (2007, pp. 12, 13) predicts that changes in the global climate system during the 21st century will very likely be larger than those observed during the 20th century. For the next 2 decades, a warming of about 0.4 degrees Fahrenheit (°F) (0.2 degrees Celsius (°C)) (per decade is projected (IPCC 2007, p. 12). The Nature Conservancy of New Mexico analyzed recent changes in New Mexico's climate. Parts I and II of a three-part series have been completed. In Part I, the time period 1961–1990 was used as the reference condition for analysis of recent departures (1991–2005; 2000–2005). This time period is consistent with the baseline used by National Oceanic and Atmospheric Administration and the IPCC for presenting 20th-century climate anomalies and generating future projections (Enquist and Gori 2008, p. 9). In Part II, trends in climate water deficit (an indicator of biological moisture stress, or drying), snowpack, and timing of peak stream flows were assessed for the period of 1970–2006 (Enquist *et al.* 2008, p. iv). The Nature Conservancy of New Mexico concludes the following regarding climate conditions in New Mexico and the Jemez Mountains:

(1) Over 95 percent of New Mexico has experienced mean temperature increases; warming has been greatest in the Jemez Mountains (Enquist and Gori 2008, p. 16).

(2) Ninety-three percent of New Mexico's watersheds experienced increasing annual trends in moisture stress during 1970–2006, that is, they have become relatively drier (Enquist *et al.* 2008, p. iv).

(3) Snowpack has declined in 98 percent of sites analyzed in New Mexico; the Jemez Mountains has experienced significant declines in snowpack (Enquist *et al.* 2008, p. iv).

(4) In the period 1980–2006, the timing of peak run-off from snowmelt occurred 2 days earlier than in the 1951–1980 period (Enquist *et al.* 2008, pp. 9, 25).

(5) The Jemez Mountains have experienced warmer and drier conditions during the 1991–2005 time period (Enquist and Gori 2008, pp. 16, 17, 23).

(6) The Jemez Mountains ranked highest of 248 sites analyzed in New Mexico in

climate exposure—a measure of average temperature and average precipitation departures (Enquist and Gori 2008, pp. 10, 22, 51–58).

Although the extent of warming likely to occur is not known with certainty at this time, the IPCC (2007a, p. 5) has concluded that the summer season will experience the greatest increase in warming in the Southwest (IPCC 2007b, p. 887). Temperature has strong effects on amphibian immune systems and may be an important factor influencing susceptibility of amphibians to pathogens (e.g., see Raffel *et al.* 2006, p. 819); thus increases in temperature in the Jemez Mountains have the potential to increase the salamander's susceptibility to disease and pathogens. As noted, we have no information that indicates disease is a threat to the species, but we intend to evaluate this issue further.

Climate Change Summary

In summary, we find that current and future effects from warmer climate conditions in the Jemez Mountains could reduce the amount of suitable salamander habitat, reduce the time period when the species can be active above ground, and increase the moisture demands and subsequent physiological stress on salamanders. Warming and drying trends in the Jemez Mountains currently are threats to the species, and these threats are projected to continue into the future.

Proposed Listing Determination

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Jemez Mountains salamander. Habitat loss, degradation, and modification through the interrelated effects from severe wildland fire, historical and current fire management practices, forest composition and structure conversions, and climate change have impacted the salamander by curtailing its range and affecting its behavioral and physiological functions. Because the salamander has highly permeable skin used for breathing and gas exchange, it must stay moist at all times or it will die. Salamanders have little control in maintaining water balance except through behaviorally changing where they are in the environment, seeking high-moisture areas to hydrate and avoiding warm, dry areas where they would otherwise dehydrate. Warmer temperatures increase water use and dehydration, as well as increase metabolic processes, which then in turn require additional energy for the salamander. This life-history trait renders hydration maintenance above all other life functions.

Therefore, any action or factor that warms and dries its habitat adversely affects the salamander and its ability to carry out normal behavior (foraging and reproduction). Furthermore, historical silvicultural practices removed most of the large-diameter Douglas fir trees from the Jemez Mountains, and this change affects the salamander now and will continue to do so in the future, because a lack of these trees results in a lack of the highest quality cover objects available to salamanders now and in the future. It has been shown for other related plethodontid salamanders that these types of cover objects were an important component in providing resiliency from the effects of factors that warm and dry habitat, such as climate change (See Factor A).

On the basis of this information, we find that the threats to the salamander most significantly result from habitat loss, degradation, and modification, including severe wildland fire, but also alterations to habitat of varying magnitude from fire suppression, forest composition and structure conversions, post-fire rehabilitation, forest and fire management, roads, trails, habitat fragmentation, and recreation (see Factor A). Some of these threats may be exacerbated by the current and projected effects of climate change, and we have determined that the current and projected effects from climate change are a direct threat to the salamander. The loss of one of the largest known populations, the documented modification of the habitat from a variety of factors, and the cascading behavioral and physiological effects from these alterations places this species at great risk of extinction.

The Act defines an endangered species as any species that is ''in danger of extinction throughout all or a significant portion of its range'' and a threatened species as any species ''that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future.'' We find that the Jemez Mountains salamander is presently in danger of extinction throughout all of its range based on the severity of threats currently impacting the salamander. The threats are both current and expected to continue in the future, and

are significant in that they limit all behavioral and physiological functions, including living, breathing, feeding, and reproduction and reproductive success, and extend across the entire range of the species. Therefore, on the basis of the best available scientific and commercial information, we propose listing the Jemez Mountains salamander as an endangered species, in accordance with sections 3(6) and 4(a)(1) of the Act.

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. The Jemez Mountains salamander proposed for listing in this rule is highly restricted in its range, and the threats occur throughout its range. Therefore, we assessed the status of the species throughout its entire range. The threats to the survival of the species occur throughout the species' range and are not restricted to any particular significant portion of that range. Accordingly, our assessment and proposed determination applies to the species throughout its entire range.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness and conservation by Federal, State, tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States and requires that recovery actions be carried out for all listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The NMEST Cooperative Management Plan and Conservation Agreement were completed in 2000 (see *Previous Federal Actions* section above). These are nonregulatory documents and were intended to be a mechanism to provide for conservation and protection in lieu of listing the salamander under the Endangered Species Act, as amended, (U.S. General Accounting Office 1993, p. 9), The goal of these documents was to ''…provide guidance for the conservation and management of sufficient habitat to maintain viable populations of the species'' (NMEST 2000, p. i.). However, they have been ineffective in preventing the ongoing loss of salamander habitat, and they are not expected to prevent further declines of the species. As discussed in the *Previous Federal Actions* section, above, the intent of the agreement was to protect the salamander and its habitat on lands administered by the USFS; however, there have been projects that have negatively affected the species (e.g., State Highway 126 project described under Factor A). The Cooperative Management Plan and Conservation Agreement have been unable to prevent ongoing loss of habitat, and they are not expected to prevent further declines of the species. They do not provide adequate protection for the salamander or its habitat.

Additionally, Los Alamos National Laboratory has committed to, whenever possible, retaining trees in order to maintain greater than 80 percent canopy cover, and avoiding activities that either compact soils or dry habitat (Los Alamos National Laboratory 2010, p. 7).

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Subsection 4(f) of the Act requires the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed, preparation of a draft and final recovery plan, and revisions to the plan as significant new information becomes available. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. The recovery plan identifies site-specific management actions that will achieve recovery of the species, measurable criteria that determine when a species may be downlisted or delisted, and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (comprising species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our Web site (*http://www.fws.gov/endangered*), or from our New Mexico Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, tribal, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (e.g., restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and tribal lands.

If this species is listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the State of New Mexico would be eligible for Federal funds to implement management actions that promote the protection and recovery of the Jemez Mountains salamander. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants.*

Although the Jemez Mountains salamander is only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize,

fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

Federal agency actions within the species habitat that may require conference or consultation or both as described in the preceding paragraph include landscape restoration projects (e.g., forest thinning); prescribed burns, wildland-urban-interface projects; forest silvicultural practices; other forest management or landscape-altering activities on Federal lands administered by the National Park Service (Bandelier National Monument), VCNP, and the Department of Energy (Los Alamos National Laboratory), and USFS; issuance of section 404 Clean Water Act permits by the Army Corps of Engineers; and construction and maintenance of roads or highways by the Federal Highway Administration.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. The prohibitions of section 9(a)(2) of the Act, codified at 50 CFR 17.21 for endangered wildlife, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these), import, export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. Under the Lacey Act (18 U.S.C. 42–43; 16 U.S.C. 3371–3378), it is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 for endangered species, and at 17.32 for threatened species. With regard to endangered wildlife, a permit must be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of species proposed for listing. The following activities could potentially result in a violation of section 9 of the Act; this list is not comprehensive:

(1) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of the species, including import or export across State lines and international boundaries, except for properly documented antique specimens of these taxa at least 100 years old, as defined by section 10(h)(1) of the Act;

(2) Unauthorized modification or manipulation of forested habitat, including restoration and thinning activities;

(3) Unauthorized actions that may further degrade salamander habitat following severe stand-replacing wildfires, such as salvage logging;

(4) Unauthorized use of heavy equipment in forested habitat in which the Jemez Mountains salamander is known to occur;

(5) Unauthorized release or introduction of nonnative or native plant species that would make salamander habitat unsuitable in areas where the Jemez Mountains salamander is known to occur;

(6) Unauthorized discharge of chemicals into forested habitat in which the Jemez Mountains salamander is known to occur; and

(7) Capture, survey, or collection of specimens of this taxon without a permit from us pursuant to section 10(a)(1)(A) of the Act.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the New Mexico Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Critical Habitat Designation for the Jemez Mountains Salamander

Background

Critical habitat is defined in section 3 of the Act as:

(1) The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical or biological features:

(a) Essential to the conservation of the species and

(b) Which may require special management considerations or protection; and

(2) Specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Conservation, as defined under section 3 of the Act, means to use and the use of all methods and procedures that are necessary to bring an endangered or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Critical habitat receives protection under section 7 of the Act through the requirement that Federal agencies ensure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Such designation does not allow the government or public to access private lands. Such designation does not require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Where a landowner requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the consultation requirements of section 7(a)(2) of the Act would apply, but even in the event of a destruction or adverse modification finding, the obligation of the Federal action agency and the landowner is not to restore or recover the species, but to implement reasonable and prudent alternatives to avoid destruction or adverse modification of critical habitat.

Under the first prong of the Act's definition of critical habitat, areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features (1) essential to the conservation of the species and (2) which may require special management considerations or protection. For these areas, critical habitat designations identify, to the extent known using the best scientific and commercial data available, those physical or biological features that are essential to the

conservation of the species (such as space, food, cover, and protected habitat). In identifying those physical and biological features within an area, we focus on the principal biological or physical constituent elements (primary constituent elements such as roost sites, nesting grounds, seasonal wetlands, water quality, tide, soil type) that are essential to the conservation of the species. Primary constituent elements are the specific elements of physical or biological features that provide for a species' life-history processes, are essential to the conservation of the species.

Under the second prong of the Act's definition of critical habitat, we can designate critical habitat in areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. For example, an area currently occupied by the species, but that was not occupied at the time of listing, may be essential to the conservation of the species and may be included in the critical habitat designation. We designate critical habitat in areas outside the geographic area occupied by a species only when a designation limited to its range would be inadequate to ensure the conservation of the species.

Section 4 of the Act requires that we designate critical habitat on the basis of the best scientific data available. Further, our Policy on Information Standards Under the Endangered Species Act (published in the **Federal Register** on July 1, 1994 (59 FR 34271)), the Information Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554; H.R. 5658)), and our associated Information Quality Guidelines, provide criteria, establish procedures, and provide guidance to ensure that our decisions are based on the best scientific data available. They require our biologists, to the extent consistent with the Act and with the use of the best scientific data available, to use primary and original sources of information as the basis for recommendations to designate critical habitat.

When we are determining which areas should be designated as critical habitat, our primary source of information is generally the information developed during the listing process for the species. Additional information sources may include the recovery plan for the species, articles in peer-reviewed journals, conservation plans developed by States and counties, scientific status surveys and studies, biological assessments, other unpublished materials, or experts' opinions or personal knowledge.

Habitat is dynamic, and species may move from one area to another over time. We recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be needed for recovery of the species. Areas that are important to the conservation of the species, both inside and outside the critical habitat designation, will continue to be subject to: (1) Conservation actions implemented under section 7(a)(1) of the Act, (2) regulatory protections afforded by the requirement in section 7(a)(2) of the Act for Federal agencies to ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species, and (3) the prohibitions of section 9 of the Act if actions occurring in these areas may affect the species. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. These protections and conservation tools will continue to contribute to recovery of this species. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans (HCPs), or other species conservation planning efforts if new information available at the time of these planning efforts calls for a different outcome.

Prudency Determination

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12), require that, to the maximum extent prudent and determinable, the Secretary designate critical habitat at the time the species is determined to be an endangered or threatened species. Our regulations (50 CFR 424.12(a)(1)) state that the designation of critical habitat is not prudent when one or both of the following situations exist: (1) The species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of threat to the species, or (2) such designation of critical habitat would not be beneficial to the species.

There is no documentation that the salamander is currently threatened by collection, and it is unlikely to experience increased threats by identifying critical habitat. Moreover, the identification and mapping of critical habitat is not expected to initiate any such threat. In the absence of a finding that the designation of critical habitat would increase threats to a species, if there are any benefits to a critical habitat designation, then a prudent finding is warranted. The potential benefits include: (1) Triggering consultation under section 7 of the Act in new areas for actions in which there may be a Federal nexus where it would not otherwise occur because, for example, it has become unoccupied or the occupancy is in question; (2) focusing conservation activities on the most essential features and areas; (3) providing educational benefits to State or county governments or private entities; and (4) preventing people from causing inadvertent harm to the species.

The primary regulatory effect of critical habitat is the section 7(a)(2) requirement that Federal agencies refrain from taking any action that destroys or adversely modifies critical habitat. Lands proposed for designation as critical habitat would be subject to Federal actions that trigger the section 7 consultation requirements. There may also be some educational or informational benefits to the designation of critical habitat. Educational benefits include the notification of the general public of the importance of protecting habitat.

Therefore, because we have determined that the designation of critical habitat will not likely increase the degree of threat to the species, and will provide considerable conservation benefit to the species, we find that designation of critical habitat is prudent for the Jemez Mountains salamander.

Critical Habitat Determinability

As stated above, section 4(a)(3) of the Act requires the designation of critical habitat concurrently with the species' listing ''to the maximum extent prudent and determinable.'' Our regulations at 50 CFR 424.12(a)(2) state that critical habitat is not determinable when one or both of the following situations exist:

(1) Information sufficient to perform required analyses of the impacts of the designation is lacking, or

(2) The biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat.

When critical habitat is not determinable, the Act provides for an additional year to publish a critical

habitat designation (16 U.S.C. 1533(b)(6)(C)(ii)).

We reviewed the available information pertaining to the biological needs of the species and habitat characteristics where this species is located. This and other information represent the best scientific data available, and the available information is sufficient for us to identify areas to propose as critical habitat. Therefore, we conclude that the designation of critical habitat is determinable for the Jemez Mountains salamander.

Physical or Biological Features

In accordance with section 3(5)(A)(i) and 4(b)(1)(A) of the Act and regulations at 50 CFR 424.12, in determining which areas within the geographical area occupied by the species at the time of listing to designate as critical habitat, we consider the physical or biological features that are essential to the conservation of the species and which may require special management considerations or protection. These include, but are not limited to:

(1) Space for individual and population growth and for normal behavior;

(2) Food, water, air, light, minerals, or other nutritional or physiological requirements;

(3) Cover or shelter;

(4) Sites for breeding, reproduction, or rearing (or development) of offspring; and

(5) Habitats that are protected from disturbance or are representative of the historical, geographic, and ecological distributions of a species.

We derive the specific physical or biological features required for the Jemez Mountains salamander from studies of this species' habitat, ecology, and life history as described below. Unfortunately, there have been relatively few studies on the salamander and its habitat, and information gaps remain. However, we have used the best available information as described in the background and threats assessment above and summarized below, as well as information from other salamanders with similar biological requirements. To identify the physical and biological needs of the Jemez Mountains salamander, we have relied on current conditions at locations where the salamander has been observed during surveys, and the best information available on the species and its close relatives. We have determined that the following physical or biological features are essential for the Jemez Mountains salamander:

Space for Individual and Population Growth and for Normal Behavior

The Jemez Mountains salamander has been observed in forested areas of the Jemez Mountains, ranging in elevation from 6,998 to 10,990 ft (2,133 to 3,350 m) (Ramotnik 1988, pp. 78, 84). Redondo Peak contains both the maximum elevation in the Jemez Mountains (11,254 ft (3,430 m)) and the highest salamander observation (10,990 ft (3,350 m)). Surveys have not yet been conducted above this highest observation on Redondo Peak, but the habitat contains those principal biological or physical constituent elements we have identified from areas known to contain the salamander. Alternatively, the vegetation communities and moisture conditions at elevations below 6,998 ft (2,133 m) are not suitable for the Jemez Mountains salamander.

The Jemez Mountains salamander spends much of its life underground, but it can be found active above ground from July through September, when environmental conditions are warm and wet. The salamander's underground habitat appears to be deep, fractured, subterranean rock in areas with high soil moisture, where geologic and moisture constraints likely limit the distribution of the species (NMEST 2000, p. 2). The aboveground habitat occurs within forested areas, primarily within areas that contain Douglas fir, blue spruce, Engelman spruce, white fir, limber pine, ponderosa pine, Rocky Mountain maple, and aspen (Degenhardt *et al.* 1996, p. 28; Reagan 1967, p. 17).

Food, Water, Air, Light, Minerals, or Other Nutritional or Physiological Requirements

Terrestrial amphibians generally inhabit environments that are hostile to their basic physiology, but nonetheless have developed combinations of unique morphological structures (e.g., shape, structure, color, pattern), physiological mechanisms, and behavioral responses to inhabit diverse terrestrial habitats (Duellman and Trueb 1986, p. 197). Terrestrial salamanders are generally active at night and have diurnal (daytime) retreats to places that have higher moisture content relative to surrounding areas that are exposed to warming from the sun and air currents (Duellman and Trueb 1986, p. 198). These daytime retreats can be under rocks, interiors of logs, depths of leaf mulch, shaded crevices, and burrows in the soil (Duellman and Trueb 1986, p. 198). These retreats provide opportunities for terrestrial salamanders to rehydrate during the day, and if water uptake is sufficient during the day, the animal can afford to lose water during nocturnal activities (Duellman and Trueb 1986, p. 198). Even though many kinds of terrestrial amphibians are normally active only at night, they often become active during the day immediately after heavy rains (Duellman and Trueb 1986, p. 198).

When Jemez Mountains salamanders have been observed above ground during the day, they are primarily found in high moisture retreats (such as under and inside decaying logs and stumps, and under rocks and bark) (Everett 2003, p. 24) with high overstory canopy cover. Everett (2003, p. 24) characterized Jemez Mountains salamander's habitat as having an average canopy cover of 76 percent, with a range between 58 to 94 percent. Areas beneath high tree canopy cover provide moist and cool conditions when compared to adjacent areas with low canopy cover. Diurnal retreats that provide moist and cool microhabitats are important for physiological requirements and also influence the salamander's ability to forage, because foraging typically dehydrates individuals and these retreats allow for rehydration. Temperature also affects hydration and dehydration rates, oxygen consumption, heart rate, and metabolic rate, and thus influences body water and body mass in Jemez Mountains salamanders ((Duellman and Treub 1986, p. 203; Whitford 1968, pp. 247–251). Because salamanders must address hydration needs above all other life-history needs, the salamander must obtain its water from its habitat, and the salamander has no physiological mechanism to stop dehydration or water loss to the environment. Based on this information, we conclude that substrate moisture through its effect on absorption and loss of water is the most important factor in the ecology of this species (Heatwole and Lim 1961, p. 818). Thus, moist and cool microhabitats are essential for the conservation of the species.

In regard to food, Jemez Mountains salamanders have been found to consume prey species that are diverse in size and type with ants, mites, and beetles being eaten most often (Cummer 2005, p. 43).

Cover or Shelter

When active above ground, the Jemez Mountains salamander is usually found within forested areas under decaying logs, rocks, bark, moss mats, or inside decaying logs and stumps. Jemez Mountains salamanders are generally found in association with decaying coniferous logs, particularly Douglas fir,

considerably more often than deciduous logs, likely due to the differences in physical features (e.g., coniferous logs have blocky pieces with more cracks and spaces than deciduous logs) (Ramotnik 1988, p. 53). Large-diameter (greater than 10 in (25 cm)) decaying logs provide important aboveground habitat because they are moist and cool compared to other cover; larger logs maintain higher moisture and lower temperature longer than smaller logs. These high-moisture retreats also offer shelter and protection from some predators (e.g., skunks, owls).

The percent surface area of occupied salamander habitat covered by decaying logs, rocks, bark, moss mats, and stumps averaged 25 percent (Everett 2003, p. 35); however, Everett (2003, p. 35) noted that areas with high percentages of area of habitat covered by decaying logs, rocks, bark, moss mats, and stumps are difficult to survey and locate salamanders when present, and may bias the data toward lower percentages of area covered by decaying logs, rocks, bark, moss mats, and stumps.

Furthermore, there may be high-elevation meadows located within the critical habitat units that are used by the Jemez Mountains salamander. The Jemez Mountains salamanders utilize habitat vertically and horizontally above ground and below ground. Currently, we do not fully understand how salamanders utilize areas like meadows, where the aboveground vegetation component differs from areas where salamanders are more commonly encountered (e.g., forested areas); however, salamanders have been found in high-elevation meadows. Therefore, meadows are considered part of the physical or biological features for the Jemez Mountains salamander.

Sites for Breeding, Reproduction, or Rearing (or Development) of Offspring

Little is known about the reproduction of the Jemez Mountains salamander. Although many terrestrial salamanders deposit eggs in well hidden sites, such as underground cavities, decaying logs, and moist rock crevices (Pentranka 1998, p. 6), an egg clutch has never been observed during extensive Jemez Mountains salamander surveys. Because the salamander spends the majority of its life below ground, eggs are probably laid and hatch underground. However, we currently lack the information to identify the specific elements of the physical or biological features needed for breeding, reproduction, or rearing of offspring.

Habitats Protected From Disturbance or Representative of the Historical, Geographic, and Ecological Distributions of the Species

All occupied salamander habitat has undergone change resulting from historical grazing practices and effective fire suppression, most often resulting in shifts in vegetation composition and structure and increased risk of large-scale, stand-replacing wildfire (see discussion in *Factor A: The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range,* above). This species was first described in 1950, about halfway through the approximate 100-year period of shifting vegetation composition and structure and building of fuels for wildfire in the Jemez Mountains. Thus, research and information pertaining to this species are in the context of a species existing in an altered ecological situation. Nonetheless, while we do not have a full understanding of how these particular alterations affect the salamander (potentially further drying habitat through increased water demand of increased density of trees, or, alternatively, potentially increasing habitat moisture from a higher canopy cover), we do know that the changes in the vegetative component of salamander habitat has greatly increased the risk of large-scale, stand-replacing wildfire. Furthermore, we are only aware of small-scale treatments or implemented forest-restoration projects to reduce this risk. Thus, there does not seem to be any areas in occupied salamander habitat that are protected from disturbance.

However, based on the biology and the physiological requirements of this and other terrestrial plethodontid salamanders, we believe that the Jemez Mountains salamander is distributed in areas not burned by large-scale, stand-replacing fires. These areas are believed to contain the physical or biological features essential to the conservation of the species. Managing for an appropriate vegetation composition and designing forest restoration treatments to minimize the risk of wildfire are difficult because we lack the information to quantify or qualify these historical attributes. We specifically solicit further input on methods or mechanisms that can better describe the appropriate vegetation composition and assist in the design of forest restoration treatments. Specific research is needed on forest restoration treatments that could minimize impacts and maximize benefits to the salamander.

Primary Constituent Elements for the Jemez Mountains Salamander

Under the Act and its implementing regulations, we are required to identify the physical or biological features essential to the conservation of the Jemez Mountains salamander in the geographic area occupied by the species at the time of listing, focusing on the features' primary constituent elements. We consider primary constituent elements to be the elements of physical or biological features that provide for a species' life-history processes and are essential to the conservation of the species.

Based on our current knowledge of the physical or biological features and habitat characteristics required sustaining the species' life-history processes, we determine that the primary constituent elements (PCEs) specific to the Jemez Mountains salamander's forested habitat are:

1. Tree canopy cover greater than 58 percent consisting of the following tree species alone or in any combination:

a. Douglas fir (*Pseudotsuga menziesii*);

b. blue spruce (*Picea pungens*);

c. Engelman spruce (*Picea engelmannii*);

d. white fir (*Abies concolor*);

e. limber pine (*Pinus flexilis*);

f. ponderosa pine (*Pinus ponderosa*);

g. aspen (*Populus tremuloides*)

and having an understory that predominantly comprises:

a. Rocky Mountain maple (*Acer glabrum*);

b. New Mexico locust (*Robinia neomexicana*);

c. oceanspray (*Holodiscus* sp.); or

d. shrubby oaks (*Quercus* spp.).

2. Elevations from 6,988 to 11,254 ft (2,130 to 3,430 m).

3. Ground surface in forest areas with

a. at least 25 percent or greater of ground surface area of coniferous logs at least 10 in (25 cm) in diameter, particularly Douglas fir and other woody debris, which are in contact with the soil in varying stages of decay from freshly fallen to nearly fully decomposed, or

b. structural features, such as rocks, bark, and moss mats that provide the species with food and cover.

4. Underground habitat in forest or meadow areas containing interstitial spaces provided by:

a. igneous rock with fractures or loose rocky soils;

b. rotted tree root channels; or

c. burrows of rodents or large invertebrates.

With this proposed designation of critical habitat, we intend to identify the

physical or biological features essential to the conservation of the species through the identification of the PCEs sufficient to support the life-history processes of the species. Because not all life-history functions require all the PCEs, not all areas proposed as critical habitat will contain all the PCEs. All units proposed to be designated as critical habitat are currently occupied by the Jemez Mountains salamander and contain one or more of the PCEs sufficient to support the life-history needs of the species.

Special Management Considerations or Protection

When designating critical habitat, we assess whether the specific areas within the geographic area occupied by the species at the time of listing contain features that are essential to the conservation of the species and which may require special management considerations or protection. The features essential to the conservation of this species may require special management considerations or protection to reduce the following threats: Historical and current fire management practices; severe wildland fire; forest composition and structure conversions; post-fire rehabilitation; forest management (including silvicultural practices); roads, trails, and habitat fragmentation; recreation; and climate change. Furthermore, disease and the use of fire retardants or other chemicals may threaten the salamander, and may need special management considerations.

Management activities that could ameliorate these threats include (but are not limited to): (1) Reducing fuels to minimize the risk of severe wildfire in a manner that considers the salamander's biological requirements; (2) not implementing post-fire rehabilitation techniques that are detrimental to the salamander in the geographic areas of occupied salamander habitat, and (3) removing unused roads and trails and restoring habitat. A more complete discussion of the threats to the salamander and its habitats can be found in ''Summary of Factors Affecting the Species'' above.

Criteria Used To Identify Critical Habitat

As required by section 4(b)(2) of the Act, we use the best scientific data available to designate critical habitat. We review available information pertaining to the habitat requirements of the species. In accordance with the Act and its implementing regulation at 50 CFR 424.12(e), we consider whether designating additional areas outside those geographic areas currently occupied are necessary to ensure the conservation of the species. We are not proposing to designate any areas outside the geographic area occupied by the species because occupied areas are sufficient for the conservation of the species.

Our initial step in identifying critical habitat was to determine the physical or biological habitat features essential to the conservation of the species, as explained in the previous section. We then identified the geographic areas that are occupied by the Jemez Mountains salamander and that contain one or more of the physical or biological features. We used various sources of available information and supporting data that pertains to the habitat requirements of the Jemez Mountains salamander. These included, but were not limited to, the 12-month finding published on September 2, 2010 (75 FR 54822), reports under section 6 of the Act submitted by NMDGF, the salamander Conservation Management Plan, research published in peer-reviewed articles, unpublished academic theses, agency reports, and mapping information from agency sources. We plotted point data of survey locations for the salamander using ArcMap (Environmental Systems Research Institute, Inc.), a computer GIS program, which were then used in conjunction with elevation, topography, vegetation, and land ownership information The point data consisted of detection (367 points) and nondetection (1,022 points) survey locations.

The units proposed for designation are based on sufficient elements of physical and biological features being present to support life-history processes of the species and are within the GIS model output. Areas that have been burned in recent fires (e.g., Las Conchas Fire and Cerro Grande Fire) were not excluded from the proposed units because fire burns in a mosaic pattern (a mix pattern of burned and unburned patches), and at least in the short-term (10 to 15 years), sufficient elements of physical and biological features remain subsequent to wildfire that allow salamanders to continuously occupy areas that have been burned. We selected areas within the geographical area occupied at the time of listing that contain the physical or biological features essential to their conservation and may require special management considerations or protection. Large areas that consisted of predominantly nondetection survey locations were not included in the proposed designation, but may contain detections. Finally, at the scale of the unit, both units are considered wholly occupied because salamanders use both aboveground and belowground habitat continuously, moving and utilizing habitat vertically and horizontally. Also, there may be high elevation meadows located within the units, but these areas are also considered wholly occupied because the salamanders have been found in high elevation meadows. While it is possible that salamanders may not be detected at the small scale of a survey (measured in meters), the entire unit is considered occupied because of the similarity and continuous nature of the physical and biological features within the units that are used by salamanders for foraging, seasonal movements, and maintaining genetic variation. For clarity, we defined occupied proposed critical habitat as those forested areas in the Jemez Mountains that:

a. Include the majority of salamander point observations that are representative of the distribution of the Jemez Mountains salamander habitat needs throughout the geographical range of the species;

b. Provide the essential physical or biological features necessary to support the species' life-history requirements surrounding salamander point observations ; and

c. Provide connectivity between Jemez Mountains salamander habitat to provide for seasonal surface movement and genetic variability.

After utilizing the above methods, we refined the model to remove isolated historical point data, because the survey data for those areas are insufficient, and we do not know if those areas contain sufficient physical or biological features to support life-history functions essential to the conservation of the salamander. The areas removed are predominantly on Forest Service and VCNP lands within the northeastern and northwestern part of the Jemez Mountains, but also include small areas on the Pueblo of Santa Clara, Los Alamos National Laboratory, and private lands.

When determining proposed critical habitat boundaries, we also made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack physical or biological features for the Jemez Mountains salamander. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this proposed rule have been excluded by text in the proposed

rule and are not proposed for designation as critical habitat. Therefore, if the critical habitat is finalized as proposed, a Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect the physical or biological features in the adjacent critical habitat.

In summary, we are proposing for designation of critical habitat geographic areas that we have determined are occupied by the salamander at the time of listing and contain sufficient elements of physical or biological features to support life-history processes essential for the conservation of the species. The critical habitat designation is defined by the map or maps, as modified by any accompanying regulatory text, presented at the end of this document in the rule portion. We will make the coordinates or plot points or both on which each map is based available to the public on *http://www.regulations.gov* at Docket No. FWS–R2–ES–2012–0063, on our Internet site at *http://www.fws.gov/southwest/es/NewMexico/*, and at the New Mexico Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT** above).

Proposed Critical Habitat Designation

We are proposing two units as critical habitat for the Jemez Mountains salamander. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for the salamander. The two areas we propose as critical habitat are: (1) Western Jemez Mountains Unit and (2) Southeastern Jemez Mountains Unit. Both units are currently occupied by the species. The approximate area of each proposed critical habitat unit and land ownership are shown in Table 1.

TABLE 1—PROPOSED CRITICAL HABITAT UNITS FOR THE JEMEZ MOUNTAINS SALAMANDER

Critical habitat unit	Land ownership by type	Size of unit in acres (hectares)
1. Western Jemez Mountains Unit	Federal	41,467 (16,781)
	Private	978 (396)
Total Unit 1		42,445 (17,177)
2. Southeastern Jemez Mountains Unit	Federal	46,505 (18,820)
	Private	1,839 (744)
Total Unit 2		48,344 (19,564)
Total	Federal	87,972 (35,601)
	Private	2,817 (1,140)
	Total	90,789 (36,741)

NOTE: Area sizes may not sum due to rounding.

We present brief descriptions of the units, and reasons why they meet the definition of critical habitat for the Jemez Mountains salamander, below.

Unit 1: Western Jemez Mountains Unit

Unit 1 consists of 42,445 ac (17,177 ha) in Sandoval and Rio Arriba Counties in the western portion of the Jemez Mountains of which 41,467 ac (16,781 ha) is federally managed, with 26,532 ac (10,737 ha) on USFS lands, 14,935 ac (6,044 ha) on VCNP lands, and 978 ac (396 ha) on private lands. This unit is located in the western portion of the distribution of the Jemez Mountains salamander and includes Redondo Peak. This unit is within the geographical area occupied by the salamander and contains elements of essential physical or biological features. The physical or biological features require special management or protection from large-scale, stand-replacing wildfire; actions that would disturb salamander habitat by warming and drying; actions that reduce the availability of aboveground cover objects including downed logs; or actions that would compact or disturb the soil or otherwise interfere with the capacity of salamanders to move between subterranean habitat and aboveground habitat.

Unit 2: Southeastern Jemez Mountains Unit

Unit 2 consists of 48,344 ac (19,564 ha) in Sandoval and Los Alamos Counties in the eastern, southern, and southeastern portions of the Jemez Mountains of which 46,505 ac (18,820 ha) is federally managed, with 30,502 ac (12,344 ha) on USFS lands, 8,784 ac (3,555 ha) on VCNP lands, and 7,219 ac (2,921 ha) on National Park Service lands (Bandelier National Monument), and 1,839 ac (744 ha) are on private lands. This unit is within the geographical area occupied by the salamander and contains elements of essential physical or biological features. The physical or biological features require special management or protection from large-scale, stand-replacing wildfire; actions that would disturb salamander habitat by warming and drying; actions that reduce the availability of aboveground cover objects including downed logs; or actions that would compact or disturb the soil or otherwise interfere with the capacity of salamanders to move between subterranean habitat and aboveground habitat.

Effects of Critical Habitat Designation

Section 7 Consultation

Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. In addition, section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any agency action that is likely to jeopardize the continued existence of any species proposed to be listed under the Act or result in the destruction or adverse modification of proposed critical habitat.

Decisions by the 5th and 9th Circuit Courts of Appeals have invalidated our regulatory definition of ''destruction or adverse modification'' (50 CFR 402.02) (see *Gifford Pinchot Task Force* v. *U.S. Fish and Wildlife Service,* 378 F. 3d 1059 (9th Cir. 2004) and *Sierra Club* v. *U.S. Fish and Wildlife Service et al.,* 245 F.3d 434, 442 (5th Cir. 2001)), and we

do not rely on this regulatory definition when analyzing whether an action is likely to destroy or adversely modify critical habitat. Under the statutory provisions of the Act, we determine destruction or adverse modification on the basis of whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species.

If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Examples of actions that are subject to the section 7 consultation process are actions on State, tribal, local, or private lands that require a Federal permit (such as a permit from the U.S. Army Corps of Engineers under section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) or a permit from the Service under section 10 of the Act) or that involve some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency). Federal actions not affecting listed species or critical habitat, and actions on State, tribal, local, or private lands that are not federally funded or authorized, do not require section 7 consultation.

As a result of section 7 consultation, we document compliance with the requirements of section 7(a)(2) through our issuance of:

(1) A concurrence letter for Federal actions that may affect, but are not likely to adversely affect, listed species or critical habitat; or

(2) A biological opinion for Federal actions that may affect, or are likely to adversely affect, listed species or critical habitat.

When we issue a biological opinion concluding that a project is likely to jeopardize the continued existence of a listed species and/or destroy or adversely modify critical habitat, we provide reasonable and prudent alternatives to the project, if any are identifiable, that would avoid the likelihood of jeopardy and/or destruction or adverse modification of critical habitat. We define ''reasonable and prudent alternatives'' (at 50 CFR 402.02) as alternative actions identified during consultation that:

(1) Can be implemented in a manner consistent with the intended purpose of the action,

(2) Can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction,

(3) Are economically and technologically feasible, and

(4) Would, in the Director's opinion, avoid the likelihood of jeopardizing the continued existence of the listed species and/or avoid the likelihood of destroying or adversely modifying critical habitat.

Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 require Federal agencies to reinitiate consultation on previously reviewed actions in instances where we have listed a new species or subsequently designated critical habitat that may be affected and the Federal agency has retained discretionary involvement or control over the action (or the agency's discretionary involvement or control is authorized by law). Consequently, Federal agencies sometimes may need to request reinitiation of consultation with us on actions for which formal consultation has been completed, if those actions with discretionary involvement or control may affect subsequently listed species or designated critical habitat.

Application of the ''Adverse Modification'' Standard

The key factor related to the adverse modification determination is whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species. Activities that may destroy or adversely modify critical habitat are those that alter the physical or biological features to an extent that appreciably reduces the conservation value of critical habitat for the Jemez Mountains salamander. As discussed above, the role of critical habitat is to support life-history needs of the species and provide for the conservation of the species.

Section 4(b)(8) of the Act requires us to briefly evaluate and describe, in any proposed or final regulation that designates critical habitat, activities involving a Federal action that may destroy or adversely modify such habitat, or that may be affected by such designation.

Activities that may affect critical habitat, when carried out, funded, or authorized by a Federal agency, should result in consultation for the Jemez Mountains salamander. These activities include, but are not limited to:

(1) Actions that would disturb salamander habitat by warming and drying. Such activities could include, but are not limited to, landscape restoration projects (e.g., forest thinning and manipulation); prescribed burns; wildland fire use; wildland-urban-interface projects (forest management at the boundary of forested areas and urban areas); forest silvicultural practices (including salvage logging); other forest management or landscape-altering activities that reduce canopy cover, or warm and dry habitat. These activities could reduce the quality of salamander habitat or reduce the ability of the salamander to carry out normal behavior and physiological functions, which are tightly tied to moist cool microhabitats. Additionally, these actions could also reduce available high-moisture retreats, which could increase the amount of time necessary to regulate body water for physiological function and thus reduce the amount of time available for foraging and finding a mate, ultimately reducing fecundity.

(2) Actions that reduce the availability of the ground surface within forested areas containing downed logs that are greater than 10 in (0.25 m) diameter and of any stage of decomposition or removal of large-diameter trees (especially Douglas fir) that would otherwise become future high quality cover. Such activities could include but are not limited to activities listed above. Aboveground cover objects within the forest provide high-moisture retreats relative to surrounding habitat and offer opportunities to regulate body water and influence the salamander's capacity to forage and reproduce.

(3) Actions that would compact or disturb the soil or otherwise interfere with the capacity of salamanders to move between subterranean habitat and aboveground habitat. Such activities could include but are not limited to use of heavy equipment, road construction, and pipeline installation.

(4) Actions that spread disease into salamander habitat. Such activities could include water drops (i.e., picking up surface water contaminated with aquatic amphibian pathogens (e.g., *Bd*) and dropping it in forested habitat). While we do not know the susceptibility of amphibian pathogens on the Jemez Mountains salamander, some pathogens (e.g., *Bd*) have caused many other amphibian species extinctions and declines and could potentially threaten the Jemez Mountains salamander.

(5) Actions that contaminate forested habitats with chemicals. Such activities could include aerial drop of chemicals such as fire retardants or insecticides. We do not know the effects of most chemicals on Jemez Mountains salamanders; amphibians in general are sensitive to chemicals with which they

come in contact because they use their skin for breathing and other physiological functions.

Exemptions

Application of Section 4(a)(3) of the Act

The Sikes Act Improvement Act of 1997 (Sikes Act) (16 U.S.C. 670a) required each military installation that includes land and water suitable for the conservation and management of natural resources to complete an integrated natural resources management plan (INRMP) by November 17, 2001. An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found on the base. Each INRMP includes:

(1) An assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species;

(2) A statement of goals and priorities;

(3) A detailed description of management actions to be implemented to provide for these ecological needs; and

(4) A monitoring and adaptive management plan.

Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management; fish and wildlife habitat enhancement or modification; wetland protection, enhancement, and restoration where necessary to support fish and wildlife; and enforcement of applicable natural resource laws.

The National Defense Authorization Act for Fiscal Year 2004 (Pub. L. 108–136) amended the Act to limit areas eligible for designation as critical habitat. Specifically, section 4(a)(3)(B)(i) of the Act (16 U.S.C. 1533(a)(3)(B)(i)) now provides: ''The Secretary shall not designate as critical habitat any lands or other geographic areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation.''

There are no Department of Defense lands within the proposed critical habitat designation.

Exclusions

Application of Section 4(b)(2) of the Act

Section 4(b)(2) of the Act states that the Secretary shall designate and make revisions to critical habitat on the basis of the best available scientific data after taking into consideration the economic impact, national security impact, and any other relevant impact of specifying any particular area as critical habitat. The Secretary may exclude an area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific data available, that the failure to designate such area as critical habitat will result in the extinction of the species. In making that determination, the statute on its face, as well as the legislative history, are clear that the Secretary has broad discretion regarding which factor(s) to use and how much weight to give to any factor.

Under section 4(b)(2) of the Act, we may exclude an area from designated critical habitat based on economic impacts, impacts on national security, or any other relevant impacts. In considering whether to exclude a particular area from the designation, we identify the benefits of including the area in the designation, identify the benefits of excluding the area from the designation, and evaluate whether the benefits of exclusion outweigh the benefits of inclusion. If the analysis indicates that the benefits of exclusion outweigh the benefits of inclusion, the Secretary may exercise his discretion to exclude the area only if such exclusion would not result in the extinction of the species.

Exclusions Based on Economic Impacts

Under section 4(b)(2) of the Act, we consider the economic impacts of specifying any particular area as critical habitat. In order to consider economic impacts, we are preparing an analysis of the economic impacts of the proposed critical habitat designation and related factors. Potential land use sectors that may be affected by Jemez Mountains salamander critical habitat designation include forest management (including silvicultural practices); road or trail construction; recreation; fire suppression or other chemical use; and grazing. We also consider any social impacts that might occur because of the designation.

We will announce the availability of the draft economic analysis as soon as it is completed. At that time, copies of the draft economic analysis will be available for downloading from the Internet at *http://www.regulations.gov,* or by contacting the New Mexico Ecological Services Field Office directly (see **FOR FURTHER INFORMATION CONTACT** section). During the development of a final designation, we will consider economic impacts, public comments, and other new information, and areas may be excluded from the final critical habitat designation under section 4(b)(2) of the Act and our implementing regulations at 50 CFR 424.19.

Exclusions Based on National Security Impacts

Under section 4(b)(2) of the Act, we consider whether there are lands owned or managed by the Department of Defense (DOD) or lands where a national security impact might exist. In preparing this proposal, we have determined that the lands within the proposed designation of critical habitat for the Jemez Mountains salamander are not owned or managed by the DOD, but there are national security interests found at Los Alamos Laboratory. Currently, there are no areas proposed for exclusion based on impacts on national security, but we seek comment on whether there is a national security interest at Los Alamos Laboratory that could be adversely affected by the proposed designation.

Exclusions Based on Other Relevant Impacts

Under section 4(b)(2) of the Act, we consider any other relevant impacts, in addition to economic impacts and impacts on national security. We consider a number of factors including whether the landowners have developed any HCPs or other management plans for the area, or whether there are conservation partnerships that would be encouraged by designation of, or exclusion from, critical habitat. In addition, we look at any tribal issues, and consider the government-to-government relationship of the United States with tribal entities. We also consider any social impacts that might occur because of the designation.

In preparing this proposal, we have determined that there are currently no HCPs for the Jemez Mountains salamander, and the proposed designation does not include any tribal lands occupied by the species that contain the physical or biological features essential for conservation of the salamander. Moreover, we are unaware of any tribal lands that are considered unoccupied by Jemez Mountains salamander that are essential for the conservation of the species. Therefore, we have not proposed designation of critical habitat for Jemez Mountains salamander on tribal lands. However, we will coordinate with tribes in nearby areas should there be any concerns or questions arising from this proposed critical habitat designation. We anticipate no impact to tribal lands, partnerships, or HCPs from this

proposed critical habitat designation. There are no areas proposed for exclusion from this proposed designation based on other relevant impacts.

Peer Review

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our listing determination and critical habitat designation is based on scientifically sound data, assumptions, and analyses. We have invited these peer reviewers to comment during this public comment period in this proposed designation of critical habitat.

We will consider all comments and information received during this comment period on this proposed rule during our preparation of a final determination. Accordingly, the final decision may differ from this proposal.

Public Hearings

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. Requests must be received within 45 days after the date of publication of this proposed rule in the **Federal Register**. Such requests must be sent to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the **Federal Register** and local newspapers at least 15 days before the hearing.

Persons needing reasonable accommodations to attend and participate in a public hearing should contact the New Mexico Ecological Services Field Office at 505–346– 2525, as soon as possible. To allow sufficient time to process requests, please call no later than 1 week before the hearing date. Information regarding this proposed rule is available in alternative formats upon request.

Required Determinations

Regulatory Planning and Review—Executive Orders 12866 and 13563

Executive Order 12866 provides that the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget will review all significant rules. The Office of Information and Regulatory Affairs has determined that this rule is not significant.

Executive Order 13563 reaffirms the principles of E.O. 12866 while calling for improvements in the nation's regulatory system to promote predictability, to reduce uncertainty, and to use the best, most innovative, and least burdensome tools for achieving regulatory ends. The executive order directs agencies to consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public where these approaches are relevant, feasible, and consistent with regulatory objectives. E.O. 13563 emphasizes further that regulations must be based on the best available science and that the rulemaking process must allow for public participation and an open exchange of ideas. We have developed this rule in a manner consistent with these requirements.

Regulatory Flexibility Act (5 U.S.C. 601 et seq.)

Under the Regulatory Flexibility Act (RFA; 5 U.S.C. 601 *et seq.*) as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 (5 U.S.C 801 *et seq.*), whenever an agency must publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended the RFA to require Federal agencies to provide a certification statement of the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities.

At this time, we lack the available economic information necessary to provide an adequate factual basis for the required RFA finding. Therefore, we defer the RFA finding until completion of the draft economic analysis prepared under section 4(b)(2) of the Act and Executive Order 12866. This draft economic analysis will provide the required factual basis for the RFA finding. Upon completion of the draft economic analysis, we will announce availability of the draft economic analysis of the proposed designation in the **Federal Register** and reopen the public comment period for the proposed designation. We will include with this announcement, as appropriate, an initial regulatory flexibility analysis or a certification that the rule will not have a significant economic impact on a substantial number of small entities accompanied by the factual basis for that determination.

We have concluded that deferring the RFA finding until completion of the draft economic analysis is necessary to meet the purposes and requirements of the RFA. Deferring the RFA finding in this manner will ensure that we make a sufficiently informed determination based on adequate economic information and provide the necessary opportunity for public comment.

Energy Supply, Distribution, or Use—Executive Order 13211

Executive Order 13211 (Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use) requires agencies to prepare Statements of Energy Effects when undertaking certain actions. A small portion of an existing gas pipeline is within proposed critical habitat; however, we do not expect the designation of this proposed critical habitat to significantly affect energy supplies, distribution, or use. Therefore, this action is not a significant energy action, and no Statement of Energy Effects is required. However, we will further evaluate this issue as we conduct our economic analysis, and review and revise this assessment as warranted.

Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.)

In accordance with the Unfunded Mandates Reform Act (2 U.S.C. 1501 *et seq.*), we make the following findings:

(1) This rule will not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, or tribal governments, or the private sector, and includes both ''Federal intergovernmental mandates'' and ''Federal private sector mandates.'' These terms are defined in 2 U.S.C. 658(5)–(7). ''Federal intergovernmental mandate'' includes a regulation that ''would impose an enforceable duty upon State, local, or tribal governments'' with two exceptions. It excludes ''a condition of Federal assistance.'' It also excludes ''a duty arising from participation in a voluntary Federal program,'' unless the regulation ''relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and tribal governments under entitlement authority,'' if the provision would ''increase the stringency of conditions of assistance'' or ''place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding,'' and the State, local, or tribal

governments ''lack authority'' to adjust accordingly. At the time of enactment, these entitlement programs were: Medicaid; Aid to Families with Dependent Children work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement. ''Federal private sector mandate'' includes a regulation that ''would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance or (ii) a duty arising from participation in a voluntary Federal program.''

The designation of critical habitat does not impose a legally binding duty on non-Federal Government entities or private parties. Under the Act, the only regulatory effect is that Federal agencies must ensure that their actions do not destroy or adversely modify critical habitat under section 7. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary Federal aid program, the Unfunded Mandates Reform Act would not apply, nor would critical habitat shift the costs of the large entitlement programs listed above onto State governments.

(2) We do not believe that this rule will significantly or uniquely affect small governments because only Federal lands are involved in the proposed designation. Therefore, a Small Government Agency Plan is not required. However, we will further evaluate this issue as we conduct our economic analysis, and review and revise this assessment if appropriate.

Takings—Executive Order 12630

In accordance with Executive Order 12630 (Government Actions and Interference with Constitutionally Protected Private Property Rights), we will analyze the potential takings implications of designating critical habitat for the Jemez Mountains salamander in a takings implications assessment. Following completion of the proposed rule, a draft economic analysis will be completed for the proposed designation. The draft economic analysis will provide the foundation for us to use in preparing a takings implications assessment.

Federalism—Executive Order 13132

In accordance with Executive Order 13132 (Federalism), this proposed rule does not have significant Federalism effects. A Federalism assessment is not required. In keeping with Department of the Interior and Department of Commerce policy, we requested information from, and coordinated development of, this proposed critical habitat designation with appropriate State resource agencies in New Mexico. The designation of critical habitat in geographic areas currently occupied by the Jemez Mountains salamander imposes no additional restrictions to those currently in place and, therefore, has little incremental impact on State and local governments and their activities. The designation may have some benefit to these governments because the areas that contain the physical or biological features essential to the conservation of the species are more clearly defined, and the elements of the features of the habitat necessary to the conservation of the species are specifically identified. This information does not alter where and what federally sponsored activities may occur. However, it may assist local governments in long-range planning (rather than having them wait for case-by-case section 7 consultations to occur).

Where State and local governments require approval or authorization from a Federal agency for actions that may affect critical habitat, consultation under section 7(a)(2) would be required. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency.

Civil Justice Reform—Executive Order 12988

In accordance with Executive Order 12988 (Civil Justice Reform), the Office of the Solicitor has determined that the rule does not unduly burden the judicial system and that it meets the requirements of sections 3(a) and 3(b)(2) of the Order. We have proposed designating critical habitat in accordance with the provisions of the Act. This proposed rule uses standard property descriptions and identifies the elements of physical or biological features essential to the conservation of the Jemez Mountains salamander within the designated areas to assist the public in understanding the habitat needs of the species.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This rule does not contain any new collections of information that require approval by OMB under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*), need not be prepared in connection with listing a species as endangered or threatened under the Endangered Species Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

It is our position that, outside the jurisdiction of the U.S. Court of Appeals for the Tenth Circuit, we do not need to prepare environmental analyses pursuant to the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*) in connection with designating critical habitat under the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244). This position was upheld by the U.S. Court of Appeals for the Ninth Circuit (*Douglas County* v. *Babbitt,* 48 F.3d 1495 (9th Cir. 1995), cert. denied 516 U.S. 1042 (1996)).] However, when the range of the species includes States within the Tenth Circuit, such as that of Jemez Mountains salamander, under the Tenth Circuit ruling in *Catron County Board of Commissioners* v. *U.S. Fish and Wildlife Service,* 75 F.3d 1429 (10th Cir. 1996), we will undertake a NEPA analysis for critical habitat designation and notify the public of the availability of the draft environmental assessment for this proposal when it is finished.

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994

(Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination With Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to tribes.

Because we are not proposing designation of critical habitat for Jemez Mountains salamander on any tribal lands, we anticipate no impact to tribal lands.

Clarity of the Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(1) Be logically organized;

(2) Use the active voice to address readers directly;

(3) Use clear language rather than jargon;

(4) Be divided into short sections and sentences; and

(5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in the **ADDRESSES** section. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

References Cited

A complete list of references cited in this rulemaking is available on the Internet at *http://www.regulations.gov* and upon request from the New Mexico Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this document are the staff members of the New Mexico Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500; unless otherwise noted.

2. In § 17.11(h), add an entry for ''Salamander, Jemez Mountains'' in alphabetical order under Amphibians to the List of Endangered and Threatened Wildlife, to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*		*
AMPHIBIANS							
*	*	*	*	*	*		*
Salamander, Jemez Mountains.	*Plethodon neomexicanus.*	U.S. (NM)	U.S. (NM)	E	.....	17.95(d)	NA
*	*	*	*	*	*		*

3. In § 17.95, amend paragraph (d) by adding an entry for ''Jemez Mountains Salamander (*Plethodon neomexicanus*),'' in the same alphabetical order that the species appears in the table at § 17.11(h), to read as follows:

§ 17.95 Critical habitat—fish and wildlife.

* * * * *

(d) *Amphibians.*

* * * * *

Jemez Mountains Salamander (*Plethodon neomexicanus*)

(1) Critical habitat units are depicted for Los Alamos, Rio Arriba, and Sandoval Counties, New Mexico, on the maps below.

(2) Within these areas, the primary constituent elements of the physical or biological features essential to the conservation of Jemez Mountains salamander consist of four components:

(i) Tree canopy cover greater than 58 percent that

(A) Consists of the following tree species alone or in any combination: Douglas fir (*Pseudotsuga menziesii*); blue spruce (*Picea pungens*); Engelman spruce (*Picea engelmannii*); white fir (*Abies concolor*); limber pine (*Pinus flexilis*); ponderosa pine (*Pinus ponderosa*); and aspen (*Populus tremuloides*) and

(B) That may also have an understory that predominantly comprises: Rocky Mountain maple (*Acer glabrum*); New Mexico locust (*Robinia neomexicana*); oceanspray (*Holodiscus sp.*); and shrubby oaks (*Quercus spp.*).

(ii) Elevations of 6,988 to 11,254 feet (2,130 to 3,430 meters).

(iii) Ground surface in forest areas with

(A) At least 25 percent or greater of ground surface area of coniferous logs at least 10 in (25 cm) in diameter, particularly Douglas fir and other woody debris, which are in contact with the soil in varying stages of decay from freshly fallen to nearly fully decomposed, or

(B) Structural features, such as rocks, bark, and moss mats, that provide the species with food and cover; and

(iv) Underground habitat in forest or meadow areas containing interstitial spaces provided by:

(A) Igneous rock with fractures or loose rocky soils;

(B) Rotted tree root channels; or

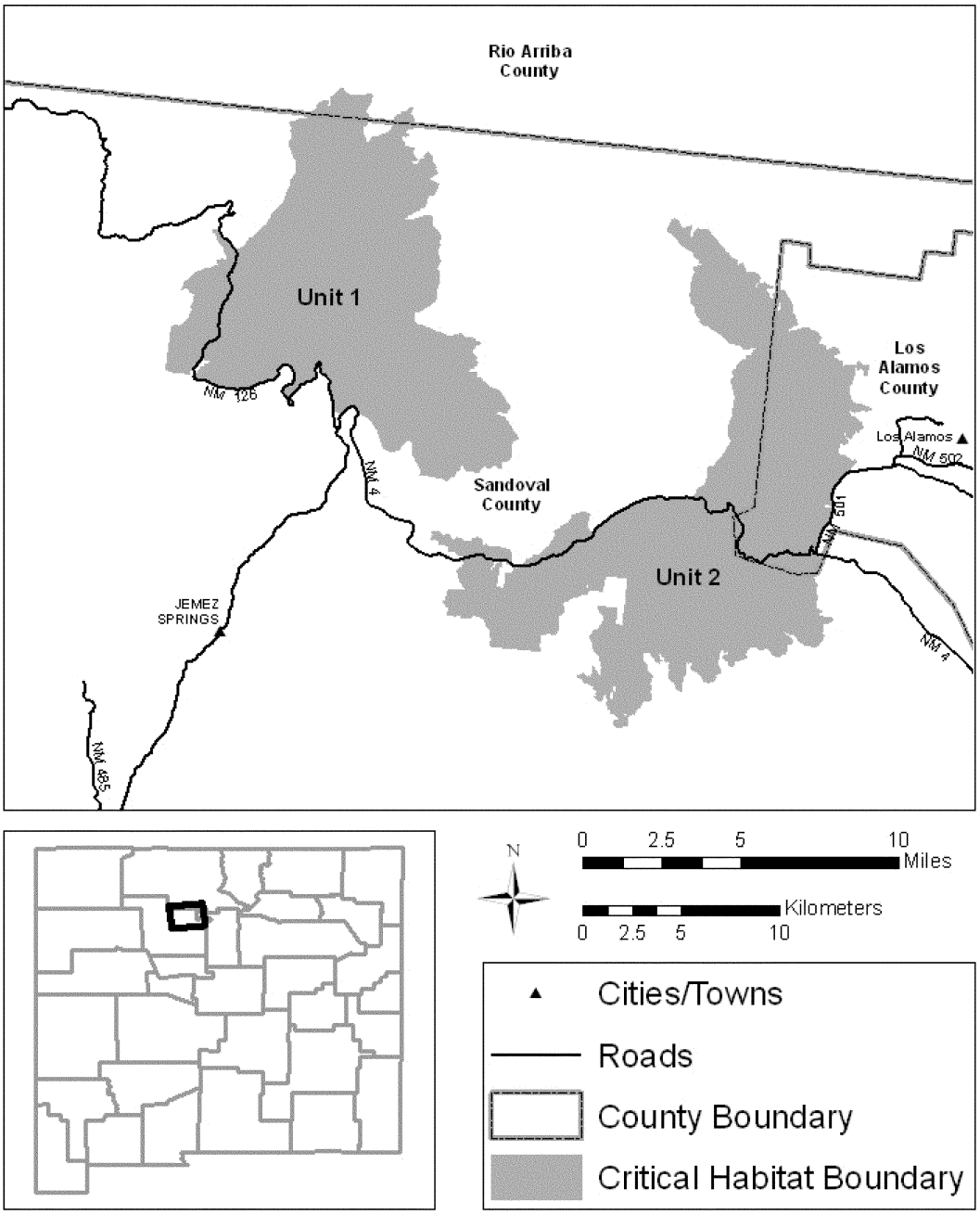
(C) Burrows of rodents or large invertebrates.

(3) Critical habitat does not include manmade structures (such as buildings, fire lookout stations, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on the effective date of this rule.

(4) *Critical habitat map units.* Data layers defining map units were created using digital elevation models, GAP landcover data, salamander observation data, salamander habitat suitability models, and were then mapped using the USA Contiguous Albers Equal Area Conic USGS version projection. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which each map is based are available to the public at the Service's Internet site (*http://www.fws.gov/southwest/es/NewMexico/*), at *http://www.regulations.gov* at Docket No. FWS–R2–ES–2012–0063, and at the New Mexico Ecological Services Field Office. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) **Note:** Index map of critical habitat for the Jemez Mountains salamander follows:

Critical Habitat for *Plethodon neomexicanus* (Jemez Mountains salamander)



* * * * *

Dated: August 23, 2012.

Rachel Jacobson,

Principal Deputy Assistant Secretary for Fish and Wildlife and Parks.

[FR Doc. 2012–21882 Filed 9–11–12; 8:45 am]

BILLING CODE 4310–55–C