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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R8–ES–2010–0006; 92210–1111–0000–B2]

Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the Mohave Ground Squirrel as Endangered or Threatened

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list the Mohave ground squirrel (*Spermophilus mohavensis*) as endangered or threatened under the Endangered Species Act of 1973, as amended (Act). After review of the best available scientific and commercial information, we find that listing the Mohave ground squirrel is not warranted at this time. However, we ask the public to continue to submit to us any new information that becomes available concerning the threats to the Mohave ground squirrel or its habitat at any time.

DATES: The finding announced in this document was made on October 6, 2011.

ADDRESSES: This finding is available on the Internet at *http://www.regulations.gov* at Docket Number FWS–R8–ES–2010–0006 and at *http://www.fws.gov/ventura/.* Supporting documentation we used in preparing this finding is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, 2493 Portola Road, Suite B, Ventura, CA 93003. Please submit any new information, materials, comments, or questions concerning this finding to the above address.

FOR FURTHER INFORMATION CONTACT: Michael McCrary, Listing and Recovery Program Coordinator, U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office (see **ADDRESSES**); by telephone at 805–644–1766; or by facsimile at 805–644–3958. If you use a telecommunications device for the deaf (TDD), call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Act (16 U.S.C. 1531 *et seq.*) requires that, for any petition to revise the Federal Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information that listing may be warranted, we make a finding within 12 months of the date of receipt of the petition. In this finding, we determine whether the petitioned action is: (a) Not warranted, (b) warranted, or (c) warranted, but the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are endangered or threatened, and expeditious progress is being made to add or remove qualified species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though resubmitted on the date of such finding, that is, requiring a subsequent finding to be made within 12 months. We must publish these 12-month findings in the **Federal Register.**

Previous Federal Actions

On December 13, 1993, the Service received a petition dated December 6, 1993, from Dr. Glenn R. Stewart of California Polytechnic State University, Pomona, California, requesting the Service list the Mohave ground squirrel as a threatened species. At that time, the species was a category 2 candidate (November 15, 1994; 59 FR 58982), and was first included in this category on September 18, 1985. Category 2 included taxa for which information in the Service's possession indicated that listing the species as endangered or threatened was possibly appropriate, but for which sufficient data on biological vulnerability and threats were not available to support a proposed listing rule. On September 7, 1995, we published our 90-day petition finding, which determined that the 1993 petition did not present substantial information indicating that the petitioned action may be warranted (60 FR 46569).

On September 5, 2005, we received a petition, dated August 30, 2005, from the Defenders of Wildlife and Dr. Glenn R. Stewart to list the Mohave ground squirrel as an endangered species in accordance with section 4 of the Act. It also requested that critical habitat be designated concurrent with the listing of the Mohave ground squirrel. The petition clearly identified itself as such and included the requisite identification information for the petitioners, as required in 50 CFR 424.14(a).

On April 27, 2010, the Service made its 90-day finding (75 FR 22063), concluding that the petition presented substantial scientific or commercial information to indicate that listing the Mohave ground squirrel may be warranted, announced the initiation of a status review of this species, and solicited comments and information to be provided in connection with the status review by June 28, 2010. This notice constitutes our 12-month finding regarding the petition to list the Mohave ground squirrel.

Species Information

Species Description

The Mohave ground squirrel is a medium-sized squirrel. Total length, including the tail, is about 9 inches (in) (23 centimeters (cm)), tail length is about 2.5 in (6.4 cm), and weight is about 3.5 ounces (104 grams). The upper body is grayish brown, pinkish gray, cinnamon gray, and pinkish cinnamon, without stripes or fleckings. The underparts of the body and the tail are silvery white and the tail is bushy (Grinnell and Dixon 1918, p. 667). The skin is darkly pigmented and dorsal hair tips are multi-banded. The Mohave ground squirrel has a winter and summer pelage (coat). In summer the pelage is coarser and shorter, the sides of the face paler, and the underbelly whiter than the winter pelage. The two sexes appear to be alike in color and measurements (Grinnell and Dixon 1918, p. 667).

Two other species of small ground squirrels occur within the range of the Mohave ground squirrel, the antelope ground squirrel (*Ammospermophilus leucurus*) and the round-tailed ground squirrel (*Xerospermophilus tereticaudus*). The three species are different in appearance. Although similar in size to the Mohave ground squirrel, the antelope ground squirrel is grayish brown in color, with a white side stripe and a black band on the underside of the tail near the tip (Ingles 1965, pp. 169–171). The round-tailed ground squirrel has a unicolored tail that is cylindrical or round and not bushy, and a larger body than the Mohave ground squirrel (Ingles 1965, p. 171). However, its skull is significantly smaller than that of the Mohave ground squirrel in 18 of 20 cranial characteristics (Best 1995, p. 508). Mohave and antelope ground squirrels occur sympatrically (occupying the same or overlapping geographic areas without interbreeding) in the same habitat (Aardahl and Roush 1985, p. 20), while round-tailed ground squirrels overlap only along the eastern edge of the Mohave ground squirrel's range (see ''Nomenclature and Taxonomy'' section below).

Nomenclature and Taxonomy

The scientific name of the Mohave ground squirrel was changed from *Spermophilus mohavensis* to *Xerospermophilus mohavensis* with the publication of a review of the available research on morphological, genetic, cytogenetic, ecological, and behavioral attributes in the genus *Spermophilus* (Helgen *et al.* 2009, p. 273).

The Mohave ground squirrel is a distinct, full species with no recognized subspecies. It was discovered in 1886 by Frank Stephens (Grinnell and Dixon 1918, p. 667) and described by Merriam (1889, p. 15). The type specimen is from near Rabbit Springs, San Bernardino County, California, about 15 miles (mi) (24.1 kilometers (km)) east of Hesperia (Grinnell and Dixon 1918, p. 667).

The closest relative of the Mohave ground squirrel is the round-tailed ground squirrel (Bell *et al.* 2009, p. 5; Helgen *et al.* 2009, p. 293). Until 1977, the ranges of these two species were thought to be adjacent to each other but not overlapping (Hall and Kelson 1959, p. 358). However, Wessman (1977, p. 10) determined that the eastern edge of the geographic range of the Mohave ground squirrel overlapped the western edge of the round-tailed ground squirrel (Wessman 1977, pp. 12–13). He identified several areas of contact between the two species and identified one area near Helendale, San Bernardino County, California, as a possible zone of hybridization between the species. He observed morphological characteristics of both species exhibited in a few of the squirrels captured there (*e.g.,* long, narrow tail with white on the underside) (Wessman 1977, p. 13). However, in 2009, Bell *et al.* (p. 11) found no evidence of mitochondrial DNA introgression between the Mohave ground squirrel and the round-tailed ground squirrel, including the three individuals identified as backcross individuals based on allozyme (form of an enzyme that differs in amino acid sequence) and karyotypic (the shape, type, number, and order of a species' chromosomes) data from Hafner and Yates (1983). We are not aware of any information that would indicate hybridization occurs with the sympatric antelope ground squirrel.

Range and Distribution

The Mohave ground squirrel is endemic to the western part of the Mojave Desert, in portions of Inyo, Kern, Los Angeles, and San Bernardino Counties, California. It has one of the smallest ranges of any species of ground squirrel in North America (Hoyt 1972, p. 3). We define range as the geographical area within which a species may be found.

Aspects of the Mohave ground squirrel's biology and behavior make individuals of the species difficult to observe, trap, and count, which in part explains why the range of the species has increased over time (see below). Mohave ground squirrels are only active and above ground for part of the year (generally February through August) and therefore can only be trapped and observed during this time. They spend much of the year underground and in a state of dormancy (see ''Active Season and Dormancy'' section). The length of the active season and movements of Mohave ground squirrels may also be affected by rainfall amounts. The number of individuals in an area appears to decline during dry years, and movements and home range size shrink (Harris and Leitner 2004, p. 521). Thus, if traps are set during a dry year, the reduced movements of Mohave ground squirrels and reduced densities or local extirpations make it less likely that the traps are located when and where they will capture Mohave ground squirrels. Conversely, if traps are set during a wet year when home ranges are larger, the Mohave ground squirrel may avoid the baited traps because of the increased availability of forage.

Because most surveys for the Mohave ground squirrel have been only 1 year in duration, this limited survey duration makes it difficult to assess population trend for a species whose numbers, movements, and ''trapability'' can fluctuate greatly among years (Brooks and Matchett 2002, p. 171). These factors in combination have made it difficult to determine the boundaries of the species' range, its distribution within the range, and population trends (see ''Abundance and Trends'' section). This has been further complicated because the vast majority of the information currently available on the distribution and abundance of Mohave ground squirrels is based on the California Department of Fish and Game (CDFG) survey protocol, which has been known to not detect squirrels when other methods have shown them to be present (see ''Abundance and Trend'' section below).

In 1938, Howell (1938, p. 184) published a map of the range of the Mohave ground squirrel that included the western Antelope Valley to an area 15 mi (25.2 km) west of Barstow. In 1977, Wessman surveyed for the Mohave ground squirrel along much of its eastern boundary and found the species' range extended 1,152,000 ac (466,200 ha) farther east and south than previously reported (Wessman 1977, p. 4).

For this 12-month finding, the Service is defining the range of the Mohave ground squirrel as about 5,319,000 acres (ac) (2,152,532 hectares (ha)) (Service calculations) (see Map 1). The range is bounded on the south and west by the San Bernardino, San Gabriel, Tehachapi, and Sierra Nevada mountain ranges, although the species occurs in canyons in the eastern foothills of the Sierra Nevada up to 5,600 feet (ft) (1,706 meters (m)) (Gustafson 1993, pp. 56–57; Laabs 1998, p. 1). The range is bounded on the north and east by Owens Lake and the Mojave River/Lucerne Valley, respectively (Leitner 2008, p. 18). Howell (1938, p. 184) and Aardahl and Roush (1985, p. 3) included the Antelope Valley west of Palmdale and Lancaster in the range of the Mohave ground squirrel (see Map 1).

The range map in the petition did not include the western Antelope Valley because there are no definite records of the species in that area. However, for several reasons, we included the western Antelope Valley in our range of the Mohave ground squirrel. First, older reports and scientific papers on the Mohave ground squirrel included this area in the range of the species (*e.g.,* Howell 1938, p. 184; Aardahl and Roush 1985, p. 3). Second, although portions of this area are now used for agriculture and livestock grazing, suitable habitat still remains and may be connected to currently occupied habitat to the east. Third, early museum collections of the Mohave ground squirrel did not record precise locality data and often used the closest town for reference such as ''near Palmdale.'' Frequently, the closest town was several miles away and the locality information vague. Fourth, recent visual observations of Mohave ground squirrels occurred southwest of Mojave (see Map 1) (Leitner 2008, p. 7). Thus, there is some indication that the Mohave ground squirrel may have occurred, and may continue to occur, in the western portion of the Antelope Valley. Although areas of natural habitat within the range of the Mohave ground squirrel have been lost or degraded from human activity (see Factor A), the boundary of the current range is larger than reported by Howell in 1938.

The range of the Mohave ground squirrel may be larger than defined by the Service, as there have been recent sightings beyond the area defined by the Service as the range of the Mohave ground squirrel. Although the Mohave ground squirrel has previously been reported at elevations up to 5,600 ft (1,706 m) in the canyons in the eastern foothills of the Sierra Nevada that open to the Mojave Desert (Gustafson 1993, pp. 56–57; Laabs 1998, p. 1), a biologist recently reported a Mohave ground squirrel about 10 mi (16.1 km) south of Weldon (see Map 1) in an interior valley in the Tehachapi Mountains (California Natural Diversity Database 2007). Another biologist sighted a Mohave ground squirrel in the Panamint Valley, which is about 5 mi (8 km) outside the northeastern edge of the range (see Map 1) (Threloff 2007 *in litt.*, p.1), whereas Aardahl

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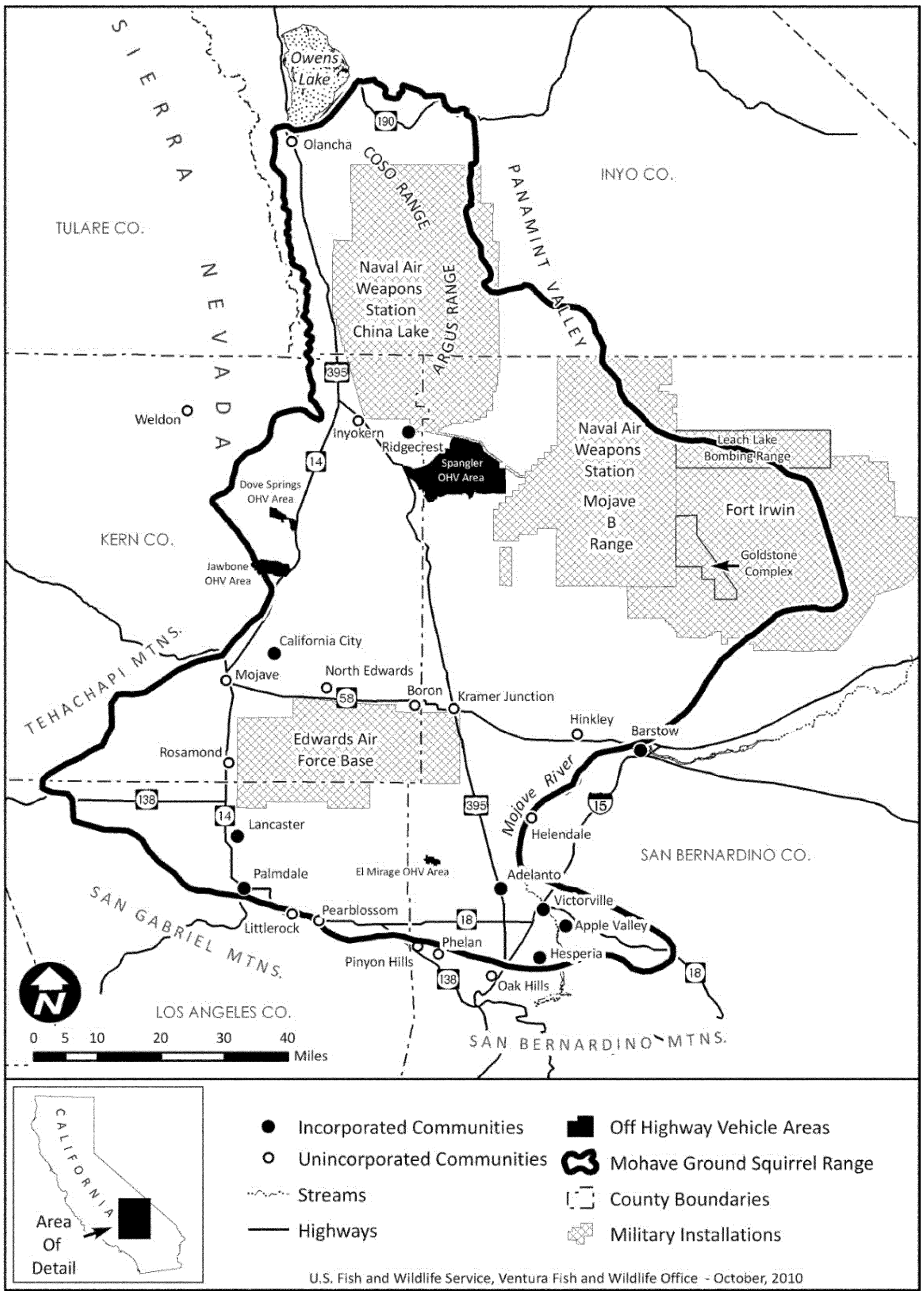
Map 1. Place names, major roads, military bases, and off-highway vehicle areas in the range of the Mohave ground squirrel (calculated by the Service).



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and Roush were unsuccessful in capturing a squirrel here in 1985 (Gustafson 1993, p. 56). We are not using these two sightings in our range calculations because they are anecdotal and fall outside the areas previously published about the range of the Mohave ground squirrel. Although we have not included these two sightings, they indicate that the range of the Mohave ground squirrel may actually be larger than previously indicated on range maps or currently defined by the Service.

Within its range, the Mohave ground squirrel has a patchy distribution (Hoyt 1972, p. 7), likely caused by differences in rainfall, terrain (Zembal and Gall 1980, p. 348), elevation, temperature (Gustafson 1993, pp. 56–57), and soils and vegetation (Harris and Leitner 2005, p. 189). The habitat requirements of the Mohave ground squirrel for feeding, breeding, and sheltering are not uniformly spaced throughout its range.

Leitner (2008, pp. i–A2) collected and analyzed 1,236 unpublished observations, field studies, and surveys from 1998 to 2007, including both positive and negative findings of trapping efforts using the CDFG survey protocol. These surveys were usually performed in association with proposed development, because the Mohave ground squirrel is listed as threatened under the California Endangered Species Act (CESA) (see Factor D, ''State Laws and Regulations''). The survey effort has been heavily weighted to the southernmost portion of the species' range (Leitner 2008, p. 5), where most of the development in the range of the Mohave ground squirrel has occurred and is occurring (see Factor A, ''Urban and Rural Development''). Approximately 67 percent of the surveys were conducted south of State Route 58 (SR–58) (see Map 1), and almost half of all surveys were in two areas in the southernmost part of the range of the Mohave ground squirrel: The Lancaster-Palmdale area and the Adelanto area. Almost all recorded observations of Mohave ground squirrels from 1998 to 2007 have been from Edwards Air Force Base (EAFB), which is south of SR–58 (see Map 1), or from the central and northern portion of the squirrel's range; only a few were observed in the southern end of the squirrel's range. However, much of the range of the Mohave ground squirrel has not been surveyed (Leitner 2008, p. 9).

Leitner (2008, p. 10) identified four areas that he labels as ''core'' areas for the Mohave ground squirrel. ''Core'' areas have the following criteria:

(1) The species has been present for a substantial period;

(2) The species is currently found at multiple locations; and

(3) There is a substantial number of adults representing a viable reproductive population.

Four areas that meet the above criteria are: (1) Coso Range-Olancha; (2) Little Dixie Wash; (3) EAFB; and (4) Coolgardie Mesa-Superior Valley (see Map 2). Leitner (2008, p. 1) also described four other population areas with multiple recent records of the species, although these areas are not known to have Mohave ground squirrels present for a substantial period: Pilot Knob, the Desert Tortoise Natural Area-Fremont Valley, Boron-Kramer Junction, and Poison Canyon (Leitner 2008, p. 34). Together these eight important population areas comprise about 606,000 ac (245,240 ha), or 11.4 percent of the species' range.

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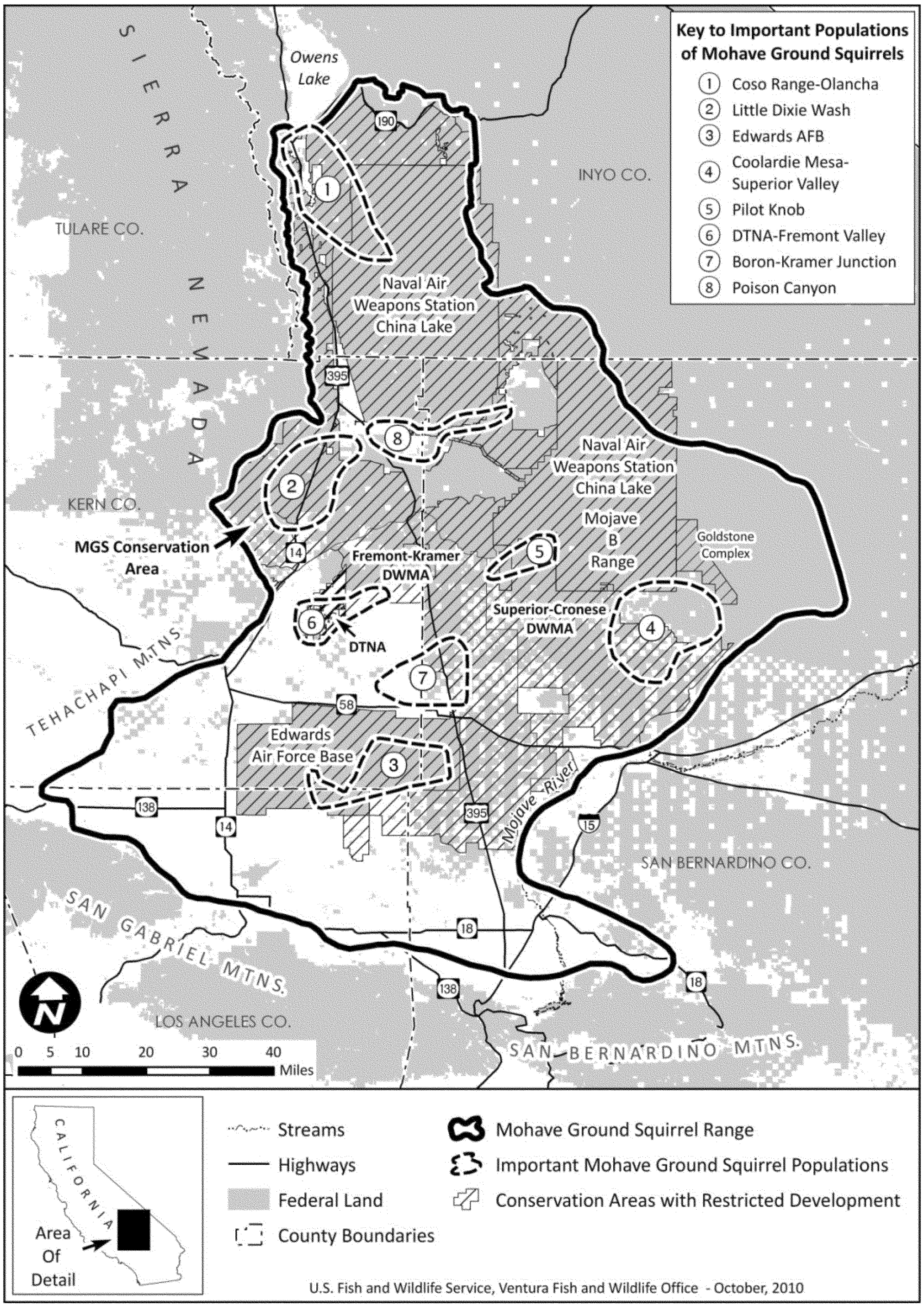
Map 2. Important Mohave ground squirrel population areas with restricted development in the range of the Mohave ground squirrel (calculated by the Service).



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Leitner has emphasized the importance of protecting and maintaining connectivity between these eight areas for the conservation of the Mohave ground squirrel (2008, p. 12). It should be noted, however, that these areas have been identified using the data available from limited surveys for the Mohave ground squirrel. Much of the range has not been surveyed (Leitner 2008, p. 9); therefore, unsurveyed areas may support additional important population areas for the Mohave ground squirrel. As an example of a recent discovery of an important population area, the Poison Canyon area was discovered during a 2006 survey for a proposed drainage improvement project along a State highway (Sapphos 2006, p. 3–1).

Abundance and Trends

Data on population abundance and trend for the Mohave ground squirrel are limited (Leitner 2008, p. 8). The behavioral characteristics of the Mohave ground squirrel make it difficult to determine its presence or abundance as it spends much of the year underground (see ''Active Season and Dormancy'' section below). Based on his observations, Burt (1936, p. 222) estimated the density of Mohave ground squirrels in the southern part of their range at 15 to 20 animals per square mi (5 to 8 animals per square km). Most subsequent studies cannot be readily compared with Burt (1936) because they did not estimate density of animals (*i.e.,* they either reported the number of animals trapped or compared numbers trapped to individual trapping efforts (Hoyt 1972, p. 6; Recht 1977, p. 4; Wessman 1977, p. 4; Leitner 1980, pp. IV–26; Aardahl and Roush 1985, pp. 11–13; Scarry *et al.* 1996, pp. 12–17; Leitner 2001, pp. 13–18, 30–32).

The only location we are aware of where a population of Mohave ground squirrels has been studied in detail for several years is in the Coso Region in the northern portion of the species' range (Leitner 2005, p. 3). Trapping surveys for the Mohave ground squirrel at this location were conducted from 1989 to 1996 and from 2001 to 2005. However, the estimated population density was only reported for 1990 and for the period from 1992 to 1996 because of limited sample size in other years (Leitner and Leitner 1998, pp. A–3, A–6, A–8, A–9, A–12, A–15, A–18, and A–22). The number of Mohave ground squirrels that were captured varied from year to year, ranging from 10 squirrels trapped in 2003 to 78 in 1994 (Leitner 2005, p. 3). The number of adult Mohave ground squirrels trapped was higher per year during the period 1990–1996 than during the period 2001–2004 (Leitner 2005, p. 3).

Researchers have suggested that trends in protocol survey data over time could be used to evaluate the status of the species. Brooks and Matchett (2002) analyzed the data from 19 reported studies on the Mohave ground squirrel in 1918 and during the period 1970–2001. They suggested that the Mohave ground squirrel may be undergoing a long-term decline as indicated by the decreased trapping success since the mid-1980s (Brooks and Matchett 2002, p. 176). One possible reason for decline is that Mohave ground squirrel populations appear to be sensitive to both seasonal and annual rainfall patterns; for example, in dry years, reproduction the following spring may be unsuccessful, and population numbers and the area occupied by the species may decrease (Leitner and Leitner 1998, pp. 29–31; Harris and Leitner 2005, p. 520).

Gustafson (1993, p. 22) reported that prolonged periods of drought may result in the loss of Mohave ground squirrels in local areas, because no young may be born for one up to several years, and adult survivability is reduced by poor habitat conditions to the point where the population dies out. In general, the population dynamics of the Mohave ground squirrel appear to follow a contraction and expansion pattern, *i.e.,* there are local extirpations of squirrel populations following drought years and recolonization of these areas with consecutive wet years (Harris and Leitner 2005, p. 189). During the last few decades, more consecutive years in the western Mojave Desert have been dry versus wet (Brooks and Matchett 2002, p. 175), suggesting a trend weighted toward extirpations rather than recolonizations. However, Brooks and Matchett (2002, p. 176) suggest that factors other than, or in addition to, rainfall amount and timing seem to be affecting Mohave ground squirrel abundance, such as trapping characteristics, trapping protocols, weather conditions, or site (habitat) characteristics.

Leitner (2001, pp. 30–31) conducted a similar comparison of trapping results at 11 sites in 1980, 1999, and 2000, and at 19 sites in 2004 (Leitner 2005, p. 5). The first study showed a positive correlation between rainfall and trapping success prior to 1991, but no correlation after that. Both studies reported that trapping success has declined and concluded that this indicated a possible decline in the distribution and abundance of the Mohave ground squirrel during this period, despite periods of above-normal precipitation (Leitner 2001, p. 32; Brooks and Matchett 2002, p. 176).

However, the survey protocol is subject to potential inaccuracies, such as yielding false negative results or undersampling the population (see also Factor D, ''State Laws and Regulations'' section). Mohave ground squirrels are difficult to trap (Hoyt 1972, p. 7), and they have been observed approaching traps but not entering them (Leitner 2009, pers. comm.). For example, in 2009, only one Mohave ground squirrel was trapped during two surveys conducted in the Fort Irwin western expansion area (Delaney and Leitner 2009, p. 9). However, the detection rate for a video detection system, which was used at the same time as the trapping was conducted, was much higher; the video system recorded nine Mohave ground squirrels compared to the one that was trapped (Delaney 2009, pp. 13–14).

Food Habits

The diet of the Mohave ground squirrel consists of leaves (Recht 1977, p. 75), flowers, fruits, and seeds (Leitner and Leitner 1992, p. 12; Gustafson 1993, pp. 77–83) from a variety of plants; they also feed on fungi (Burt 1936, p. 223) and arthropods (caterpillars) when available (Zembal and Gall 1980, p. 345). When available in spring, new, tender, green vegetation makes up nearly all of the diet of the Mohave ground squirrel (Best 1995, p. 6). The Mohave ground squirrel is also known to eat alfalfa (Best 1995, p. 5).

The Mohave ground squirrel forages on the ground, in the branches of shrubs, and, where present, in *Yucca brevifolia* (Joshua trees) (Johnson no date, p. 1). It caches food in its burrow for future use (Johnson no date, p. 1). It obtains water from its diet, but will drink water if available (Johnson no date, p. 1).

Recht (1977, p. 80) categorized the foraging strategy of the Mohave ground squirrel as a facultative specialist. Because the availability of food resources fluctuates seasonally and annually in the Mojave Desert, the Mohave ground squirrel specializes in certain food species for short periods, but changes the foods it consumes as their availability changes. For example, in March 1994, the diet of the Mohave ground squirrel in the northern part of its range was 90 percent shrubs, 10 percent forbs (*i.e.,* any herbaceous plant that is not grass or grasslike), and less than 1 percent nonnative annual grasses (*Schismus* and *Bromus*) (Leitner *et al.* 1995, p. 45). By April, the Mohave ground squirrel's diet had changed to 60 percent shrubs, 35 to 40 percent forbs, and 2 percent grasses (Leitner *et al.* 1995, p. 48).

The quantity, variety, and nutritional quality of plant food sources available ultimately depend on the amount of rainfall from the preceding fall and winter (Aardahl and Roush 1985, p. 22). During drought years, there are few-to-no herbaceous native annual forbs available, and Mohave ground squirrels must then depend on shrub foliage for water and nutrition (Leitner and Leitner 1998, p. 20).

This foraging strategy provides efficiency and flexibility to maximize nutritional and water intake in a changing desert habitat (Recht 1977, p. 80). These abilities are needed, as the Mohave ground squirrel must increase its body weight in spring and early summer to sustain itself during the dormant period of mid-summer through winter (Leitner and Leitner 1998, p. 33).

Reproduction

Female Mohave ground squirrels can breed at 1 year of age if environmental conditions are favorable (Leitner and Leitner 1998, p. 28), while males do not breed until 2 years of age or older (Leitner and Leitner 1998, p. 36).

The Mohave ground squirrel mating season occurs from mid-February to mid-March (Harris and Leitner 2004, p. 1). Mohave ground squirrel males typically emerge from dormancy in February, up to 2 weeks before females (Recht pers. comm., as cited in Gustafson 1993, p. 83). Male Mohave ground squirrels defend a territory, which females enter for mating (Recht pers. comm., as cited in Gustafson 1993, pp. 83–84). Three to four females mate and remain in the male's territory for a day or so, before returning to their respective home ranges. After a gestation period of 29 to 30 days, the young are born in the female's burrow (natal burrow) from March to May, with a peak in April. Average litter size is about six (Burt 1936, p. 224; Recht pers. comm., as cited by Leitner *et al.* 1991, p. 63) and ranges from four to nine (Best 1995, p. 3). Parental care continues through mid-May, with juveniles emerging above ground at 10 days to 2 weeks of age (Gustafson 1993, p. 84). By early May, the juveniles are active above ground and can be captured in live traps.

Reproductive success appears to be strongly influenced by rainfall. In dry years, the Mohave ground squirrel's survival strategy appears to be to forego reproductive activity and concentrate on gaining weight and fat reserves in the spring and early summer to better survive the dormant period (Leitner and Leitner 1998, p. 32). For example, Mohave ground squirrels in the Coso Range failed to reproduce successfully in 1989, 1990, and 1994, which correlated with low fall and winter precipitation and a low standing crop of annual forbs. In each of the 3 years, precipitation during the period when it normally occurs in the region (September 1 to March 31) was lower than the long-term average for the same period (average of 3.3 in (8.5 cm) versus the average of 5 in (12.7 cm), respectively) (Leitner and Leitner 1998, pp. 18–19, 21, and 29). In years when reproduction does occur, females of all age classes (including yearlings) produce young (Leitner and Leitner 1998, p. 28).

Mortality and Predation

Mohave ground squirrels can live up to 5 years or longer (Leitner and Leitner 1998, p. 28). Mortality for juveniles is high during the first year and is disproportionately higher for males than females. As a result, the juvenile population contains significantly more females than males, and the adult female-to-male ratio averages about 2.6:1, but was reported to be as high as 7:1 in one population (Leitner and Leitner 1998, p. 36).

Information on the causes of mortality in the Mohave ground squirrel is limited. We are not aware of any information on diseases in the species. Although not based on direct observation, predators are believed to include coyote (*Canis latrans*), American badger (*Taxidea taxus*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), prairie falcon (*Falco mexicanus*), common raven (*Corvus corax*), and rattlesnake (*Crotalus* sp.) (Boarman 1993, p. 2; Gustafson 1993, p. 88; Harris, pers. comm., as cited in Defenders of Wildlife and Stewart 2005, p. 15).

Mortality may also be caused by extended periods of low amounts of winter rainfall, which results in reduced availability of forage and water and increases the species' vulnerability to malnutrition, disease, and starvation. Gustafson (1993, p. 22) indicated that prolonged periods of drought result in the extirpation of Mohave ground squirrels in local areas as adult survival is reduced by poor forage conditions.

Active Season and Dormancy

The Mohave ground squirrel lives in burrows which it digs (Gustafson 1993, p. ix), and remains in burrows in a state of dormancy throughout much of the year. For the Mohave ground squirrel, dormancy is a physiological state that includes a reduced frequency of breathing, or apnea, reduced oxygen consumption, reduced body temperature (Bartholomew and Hudson 1960, pp. 195–197), and a reduced heart rate (Ingles 1965, p. 177). Mohave ground squirrels may be active from February to August (Bartholomew and Hudson 1960, p. 194), with dormancy usually beginning in July or August; emergence dates vary with elevation (Johnson no date, p. 1). In years when reproduction occurs, most adults are active through June, but all have entered dormancy by the end of July; in years with no reproduction, adults may enter dormancy as early as the end of April. In contrast, juvenile Mohave ground squirrels begin to forage outside their natal burrows by mid-May and do not enter dormancy until July at the earliest and as late as the end of August (Leitner and Leitner 1998, pp. 32, 38).

The period when dormancy begins varies annually. Dormancy does not appear to be an adaptation to avoid low temperatures; rather it appears to be an adaptation to seasonally restricted food and water (Bartholomew and Hudson 1960, p. 202). The initiation of dormancy appears to correspond to either the absence of available green vegetation or its abundance (Aardahl and Roush 1985, pp. 20–21). For the latter, the Mohave ground squirrel enters dormancy earlier as food abundance allows the animal to meet energy needs to sustain it through dormancy earlier (Harris and Leitner 2004, p. 521).

The principal source of energy for the Mohave ground squirrel during dormancy is stored body fat, although food is stored in burrows and may be consumed during the dormant period (Ingles 1965, p. 177; Recht 1977, p. 85; Johnson no date, p. 1). During more severe drought years, Mohave ground squirrels may enter dormancy with relatively low body weight, which likely affects survivorship of Mohave ground squirrels, especially juveniles, to the following spring (Leitner and Leitner 1998, p. 32).

Home Range and Movements

In general, juvenile Mohave ground squirrels have larger home ranges (at least twice as large) than adults, and adult males have larger home ranges than females (Aardahl and Roush 1985, p. 11; Best 1995, p. 6). Mohave ground squirrels are territorial and, throughout much of their active period, there is little overlap between home ranges (Recht 1977, p. 20). Best (1995, p. 6) observed that home ranges are separate until late June, with little evidence of territorial behavior. The home ranges are not static and may shift during the active season, and from year to year, in response to changes in food quality and quantity (Best 1995, p. 6; Harris and Leitner 2004, p. 520). Home ranges of juveniles form a cluster around the home range of an adult (Best 1995, p. 6), and adults exclude juveniles from those portions of the habitat with the densest vegetation (Best 1995, p. 6). Adult Mohave ground squirrels gain weight twice as fast as most juveniles, likely due to differences in resource quality between adult and juvenile home ranges (Recht 1977, p. 82).

Home range size varies with the reproductive period and rainfall levels and food availability (Harris and Leitner 2004, p. 1). During the mating season, the median male home range is much larger than the female home range, 16.6 ac (6.73 ha) compared to 1.8 ac (0.74 ha) (Harris and Leitner 2004, pp. 521–522). The females' home ranges are non-overlapping and noncontiguous, and each individual exhibits a high degree of site fidelity (Harris and Leitner 2004, p. 522). During the post-mating period, male home range size varies from 3.7 to 26.7 ac (1.5 to 10.8 ha), while female home range size varies from 0.72 to 4.69 ac (0.29 to 1.90 ha) (Harris and Leitner 2004, pp. 517, 521). Female post-mating home range size is larger than the mating season home range (Harris and Leitner 2004, p. 520).

An evaluation of different sequential survey results indicated that juvenile Mohave ground squirrels moved farther than adults (Aardahl and Roush 1985, p. 11), and long-distance movements were greater in males than in females. Among juveniles, the greatest long-distance movements between two sites for males (n = 15) was a mean of 4,987 ft (1,520 m) (range 360–20,440 ft (110–6,230 m)), and for females (n = 21) 1,657 ft (505 m) (range 344–12,670 ft (105–3,862 m)) (Harris and Leitner 2005, p. 188).

Both adult male and female Mohave ground squirrels vocalize during their active season, and have multiple types of calls (Delaney 2009, pp. 15–17). The purpose of these calls is unknown but may be linked to identifying home ranges.

Habitat Requirements

The Mohave ground squirrel occurs in a wide variety of habitats in the western Mojave Desert (Wessman, as cited in Aardahl and Roush 1985, p. 22). They include Mojave creosote bush scrub, Mojave mixed woody scrub, desert saltbush scrub, blackbrush scrub, Mojave desert wash scrub, Joshua-tree woodland, and shadescale scrub (Gustafson 1993, pp. ix, 81; Bureau of Land Management (BLM) 1998, p. 1); Mojave creosote bush scrub is the preferred habitat of the Mohave ground squirrel (Aardahl and Roush 1985, pp. 22, 23). The Mohave ground squirrel has also been found in some areas used for agriculture (Gustafson 1993, pp. ix, 81; BLM 1998, p. 1).

Habitat features considered most suitable for the Mohave ground squirrel include areas with relatively flat topography, often located in large alluvial-filled valleys, containing fine-to-medium-textured soil with little or no rocks, and with the presence of a variety of native shrubs, including *Larrea tridentata* (creosote bush), *Ambrosia dumosa* (white bursage), and *Atriplex* spp. (saltbush) (Aardahl and Roush 1985, p. 9).

Soil characteristics are important, as the Mohave ground squirrel constructs burrows to escape temperature and humidity extremes and predators, and to give birth (Aardahl and Roush 1985, p. 23). The species is absent from very rocky areas and playas (*i.e.,* a sandy, salty, or mud-caked flat floor of a desert drainage basin that is periodically covered with water) (Wessman 1977, pp. 7–9; Zembal and Gall 1980, p. 348). Rainfall must be adequate as it affects the quality and quantity of forage (Gustafson 1993, p. 57). Plant species diversity and the availability of native annual forbs are important to population stability and reproduction (Aardahl and Roush 1985, p. 22). The presence of a variety of shrubs that provide a reliable food source during drought years may be critical for a population to persist (Charis 2005, pp. 3–75).

The Mohave ground squirrel is considered to be absent, or nearly so, from dry lakebeds, lava flows, and steep, rocky slopes, although juveniles may disperse through such areas (Leitner, pers. comm., as cited in Laabs 1998, p. 3). Harris and Leitner (2005, p. 193) found that Mohave ground squirrels travelled through habitats considered marginal for permanent occupancy (*e.g.,* contained rocky or gravelly soils, and elevation changes of hundreds of feet) but did not cross a playa barren of vegetation. Long-distance movement by juveniles through marginal areas may be critical for connecting local populations and recolonizing sites after local, drought-related extirpations (Harris and Leitner 2005, p. 1).

Summary of Information Pertaining to the Five Factors

Section 4 of the Act (16 U.S.C. 1533) and implementing regulations (50 CFR part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be endangered or threatened 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; or

(E) Other natural or manmade factors affecting its continued existence.

In making this 12-month finding, information pertaining to the Mohave ground squirrel in relation to the five factors provided in section 4(a)(1) of the Act is discussed below.

In making our 12-month finding on a petition to list the Mohave ground squirrel, we considered and evaluated the best available scientific and commercial information. To ensure that this finding is based on the latest scientific information, we contacted species experts; land managers within the range of the Mohave ground squirrel; the CDFG; and others with expertise on the species, its habitat, and threats occurring, or likely to occur, within the range of the species. We conducted a search of the available published literature on the Mohave ground squirrel and collected unpublished reports on the species from resource agencies and others. Unpublished reports included regional field studies by State and Federal agencies and conservation groups, results of presence/absence surveys conducted prior to proposed development, and incidental observations reported by field biologists. In addition, we accessed information in the California Natural Diversity Database. This information, information provided by the public, and additional information and data in our files provided the basis for the status review for the Mohave ground squirrel. In making our 12-month finding, we considered and evaluated all scientific and commercial information in our files, including information received during the public comment period that ended June 28, 2010. The analysis of potential threats to the Mohave ground squirrel discussed below includes those identified in the petition and those identified in the information sources listed above.

In considering what factors might constitute threats to a species, we must look beyond the exposure of the species to a particular factor to evaluate whether the species may respond to that factor in a way that causes actual impacts to the species. If there is exposure to a factor and the species responds negatively, the factor may be a threat and, during the status review, we attempt to determine how significant a threat it is. The threat is significant if it drives or contributes to the risk of extinction of the species such that the species warrants listing as endangered or threatened as those terms are defined in the Act. However, the identification of factors that could impact a species negatively may not be sufficient to compel a finding that the species warrants listing. The information must include evidence sufficient to suggest that the potential threat has the capacity (*i.e.,* it should be of sufficient magnitude and extent) to affect the species' status such that it meets the definition of endangered or threatened under the Act.

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of the Species' Habitat or Range

The following potential threats that may affect the habitat or range of the Mohave ground squirrel are discussed in this section: (1) Urban and rural development, (2) off-highway vehicle (OHV) recreational use, (3) transportation infrastructure, (4) military operations, (5) energy development, (6) livestock grazing, (7) agriculture, (8) mining, and (9) climate change. Climate change is discussed under Factor A because, although climate change may affect Mohave ground squirrels directly by creating physiological stress, the primary impact of climate change on the species is expected to be through changes to the availability and distribution of Mohave ground squirrel habitat. In addition, commercial filming occurs on private and Bureau of Land Management (BLM) lands in the western Mojave Desert. The activities for creating motion pictures, television shows, and commercials may require travelling on unpaved roads and trails or cross-country use. However, in our review of the best available scientific and commercial information, we did not find information that indicates these filming activities have occurred, are presently occurring, or are likely to occur in the future within Mohave ground squirrel habitat, and therefore, we have determined that they are not a threat to the species.

Urban and Rural Development

The present and projected future growth of urban areas in the western Mojave Desert could adversely affect the Mohave ground squirrel. About 136,900 ac (55,426 ha), or 2.6 percent of the 5,319,000 ac (2,152,532 ha) range of the Mohave ground squirrel (see Background section), has been lost to urban and rural development (Defenders of Wildlife and Stewart 2005, pp. 19, 38). Loss of Mohave ground squirrel habitat has occurred from the construction of residential homes, commercial and industrial complexes, shopping malls, golf courses, airports and associated commercial and industrial development, roads, landfills, wastewater treatment facilities, prisons, flood management structures, and other facilities.

Most urban and rural development has occurred in valleys, flats, and gently sloping areas, which are the same types of areas most often used by Mohave ground squirrels. The greatest losses of Mohave ground squirrel habitat have occurred in, and adjacent to, cities including Palmdale, Lancaster, Victorville, Adelanto, Hesperia, Apple Valley, Barstow, and Ridgecrest, California (see Map 1). Smaller areas have also been lost at the towns of Hinkley, Boron, North Edwards, California City, Mojave, Rosamond, Inyokern, and Littlerock, and the unincorporated communities of Pearblossom, Phelan, and Pinyon Hills, California (see Map 1).

Most of this urban development has occurred in the southernmost portion of the Mohave ground squirrel's range on private land, generally south of SR–58 (see Map 1). More than 62 percent of the private land within the range of the Mohave ground squirrel is south of SR–58. The three cities with the largest developed areas within the range of the squirrel (*i.e.,* Lancaster, Palmdale, and Victorville) occur in this area, as do several of the smaller towns listed above (see Map 1). Some of this area has also been converted to agriculture (see ''Agriculture'' section below), and there are areas that do not contain suitable habitat for the squirrel (*e.g.,* dry lake beds). We estimate the portion of the range of the Mohave ground squirrel south of SR–58 to be 1,690,797 ac (684,244 ha), or about 31.8 percent of the range of the Mohave ground squirrel (see Background section for our range analysis). Urbanization in this area is mainly concentrated along the southern edge of the squirrel's range, and much of the area south of SR–58 is undeveloped.

Trapping results in the southern portion of the Mohave ground squirrel's range have generally been negative, especially in areas that are most heavily developed (Leitner 2008, p. 5). Mohave ground squirrels are currently known to occur in several areas south of SR–58, including one of the largest concentrations of squirrels on EAFB (see below). Recent records of the Mohave ground squirrel south of SR–58 and outside EAFB include two in the Victor Valley-Lucerne Valley area (Jones pers. comm., as cited in Defenders of Wildlife and Stewart 2005, p. 8), four records near Adelanto (Leitner 2008, p. 7), three records west and south of Barstow (Leitner 2008, pp. 7–8), and two records southwest of the town of Mojave (Leitner 2008, pp. 7–8).

The fact that trapping results south of SR–58 have generally been negative does not necessarily mean that the Mohave ground squirrel is absent from the area or the area does not provide habitat for the species (Leitner 2008, p. 9). Negative trapping results can occur for various reasons, including trap location, time of trapping, and food availability (Brooks and Matchett 2002, p. 172; Leitner 2008, p. 9) (see ''Range and Distribution'' section and Factor D, ''State Laws and Regulations,'' for further discussion of the survey protocol).

As discussed in the Background section, trapping surveys south of SR–58 have most often been conducted in areas where the squirrel has already been extirpated due to extensive urbanization, such as the Palmdale-Lancaster area in the southwestern portion of the range (Leitner 2008, p. 3). More importantly, large areas south of SR–58 have either never been surveyed or have been surveyed only 1–2 times (Leitner 2008, pp. 5, 9, 25). In addition, the trapping protocol that was used may not be the most effective method to determine the presence or absence of Mohave ground squirrels. Some scientists have identified potential problems with the protocol that raise questions about the accuracy of the current survey technique (Brooks and Matchett 2002, p. 172) (see Factor D, ''State Laws and Regulations,'' for further discussion of the survey protocol).

Federal lands comprise 28.5 percent of the area south of SR–58 (9.3 percent of the total range of the Mohave ground squirrel). One of the more important concentrations of Mohave ground squirrels south of SR–58 is on EAFB. The 307,435 ac (124,468 ha) EAFB encompasses about 18 percent of the area south of SR–58 (5.8 percent of the range of the Mohave ground squirrel) and contains one of the eight important population areas for the Mohave ground squirrel (Leitner 2008, p. 10; se Map 2 and Background section). EAFB is used primarily for testing and evaluating aircraft, and the impacts to Mohave ground squirrel habitat from urban and rural development are primarily confined to the small cantonment areas (see ''Military Operations'' section below for details).

In addition to the Federal lands on EAFB, there are more than 175,000 ac (70,820 ha) of Federal land managed by the BLM south of SR–58, all of which is not subject to the direct impacts of urbanization. These BLM lands include the southern part of the Fremont-Kramer Desert Wildlife Management Area (DWMA), which is managed for Mohave ground squirrel habitat. Urban and rural development will not occur on these lands (however, see ''Off-Highway

Vehicle Recreational Use,'' ''Military Operations,'' and ''Energy Development'' sections below for a discussion on other activities that may affect these areas managed by EAFB and the BLM).

We expect that further urbanization of privately owned lands south of SR–58 will occur in the future. The population of the western Mojave Desert is projected to grow from 795,000 (in 2000) to more than 1.5 million people by 2035 (BLM *et al.* 2005, p. 244). Most incorporated cities and communities in the western Mojave Desert have general or community plans that describe their growth and development for the next 20 years or more. We estimate that about 475,000 ac (192,226 ha), or about 8.9 percent of the entire range of the Mohave ground squirrel, is incorporated. The majority (about 70 percent) of the incorporated land south of SR–58 occurs within the cities of Palmdale, Lancaster, Victorville, Apple Valley, Hesperia, Adelanto, and Barstow. Although these areas are already extensively urbanized, not all of the incorporated lands south of SR–58 are developed, and future growth is expected to occur in these areas. Under a worst-case scenario, all areas within the incorporated boundaries could be developed in the future.

We did not find any information on major proposed urban developments or new communities being planned in the unincorporated and rural lands south of SR–58, although the existing unincorporated communities will likely continue to grow. However, we expect that future development will most likely occur in areas that are already incorporated because of proximity to existing infrastructure. Although we cannot predict with any certainty what areas will be developed or when they may be developed in the next 20–30 years, even if all incorporated lands south of SR–58 were developed, more than 475,000 ac (161,875 ha) would likely remain under Federal ownership south of SR–58. Much of this land is in the Fremont-Kramer DWMA, which the BLM designated for management of Mohave ground squirrel habitat, and includes the important population area for the Mohave ground squirrel at EAFB (Leitner 2008, p. 10) (see Map 2). Except for possibly minor additions to the cantonment areas of EAFB, the Federal land south of SR–58 is not subject to urban and rural development.

About 3,648,830 ac (1,476,635 ha) or 68.6 percent of the range of the Mohave ground squirrel is north of SR–58. This area comprises the central and northern portions of the range of the Mohave ground squirrel. Most of this land has not experienced urban development; rather, urbanization is limited and concentrated mainly around Ridgecrest and California City. About 144,000 ac (58,275 ha), or 3.9 percent of the Mohave ground squirrel's range north of SR–58, is incorporated, almost all of which (90 percent) is within California City (BLM *et al.* 2005, chapter 3, p. 2). California City was incorporated in 1965, and although it is the third largest city in California in area, the population has grown to only about 14,120 in the 46 years since it was incorporated. Additionally, most of the incorporated area remains undeveloped. Given the slow growth rate of California City, we believe that much of the land within its incorporated boundaries will likely remain undeveloped.

Federal lands managed by the BLM and Department of Defense (DOD) make up about 80 percent (2,109,326 ac (853,617 ha)) of the range of the Mohave ground squirrel north of SR–58 (39.7 percent of the entire range). The BLM manages 438,364 ac (177, 400 ha), while the DOD manages 1,670,962 ac (676,217 ha). Most of the 1,110,443-ac (449,382-ha) China Lake Naval Air Weapons Station (NAWS) and the 33,359-ac (13,500-ha) Goldstone Deep Space Communications Complex (Goldstone Complex), managed by the National Aeronautical and Space Administration (NASA), experience little habitat disturbance. Seven of the eight Mohave ground squirrel important population areas are located north of SR–58, occur mostly or entirely on Federal land (see Map 2), and are not subject to urban development on Federal land. We do not expect any urbanization to occur on BLM land. Because of their missions, we anticipate minimal future urban development on the military bases; any development will likely be limited to the cantonment areas (see ''Military Operations'' section).

In summary, we recognize that some Mohave ground squirrel habitat has been lost to development within the range of the squirrel. Currently, about 2.6 percent of the range of the Mohave ground squirrel has been lost to development, and we expect that more of the range will be lost in the future, most likely adjacent to existing urban areas. A worst-case scenario would be that all incorporated land (about 8.9 percent (475,000 ac (192,226 ha)) within the range of the squirrel is developed. Although unlikely because of the expected slow growth of California City, even if this were to occur, 62 percent (3,300,000 ac (1,335,468 ha)) of the squirrel's range is federally owned, very little of which is subject to urban development. We estimate that about 57 percent of the Federal lands (EAFB, NAWS, Goldstone Complex, DWMAs, and Mohave Ground Squirrel Conservation Areas (MGSCA)) are managed, at least in part, for Mohave ground squirrel habitat (see Map 2, Table 1, and Factor D, ''Federal Laws and Regulations''). The eight important population areas for the Mohave ground squirrel occur mostly or entirely within Federal lands managed in part for the Mohave ground squirrel, and are therefore not threatened with urban development. In addition, Leitner (2008, p. 9) has stated that additional populations of the Mohave ground squirrel may well exist because much of the range of the squirrel has never been surveyed or has only been surveyed 1–2 times, which may not be sufficient to determine the presence of the squirrel (Leitner 2008, p. 25). We conclude, based on this assessment, that urban and rural development does not currently pose a threat to the Mohave ground squirrel in relation to the present or threatened destruction, modification, or curtailment of its habitat or range, nor do we anticipate it posing a threat in the future.

TABLE 1—FEDERAL LANDS MANAGED FOR THE MOHAVE GROUND SQUIRREL OR ITS HABITAT, AND THE PERCENT OF THE SPECIES' RANGE [1]

Management areas for the Mohave ground squirrel	Percent of Mohave ground squirrel range		
	Federal ownership	State/private ownership [2] within management area	Total area within management area boundary
Mohave Ground Squirrel Conservation Area [3]	16.7	7.9	24.6
Department of Defense—Limited Use/Protected	27.0	0	27.0

TABLE 1—FEDERAL LANDS MANAGED FOR THE MOHAVE GROUND SQUIRREL OR ITS HABITAT, AND THE PERCENT OF THE SPECIES' RANGE [1]—Continued

Management areas for the Mohave ground squirrel	Percent of Mohave ground squirrel range		
	Federal ownership	State/private ownership [2] within management area	Total area within management area boundary
Bureau of Land Management ACECs [4] (Fremont-Kramer Desert Wildlife Management Area, Superior-Cronese Desert Wildlife Management Area, Desert Tortoise Research Natural Area) [3]	13.6	8.5	22.1
Total	57.3	16.4	73.7

[1] Species' range is 5,319,000 ac (2,152,532 ha) as calculated by the Service.
[2] State/private ownership is not specifically managed for the Mohave ground squirrel.
[3] Land ownership within designated boundary includes Federal, State, and privately-owned lands.
[4] Area of Critical Environmental Concern.

Off-Highway Vehicle Recreational Use

Off-highway vehicle (OHV) use is any use that includes driving a motorized vehicle off a paved road, including driving cross country and on existing dirt roads. OHV use has the potential to adversely affect the Mohave ground squirrel by crushing individuals (see Factor E, ''Direct Mortality'') and their burrows (Bury *et al.* 1977, p. 16), damaging or destroying native vegetation, and compacting soils. Burrows are essential to the survival of the Mohave ground squirrel, as they provide protection from predation and the temperature extremes of the desert, are likely used to store food, and provide a safe location for reproduction and rearing young. Impacts to vegetation increase the exposure of the Mohave ground squirrel to predators, decrease available shade for thermoregulation, and increase soil temperature extremes, which adversely affect plant germination, growth (Boarman 2002, p. 47), and food availability. Compacted soils reduce the infiltration rate of rain, which means there is less water available for plants and seed germination (Boarman 2002, p. 46), reduce the root growth of established plants, and make it harder for seedlings to survive (Lovich and Bainbridge 1999, p. 316). With soil compaction, soil erosion from wind and water increases, nitrogen fixation is reduced, less organic material is available for plant growth, and seedling establishment is reduced (Lovich and Bainbridge 1999, pp. 315–316; Boarman 2002, pp. 45–46).

OHVs also transport nonnative annual seeds and plant parts from other locations. Their roads, trails, and tracks act as dispersal corridors for invasive annual plant species (Lovich and Bainbridge 1999, p. 313). These nonnative species suppress the growth of native annual forbs (Brooks 2000, p. 105), which are a source of food and water for the Mohave ground squirrel. Many native annual plants have a higher percentage of water and protein than nonnative plants (Oftedal *et al.* 2002, p. 344); however, we have no information on the Mohave ground squirrel's nutritional needs and their use of nonnative plants.

Other potential impacts of OHV use include: Noise, which can cause hearing loss in rodents (Lovich and Bainbridge 1999, p. 316) and may interfere with the Mohave ground squirrel's ability to detect predators and establish and maintain territories (Bury *et al.* 1977, p. 16); littering and dumping of garbage (BLM 2003, p. 31), which can attract Mohave ground squirrel predators (see Factor C, ''Predation''); and increased fire sources (BLM 2003, p. 32), such as campfires and cigarettes, which can result in fires that destroy Mohave ground squirrel habitat.

In the western Mojave Desert, the BLM manages its lands for OHV recreation. The BLM has designated four open areas (*i.e.,* OHV management areas) within the range of the Mohave ground squirrel as open to all OHV use, including cross-country use (BLM *et al.* 2005, chapter 3, pp. 242–243). The four OHV management areas within the range of the Mohave ground squirrel are: (1) Dove Springs (3,840 ac (1,554 ha)); (2) El Mirage (25,600 acres (10,360 ha)); (3) Jawbone Canyon (3,827 ac (9,642 ha)); and (4) Spangler Hills (62,080 acres (25,123 ha)) (BLM *et al.* 2005, chapter 3, pp. 243, 244; Service GIS data) (see Map 2). These four areas comprise 95,347 ac (38,586 ha) (BLM 2003, p. 31), or 1.8 percent of the range of the Mohave ground squirrel. Outside of these four areas, the BLM restricts OHV use to specific existing roads and trails, and cross-country use is prohibited (BLM *et al.* 2005, chapter 3, pp. 264–273). We are not aware of any plans on the part of the BLM to designate new OHV management areas in the future.

The impacts from OHV use to the Mohave ground squirrel and its habitat vary depending on the type of OHV activity, the designated land use, and the level of enforcement. The impacts to the Mohave ground squirrel and its habitat are greatest in open areas and high-OHV-use areas (*e.g.,* staging areas for OHV events, camping areas), and less in areas where activities are confined to existing roads and trails.

Cross-country OHV use is restricted to the four management areas; however, the occurrence of off-route OHV use tends to extend or spill over into areas immediately adjacent to the management areas. Although the impacts to Mohave ground squirrels likely diminish with distance from the management areas, the BLM estimates that these ''spill-over'' zones, some of which are on private land, encompass an additional 150,239 ac (60,800 ha) (BLM *et al.* 2005, chapter 3, pp. 131, 132), or 2.8 percent of the range of the Mohave ground squirrel. This area, combined with the four designated OHV management areas, constitutes about 4.6 percent of the range of the Mohave ground squirrel.

The BLM has documented other areas not associated with the designated management areas where OHV use of designated routes is more frequent. The BLM estimates that these high-use areas include about 107,520 ac (43,512 ha), or 2 percent of the range of the Mohave ground squirrel (BLM *et al.* 2005, chapter 3, p. 133). When combined with the management areas and spill-over zones, about 6.6 percent of the squirrel's range is intensively used for OHV recreation. One of the more extensive high-use areas is the Rand Mountains area. To reduce OHV impacts in part of the Rand Mountains area, the BLM expanded the Western Rand Mountain

Area of Critical Environmental Concern (ACEC) from 17,877 ac (7,235 ha) to 32,050 ac (12,970 ha), and closed the ACEC to OHV use except for 129 mi (208 km) of designated open routes, a 90-percent reduction in miles of open routes (BLM *et al.* 2005, chapter 3, p. 8). This resulted in a reduction of more than 14,000 acres (5,666 ha) of the high-use area in the Rand Mountains.

Although we are not aware of any estimates, the intensive and widespread OHV activity that occurs within the management and high-use areas has likely resulted in extensive loss and degradation of potential habitat for the squirrel. However, the status of the Mohave ground squirrel within these areas is not well known. Mohave ground squirrels have been trapped in the Dove Springs OHV Area, but not the Spangler Hills OHV Area (Leitner 2010, *in litt.*). Leitner suggests that the negative trapping results at the Spangler Hills OHV Area may be from an inadequate trapping effort in this large area. Thus, we cannot confirm that the Mohave ground squirrel occurs or does not occur at the Spangler Hills OHV Area. We are not aware of any information on the status of the Mohave ground squirrel in the other two management areas or the high-use areas.

In addition to the management areas and high-use areas, there are numerous single unpaved roads and trails within the range of the Mohave ground squirrel that are used by OHVs, including utility corridors. The potential direct and indirect impacts of roads are described above; however, road density and OHV use of these roads are much lower than in management areas. This lower use likely means potential impacts to the Mohave ground squirrel are less than in management and high-use areas.

We were unable to find information on the total number of miles of unpaved roads within the range of the Mohave ground squirrel. Based on a 2001–2002 inventory, the BLM estimated that 5,054 linear mi (8,134 km) of roads (including paved roads, unpaved roads, and trails) occur on BLM land in the western Mojave Desert. However, subsequent to that inventory, the BLM permanently closed 2,260 mi (3,637 km), or 45 percent of the roads and trails (BLM 2003, pp. 4–9). Most closures occurred in the DWMAs in Mohave ground squirrel habitat (BLM 2003, p. 396). DWMAs are ACECs where the BLM can limit or exclude surface disturbance, including use of roads and trails (see Factor D). In addition, the West Mojave (WEMO) Plan commits the BLM to an aggressive program of closed route rehabilitation (BLM *et al.* 2005, chapter 4, p. 7). The WEMO Plan is the BLM's resource management plan for the western Mojave Desert and amends the California Desert Conservation Area (CDCA) Plan. It also implements the Rand Mountains Fremont Valley Management Plan that reduces the number of open routes in the Rand Mountains by 90 percent (BLM *et al.* 2005, chapter 3, p. 8).

The BLM has implemented minimization measures to ensure that the different types of OHV uses occur within the appropriate designated management areas, roads, and trails, and thereby avoid the loss of additional Mohave ground squirrel habitat. These measures also allow for the eventual restoration of the habitat in areas where the roads and trails have been closed to OHV use (although restoration time from these impacts is believed to take several decades (Bury *et al.* 1977, p. 16; Lovich and Bainbridge 1999, p. 316)). These measures include signing closed routes, obscuring closed routes with vertical mulching, increasing public education, installing fencing and barriers, and increasing law enforcement (BLM *et al.* 2005, chapter 2, pp. 156–157, 163). In 2011, BLM is signing open routes, implementing a monitoring plan to determine compliance with route closures and whether any new illegal routes are being created, and implementing additional enforcement capability for the route network in the WEMO Plan area (U.S. District Court 2011, pp. 13–15). By 2014, the BLM will be preparing a revised OHV route network that complies with the Federal Land Policy and Management Act's (FLPMA) requirement to minimize damage to public resources and harassment and disruption of wildlife and habitat (U.S. District Court 2011, pp. 2, 13). These measures should reduce the impacts from OHV use on BLM land near management areas and on designated roads and trails in the range of the Mohave ground squirrel. However, the BLM's management actions for OHV use only apply to lands that they manage; they do not apply to State or private lands.

Part or all of 14 designated Wilderness areas (BLM *et al.* 2005, chapter 3, p. 9) are in the range of the Mohave ground squirrel. Under the Wilderness Act of 1964, roads, new structures, commercial activities, and use of motorized vehicles or equipment are prohibited within designated wilderness areas (BLM *et al.* 2005, chapter 3, p. 9). The acreage of wilderness area within the range of the Mohave ground squirrel and therefore closed to vehicle access and other forms of surface disturbance is about 253,000 ac (102,386 ha), or 4.6 percent of the range of the Mohave ground squirrel. Although portions of the wilderness areas include steep slopes and rocky substrates that would not provide suitable habitat for the Mohave ground squirrel, most of the wilderness areas are within the elevational range of the Mohave ground squirrel (BLM *et al.* 2005, chapter 3, p. 138) and provide connectivity among squirrel habitat.

DOD lands are closed to public access, and only persons with business on the military installations may enter. Because of the research, development, testing, and evaluation missions of EAFB and NAWS (see ''Military Operations'' below), vehicle access is restricted almost entirely to existing roads in those areas (EAFB 2008a, p. 102). However, EAFB has designated a 10,387 ac (4,203 ha) OHV recreation area on the base for use by base personnel (EAFB 2008a, p. 104), and Fort Irwin has an 82 ac (33 ha) OHV recreation area (Department of the Army 2003, p. 1). Although these activities may impact the Mohave ground squirrel and its habitat, the two areas comprise only 0.2 percent of the squirrel's range.

There are no State Vehicular Recreation Areas (SVRAs) in the range of the Mohave ground squirrel. SVRAs are operated and managed by the Off-Highway Motor Vehicle Recreation Division of California State Parks and provide trails, tracks, and other OHV recreational opportunities; interpretive and educational activities and publications promoting safe and responsible OHV recreation; public safety, including law enforcement and first aid; and resource management designed to sustain OHV opportunities and protect and enhance wildlife habitat, erosion control, revegetation, *etc.* (California State Parks 2011, unpublished information).

OHV recreation also occurs on private lands. Unauthorized OHV use on private lands includes illegal trespass, off-trail riding, illegal operation of non-street legal vehicles, and vandalism (Ciani 2011, p. 1). The Kern County Sheriff's Department is proposing to reduce unauthorized OHV use on private lands by expanding and enhancing current safety and enforcement efforts (Ciani 2011, p. 1). However, there is no information quantifying the degree or extent of the areas impacted by this unauthorized use, either in Kern County or anywhere else in the range of the Mohave ground squirrel. Additionally, although some authorized OHV activity may occur on private lands, we are unaware of any information on the degree or extent of impacts for authorized OHV activity on private lands.

OHV recreational use is likely to continue to increase in the future. The State's population is projected to grow from 34 million in 2000 to 46 million by 2020 (BLM *et al.* 2005, chapter 3, p. 244). The demand for OHV recreational opportunities is increasing, along with California's growing population (BLM *et al.* 2005, p. 244). However, the BLM has reduced the number of roads and trails available for OHV use and has not indicated that it has plans to designate additional OHV management or high-use areas in the range of the Mohave ground squirrel, and the expected increase in OHV use will mainly be limited to existing management or high-use areas.

In summary, OHV use is a popular recreational activity within portions of the range of the Mohave ground squirrel. Potential impacts of OHV use vary from none in wilderness areas, to substantial in management or high-use areas, depending on the type and intensity of OHV activity, the designated land use, and the level of enforcement. About 6.6 percent of the range of the Mohave ground squirrel, including BLM, DOD, and private lands, is classified as management areas, spillover zones, or high-use areas. Although Mohave ground squirrels have been reported in one of the four management areas, we have no information that indicates that the impacts from OHV use in these areas constitute a barrier to their movement. We presume the management areas are extensively degraded and provide little value to supporting populations of Mohave ground squirrels now or in the future; however, these areas occur in less than 7 percent of the range of the Mohave ground squirrel. Additionally, we have no information indicating that additional management areas will be designated for OHV use in the future.

In addition, the BLM has:

(1) No plans to designate additional high-use areas or roads and trails for the next few decades,

(2) Closed 45 percent of the roads and trails in the DWMAs and 90 percent in the western Rand Mountains, and

(3) Implemented actions to restore habitat in these areas (BLM *et al.* 2005 chapter 2, p. 167) and monitor compliance (such as increasing enforcement and minimizing damage to public resources and harassment/disruption of wildlife and habitat).

Areas of lesser use, such as existing unpaved roads and trails, can result in the loss of habitat, and vehicle activity can crush Mohave ground squirrels and their burrows; however, the significance of such losses is undocumented for the Mohave ground squirrel. Although miles of roads and trails exist, the habitat loss is essentially a narrow, linear band, the impacts of which are minor compared to that of a management or high-use area. Unpaved roads and trails do not result in the total fragmentation of habitat as they are not barriers to Mohave ground squirrel movement (Leitner 2010, *in litt.*).

OHV use of unpaved roads and trails also occurs on private land, and most of this use is probably not authorized by the land owner. However, we found no information on the extent of this type of OHV use on private lands. At least one county in the range of the Mohave ground squirrel has identified unauthorized OHV activities on private land as a natural resource and public safety problem and is seeking ways to reduce these activities through enforcement (Kern County Sheriff 2011, unpublished information).

Using the best available information, we have determined that OHV use is not a significant threat to the Mohave ground squirrel. We found no information that the transport and expansion of nonnative vegetation or potential impacts of noise and other indirect impacts are adversely affecting the Mohave ground squirrel. The impact of OHV use to the habitat of the squirrel mainly occurs in management, spill-over, and high-use areas, which comprise less than 7 percent of the range of the Mohave ground squirrel. Recreational OHV use is of minimal concern on DOD land due to restrictions, and because only 0.2 percent of the species' range overlaps with DOD recreational use areas. The BLM has closed a substantial number of roads and trails in the squirrel's range and is implementing measures to monitor and enforce these closures and to restore habitat in the closed areas. The BLM has no plans to establish additional areas for OHV use in the range of the Mohave ground squirrel. Therefore, we find that OHV recreational use on BLM land is not a significant threat to the Mohave ground squirrel. Although we do not have an exact estimate, less than 2 percent of the high-use area is on private land, and one county is pursuing enforcement options to address this unauthorized OHV use and its impacts on natural resources. In the future, we expect that OHV use will likely increase but will be limited to existing management areas and designated roads and trails. Therefore, based on our evaluation of the best available scientific and commercial data, we conclude that OHV recreational use does not currently pose a significant threat to the Mohave ground squirrel in relation to the destruction, modification, or curtailment of habitat or range, nor do we anticipate OHV recreational use posing a threat in the future.

Transportation Infrastructure

Transportation infrastructure is a network of paved highways and roads. Although we were unable to find studies on the effects of transportation infrastructure on the Mohave ground squirrel, research on other animals has found that the presence of roads in an area may have a positive, negative, or no effect on animal abundance (Fahrig and Rytwinski 2009, p. 21).

Potential positive effects of roads include greater availability of forage plants adjacent to the roadway caused by precipitation runoff from the roadway and fewer predators near roadways because of the negative effects of roadways on larger mammals (Garland and Bradley 1984, p. 47; Fahrig and Rytwinski 2009, p. 21). Potential negative impacts from construction and operation may include mortality (see Factor E, ''Direct Mortality''), barriers to movement and fragmentation (see Factor E, ''Fragmentation''), and habitat loss and degradation (Gustafson 1993, pp. 23, 26; BLM 2003, p. 30; Leitner, pers. comm., as cited in Defenders of Wildlife and Stewart 2005, p. 22).

Mohave ground squirrels may be crushed by vehicles, and the presence of trash and other animals that are run over by vehicles (''road kill'') may attract common ravens and other predators to the road and nearby areas, thereby increasing the likelihood that Mohave ground squirrels adjacent to these sites would be vulnerable to predation (see Factor C, ''Predation''). Some studies showed that roads produce an ecological ''road-effect zone,'' a zone over which significant ecological effects extend outward from a road (Forman and Deblinger 2000, p. 37). Besides road kill and loss of habitat, indirect effects of roads in the road-effect zone may include traffic noise, which many species avoid, and barriers to movements within a population, with potential demographic and genetic consequences (see Factor E, ''Fragmentation'').

Roads alter habitat upslope and downslope by causing hydrologic and erosion effects (Foreman and Alexander 1998, p. 217), and promote the invasion of nonnative annual plant species (Brooks 2007, p. 154). Thus, the road-effect zone may interrupt horizontal ecological flows (*e.g.,* animal movements, hydrology), alter landscape spatial patterns (*i.e.,* the number, size, and arrangement of ecological pattern and ecological function and process), and change species distribution and abundance (Forman and Alexander 1998, p. 1). The interruption of hydrologic flows may have both positive and negative impacts on the habitat of the Mohave ground squirrel. The interruption may provide more water to upslope habitat, thereby increasing the amount and availability of forage. Conversely, the interruption may impede or prevent surface flow from reaching downslope areas, thereby decreasing the amount and availability of forage.

One major highway is planned within the range of the Mohave ground squirrel, the High Desert Transportation Corridor. This 63-mi (101.4-km) long east-west corridor would connect SR–14 in Palmdale with US–395 (Adelanto) and I–15 (Victorville), and would terminate on the southeast side of Apple Valley at SR–18 (see Map 1) (San Bernardino County 2011, unpublished information). The corridor would contain a highway with all, or portions, composed of freeway/expressway/tollway, and it may contain a high-speed rail line (Caltrans 2010a, p. 1). We estimate this project would result in the loss of 7,634 ac (3,089 ha), or 0.14 percent of the range of the Mohave ground squirrel.

The new highway would be located in the southern portion of the range of the Mohave ground squirrel, and south of the important population area on EAFB. The highway is planned to include areas currently developed for urban and rural use and agriculture, and thus, the loss of Mohave ground squirrel habitat would likely be less than the footprint of the proposed corridor. The project proponent may be required to mitigate for the loss of Mohave ground squirrel habitat as part of the permitting process under CESA (Jones 2011, *in litt.*) (see Factor D, ''State Laws and Regulations'') and the WEMO Plan (see Factor D, *Bureau of Land Management*).

Although the new highway will likely have some effect on the habitat of the Mohave ground squirrel beyond what will be removed during road construction, we are not aware of any study on the extent of a potential road-effect zone or whether such a zone will have a positive or negative impact on Mohave ground squirrel populations, or how any impacts might change with variables, such as road width, traffic rates, and location. The extent of the road-effect zone varies, depending on the species being affected, location, habitat, road width, traffic density, and other factors. For example, the road-effect zone along one road in Massachusetts that passes through an area with many swamps and ponds varied from greater than 328 ft (100 m) to greater than 3,280 ft (1,000 m), and averaged 1,968 ft (600 m) (Forman and Deblinger 2000, p. 1). However, working in the high desert of southwestern Utah, which is similar to the environment in the west Mojave Desert, Bissonette and Rosa (2009, p. 27) found no clear road-effect zone for small mammals.

Although they did not conduct their study in desert areas, Adams and Geis (1983, p. 1) found instances where population abundance of some small mammal species was greater near roads because of their use of the adjacent habitat created or enhanced by the roadway (*e.g.,* water collection, increased vegetation). In a creosote bush community in southern Nevada, Garland and Bradley (1984, p. 47) found the effects of roads on small mammals may differ in deserts when compared with mesic habitats. Roadsides receive runoff from pavement, which supports lush vegetation compared to adjacent habitat. They also found that round-tailed ground squirrels, a close relative of the Mohave ground squirrel, were more common near roadways (Garland and Bradley 1984, p. 54). In a review of the literature on the effects of roads on wildlife, Fahrig and Rytwinski (2009, p. 3) found that small mammals generally showed either a slightly positive effect from roads or no effect.

With so little known about the effects of roads on the Mohave ground squirrel and so many variations in the road-effect zone reported in the scientific literature, we employ a worst-case approach to our assessment of the impact of the new highway, in which we assume that there will be a road-effect zone associated with the new highway and that the impacts would be so severe as to eliminate all Mohave ground squirrel habitat within the zone. If such a zone were twice or even three times the width of the proposed highway, then at most the zone would result in the loss of an additional 22,902 ac (9,268 ha) of habitat, or an additional 0.43 percent of the range of the squirrel.

In total, construction of the proposed highway could result in the loss of less than 0.6 percent of the range of the Mohave ground squirrel, which includes potential impacts associated with a road-effect zone. However, the actual loss of habitat will likely be less because some areas have already been developed and mitigation will likely be required for the loss of habitat under the WEMO Plan and CESA (see Factor D, *Bureau of Land Management* and ''State Laws and Regulations''). Within the DWMA, the mitigation ratio is 5:1 (see ''Energy Development'' section below).

In addition to the proposed highway, two existing highways within the range of the squirrel are planned to be modified. Areas of US–395 may be realigned and portions of SR–58 and US–395 would be widened within the range of the Mohave ground squirrel (Caltrans District 8 website, 2010b, unpublished information). For US–395, the proposed widening and realignment projects extend from the southern terminus at I–15 north to Kramer Junction (see Map 1). The US–395 projects occur within the southern portion of the range of the Mohave ground squirrel, well outside any of the important population areas for the squirrel. Some of the areas where the road will be widened have already been developed (*e.g.,* Adelanto, Victorville, Kramer Junction, *etc.*) and would therefore not result in any additional loss of habitat. However, a portion is located in the Fremont-Kramer DWMA, which is managed for the Mohave ground squirrel (see Map 2). We estimate the proposed highway widening would directly impact an additional 1,600 ac (647 ha), or 0.03 percent of the range of the Mohave ground squirrel including the areas that have already been developed. If a road-effect zone exists for the Mohave ground squirrel, under a worst-case scenario, up to an additional 4,800 ac (1,942 ha) of habitat could be lost, or an additional 0.09 percent of the range of the squirrel.

For SR–58, the proposed widening projects extend from near Boron east to 7.5 mi (12.1 km) east of Kramer Junction (see Map 1). The project would occur in the southern portion of the range of the Mohave ground squirrel, well outside any important squirrel population area. Most of the proposed highway widening is located in the Fremont-Kramer DWMA (see Map 2); however, in the Kramer Junction area, impacts to the Mohave ground squirrel have already occurred from existing urban and rural development. The proposed highway widening is estimated to directly impact an additional 273 ac (110 ha), or less than 0.01 percent of the range of the Mohave ground squirrel, which includes the areas that have already been developed. Again, under a worst-case scenario, up to an additional 819 ac (331 ha) could be lost within the road-effect zone.

In total, road widening would result in the loss of about 7,492 ac (3,032 ha), or about 0.14 percent of the range of the Mohave ground squirrel, which includes potential impacts associated with a road-effect zone. However, the actual loss of habitat will likely be less because some areas have already been developed and mitigation will likely be required for the loss of habitat under the WEMO Plan and CESA (see Factor D, *Bureau of Land Management* and ''State Laws and Regulations''); within the DWMA, the mitigation ratio is 5:1 (see ''Energy Development'' section below).

In summary, there are a few major highways and numerous roads within the range of the Mohave ground squirrel. There are plans to build a new east-west highway across the southern portion of the range of the Mohave ground squirrel and widen two existing highways, none of which will affect any of the important squirrel population areas. Combined, these projects would result in the direct loss of about 9,507 ac (3,738 ha) of habitat, or about 0.18 percent of the range of the squirrel. The actual amount would be less because some areas have already been developed and no additional habitat would be lost, and mitigation for loss of habitat would be required.

We acknowledge that roads may affect habitat beyond that lost during construction. This road-effect zone can have varying degrees of both positive and negative impacts on a species and its habitat, and the zone can extend various distances from the road depending on factors, such as the species being affected, location, habitat, road width, and traffic density. For squirrels and other small mammals, the road-effect zone tends to be neutral to slightly positive (Fahrig and Rytwinski 2009, p. 13). Although we do not have any information that such a zone exists for the Mohave ground squirrel or whether the impacts within the zone would be positive or negative, based on a worst-case scenario, an additional 28,521 ac (11,542 ha) of habitat or about 0.54 percent of the range of the squirrel could be lost. Therefore, based on a review of the best available scientific and commercial data, we find that transportation infrastructure projects likely to occur in the future could affect at most 0.74 percent of the range of the Mohave ground squirrel, and therefore do not pose a significant threat to the Mohave ground squirrel in relation to the destruction, modification, or curtailment of habitat or range. Note that other impacts that may be associated with roads, including mortality and habitat fragmentation, are discussed under Factor E.

Military Operations

The DOD manages about one-third of the range of the Mohave ground squirrel. Within the species' range, there are three major military bases—Fort Irwin and the National Training Center (NTC), EAFB, and NAWS.

Fort Irwin has three major management units; the National Training Center (NTC), the Goldstone Deep Space Communications Complex, and the Leach Lake Bombing Range. Fort Irwin's primary mission is training ground forces for combat, including the use of tanks, other tracked vehicles, and wheeled vehicles. Impacts from the training of ground forces and associated use of wheeled and tracked vehicles would be similar to impacts in OHV management areas (see ''Off-Highway Vehicle Recreational Use'' section above). In addition, Fort Irwin has a small cantonment area, which contains offices, housing, shops, restaurants, utilities, and other facilities. The impacts to the Mohave ground squirrel from the cantonment area would be similar to those described above under ''Urban and Rural Development,'' but on a very small scale. The Army has a proposal for both solar (14,000 ac (5,666 ha)) and wind (49 ac (20 ha)) (Department of the Army 2009, p. 33) energy projects within the boundaries of Fort Irwin (which also potentially includes the Goldstone Complex).

The NTC is about 642,558 ac (260,035 ha), with approximately 435,978 ac (176,435 ha) within the range of the Mohave ground squirrel. Located on the eastern edge of the range of the Mohave ground squirrel, we estimate that 8.2 percent of the range of the species is within the NTC boundary, which includes a recent expansion of Fort Irwin's southwestern boundary of 75,300 ac (29,745 ha) into an area that is within the range of the Mohave ground squirrel (see Factor D, *Department of Defense,* for additional discussion on the expansion area). Ground forces training is usually located on the flats and lower slopes of the NTC, which are the preferred habitat of the Mohave ground squirrel.

Prior to 1977, the Mohave ground squirrel was not known to occur on Fort Irwin. From 1977 to the early 1990s, Fort Irwin conducted surveys and found Mohave ground squirrels 40 mi (64 km) farther east than previously documented occurrences (Wessman 1977, pp. 11, 12). Krzysik (1994, p. 29) documented the impacts of ground forces training on the habitat of the Mohave ground squirrel, which included extensive losses of shrub cover, soil layers, and cryptobiotic soil crusts. Cryptobiotic soil crusts are collections of symbiotic bacteria, algae, fungi, and lichen that live on or slightly below the soil's surface and create a semipermeable soil surface or crust. They reduce soil erosion, promote and control water infiltration, regulate soil temperatures, catch and convert atmospheric nitrogen, accumulate organic matter, and facilitate native seedling establishment and growth (Boarman 2002, pp. 46 and 47), and thus aid in the maintenance of high-quality forage and habitat for the squirrel.

In the future, the 75,300 ac (29,745 ha) expansion area, some of which is likely Mohave ground squirrel habitat, will be used for ground forces training; impacts to the expansion area are expected to be the same as areas currently used for ground forces training. However, the entire area within the NTC is not used for ground forces training, as some of the terrain is not suitable for training and some areas are set aside as buffer zones to shield the training activities from civilian uses on lands adjacent to the base's boundary. Human access to the NTC is restricted, which precludes the use of the land for other forms of surface disturbance (*e.g.,* OHV recreational use, urban and rural development, mining). Thus, while some areas are intensively used for ground forces training, others are not and remain undisturbed. Therefore, the estimated 8.2 percent of the range of the Mohave ground squirrel that is within the NTC is an overestimate of the portion of the species' range impacted by military training activities. In addition, Fort Irwin and the NTC have implemented mitigation measures for the Mohave ground squirrel to offset the impacts from the expansion area (see Factor D, *Department of Defense*). The location of the NTC does not appear to have an adverse effect on the movement of the Mohave ground squirrel between the Coolgardie Mesa and the EAFB important population areas (Bell 2006, pp. 43, 72) (see Map 2 and *Significant Portion of the Range Analysis*).

The 33,359-ac (13,500-ha) Goldstone Deep Space Communications Complex, which is operated by the National Aeronautics and Space Administration (NASA) for tracking and communication for space missions, is off limits to Army training activities, although a tank trail constructed in 1985 bisects most of the Complex. Little or no OHV use occurs within the Goldstone Complex, because there is no public access; personal staff vehicles are confined to paved and dirt maintenance roads, and military vehicles are restricted to the tank trail. Therefore, the Mohave ground squirrels within the Goldstone Complex are essentially protected from military training activities. This is 0.6 percent of the range of the Mohave ground squirrel.

The 91,182 ac (36,900 ha) Leach Lake Bombing Range is managed by the Air Force for live-bomb practice, and is off limits for ground use because of the high risk of unexploded ordnance. This area is 1.7 percent of the range of the Mohave ground squirrel; however, only a small portion of it is used for bombing practice. The remainder is managed as a buffer from human development in case a bomb misses its intended target. Although there are likely patches of Mohave ground squirrel habitat in the Bombing Range, their size, spatial arrangement, and degree of habitat quality are unknown because there is no ground access.

The 307,435 ac (124,468 ha) EAFB (see Map 1) is primarily used to test and evaluate aircraft. Additional activities include conducting and supporting tests of aerospace vehicles, evaluating flight and recovery of research vehicles, participating in developmental test and evaluation programs for the DOD and other government agencies, and operating the Air Force Test Pilot School (EAFB 2008b, pp. iii, 19). Because the emphasis at EAFB is training and testing in the air, the impacts to Mohave ground squirrel habitat are minimal and localized. Large areas of the base remain undeveloped and accommodate testing activities and buffers for these activities. These undisturbed and ''off-limits'' areas allow EAFB to conserve natural resources and minimize impacts to Mohave ground squirrel habitat.

Between 1993 and 2007, about 652 ac (264 ha) (about 0.2 percent of the base) of permanent land disturbance (*e.g.,* urban development within the cantonment area) occurred at EAFB. EAFB recently announced plans to construct more than 3,000 ac (1,214 ha) of solar panels in the northwestern portion of the base to be energy self-sufficient; however, there is no timeframe for this project. Although this project would result in the loss of more Mohave ground squirrel habitat than has occurred in the past at EAFB (EAFB 2008b, p. iv), it is less than 0.06 percent of the range of the Mohave ground squirrel and has been sited to avoid: (1) The EAFB important population area; (2) areas with recorded occurrences of Mohave ground squirrels on EAFB; and (3) areas with likely connectivity to the south, east, and north where other important populations of Mohave ground squirrel are present (see Map 2). OHV use is strictly confined to designated areas on the base (see ''Off-Highway Vehicle Recreational Use'' section), while other activities that may affect Mohave ground squirrel habitat (*e.g.,* livestock grazing and agriculture) are not allowed (EAFB 2008a, p. 73). The southeast portion of the base is designated critical habitat for the federally threatened desert tortoise, and the east boundary abuts the Fremont-Kramer DWMA, providing connectivity to this and other areas managed for the Mohave ground squirrel (see Factor D, *Bureau of Land Management,* and Factor E, ''Fragmentation''). The Air Force has an active program on EAFB to minimize ground disturbing activities in desert tortoise habitat, which also benefits the Mohave ground squirrel (EAFB 2008a, p. 74).

The Air Force has conducted Mohave ground squirrel presence/absence surveys on EAFB since 1988, concentrating on 60 study plots distributed throughout the base that were established to monitor long-term trends of habitat quality and species diversity (EAFB 2008a, p. 74). Annual trapping studies have occurred since the mid-1990s based on funding availability (EAFB 2008a, p. 73). Mohave ground squirrels have been trapped in all years when trapping was conducted; these results indicate that the Mohave ground squirrel is relatively widespread on the base except for the northwest portion. Most observations have occurred in the east and south portions of EAFB (EAFB 2008a, p. 75). Although densities are not available with the methodology used on EAFB, one of the Mohave ground squirrel important population areas was designated here because the area meets the three criteria for a ''core'' area (Leitner 2008, p. 12) (see Map 2).

The 1,110,443 ac (440,695 ha) NAWS is located in the northern portion of the range of the Mohave ground squirrel (NAWS 2002, p. 6). The primary function of NAWS is to research, develop, test, and evaluate weapons systems for Navy, Air Force, Army, Joint Service, commercial, and foreign military weapons systems. NAWS also develops and tests airborne electronic warfare systems and performs aircraft weapons integration (NAWS 2002, p. 1). The Mohave ground squirrel has been studied for several years at the Coso Range in the northwest area of NAWS (see ''Abundance and Trend'' section) and has been documented at other locations throughout the base.

Impacts to the Mohave ground squirrel and its habitat on NAWS are similar to those described for EAFB in both type and magnitude. Similar to EAFB, large areas of NAWS remain undeveloped to accommodate aerial testing activities and to serve as buffers for testing activities. For example, NAWS tests unmanned aerial vehicles for which they need large areas of open space to fly these vehicles and test their control capabilities and buffers to ensure the safety of civilians outside the base. These large undisturbed and ''off-limits'' areas allow NAWS to conserve natural resources, including Mohave ground squirrel habitat, on much of the base.

Cattle grazing under BLM grazing leases no longer occurs on the base (BLM *et al.* 2005, chapter 4, p. 98). Feral burros and wild horses occur on NAWS. Impacts from burros and horses include loss of annual and woody perennial vegetation used by Mohave ground squirrels for forage, loss of cover from predators and thermal shade, and soil compaction from trailing (NAWS 2002, p. B–97) (see ''Grazing'' section below). However, NAWS and the BLM have an extensive burro removal program that has substantially reduced the impact of burros (BLM *et al.* 2005, chapter 2, p. 81).

In summary, Mohave ground squirrel habitat has been lost to military operations primarily from ground forces training. The largest area of loss is in the NTC, including the expansion area, with about 8.2 percent of the range of the Mohave ground squirrel within the NTC boundary. However, the NTC is on the eastern edge of the range of the Mohave ground squirrel (see Factor E, ''Fragmentation''), and not all of the area within the NTC is impacted by ground forces training. Other locations on DOD land, such as the Goldstone Complex and much of EAFB and NAWS (more than 1,745,000 ac (706,180 ha)), are undeveloped and receive little-to-no surface impacts from military operations. Because of military security and the need for large areas of open space to test aircraft and weapon systems and buffer areas around the test areas, these areas become *de facto* conservation areas for Mohave ground squirrel habitat.

We found no information that the DOD is proposing to change its mission in the future and no information on proposals that would impact additional lands within military boundaries. The DOD manages about one third of the range of the Mohave ground squirrel. Although about 9 percent of the range of the squirrel is used for training and testing to meet the military's mission, we estimate that 27 percent of the range is managed under limited use or *de facto* habitat conservation for the Mohave ground squirrel (see Table 1). Therefore, after reviewing the best available scientific and commercial information, we conclude that military operations do not currently pose a significant threat to the Mohave ground squirrel in relation to the destruction, modification, or curtailment of habitat or range of the species, nor do we anticipate military operations posing a threat in the future.

Energy Development

Energy development includes two components, the power plant where energy production or generation occurs, and the transmission line that transports the energy to users. In the western Mojave Desert, power plants currently generate energy using both non-renewable sources (*e.g.,* natural gas, *etc.*) and renewable sources (*e.g.,* solar, wind, and geothermal) with several proposals to generate additional energy using renewable sources.

Power Generation

A total of 22 non-renewable and renewable energy power plants have been constructed within or near the range of the Mohave ground squirrel, including solar, wind, and geothermal facilities. These facilities are located in or near cities and communities in the range of the Mohave ground squirrel, including Little Lake, Tehachapi, Mojave, Cantil, Argus, Trona, Boron, Hinkley, Hesperia, Victorville, Oro Grande, Barstow, Daggett, and Newberry Springs (California Energy Commission (CEC) 2011 Web site). These non-renewable and renewable power plants produce energy by using water, geothermal, natural gas, biomass, wind, solar thermal, and coal, and they have ancillary facilities that require ongoing maintenance (such as pipelines, transmission lines, and roads). Impacts from the construction and operation of these existing facilities to the Mohave ground squirrel are similar to those described below for new renewable energy projects.

In addition, several applications have been submitted to Federal, State, and local agencies for the construction and operation of new renewable energy projects (*e.g.,* solar, wind, and geothermal) and associated transmission lines, and for the expansion of existing renewable energy projects in the range of the Mohave ground squirrel.

Various Federal and State directives foster the increase in proposed renewable energy projects. The Energy Policy Act of 2005 requires the Department of the Interior to approve at least 10,000 megawatts (MW) of renewable energy on public lands by 2015. The American Recovery and Reinvestment Act of 2009 provides monetary incentives for utility-level renewable energy development that occurs through December 2011. Executive Order 13514 declares the reduction of greenhouse gases as a priority for Federal agencies, and Executive Order 13212 requires Federal agencies to expedite review of energy project applications. In addition, the Governor of California's Executive Order S–14–08 requires California electric utilities to obtain 33 percent of their power from renewable energy by 2020. These laws and directives mean that renewable energy projects will likely be located in the Mojave Desert in the future and possibly in the range of the Mohave ground squirrel.

The Department of the Interior has and continues to receive applications for utility-scale renewable energy projects on public lands, primarily in the western United States. As of November 2010 (Miller 2010, *in litt.*), the BLM had received 23 applications for solar and wind renewable energy projects in the CDCA, of which part or all of each project would be located in the range of the Mohave ground squirrel. These applications that are entirely or partly within the squirrel's range encompass an estimated 204,200 ac (82,637 ha) of BLM land. However, this is only a rough approximation, because at this point in the application process we cannot determine with any accuracy what areas fall inside or outside the range of the squirrel. Some proposed projects are located on both BLM and private land, but the amount on private land is not available at this time, and the location, size, and status of many of these proposed energy projects changes frequently. In addition, it is not likely that all of these proposed projects will be permitted (see discussion below under *Solar Projects*).

In addition to those applications on BLM-managed lands, several applications for solar and wind energy and transmission projects have been submitted to other agencies that manage lands in the Mojave Desert or that are privately owned. These include the DOD, Department of Energy, CEC, California Public Utilities Commission, and County planning agencies. At least a portion of many of these projects may fall within the range of the Mohave ground squirrel.

In response to the Federal and State initiatives to encourage renewable energy development and the several applications for permits for renewable energy projects, the Renewable Energy Action Team (REAT) was formed. Its members include the CEC, CDFG, BLM, Service, California Public Utilities Commission, California Independent System Operators, National Park Service, U.S. Environmental Protection Agency, and DOD. The REAT is developing the Desert Renewable Energy Conservation Plan (DRECP), which was mandated by California Executive Order S–14–08. This plan is a joint State Natural Communities Conservation Plan (NCCP) and Federal planning effort that will identify and provide measures necessary to conserve and manage natural biological diversity within the plan area while allowing compatible and appropriate economic development, growth, and other human uses (California Fish and Game Code section 2805(g)). This includes mitigation measures that will offset impacts to sensitive species that are addressed in the DRECP, including the Mohave ground squirrel.

Solar Projects

Solar energy projects require a large, clear area for placing and maintaining photovoltaic panels or mirrors to produce energy and ancillary structures, including distribution lines to transport the generated energy to a high-voltage transmission line and provide power to the administration and operation facilities at the site; pipelines to supply water for administration and operation facilities and for the production of energy (*e.g.,* washing mirrors and panels, generating steam to produce energy); and roads to access the project site, distribution line route, and pipeline route(s). Some of these ancillary structures are tens of miles long. In addition, some projects are obligated to provide energy on cloudy days. Therefore, a backup energy system may be constructed within the project site that uses non-renewable energy sources, such as natural gas or propane, to produce energy, which may require the construction of a pipeline to deliver the hydrocarbon fuel to the project site.

Solar energy projects are likely the most destructive renewable energy projects to Mohave ground squirrel habitat. Based on the past construction and operation of both solar thermal and photovoltaic solar energy projects in the Mojave Desert, the footprint of the project site is usually a large area, most of which is cleared and maintained free of vegetation, and the right-of-way for the transmission line and pipeline(s) includes a maintained access road for operation and maintenance. Solar energy projects are usually located on level or slightly sloping ground, which is characteristic Mohave ground squirrel habitat.

Adverse effects to the Mohave ground squirrel from construction and operation of solar plants include crushing animals and their burrows; loss of habitat for foraging, cover, and reproduction; increased levels of vehicle traffic that potentially result in the increased mortality of squirrels and increased predation; introduction of nonnative plants, especially along pipelines, transmission lines, and access roads; and altering habitat upslope and downslope, causing hydrologic and erosion effects.

There are two existing solar thermal power plants in the range of the Mohave ground squirrel, one near Kramer Junction and the second near Harper Dry Lake. These two facilities, both of which are located on private land, use solar trough or mirror technology, with backup natural gas as an energy source to produce power at night and on cloudy days. They cover an estimated 3,600 ac (1,457 ha), or 0.07 percent of the range of the Mohave ground squirrel, plus additional area for transmission lines, pipelines, and access roads. We are unaware of any information documenting impacts of these facilities on the Mohave ground squirrel population.

It is difficult to quantify the impacts of proposed solar energy projects on the habitat of the Mohave ground squirrel because of the uncertainty about their potential number, size, location, and jurisdiction. The DOD has proposed the development of 14,000 ac (5,666 ha) for solar energy production on Fort Irwin and 3,000 ac (1,214 ha) on EAFB. Although the average size of a solar project proposed on BLM land is about 7,000 ac (2,832 ha), the combined size of the three applications BLM has received that fall within the range of the Mohave ground squirrel was originally 9,686 ac (3,920 ha) (Miller 2010 *in litt.*). However, one of the three, the 3,883 ac (1,571 ha) Solar Millennium project, was recently cancelled after 2 years of environmental planning. It should be noted, however, that the cancellation of this project does not preclude another project proponent from submitting an application for solar development at the same site. The sizes of the two remaining projects are substantially different (5,325 ac (2,155 ha) versus 478 ac (193 ha)), which adds to the uncertainty about potential impacts on Mohave ground squirrel habitat. Ultimately, solar energy development on BLM land is likely to be limited within the range of the Mohave ground squirrel. Currently, none of the proposed solar energy projects are located in any of the eight important population areas for the Mohave ground squirrel.

The BLM is developing programmatic-level guidance for the development of solar energy projects and recently released a draft programmatic Environmental Impact Statement (EIS) for solar energy (BLM and DOE 2010). This draft EIS proposes four solar energy zones (SEZs) on 677,400 ac (27,414 ha) in the California desert. These SEZs are areas where the BLM would either make processing utility-scale solar energy project applications located in SEZs a priority or restrict solar energy project development to SEZs. None of the four proposed SEZs is in the range of the Mohave ground squirrel, and the EIS includes language and a map showing that BLM lands that are ACECs, DWMAs, or Mohave ground squirrel habitat are excluded from solar development. However, within the range of the Mohave ground squirrel, the map identifies scattered tracts of BLM land near the edge of EAFB and Victorville that have been identified as available for solar energy development (BLM and DOE 2010, p. 2). We note that this is a draft document, and the final document may be similar or different from the current EIS. Based on the currently available information, none of the proposed solar energy projects, the SEZs, or the scattered tracts of BLM land are within any of the important population areas for the Mohave ground squirrel.

Under the current WEMO Plan, which may extend to 2035, solar development within the range of the Mohave ground squirrel will also be restricted because the BLM has a maximum cumulative limit of 1 percent new surface disturbance of any kind for the MGSCA. One large solar project within the MGSCA would meet or exceed this 1-percent cap on any kind of surface disturbance. Although the 1-percent cap also applies to DWMAs, solar energy projects on BLM land in DWMAs are not likely to occur because of their designation as ACECs (see Factor D, *Bureau of Land Management*). The WEMO Plan also requires a mitigation ratio of 5:1 for lands within the DWMAs and the MGSCA for habitat lost from ground disturbance (BLM *et al.* 2005, chapter 2, p. 204). The mitigation generally involves acquisition of non-Federal land to add to the DWMAs and MGSCA, but mitigation measures other than habitat acquisition may be implemented to meet the 5:1 mitigation ratio. Outside of these areas, the mitigation ratio is 1:1 (BLM *et al.* 2005, chapter 2, p. 204, LaPre 2010). Once the DRECP is completed, the WEMO Plan would likely be amended to adopt this plan. The current delineation for the DWMAs and MGSCA are not likely to change with implementation of the DRECP.

BLM does not have jurisdiction over the permitting, development, and operation of solar energy projects on private land within the range of the Mohave ground squirrel and, therefore, does not have information on the number, size, and location of these projects. A project on private land may require approval from a County agency only, or from the County and the CEC. The applications received by these agencies are not always available to the public because of potential competition between energy developers, and as with BLM land, the number, size, and location of proposed solar energy projects changes frequently. However, we are aware of 21 proposed projects on private land within the range of the Mohave ground squirrel, which combined total 16,772 ac (6,787 ha), or about 0.3 percent of the range of the Mohave ground squirrel. Many of these projects are proposed for areas that were previously cleared and used for agriculture. None of these projects are located in any of the important population areas for the Mohave ground squirrel.

In summary, the impacts from construction and operation of a solar project in the range of the Mohave ground squirrel are similar to those described in the ''Urban and Rural Development'' section and are primarily loss of habitat. Two solar energy projects occur in the range of the Mohave ground squirrel, which combined are less than 0.1 percent of the range of the Mohave ground squirrel. The solar projects proposed on DOD land could comprise about 0.3 percent of the range of the squirrel. Three projects have been proposed on BLM land within the range of the squirrel, one of which was recently cancelled. The remaining two proposed projects make up about 0.1 percent of the range of the squirrel. Given the limitations for future development in the MGSCA and DWMAs, the BLM's current proposed position to either limit utility-scale solar energy development to SEZs or make projects located in SEZs a priority for processing over other projects, we expect that few solar projects will be approved and constructed on BLM land within the range of the Mohave ground squirrel within the foreseeable future.

We are aware of 21 proposed solar projects on private land, which combined are about 0.3 percent of the range of the Mohave ground squirrel. However, the locations for many of these projects primarily occur on lands previously cleared for agriculture. The combined total of existing and proposed solar projects make up no more than 0.81 percent of the range of the Mohave ground squirrel. It is unlikely that all of the proposed projects will be built, and none of them are located in any of the important population areas for the Mohave ground squirrel. Therefore, based on the best available scientific and commercial information, we conclude that solar energy development is not currently a significant threat to the Mohave ground squirrel in relation to the present or threatened destruction, modification, or curtailment of its habitat or range, nor do we anticipate it posing a threat in the future.

Wind Projects

At wind energy project sites, wind turbine towers are scattered among hundreds or thousands of acres. The entire project site is not cleared of vegetation, rather an area at the base of each tower and the roads that provide access to the towers are cleared. Thus, the project area is crisscrossed with cleared areas, which are used during operation and maintenance. In addition to the roads, ancillary facilities include meteorological towers, a substation and an electrical collection system of buried electrical cables conveying electricity from the wind turbines to a substation, an operation and maintenance building, an electrical transmission line and associated tower structures to transmit the generated power to an existing high-voltage transmission line, and a ''switching station'' that connects the electrical components associated from the wind turbines to the high-voltage transmission line. Additionally, water and sewer lines are needed for an operations and maintenance building.

Adverse effects to the Mohave ground squirrel from construction and operation of wind energy projects include crushing animals and their burrows; loss of habitat for foraging, cover, and reproduction; increased levels of vehicle traffic that potentially result in the increased mortality of squirrels and increased predation; introduction of nonnative plants, especially along pipelines, transmission lines, and roads; and alteration of habitat upslope and downslope causing hydrologic and erosion effects. Although wind energy projects are usually similar in size or larger than solar energy projects, averaging about 8,725 ac (3,530 ha), they do not result in the elimination of all habitat within their perimeter as solar energy projects do. Habitat remains between the turbine pads and access roads. In addition, unlike solar projects, wind energy projects are frequently located on ridgelines, slopes, or in passes and would not likely be in areas with habitat characteristics preferred by Mohave ground squirrels. However, we have no information on how Mohave ground squirrel populations have been affected by currently operating wind energy projects or how they would be affected by the construction and operation of proposed wind energy projects.

Small patches of wind resources that are considered economically feasible to develop occur within the range of the Mohave ground squirrel (LM 2005, Appendix B, pp. 31–32), and some wind development is likely to occur. However, most of the large, commercially important wind fields in the Mojave Desert are to the west and south of the squirrel's range. So far, wind energy projects have been constructed on non-Federal land along the western edge of the Mohave ground squirrel's range in Kern County. Existing projects encompass about 4,900 ac (1,983 ha) or about 0.01 percent of the range of the Mohave ground squirrel (Waln 2011, p. 1). Wind turbines in this area have been placed mainly on hilltops and ridgelines, which are not generally suitable habitat for the Mohave ground squirrel.

It is difficult to quantify the impacts of proposed wind energy projects on the habitat of the Mohave ground squirrel. Applications have been submitted and withdrawn, and the size and location of the projects have changed after submission. It should be noted, however, that even if a project is cancelled, it does not prevent another project proponent from submitting an application for wind development at the same site. Recently the demand for energy sources from wind has been dampened by a reduction in the price of newly-found sources of natural gas and concerns over the future of renewable energy subsidies from Congress (Ball 2011, p. 2). As with solar energy projects, there is no single entity that is responsible for overseeing the development and operation of all wind energy projects in the Mojave Desert or within the range of the Mohave ground squirrel.

There is uncertainty in the development of future wind energy projects in the range of the Mohave ground squirrel. For example, only one wind project has been proposed on DOD land, a 49 ac (20 ha) project on Fort Irwin. In 2010, the BLM reported receiving 20 applications for wind energy projects totaling about 194,000 ac (78,509 ha) (Miller 2010, *in litt.*), although not all proposals occur within the range of the Mohave ground squirrel. The average project size is about 9,700 ac (3,925 ha), but sizes range from 160 ac (65 ha) to 45,385 ac (18,367 ha) (Miller 2010, *in litt.*). In contrast, in 2011 the BLM's list of wind energy applications (BLM 2011a, pp. 1, 3, and 4) did not include eight projects from the 2010 list. This change from 2010 was a reduction of about 86,000 ac (34,803 ha).

The total acreage of currently proposed wind energy projects that potentially occur in the range of the Mohave ground squirrel is about 107,347 ac (43,442 ha), or about 2 percent of the range of the species. In addition, the actual number of acres that fall within the range of the Mohave ground squirrel is likely to be far less because at this early stage in the proposal process the boundaries of each project are very generalized, and some of the current proposals overlap and some are partly outside the squirrel's range. In fact, requests for permits submitted to the BLM far exceed the 72,300 ac (29,259 ha) of economically developable wind resources that the BLM estimates occur on the lands they manage in the entire State of California (BLM 205, pp. 2–5). Most of the currently proposed wind energy projects on BLM land are located along the west and southeast edges of the range of the Mohave ground squirrel, and most are located on ridgetops and hillsides, which are not considered suitable habitat for the Mohave ground squirrel.

The BLM's wind energy program established policies, Best Management Practices (BMPs), and an Instructional Memorandum (IM 2009–043, December 19, 2008) to address the administration of wind energy development activities and identify minimum requirements for mitigation measures. These programmatic policies and BMPs would be applicable to all wind energy development projects on BLM lands. Site-specific and species-specific concerns, and the development of additional mitigation measures, would be addressed in project-level reviews, including National Environmental Policy Act (NEPA) analyses, as required (BLM 2005, Volume 1, Chapter ES, p. 4) (see Factor D below for a discussion of NEPA). For example, the BLM recommends establishing a policy by which right-of-way grants will not be issued for lands where wind energy development would be incompatible with specific resource values (BLM 2005, Volume 1, Chapter 2, pp. 6–7), such as those found within ACECs. Additional areas of land may be excluded from wind energy development on the basis of findings of resource impacts that cannot be mitigated and/or conflict with existing and planned multiple use activities or land use plans (BLM 2005, Volume 1, Chapter 2, p. 7). Other BLM policies include incorporating management goals and objectives specific to habitat conservation for species of concern (BLM 2005, Volume 1, Chapter 2, p. 9), such as the Mohave ground squirrel.

Under the current WEMO Plan, which may extend to 2035, wind development within the range of the Mohave ground squirrel will also be restricted because the BLM has a maximum cumulative limit of 1 percent new surface disturbance of any kind for the MGSCA and 1 percent for each of the two DWMAs. One large wind project within the MGSCA would meet or exceed this 1-percent cap on any kind of surface disturbance. The WEMO Plan also requires a mitigation ratio of 5:1 for lands within the DWMAs and the MGSCA for habitat lost from ground disturbance (BLM *et al.* 2005, chapter 2, p. 204). The mitigation generally involves acquisition of non-Federal land to add to the DWMAs and MGSCA, but mitigation measures other than habitat acquisition may be implemented to meet the 5:1 mitigation ratio. Outside of these areas, the mitigation ratio is 1:1 (BLM *et al.* 2005, chapter 2, p. 204; LaPre 2010, *in litt.*). Although compensation is required, there is no requirement that the lands acquired will be enhanced or excluded from future development projects, but they are subject to the 1-percent development cap. Once the DRECP is completed, the WEMO Plan would likely be amended to adopt this plan. The current delineations for the DWMAs and MGSCA are not likely to change with implementation of the DRECP.

Although patches of economically developable wind resources occur on private land throughout the range of the Mohave ground squirrel, most of the proposed and approved projects are along the western edge of the Mohave ground squirrel's range in Kern County. The Kern County Planning and Community Development Department listed 16 wind projects as either approved for construction or as deemed complete to begin the approval process (Kern County Planning 2011, pp. 1–2). Thirteen of these projects are located partly or entirely within the range of the Mohave ground squirrel. Their area is estimated to be 47,000 ac (19,020 ha), or about 0.9 percent of the range of the Mohave ground squirrel.

In summary, existing wind energy projects occur in the range of the Mohave ground squirrel and additional projects have been proposed and approved. Most wind energy projects are or will be located on ridgetops and hillsides, which are not considered suitable habitat for the Mohave ground squirrel for feeding, breeding, or shelter. None of the existing or proposed wind energy projects are located in any of the important population areas for the Mohave ground squirrel.

The impacts from construction and operation of a wind energy project in the range of the Mohave ground squirrel would likely be similar to those described under the ''Off-Highway Vehicle Recreational Use'' section but with low vehicle use due to restricted access, the impacts would be reduced.

Current operational wind energy projects are on non-Federal lands on the western edge of the range of the Mohave ground squirrel and encompass about 0.01 percent of the species' range. Plans for wind energy development on DOD land are limited to 49 ac (20 ha) on Fort Irwin. On BLM land, development of wind energy projects in the MGSCA would be limited and none is likely to occur in the DWMAs in the future as the BLM has imposed restrictions on future development in these areas. Although likely an overestimate, if we assume that all proposed wind energy projects on BLM land are entirely within the range of the Mohave ground squirrel, would be constructed, and would result in the total loss of habitat within the project boundaries, 107,347 ac (43,442 ha), or 2 percent of the range of the Mohave ground squirrel, would be lost. On non-Federal land, about 47,000 ac (19,020 ha), or 0.9 percent of the range of the Mohave ground squirrel, have proposed or recently approved wind energy projects. The combined total of existing, proposed, and approved wind projects make up at most about 3 percent of the range of the Mohave ground squirrel; however, this is an overestimate as the projects would not result in a total loss of Mohave ground squirrel habitat.

Therefore, based on the best available scientific and commercial information, we conclude that wind energy development does not currently pose a threat to the Mohave ground squirrel in relation to the present or threatened destruction, modification, or curtailment of its habitat or range, nor do we anticipate it posing a threat in the future, because:

(1) Large areas of economically developable wind resources do not occur within the range of the Mohave ground squirrel;

(2) The number and size of proposed or approved development on DOD land is limited;

(3) There are limitations on the areal extent of development in the MGSCA and DWMAs; and

(4) Typical construction and operation of wind energy projects does not result in the total loss of habitat within the project site.

Geothermal Projects

A typical geothermal project has one or more power plants, a series of wells scattered throughout an area, pipelines delivering water to the wells and heated water to the power plant(s), a substation, transmission lines to a high-voltage transmission line, administrative offices, water and sewer lines, and ponds. Geothermal projects are not limited to a particular type of terrain as are wind turbines; they may or may not be located in areas with suitable habitat for Mohave ground squirrels. However, ancillary facilities such as transmission lines, pipelines, and access roads, would likely occur in Mohave ground squirrel habitat.

Adverse effects to the Mohave ground squirrel from construction and operation of geothermal energy projects include crushing animals and their burrows; loss of habitat used for foraging, cover, and reproduction; increased levels of vehicle traffic that potentially result in the increased mortality of squirrels and increased predation; introduction of nonnative plants, especially along pipelines, transmission lines, and roads; and altering habitat upslope and downslope causing hydrologic and erosion effects. Similar to wind energy projects, the overall size of geothermal projects may be large, but the entire project area is not cleared of vegetation, which leaves patches of habitat within the project area. Habitat patches would remain between the wells, pipelines, transmission poles/towers, and access roads.

Unlike solar and wind energy projects, geothermal energy projects are restricted to very specific areas where geothermal energy is sufficient and near the surface. There are only two locations in the range of the Mohave ground squirrel with actual and potential geothermal resources (Known Geothermal Resource Areas (KGRA)). One, the Coso Hot Springs KGRA, is on both NAWS (NAWS 2002, p. 47) and BLM land in the northern portion of the range of the Mohave ground squirrel; the second, the Randsburg KGRA, is mostly or entirely on BLM land near Randsburg in the central portion of the range of the squirrel (BLM *et al.* 2005, Appendix P–2, p. 3; California Department of Conservation 2002, p. 1). The single existing geothermal power plant, the Coso geothermal plant, is located in the Coso Hot Springs KGRA and consists of 106,000 ac (42,897 ha), or 2.0 percent of the range of the Mohave ground squirrel. Completed in 1987, it has 4 power plants and more than 120 wells producing 270 MW of energy (NAWS 2002, p. 48). Within the Coso Hot Springs KGRA, the BLM recently approved a 55 ac (22.3 ha) (BLM 2008, p. 13) project that includes a groundwater extraction and pipeline delivery system for injection into the existing geothermal project. The addition of the 9-mile-long (14.5-km-long) pipeline and access right-of-way would expand the existing energy output by pumping an additional 4,800 ac-feet (5,920,713 cubic meters) of ground water per year, extending the life of the power plants.

Although a geothermal energy project has been constructed in the range of the Mohave ground squirrel, we have no information on how Mohave ground squirrel populations have been affected by the currently operating project and can therefore only speculate how the Mohave ground squirrel would be affected by the construction and operation of proposed geothermal energy projects. Mohave ground squirrels at the existing project in the northwest portion of the species' range have been studied, but the purpose of the study was to gather data on the effects of excluding livestock grazing and provide data on the biology of the Mohave ground squirrel (Leitner and Leitner 1998, p. i), and not the impacts of geothermal development on the squirrel. Only one of the important population areas for the Mohave ground squirrel, the Coso Range—Olancha area, is near the Coso geothermal power plant. Although the power plant is on the southern edge of this important population area for the Mohave ground squirrel, it has not been reported as having been affected by construction and operation of the geothermal plant.

The BLM issued a decision on the final programmatic Environmental Impact Statement (EIS) for geothermal development in December 2008 (BLM and USFS 2008). In its Record of Decision, the BLM determined that issuing a geothermal lease does not cause any effect on a species, as there is no guarantee that any development will ever take place on such a lease (BLM 2008c pp. 1–22). If development does take place, prior to the development the BLM would examine individual projects and phases (exploration, development, and operation) to determine the appropriate level of environmental analysis needed to comply with NEPA (BLM and USFS 2008, pp. 2–23) and address the impacts to the Mohave ground squirrel at that time. In addition, the BLM would apply stipulations on any lease where a special status species, such as the Mohave ground squirrel, is known or strongly suspected to occur. These stipulations include modifications to existing exploration and development proposals or modifications to lease terms (BLM 2008c pp. 1–23). The BLM has developed BMPs for geothermal projects which include requiring the operator or lessee to identify important, sensitive, or unique habitats and biota in the project vicinity, and siting and designing the project to avoid (if possible), minimize, or mitigate potential impacts on these resources (BLM and USFS 2008, p. D–6), such as the Mohave ground squirrel. During each stage from exploration to utilization, the BLM retains the authority to approve, deny, or approve with conditions such as protective measures (BLM 2008c, pp. 1–24). In the CDCA, geothermal leasing is designated for all lands, with the exception of wilderness areas (BLM 2008c, pp. 2–3; BLM 1999, p. 15). We are not aware of any proposed geothermal projects on private lands in the range of the Mohave ground squirrel.

On September 11, 2009, the BLM issued a notice of intent to prepare an EIS for the exploration, development, and use of up to an additional 22,060 ac (8,927 ha), or 0.4 percent of the range of the Mohave ground squirrel in the northern resource area (74 FR 175 46786–46787). Within this 22,060 ac (8,927 ha) area, the BLM has received three applications for new geothermal development on 4,460 ac (1,805 ha), or 0.08 percent of the range of the Mohave ground squirrel. The BLM has received no applications for geothermal energy development near Randsburg.

Once the DRECP is completed, the WEMO Plan would likely be amended to adopt this plan. The current delineations for the DWMAs and MGSCA are not likely to change with implementation of the DRECP.

In summary, there are limited locations for geothermal energy projects within the range of the Mohave ground squirrel. Currently, there is only one operating geothermal energy project in the range of the squirrel, and its impacts on the Mohave ground squirrel and its habitat have not been studied. Although an important population area for the Mohave ground squirrel is nearby the existing project, the Mohave ground squirrel has not been reported as having been affected by construction and operation of the geothermal plant. Additional geothermal energy projects have been proposed in the vicinity of the existing plant, and, when added to the existing project, would impact about 2.1 percent of the range of the Mohave ground squirrel. However, the impacts would likely not affect the entire area, as not all of the habitat within these geothermal energy areas is removed during construction and operation; not all of the habitat within the project sites is likely to be suitable for the Mohave ground squirrel; and the BLM is required to implement best management practices to avoid (if possible), minimize, or mitigate potential impacts to species of concern, such as the Mohave ground squirrel. Therefore, we conclude that the construction and operation of geothermal energy projects are not currently a threat to the Mohave ground squirrel, nor do we anticipate geothermal energy projects posing a threat in the future.

Utility Corridors

The development of renewable energy projects in the western Mojave Desert will require construction of new transmission lines and the upgrading of existing transmission lines to carry the increased electrical energy production. Pipelines are also needed to carry water to some solar and geothermal energy plants for daily operational needs and natural gas or propane to some solar energy plants for energy production on cloudy days.

Utility corridors may impact the Mohave ground squirrel and its habitat in various ways. Construction activities result in direct impacts by crushing Mohave ground squirrels and their burrows, and collapsing burrows, which destroy the shelter the species needs to escape temperature extremes and predators and to rear young. Construction activities also unearth, injure, or kill other animals that attract Mohave ground squirrel predators, such as the common raven. The construction and use of unpaved roads along transmission lines and pipelines affect Mohave ground squirrel habitat in the same manner as roads created and used by OHVs (see ''Off-Highway Vehicle Recreation Use'' section); OHVs would also use the utility corridors. The physical structures (*e.g.,* towers and pads, access roads) cause loss of habitat and facilitate predation of the Mohave ground squirrel by providing nesting, roosting, and perching habitat for common ravens and birds of prey (Boarman and Heinrich 1999, pp. 23–24). Because of ongoing operation and maintenance, the recovery or restoration of these areas of lost habitat is limited (Lovich and Bainbridge 199, p. 313).

Because we have no reliable information on the number, size, and location of potential renewable energy projects in the range of the Mohave ground squirrel, we have no reliable information of the number, size, and location of their associated utility lines. However, utility corridors in the range of the Mohave ground squirrel already exist, having been designated by the BLM. In the range of the Mohave ground squirrel, these corridors generally run closely parallel to major highways, including I–15, US–395, SR–58, and SR–178 (Inyokern to Ridgecrest and Trona). Corridors that are not associated with highways, or that are only occasionally associated with highways, include ones along the Mojave River, another along the southern boundary of Fort Irwin, two north-south corridors in the western Antelope Valley, and one east-west corridor near SRs-138 and 18 (Palmdale to Victorville) (BLM 2011b, p. 1). The purpose for designating the corridors is to provide a coordinated and consolidated delivery system network that meets the needs of the public and minimizes the proliferation of rights-of-way, construction, and loss of habitat through the western Mojave Desert (BLM *et al.* 2005, Chapter 3, p. 275). The BLM requires all new linear utilities exceeding certain thresholds to be placed within these designated corridors (BLM *et al.* 2005, chapter 3, pp. 274–275).

It is difficult to quantify the impacts of proposed transmission lines and pipelines (''lines'') on the habitat of the Mohave ground squirrel. First, the number, length, and location of new lines are dependent on the size, number, and location of new solar, wind, and geothermal development. Applications for these have been submitted and withdrawn, and the size and location of some of the projects may have changed after they were submitted. The cost of constructing new lines is a significant part of the overall cost of an energy project, and therefore, most power suppliers locate their power generation source close to an existing utility corridor to reduce costs. Regardless, many miles of new lines and associated access roads will likely be constructed in the range of the Mohave ground squirrel, a portion of which will be outside of existing utility corridors.

Another important factor in determining the overall impact of new lines on the Mohave ground squirrel and its habitat is that the BLM requires mitigation for the Mohave ground squirrel from direct impacts of projects, such as energy development, and utility construction and maintenance. The WEMO Plan requires a mitigation ratio of 5:1 for lands within the DWMAs and the MGSCA for habitat lost from ground disturbance (BLM *et al.* 2005, chapter 2, p. 204). The mitigation generally involves acquisition of non-Federal land to add to the DWMAs and MGSCA, but mitigation measures other than habitat acquisition may be implemented to meet the 5:1 mitigation ratio. Outside of these areas, the compensation requirement is at a rate of 1:1 (BLM *et al.* 2005, chapter 2, p. 204, LaPre 2010, *in litt.*). Although compensation is required, there is no requirement that the lands acquired will be enhanced or excluded from future development projects, but any acquired lands are subject to the 1-percent development cap. Thus, habitat acquisition may result in securing blocks of habitat for the Mohave ground squirrel, but it will also result in a net loss of total available acres of habitat. In addition, the CDFG may require mitigation for the loss of Mohave ground squirrel habitat as part of the permitting process under CESA (see Factor D, ''State Laws and Regulations'').

In summary, the construction and operation of utility corridors may impact the Mohave ground squirrel through increased animal mortality and the loss and degradation of habitat used for feeding, breeding, and sheltering. Utility corridors have been designated to minimize the proliferation of rights-of-way through the western Mojave Desert and range of the Mohave ground squirrel. Many are located along existing highways, which confines the locations and impacts of linear structures and minimizes new impacts to Mohave ground squirrel habitat. Where these rights-of-way cross BLM land, any permitted surface disturbance would be limited to a 1 percent development cap in the MGSCA and the DWMAs and the mitigation rate would be 5:1. Outside these special management areas, the mitigation rate would be 1:1. Thus, habitat for the Mohave ground squirrel would likely be lost, but this loss would be confined mainly to the utility corridors and other areas of habitat would be acquired through mitigation that could benefit the Mohave ground squirrel.

Summary of Energy Development

In summary, 22 non-renewable and renewable energy projects have been constructed within the range of the Mohave ground squirrel. No new non-renewable projects have been proposed; however, many more renewable energy projects have been proposed. Existing solar, wind, and geothermal projects encompass about 2.2 percent of the range of the Mohave ground squirrel. However, at the present time, there is a great deal of uncertainty as to the number, size, and location of future energy development and its potential impact on the Mohave ground squirrel. This uncertainty is caused by a number of factors, including overlapping proposed projects, the cost of supplying renewable energy compared to other energy sources, and whether or not the December 2011 construction deadline for funding under the American Recovery and Reinvestment Act of 2009 will be extended.

Although we are not aware of any studies on the impact of renewable energy development on the Mohave ground squirrel, at least some loss of habitat will occur, with the potential amount and suitability of the habitat lost dependent in part on the type of energy development. Solar energy development may occur anywhere there is flat or gently sloping land, which is where Mohave ground squirrel habitat usually occurs, and is likely the most destructive type of renewable energy to Mohave ground squirrel habitat because most of the area is cleared of vegetation during construction and operation. In contrast, wind development is limited to those areas with economically developable wind energy and generally occurs on ridges and hilltops, while geothermal development within the range of the Mohave ground squirrel is limited to two areas where geothermal energy can be commercially developed. The impact of both wind and geothermal development may also be less than solar because much of the vegetation is not cleared during their construction.

Future solar and wind development on Federal land, which makes up about two-thirds of the range of the Mohave ground squirrel, is likely to be limited for several reasons. No solar and wind projects exist on the 37 percent of the range of the Mohave ground squirrel that is managed by the DOD, while proposed solar and wind development on DOD land makes up about 0.3 percent of the range of the Mohave ground squirrel. On BLM land, which includes about one-third of the range of the Mohave ground squirrel, existing renewable energy projects make up about 2.1 percent of the range of the squirrel, most of which is geothermal. However, the BLM has received applications for solar, wind, and geothermal projects that could encompass about an additional 2.2 percent of the range of the Mohave ground squirrel. This level of development on BLM land is likely an overestimate because the BLM has implemented a 1-percent cap (BLM *et al.* 2005a, chapter 2, p. 48) on all new development, including energy projects, in the 1,726,722 ac (698,78 ha) MGSCA and in the two DWMAs, which total 1,155,835 ac (467,752 ha) (BLM *et al.* 2005, chapter 2, pp. 15, 48, 204) (see Map 2 and Factor D); the BLM also requires extensive and potentially expensive mitigation in these areas. This cap means the BLM would limit new development in each of these areas, which make up most of the range of the

BLM land within the range of the Mohave ground squirrel, to no more than 1 percent under the current WEMO Plan, which may extend to 2035. However, the proposed renewable energy projects in these limited development areas may already exceed this 1-percent cap, which means not all of the proposed projects would be built, and no other permitted projects of any kind with surface disturbance could occur in these areas.

For solar development, the BLM has proposed four SEZs in its programmatic EIS for solar energy, all of which are outside the range of the Mohave ground squirrel and within which solar development is more likely to occur. Wind development may be more likely to occur on BLM land within the range of the Mohave ground squirrel than solar, but it will be restricted because of the 1-percent cap within the MGSCA and each of the DWMAs and the required mitigation. The mitigation ratio for ground disturbing activities within the MGSCA is 5:1; for land acquisition that means up to 65,440 ac (26,483 ha) of private lands (inholdings) in the MGSCA could be purchased and become part of the MGSCA if the entire 1 percent (13,088 ac (5,297 ha)) was developed. The same mitigation requirement (1-percent cap on development and 5:1 mitigation ratio) applies in the DWMAs, where up to 86,335 ac (34,939 ha) could be added to the DWMAs. However, assuming the worst-case scenario that all proposed wind and geothermal projects on BLM land are developed within the range of the Mohave ground squirrel, then as much as 2.2 percent of the range would be affected.

On non-Federal land, which comprises about one-third of the range of the Mohave ground squirrel, several solar and wind energy projects have been proposed that would impact about 1.2 percent of the range of the Mohave ground squirrel. However, many of the projects on private land will be constructed on land previously converted to agriculture. Therefore, although most probably an overestimate, 5.9 percent of the range could be lost as a result of renewable energy development. None of the existing or proposed renewable energy projects on Federal or private land are located within any of the important population areas for the Mohave ground squirrel.

Renewable energy development will also require the construction of additional utility lines, which may result in the loss of Mohave ground squirrel habitat. These additional lines will be limited in the MGSCA and the DWMAs, as energy development in these areas is expected to be limited, long utility lines add substantially to the cost of a project, and the lines are subject to the 1-percent development cap and the 5:1 mitigation ratio. New lines would be subject to a 1:1 mitigation ratio outside the MGSCA and DWMAs.

In conclusion, existing non-renewable energy development has occurred in or near cities and communities in the range of the Mohave ground squirrel; however, no new non-renewable projects are proposed. Renewable energy development has occurred in rural areas within the range of the Mohave ground squirrel and has been mainly limited to solar thermal development in the central portion of the range and geothermal development in the northern portion of the range. Future development on Federal land, which makes up about two-thirds of the range, is likely to occur outside the MGSCA and the DWMAs. Development on BLM land outside the MGSCA and the DWMAs will require a mitigation ratio of 1:1. This mitigation could include the acquisition of additional lands to be included in the DWMAs and MGSCA. Proposed energy development on DOD land makes up 0.3 percent of the range. We are aware of several proposed projects on private land, but many of them are in areas where the site has been graded, so the habitat is not suitable for the Mohave ground squirrel. Therefore, after reviewing the best available scientific and commercial information, we conclude that energy development does not currently pose a threat to the Mohave ground squirrel in relation to the present or threatened destruction, modification, or curtailment of its habitat or range, nor do we anticipate it posing a threat in the future.

Livestock Grazing

Potential impacts from livestock grazing to Mohave ground squirrel habitat are mainly from degradation of soils and vegetation rather than direct loss of habitat, which is limited to construction and use of certain livestock improvements, such as livestock troughs, stock tanks, and corrals (Lovich and Bainbridge 1999, p. 313). Habitat degradation due to grazing occurs to varying degrees and includes soil compaction, destruction or degradation of cryptobiotic soil crusts, decreased water infiltration, increased erosion, trampling of plants, and overcropping (Lovich and Bainbridge 1999, p. 311). Grazing also collapses burrows (Boarman 2002, p. 28). Several studies have been conducted that document the impacts of livestock grazing, especially overgrazing, on soils and vegetation in the Mojave Desert (Busack and Bury 1974, pp. 181–182; Berry 1978, pp. 511–515; Webb and Stielstra 1979, pp. 522–527; Nicholson and Humphreys 1981, pp. 171–81; Brooks 1995, pp. 67–69; Avery 1998, pp. 67–68).

In the Mojave Desert, livestock grazing impacts soils in various ways. It damages cryptobiotic soil crusts (see ''Military Operations'' section) in the open spaces between desert shrubs and causes soil compaction. In a comparison of soil conditions following sheep grazing in the western Mojave Desert, Webb and Stielstra (1979, pp. 522–523) noted that surface strength (a measure of compaction) was significantly greater in grazed as compared to ungrazed areas, particularly in the upper 4 in (10 cm) of the soil, and that surface erosion was greater after grazing.

Grazing has also been found to reduce the number of seeds in a soil seed bank (Brooks 1995, p. 670), which contributes to changes in plant communities. In the western Mojave Desert, a study comparing grazed and ungrazed plots reported the grazed plot had reduced native forb density (Larson *et al.* 1997, as cited in Boarman 2002, p. 34). Native vegetation biomass in the Mojave Desert is higher in areas protected from grazing, while nonnative grass biomass is greater outside protected areas (Brooks 1995, pp. 67–68).

The impacts to soils and vegetation in active allotments vary by location and intensity. For much of the grazing season, the areas livestock graze are limited by distance from water. Grazing intensity and associated impacts are generally greater near watering areas, but decrease substantially within a short distance (Boarman 2002, p. 34), and some areas within an allotment may not be grazed because of their distance from water.

Although several studies have been conducted on the effects of livestock grazing on soils and vegetation in the Mojave Desert, we found only one study on the effects of livestock grazing on the Mohave ground squirrel. This study focused on dietary overlap, not impacts to soils and vegetation. Using fecal microhistological analysis, Leitner and Leitner (1998, pp. iv, 27) reported that both Mohave ground squirrels and livestock rely on the leaves from shrubs, particularly one uncommon shrub, *Krascheninnikovia lanata* (winterfat). This reliance by both livestock and squirrels was greater in dry years. The researchers concluded there was dietary overlap between the Mohave ground squirrel and cattle (Leitner and Leitner 2006, p. 38), but provided no information on whether this overlap was impacting the Mohave ground squirrel.

Cattle and sheep grazing are authorized within the range of the Mohave ground squirrel. The majority of grazing occurs on BLM land, but grazing also occurs on private land. The BLM has designated 21 grazing allotments (11 sheep, 7 cattle, and 3 cattle/sheep) within the range of the Mohave ground squirrel (BLM *et al.* 2005, chapter 2, pp. 125, 130; chapter 3, pp. 213, 215–216). An allotment is an area designated for grazing for a private rancher to use. The grazing program in the WEMO Plan addresses BLM lands only; however, many of the BLM allotments include both public and private lands (BLM *et al.* 2005, chapter 2, p. 130).

With adoption of the WEMO Plan, the BLM made several changes to grazing management. The BLM implemented public land health standards and guidelines for grazing management to improve ecological conditions and ensure healthy sustainable rangelands (BLM *et al.* 2005, chapter 2, p. 118). The standards in the WEMO Plan include managing soils and native species' habitats by managing ecological processes, and include indicators to evaluate whether populations and their habitats are sufficiently distributed and healthy to prevent the need for listing under the ESA (BLM *et al.* 2005, chapter 2, p. 121). The BLM is required to restore, maintain, or enhance habitats of special status species, such as the Mohave ground squirrel, to promote their conservation (BLM *et al.* 2005, chapter 2, p. 124).

Under the WEMO plan, specific management changes to livestock grazing in the range of the Mohave ground squirrel included reducing the area authorized for grazing in the range of the Mohave ground squirrel by 33 percent; eliminating ephemeral grazing for cattle in the DWMAs; eliminating sheep grazing in most of the DWMAs; excluding cattle grazing in the spring in DWMAs in years when annual plant productivity is low; excluding cattle grazing on NAWS; and allowing permittees to voluntarily relinquish cattle and sheep allotments (BLM *et al.* 2005, chapter 2, pp. 127, 132–135). These management prescriptions will be in effect during implementation of the current WEMO Plan, which may extend to 2035. The area currently authorized for grazing by the BLM within the range of the Mohave ground squirrel habitat is 1,718,686 ac (695,530 ha) of BLM and private land (BLM *et al.* 2005, chapter 3, pp. 213, 215–216; Waln 2010, p. 1), or about 32.3 percent of the range of the Mohave ground squirrel (see ''Range and Distribution'' section). In addition, the BLM reports that although no allotments have been voluntarily relinquished, the permittee for the 45,619 ac (38,994 ha) Pilot Knob allotment has not grazed livestock recently and has requested relinquishment (Fitton 2010, *in litt.*). This area is 0.9 percent of the range of the Mohave ground squirrel.

We do not have any information on regionwide grazing on private lands outside of BLM allotments; therefore, the total area grazed presented above underestimates the actual area of grazing within the range of the Mohave ground squirrel (BLM *et al.* 2005, Appendix M, no page number).

Mohave ground squirrel habitat can also be degraded by feral burros and wild horses, which occur in the northern portion of the species' range. Impacts to Mohave ground squirrel habitat from feral burro and wild horses are hypothesized to be similar to those of livestock grazing. The extent of these impacts on Mohave ground squirrel habitat is likely influenced by wild horse and feral burro population density, topography and soils, resident plant communities, spatial and temporal scale, other disturbances, year to year and longer term climatic variation, and animal behavior (Abella 2008, p. 817).

The BLM has an ongoing program on its lands to capture and move feral burros and wild horses (BLM *et al.* 2005 chapter 2, p. 90), and although these animals remain within the range of the Mohave ground squirrel, their degree of impact they have on the habitat of the Mohave ground squirrel has been greatly reduced. The Navy also has an ongoing program to capture and move burros and horses from the NAWS (see ''Military Operations'' section).

In summary, although livestock grazing may result in the degradation of soils and vegetation, it rarely results in the direct loss of habitat, and there is no information that demonstrates livestock grazing is negatively impacting Mohave ground squirrel habitat. The focus of studies on livestock grazing in the Mojave Desert has been on general impacts to soils and vegetation rather than how those impacts are affecting the Mohave ground squirrel and its habitat. One study found there was dietary overlap between the Mohave ground squirrels and livestock for one forage species, but provided no information that this was adversely affecting the Mohave ground squirrel. Although we are not aware of any significant impacts of grazing on Mohave ground squirrel habitat, soil and habitat degradation associated with grazing have been further reduced with the BLM's recent implementation of public land health standards and guidelines for grazing. Recent BLM actions in the range of the Mohave ground squirrel include eliminating grazing in some areas and reducing it in others, which should improve the condition of the soils and vegetation, particularly in the MGSCA and the DWMAs (see Map 2). Over time, these changes are likely to provide increased foraging opportunities for the Mohave ground squirrel and reduce the overall amount of time that livestock spend within these areas, thus reducing impacts to soils, vegetation, and dietary overlap. Therefore, based on the best available scientific and commercial data, we conclude that livestock grazing does not currently pose a threat to the Mohave ground squirrel in relation to the present or threatened destruction, modification, or curtailment of its habitat or range, nor do we anticipate livestock grazing posing a threat in the future.

Agriculture

Agriculture occurs in the range of the Mohave ground squirrel. Agricultural development results in the conversion of native desert habitat to croplands and orchards. In addition to the direct loss of habitat, agricultural activities expose Mohave ground squirrels and nearby habitat to insecticides, herbicides, and rodenticides (Hoyt 1972, p. 7). Because the Mohave ground squirrel eats both plants and insects, it could be adversely affected by the loss or reduction of these food items from the use of insecticides and herbicides. In addition, drift of insecticides, herbicides, or rodenticides from the fields into adjacent habitat or bioaccumulation of these chemicals from contaminated forage and insects could adversely affect the Mohave ground squirrel.

We found no information that the use of pesticides is adversely affecting the Mohave ground squirrel from direct exposure, reduction of forage, or bioaccumulation from consuming treated vegetation or insects. Habitat loss from agricultural activities has occurred at several locations within the range of the Mohave ground squirrel. By the early 1990s, more than 39,000 ac (15,700 ha), or 0.7 percent of the range of the Mohave ground squirrel, had been lost to agriculture, including areas in the Antelope Valley and Mojave River Basin (Gustafson 1993, p. 24). In 1994, Krzysik (1994, p. 18) reported that the spread of alfalfa fields throughout the species' southern range in the Mojave River area had destroyed prime Mohave ground squirrel habitat and fragmented populations. Krzysik (1994, p. 18) concluded that the Mohave ground squirrel was no longer found in the

Lucerne Valley, Apple Valley, or Victorville areas, which are in the southern portion of the squirrel's range (see Map 1). We estimate this area to be about 2.4 percent of the range of the Mohave ground squirrel. However, there have been recent sightings of the Mohave ground squirrel near Adelanto and Hesperia (Victorville/Mojave River Valley area) and Mojave (western Antelope Valley) (Leitner 2008, pp. 6–7) (see Map 1).

We acknowledge that past agricultural development resulted in the destruction of Mohave ground squirrel habitat. However, the current cost of pumping ground water to irrigate crops in the western Mojave Desert discourages the development of new areas for agriculture (Los Angeles County Cooperative Extension 2009, p. 1). In addition, many areas historically used for agriculture are being converted to residential and commercial development (Los Angeles County Cooperative Extension 2009, p. 1). This conversion would not result in additional loss of habitat for the Mohave ground squirrel, as the native vegetation had previously been removed when developed for agriculture. After reviewing the information on Web sites of local agricultural agencies in the western Mojave Desert, we conclude that there will likely be no increase in agricultural development in the future. Given the best available scientific and commercial data, and the small percent of the range of the species affected by agriculture, we conclude that agriculture does not currently pose a threat to the Mohave ground squirrel in relation to the present or threatened destruction, modification, or curtailment of its habitat or range, nor do we anticipate it posing a threat in the future.

Mining

Limited mining occurs in the range of the Mohave ground squirrel, and includes mineral, sand, and gravel mines. Mining results in the loss of Mohave ground squirrel habitat through removal of vegetation used for forage and cover, and removal of soils used for burrows, which provide protection from temperature extremes and predation, and serve as a location to give birth. Travel off road during mining exploration, and the construction and use of roads to access the mine site during production, also result in the loss of habitat (Boarman 2002, p. 18). These activities impact the Mohave ground squirrel by damaging and removing shrub cover and compacting the soil (see ''Off-Highway Vehicle Recreational Use'' section above for additional details). Extracting minerals is usually done by constructing addits (a type of horizontal shaft), shafts, and/or pits. The unused materials may include overburden, waste ore, and tailings, which are deposited near the mine site. A mining operation may require office space, storage facilities, and power plants at the mine site. These activities impact Mohave ground squirrels through a direct loss of habitat, similar to impacts from urban development, although on a reduced scale (Boarman 2002, p. 18) (see ''Urban and Rural Development'' section).

Mining has occurred in the western Mojave Desert for more than a century. Minerals extracted in the western Mojave Desert include gold, borates, and aggregate materials (sand, gravel, and stone). Mine size ranges from less than a few acres for recreational mining and exploration, to large commercial mines covering several square miles. However, most of the mines in the western Mojave Desert are small and their impacts are very limited and localized.

The only extensive mining operation in the range of the Mohave ground squirrel is the U.S. Borax borate mine located north of Boron (see Map 1). This operation is proposing to increase its footprint by 1,500 ac (607 ha) (U.S. Borax 2008, Figure ES–2), which would allow the mine to operate past 2050. Sand, gravel, cement, and other mineral commodities used for construction materials are in demand as the population in the western Mojave Desert and southern California continues to grow. We anticipate there will be an increase in demand for these materials in the future in the western Mojave Desert (BLM *et al.* 2005, Appendix P, p. 2), despite the current slowdown in the economy. As sand and gravel mining operations deplete their material sources at currently approved mining sites, they will likely request permits to expand their current operation sites (*e.g.,* Ag Con in Oro Grande, San Bernardino County 2003 Mining Conditional Use Permit and Reclamation Plan). Mine expansion would result in the loss of Mohave ground squirrel habitat, but this loss would likely be minimal in area when compared to the range of the species (far less than 0.01 percent of the range). Much smaller existing or proposed gold and silver mines are in the Mojave-Rosamond and Randsburg areas, but these mines are located on rocky buttes and do not occur in Mohave ground squirrel habitat.

Commercial and recreational mining does not occur on DOD lands. On public land, the BLM allows mining in all areas, unless the land has been withdrawn from mineral entry. Lands not withdrawn but requiring an approved plan of operation prior to commencing mining activities include proposals to remove more than 1,000 tons of ore, to disturb more than 5 ac (2 ha) of BLM land, or to be located on lands that are ACECs or wilderness. Class L public lands are limited-use areas to help protect sensitive, natural, scenic, ecological, and cultural resource values. These public lands are also managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished. Class C public lands are wilderness areas with controlled use that is also closed to OHV use (BLM *et al.* 2005, chapter 3, p. 3 and Appendix P, p. 4). Casual mining use or prospecting can occur on BLM lands in the western Mojave Desert, as can commercial mining. However, the DWMAs are ACECs and the MGSCA area is Class L land. The BLM would need to approve a plan of operation prior to anyone initiating mining activities in these areas. The plan of operation would also need to include the 5:1 mitigation ratio, and mine development would contribute to the 1-percent development cap. Given these requirements, it is unlikely that mining would occur on these lands in the range of the Mohave ground squirrel in the future.

In summary, mining occurs in the range of the Mohave ground squirrel on private and BLM lands. However, using the best available scientific and commercial information, we find that only a small number of known active and proposed mines occur in the range of the Mohave ground squirrel; many of these mines are located in areas that are not suitable habitat (*i.e.,* rocky, mountainous areas) for the Mohave ground squirrel; and commercial mining is absent on DOD lands (which constitute about one third of the range of the species). Therefore, we conclude that mining does not currently pose a threat to the Mohave ground squirrel in relation to the present or threatened destruction, modification, or curtailment of its habitat or range, nor do we anticipate it posing a threat in the future.

Climate Change

Climate change may be impacting the Mohave ground squirrel. Climate change is discussed here under Factor A because, although climate change may affect the Mohave ground squirrel directly by creating physiological stress, the primary impact of climate change on the Mohave ground squirrel is expected to be through changes to the availability and distribution of Mohave ground squirrel habitat.

''Climate'' refers to an area's long-term average weather statistics (typically for at least 20- or 30-year periods), including the mean and variation of surface variables, such as temperature, precipitation, and wind, whereas ''climate change'' refers to a change in the mean and/or variability of climate properties that persists for an extended period (typically decades or longer), whether due to natural processes or human activity (Intergovernmental Panel on Climate Change (IPCC) 2007a, p. 78). Although changes in climate occur continuously over geological time, changes are now occurring at an accelerated rate. For example, at continental, regional and ocean basin scales, recent observed changes in long-term trends include: A substantial increase in precipitation in eastern parts of North America and South America, northern Europe, and northern and central Asia, and an increase in intense tropical cyclone activity in the North Atlantic since about 1970 (IPCC 2007a, p. 30); and an increase in annual average temperature of more than 2 degrees Fahrenheit (F) (1.1 degrees Celsius (C)) across the U.S. since 1960 (Global Climate Change Impacts in the United States (GCCIUS) 2009, p. 27). Examples of observed changes in the physical environment include: An increase in global average sea level, and declines in mountain glaciers and average snow cover in both the northern and southern hemispheres (IPCC 2007a, p. 30); substantial and accelerating reductions in Arctic sea ice (*e.g.,* Comiso *et al.* 2008, p. 1), and a variety of changes in ecosystem processes, the distribution of species, and the timing of seasonal events (*e.g.,* GCCIUS 2009, pp. 79–88).

The IPCC used Atmosphere-Ocean General Circulation Models and various greenhouse gas emissions scenarios to make projections of climate change globally and for broad regions through the 21st century (Meehl *et al.* 2007, p. 753; Randall *et al.* 2007, pp. 596–599), and reported these projections using a framework for characterizing certainty (Solomon *et al.* 2007, pp. 22–23). Examples include: (1) It is virtually certain there will be warmer and more frequent hot days and nights over most of the earth's land areas; (2) it is very likely there will be increased frequency of warm spells and heat waves over most land areas, and the frequency of heavy precipitation events will increase over most areas; and (3) it is likely that increases will occur in the incidence of extreme high sea level (excludes tsunamis), intense tropical cyclone activity, and the area affected by droughts (IPCC 2007b, p. 8, Table SPM.2). More recent analyses using a different global model and comparing other emissions scenarios resulted in similar projections of global temperature change across the different approaches (Prinn *et al.* 2011, pp. 527, 529).

All models (not just those involving climate change) have some uncertainty associated with projections due to assumptions used, data available, and features of the models; with regard to climate change this includes factors such as assumptions related to emissions scenarios, internal climate variability and differences among models. Despite this, however, under all global models and emissions scenarios, the overall projected trajectory of surface air temperature is one of increased warming compared to current conditions (Meehl *et al.* 2007, p. 762; Prinn *et al.* 2011, p. 527). Climate models, emissions scenarios, and associated assumptions, data, and analytical techniques will continue to be refined, as will interpretations of projections, as more information becomes available. For instance, some changes in conditions are occurring more rapidly than initially projected, such as melting of Arctic sea ice (Comiso *et al.* 2008, p. 1; Polyak *et al.* 2010, p. 1797), and since 2000 the observed emissions of greenhouse gases, which are a key influence on climate change, have been occurring at the middle to higher levels of the various emissions scenarios developed in the late 1990s and used by the IPPC for making projections (*e.g.,* Raupach *et al.* 2007, Figure 1, p. 10289; Manning *et al.* 2010, Figure 1, p. 377; Pielke *et al.* 2008, entire). Also, the best scientific and commercial data available indicate that average global surface air temperature is increasing and several climate-related changes are occurring and will continue for many decades even if emissions are stabilized soon (e.g. Meehl *et al.* 2007, pp. 822–829; Church *et al.* 2010, pp. 411–412; Gillett *et al.* 2011, entire).

Changes in climate can have a variety of direct and indirect impacts on species, and can exacerbate the effects of other threats. Rather than assessing ''climate change'' as a single threat in and of itself, we examine the potential consequences to species and their habitats that arise from changes in environmental conditions associated with various aspects of climate change. For example, climate-related changes to habitats, predator-prey relationships, disease and disease vectors, or conditions that exceed the physiological tolerances of a species, occurring individually or in combination, may affect the status of a species. Vulnerability to climate change impacts is a function of sensitivity to those changes, exposure to those changes, and adaptive capacity (IPCC 2007, p. 89; Glick *et al* 2011, pp. 19–22). As described above, in evaluating the status of a species, the Service uses the best scientific and commercial data available, and this includes consideration of direct and indirect effects of climate change. As is the case with all potential threats, if a species is currently affected or is expected to be affected by one or more climate-related impacts, this does not necessarily mean the species is a threatened or endangered species as defined under the Act. If a species is listed as threatened or endangered, this knowledge regarding its vulnerability to, and impacts from, climate-associated changes in environmental conditions can be used to help devise appropriate strategies for its recovery.

While projections from global climate model simulations are informative and in some cases are the only or the best scientific information available, various downscaling methods are being used to provide higher resolution projections that are more relevant to the spatial scales used to assess impacts to a given species (see Glick *et al.* 2011, pp. 58–61). With regard to the area of analysis for the Mohave ground squirrel, downscaled projections are available to some degree. Specifically, the IPCC models predict that precipitation will decrease, but the frequency and magnitude of extreme precipitation events will increase. The IPCC provides a more recent report that supports EPA's prediction of temperature increases and adds that rising air and ocean temperature is unquestionable (IPCC 2007a, p. 4). The Western Regional Climate Center's California Climate Tracker has developed 11 climate-monitoring regions for California. The western Mojave Desert is part of one region that includes most of the Mojave Desert in California and the Owens Valley. Data collected from this region indicate that mean, maximum, and minimum temperatures have increased during the last 110 years (Redmond 2009, pp. 36–46).

There is still a considerable degree of uncertainty associated with projecting future climate change, due in part to uncertainties about future emissions of greenhouse gases and to differences among climate models and simulations (Stainforth *et al.* 2005, pp. 403–406; Duffy *et al.* 2006, pp. 873–874), and to the inability to predict change at a local scale. It is difficult with currently available models to make meaningful predictions of climate change for areas such as the range of the Mohave ground squirrel (Parmesan and Matthews 2005, p. 354). The difficulty in predicting how an animal or plant will respond further increases the uncertainty of evaluating the potential impacts of climate change. Responses may include changes in distribution, population size, behavior, and physiological and physical characteristics (Parmesan and Mathews 2005, p. 373). Several published studies predict that temperature and precipitation trends may change in the near future, and some describe how biotic communities may respond to such changes (Parmesan and Mathews 2005, pp. 333–374; IPCC 2007a, pp. 1–21; IPCC 2007b, pp. 1–22; Jetz *et al.* 2007, pp. 1211–1216; Kelly and Goulden 2008, pp. 11823–11826; Loarie *et al.* 2008, pp. 1–10; Miller *et al.* 2008, pp. 1–17). In the interior western region of the United States, species may respond to increases in temperature by shifting their range to cooler areas.

The Mohave ground squirrel usually occurs in the flats and alluvial fans between rocky, mountainous areas. Based on the specific known habitat requirements of the Mohave ground squirrel, the species could respond to ambient temperature increases in three general ways: (1) Constrict its range; (2) move farther north; or (3) move higher in elevation within its current range. Moving farther north would require travelling over rocky hills, which is difficult, but possible, in some areas for the Mohave ground squirrel (see ''Home Range and Movements'' section). Moving to higher elevations would require the Mohave ground squirrel to cross rocky terrain and inhabit more marginal habitats at higher elevations with less suitable substrate for burrow construction. The most likely response by the Mohave ground squirrel to climate change would be to move north. However, we cannot be certain that the Mohave ground squirrel will respond this way. Regardless of the species' response to ambient temperature increases, ultimately the range of the species will likely be smaller than it is currently.

Based on the information discussed above, we acknowledge that temperatures in the western Mojave Desert where the Mohave ground squirrel occurs have increased and are likely to continue increasing. We also acknowledge that, if hotter and drier summers and more extreme weather patterns in temperature and precipitation occur within its range, the Mohave ground squirrel may be negatively affected. As discussed in the ''Biology and Natural History'' section, the activity period of the Mohave ground squirrel is generally spring and early summer when they mate and forage to sustain themselves for the remainder of the year. Increased temperatures could cause Mohave ground squirrels to have a shorter active period. A reduced active period may lessen the species' ability to consume and store sufficient forage to sustain it through the dormant period, and may reduce the frequency of reproduction. If precipitation declines, the availability of nutritious forage would likely decline in a given year and across years. If such reduced precipitation levels persist, the habitat may no longer be suitable for the Mohave ground squirrel during the drought period.

Drought is a natural feature of the Mojave Desert. The State of California has experienced cycles of drought for many years. For example, between 1928 and 1987 the U.S. Geological Survey (USGS) reported five severe droughts across California, including the longest drought in the State's history during the period 1929–1934 (USGS 2004, p. 2).

The Mohave ground squirrel has evolved several adaptations to persist in an environment with drought. These adaptations include suppressing reproduction during periods of low rainfall and food availability, retreating to burrows for most of the year to escape temperature and humidity extremes in summer and winter, reducing physiological demands by going into a state of torpor for much of the year, and caching food in burrows. However, prolonged drought exacerbates the effects of drought on the species; no young may be born for several years, the survivability of adults is reduced by poor forage conditions, and the surviving adults eventually die due to old age or predation (Gustafson 1993, p. 22). This situation can result in the extirpation of the Mohave ground squirrel in local areas (Gustafson 1993, p. 22). However, based on past records of severe drought, the Mohave ground squirrel has demonstrated that it can persist and recolonize areas following episodes of severe drought. Therefore, we have no information that supports the assumption that severe drought will threaten the species in the foreseeable future.

We also have no information on which to base meaningful predictions on how climate change may influence the duration or severity of drought within the range of the Mohave ground squirrel, or how its status may be affected. Increasing temperature could result in more severe and frequent drought, especially in the Southwest (Karl *et al.* 2009, p. 42). However, we are not aware of any formal studies on the direct effect of rising global temperature on drought severity or frequency (Karl *et al.* 2009, p. 5). Drought severity and frequency are a function of a complex series of factors, such as the El-Nino-Southern Oscillation (ENSO) intensity and duration, as well as geographic variations in sea surface temperature, which may also be affected by increasing temperatures (Karl *et al.* 2009, p. 105), thereby compounding the uncertainty associated with precipitation projections (Karl *et al.* 2009, p. 105).

In summary, within the range of the Mohave ground squirrel, the potential effects of climate change, their magnitude, and projections on how the species will react are speculative for several reasons, including the uncertainties of climate projection models, the lack of models for projecting climate change for relatively small geographic areas, the complexity of interacting factors that may influence vegetation changes, and the uncertainty regarding the effects of climate change on the Mohave ground squirrel's foraging, breeding, and movement/dispersal behaviors. Although climate change may have some effect on the species, at this time we cannot make meaningful projections on either how the climate within the range of the Mohave ground squirrel may change, or how the species may react to climate change. The Mohave ground squirrel has survived several periods of drought in the 20th century, including a 5-year drought in the early 20th century, and has evolved several adaptations to persist in an environment with drought as a natural feature of its environment, including recolonizing areas following episodes of severe drought. Therefore, based on a review of the best available scientific and commercial data, we conclude that climate change does not currently pose a threat to the Mohave ground squirrel in relation to the present or threatened destruction, modification, or curtailment of its habitat or range, nor do we anticipate it posing a threat in the future.

Summary of Factor A

We have assessed the best available scientific and commercial data on the impacts of urban and rural development, OHV recreational use, transportation infrastructure, military operations, energy development, livestock grazing, agriculture, mining, and climate change on the range and habitat of the Mohave ground squirrel.

Urban and rural development destroys habitat used by the Mohave ground squirrel for feeding, breeding, and shelter; reduces or prevents movement of individuals among populations (see Factor E); and introduces human behaviors that result in an increase in the number of Mohave ground squirrel predators (see Factor C). Most habitat loss occurs at the southern end of the species' range in the incorporated areas of Palmdale, Lancaster, Victorville, Apple Valley, Hesperia, Adelanto, and Barstow (see Map 1). Except for California City, which is located in the central part of the Mohave ground squirrel's range (see map 1), these cities make up almost all the incorporated lands within the squirrel's range. Not all the incorporated lands within these cities are developed; however, because of the proximity to existing infrastructures, we expect that future growth will take place in these incorporated areas. We cannot predict with any certainty how much or which of these areas will be developed in the next 20–30 years. Currently, about 2.6 percent of the range of the squirrel has been lost to urban and rural development. The development of all incorporated areas would result in the loss of approximately 9–10 percent of the Mohave ground squirrel's range; this number includes the 2.6 percent of the range already lost to development. However, this is highly unlikely because we expect very limited development of California City (or 2.45 percent of the species' range), which is the largest incorporated area within the range of the squirrel.

OHV recreational use occurs throughout much of the range of the Mohave ground squirrel. However, impacts to the Mohave ground squirrel and its habitat occur mainly in the most heavily used areas (management areas, spill-over zones, and high-use areas). If we assume that all habitat in the management areas, spill-over zones, and high-use areas has been severely impacted, then about 6.6 percent of the range of the Mohave ground squirrel has been lost to OHV use. However, we know that the Mohave ground squirrel continues to occur on at least one of the four management areas. Areas of lesser use (*e.g.,* existing unpaved roads and trails) result in the loss of habitat, and vehicle activity can crush Mohave ground squirrels. However, the significance of such losses is undocumented for the Mohave ground squirrel and does not result in the total fragmentation of habitat, as unpaved roads and trails are not barriers to Mohave ground squirrel movement (Leitner 2010, *in litt.*). In addition, the BLM, through implementation of the WEMO Plan, has no plans to designate additional high-use areas or roads and trails for the next few decades, has closed 45 percent of the roads and trails in the DWMAs and 90 percent in the Rand Mountains ACEC (BLM *et al.* 2005, chapter 2, p. 167), is restoring habitat in areas of closed roads and trails, is increasing enforcement, and is revising its route designation to minimize damage to public resources and harassment and disruption of wildlife and habitat.

Several highways and roads cross the western Mojave Desert. This network of roads potentially impacts the Mohave ground squirrel and its habitat by direct mortality, loss of habitat from initial construction, introduction of invasive plants, and alteration of habitat upslope and downslope from hydrologic and erosion effects. One new highway is proposed in the southern portion of the range of the Mohave ground squirrel, and two highways are proposed for widening, which combined would result in the loss of at most 0.18 percent of the range of the squirrel. Although there is no information specific to the Mohave ground squirrel, roads are known in some cases to affect species and their habitat beyond the loss of habitat from construction of the road itself. This road-effect zone can have varying degrees of both positive and negative impacts, with the width of the zone varying with the species affected, location, habitat, road width, and traffic density. There is research that indicates that the effects of roads on small mammals in the desert are neutral to slightly positive. Assuming the worst case scenario that such a road-effect zone exists for the Mohave ground squirrel, and its impacts to the species' habitat are severe, we estimate that about 0.74 percent of the range could be lost.

Military operations vary in their magnitude and intensity of impacts to Mohave ground squirrel habitat. Ground force training activities that use live ammunition, ordnance, and tracked and wheeled vehicles remove vegetation, compact the soil, and cause fires that remove perennial plants. These activities, including the Fort Irwin expansion area, occur on about 8.2 percent of the range of the Mohave ground squirrel. Bombing and weapons testing often result in intense disturbance in small areas while large buffer areas remain undisturbed. Flight-testing and training have limited if any ground impacts. Training areas for the military bases in the western Mojave Desert have buffer areas where surface disturbance is limited, or not allowed. However, much of the habitat on the three major bases in the western Mojave Desert, especially EAFB and NAWS, is protected from human impacts, such as urban and rural development, OHV recreational use, agriculture, and grazing, because these activities are not compatible with the military mission. Approximately 37.2 percent of the range of the Mohave ground squirrel occurs within the boundaries of Fort Irwin, EAFB, and NAWS. Although about 8.2 percent of the military land is intensively used for military operations, much of the remainder of its range within these DOD facilities is not heavily used, and large undisturbed areas are needed to test aerial vehicles and weapons and to act as buffer areas around target sites. To maintain the ongoing mission of the military, these large, undisturbed areas must remain undeveloped. Thus, while habitat for the Mohave ground squirrel is severely impacted in some areas by military operations, there are extensive areas where it does not experience these impacts.

Several renewable energy projects and utility lines have been constructed or are proposed for construction in the range of the Mohave ground squirrel. Besides the direct loss of potentially large areas of habitat from the construction of new facilities, new and existing energy projects can also facilitate an increased presence of predators and promote invasive plants. Solar projects are likely to be the most destructive to Mohave ground squirrel habitat because these projects are situated in relatively flat or gently sloping areas that are preferred by the squirrel and because all vegetation is removed during construction and operation. There are two existing solar projects within the range of the squirrel, which make up about 0.07 percent of the range. Both of these projects are on private land; there are no projects at the present time on BLM or DOD land within the range of the squirrel. Unlike solar projects, wind turbines are often situated on ridges and hilltops, which are not the squirrel's preferred habitat, and geothermal energy only occurs in two areas within the range of the squirrel. Also, all vegetation is not cleared during the construction of wind and geothermal projects. Existing wind projects are on private land on the western edge of the squirrel's range and make up about 0.1 percent of the range. There are no wind projects on BLM or DOD land at the present time. There is one large geothermal project on Federal land that makes up about 2 percent of the range, although much of the habitat in this area has not been destroyed.

Combined, existing renewable energy projects make up about 2.2 percent of the range of the Mohave ground squirrel.

Several renewable energy projects have been proposed on both Federal and private land in the range of the Mohave ground squirrel. However, at the present time, there is a great deal of uncertainty as to the number, size, and location of future energy development and its potential impact on the Mohave ground squirrel. This uncertainty is caused by a number of factors, including the overlap of proposed projects, the cost of supplying renewable energy compared to other energy sources, and the uncertainty of whether or not the December 2011 construction deadline for funding under the American Recovery and Reinvestment Act of 2009 will be extended. Proposals for solar and wind projects on DOD land, which include about 27 percent of the range of the Mohave ground squirrel, would encompass about 0.3 percent of the range, if constructed. Proposed solar and wind projects on BLM land, which includes about one third of the range of the squirrel, would encompass about 2.2 percent of the range, almost all of which is wind energy. However, this is likely an overestimate because not all of the proposed projects would likely be built. In addition, there is a 1 percent cap on development in the DWMAs and MGSCA and the BLM would require a 5:1 mitigation ratio on all types of development in the MGSCA and DWMAs and a 1:1 mitigation ratio outside these areas. Also, the BLM's draft PEIS on solar energy development has identified four proposed SEZs, none of which are within the range of the squirrel.

Proposals for new geothermal development on Federal land amount to only about 0.08 percent of the range of the Mohave ground squirrel. Although unlikely, if all proposed projects on Federal land, which makes up about 62 percent of the range, were constructed they would make up about 2.5 percent of the range. There are also proposals on private land, which would encompass about 1.2 percent of the squirrel's range, but many of these are proposed for land that has already been converted to agriculture. Therefore, under the worst case scenario, if we assume all proposed projects are constructed, construction of all renewable energy projects destroys all habitat, and all the habitat that is lost is suitable for Mohave ground squirrels, then an additional 3.7 percent of habitat could be lost. However, even in this worst case, large tracts of habitat would remain untouched, especially on Federal land.

Livestock grazing occurs throughout portions of the range of the Mohave ground squirrel. The available information on the effects of livestock grazing on the Mohave ground squirrel is limited to a study on dietary overlap between cattle and Mohave ground squirrels; the study provided no indication that this overlap was adversely affecting the Mohave ground squirrel. Other studies in the Mojave Desert have described the general impacts of livestock grazing, particularly overgrazing, on soils and vegetation, which may result in habitat degradation but rarely habitat loss. The greatest ground-disturbance impact of grazing occurs at and near stock tanks and other water sources where cattle congregate. However, these areas make up a small percent of the range of the Mohave ground squirrel. The BLM's recent implementation of public land health standards and guidelines, which include eliminating or reducing grazing in some areas in the range of the Mohave ground squirrel, should improve the conditions of the soils and vegetation, including in the MGSCA and DWMAs. Over time, these changes are likely to improve the condition of soils and vegetation in the range of the Mohave ground squirrel.

Agricultural activities are ongoing in the range of the Mohave ground squirrel. Agricultural development is focused in three areas: the western Antelope Valley, an area south of EAFB, and the Mojave River Valley and results in the direct loss of Mohave ground squirrel habitat. However, this loss is estimated to be less than 1 percent of the range of the Mohave ground squirrel. Operational impacts in agricultural areas may also include exposing Mohave ground squirrels and their forage to pesticide contamination. We found no information that pesticide use is adversely affecting the Mohave ground squirrel or its habitat. We also found no information that agricultural development and associated impacts would likely increase in the western Mojave Desert. The cost of irrigation has risen to a level that discourages extensive conversion of desert scrub habitat to agriculture, and instead, some agricultural lands are being converted to residential and commercial development.

Mining activities have been ongoing in the western Mojave Desert for more than a century. Mining activities have impacts to the Mohave ground squirrel similar to urban and rural development and OHV recreational use, but on a more localized and limited scale. BLM lands are open to mining unless otherwise withdrawn; however, the number of active mines is small when compared to the number of inactive mines. There is no commercial mining on DOD lands, and there are few large mines in the range of the Mohave ground squirrel.

Average temperatures have been rising in the western Mojave Desert, and this trend will likely continue because of climate change. Climate change may also affect precipitation and the severity, duration, or periodicity of drought. However, there is a great deal of uncertainty as to the rate at which the average temperature may increase, and the effect of climate change on both precipitation and drought. In addition to the uncertainty associated with how the overall climate of the Mojave Desert may change, the impact of climate change on the Mohave ground squirrel will depend on a complex array of other factors, including how the species and its habitat respond to climate change. In light of all the factors involved, we are not aware of information that would allow us to make a meaningful projection on the impact of climate change on the Mohave ground squirrel.

We now look at the impacts of urban and rural development, OHV recreational use, transportation infrastructure, military operations, energy development, livestock grazing, agriculture, mining, and climate change, cumulatively. Many acres of Mohave ground squirrel habitat have been lost to these impacts and additional habitat is expected to be lost in the future. The greatest impacts have resulted from urban and rural development. Impacts from development as well as those from agriculture have and continue to be mainly concentrated on private lands in the southern portion of the range of the Mohave ground squirrel. Habitat loss due to military operations has been concentrated in the NTC in the easternmost portion of the squirrel's range. Other impacts, including heavy-use OHV recreation and transportation infrastructure, existing and proposed renewable energy development, and grazing are more dispersed throughout the species' range. Based on a worst-case analysis, we estimate that in the next 20–30 years about 32.2 percent of the range of the Mohave ground squirrel could be lost. However, we expect that the actual loss during this timeframe will be much less because this estimate is based on a series of worst-case assumptions.

For urban and rural development, we expect the loss of habitat to be less because California City, which is the largest incorporated area in the Mojave Desert, has developed very little of its incorporated area in the past 46 years and because the CDFG would likely require mitigation for the loss of Mohave ground squirrel habitat as part of the permitting process under CESA (see Factor D, ''State Laws and Regulations'').

For transportation infrastructure, we calculated the loss of habitat from road construction along the entire highway length, which includes portions located within incorporated areas and currently developed areas, thus double counting these impacts within the range of the Mohave ground squirrel. In addition, we assumed a road-effect zone for the Mohave ground squirrel, although there may be little or no such zone for the squirrel, as several studies indicate that the impacts of highways are generally neutral to slightly positive for small mammals.

For military operations, we assumed that the entire NTC including the expansion area would be used for ground forces training resulting in the loss of all Mohave ground squirrel habitat within this area. In reality, not all of this area will be used for training and some areas have been set aside as buffer zones needed to shield the training activities from civilian uses on lands adjacent to the base.

For renewable energy, although the area requested for development may be large, the actual footprint of the projects is small, much of the Mohave ground squirrel habitat within the project boundary for wind and geothermal will not be developed, and many of these projects are proposed for areas that were previously cleared and used for agriculture. We also believe the total loss from renewable energy will be less because habitat loss is frequently mitigated by the acquisition and enhancement of habitat for the Mohave ground squirrel. In the squirrel's range, the CDFG may require mitigation for development on private land and for Federal projects (see Factor D, ''State Laws and Regulations''). The BLM requires 5:1 mitigation for projects in the DWMAs and MGSCA and 1:1 elsewhere. Even if the worst case occurs and all 32.2 percent of the range is eventually lost, we expect that most of the remaining area will remain relatively undisturbed. More than 80 percent of the remaining land is Federal, and includes the MGSCA and DWMAs, which are managed at least in part for the Mohave ground squirrel, and large areas of DOD land, especially on EAFB and NAWS, which we expect to remain undisturbed in support of the military's mission. Of particular importance to the Mohave ground squirrel, much of the remaining lands are contiguous and provide connectivity from the northern end of the range to well south of SR–58 in the southern portion of the range. These lands contain most or all the habitat within the eight important population areas and include habitat that provides for connectivity among the eight areas.

Based on this information, we conclude that the cumulative impacts of urban and rural development, OHV recreational use, military operations, energy development, transportation infrastructure, grazing, agriculture, mining, and climate change do not currently constitute a significant threat to the Mohave ground squirrel in relation to the present or threatened destruction, modification, or curtailment of its habitat or range, nor do we anticipate that they will pose a threat in the future.

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

We found no known commercial or recreational utilization of the Mohave ground squirrel. Scientific and educational activities associated with the Mohave ground squirrel are controlled by the CDFG through the issuance of scientific research permits.

Based on our review of the best available scientific and commercial information, we found no evidence of threats from overutilization for commercial, recreational, scientific, or educational purposes affecting the Mohave ground squirrel or potential risks in the future. We therefore conclude that overutilization for commercial, recreational, scientific, or educational purposes is currently not a threat to the Mohave ground squirrel across its range, nor do we anticipate overutilization for commercial, recreational, scientific, or educational purposes posing a threat in the future.

Factor C: Disease or Predation

Disease

Although other species of ground squirrels are subject to sylvatic plague (Foley *et al.* 2007, p. 1; CA Dept. Public Health 2008, p. 2), there is no evidence of its presence in Mohave ground squirrels (Leitner 2005, PowerPoint presentation, slide 11). There is no information of any other disease present in the Mohave ground squirrel. Based on our review of the best available scientific information, we found no research or observational evidence that documents or suggests that disease is affecting the Mohave ground squirrel (Service and CDFG 1998, p. 2; Leitner presentation, 2005).

Predation

Small rodents such as the Mohave ground squirrel are important prey for many species. The Mohave ground squirrel is potentially prey to a host of native predators, including the coyote; American badger; bobcat (*Lynx rufus*); various species of raptors, such as the golden eagle, prairie falcon, and red-tailed hawk (Gustafson 1993, p. 88); common raven (Boarman 1993, p. 2); and various species of rattlesnakes (Gustafson 1993, p. 88). In addition, domestic cats and dogs may also prey on Mohave ground squirrels. Of 36 Mohave ground squirrels radio-collared in 1995 and 1997, 12 (33 percent) were believed to be lost to predation (Harris and Leitner 2005, pp. 190–191). Although not directly observed, mortality from predation was determined from a combination of blood or toothmarks on radio collars or the discovery of collars at a raptor or raven perch site. Overall, predation on Mohave ground squirrels has seldom been observed, and the impact of predation on the species is not known. Small rodents are important prey for many of the species listed above, and predation on small rodents, including the Mohave ground squirrel, can be high.

The coyote is a common predator in the western Mojave Desert. Although the coyote is likely a predator of the Mohave ground squirrel, we found no recorded observations of coyotes preying on Mohave ground squirrels or fecal analysis of coyote scat that contained remains of Mohave ground squirrels. In addition, we found no information documenting that the coyote population has increased or is expected to increase in the western Mojave Desert, or the level of predation by the coyote on the Mohave ground squirrel has increased or is expected to increase, or that coyote predation is having an adverse impact on the species.

The increased presence of domestic dogs and cats in the western Mojave Desert may impact the Mohave ground squirrel. Feral or free-ranging domestic dogs have been identified as potential predators of the Mohave ground squirrel (D. LaBerteaux, cited in Gustafson 1993, Appendix, p. 86). The BLM (BLM *et al.* 2005, chapter 3, p. 65) noted ''feral dogs are a problem in several areas'' of the western Mojave Desert ''where they may kill Mohave ground squirrels.'' The BLM found that dogs are most common in the habitat adjacent to urbanized areas (BLM *et al.* 2005, chapter 3, p. 96). For example, BLM survey results showed that dog sign occurred on 88 percent of the transects surveyed in proximity to urbanized areas but occurred on less than 1 percent of the transects surveyed in the undeveloped Fremont-Kramer and Superior-Cronese DWMAs (BLM *et al.* 2005, chapter 3, p. 104). For those transects within the range of the Mohave ground squirrel, 4 percent had dog sign (BLM *et al.* 2005, chapter 3, p. 156). Although these data indicate that dogs, based on the presence of sign, occur in desert habitats within the range of the Mohave ground squirrel, Leitner (2005 presentation) indicated that no data have been collected that document that dogs have an impact on the species. In our review of the available information, we did not find any indication that feral or domestic dogs prey on Mohave ground squirrels or dig up Mohave ground squirrel burrows. In the WEMO Plan, the BLM stated that failure to implement a feral dog management plan is not likely to adversely affect the Mohave ground squirrel, as ''feral dog predation has not been documented as a significant threat'' (BLM *et al.* 2005, chapter 4, p. 153). Therefore, we conclude that domestic or feral dogs are not a major predator of the Mohave ground squirrel and their rate of predation is not likely to increase in the future.

Domestic cats may have increased near urban expansion areas in the western Mojave Desert. Domestic cats are efficient predators of small birds and mammals (Harrison 1992, p. 10). Gustafson (1993, p. 30–31) postulated that domestic cats may kill Mohave ground squirrels. However, Leitner (2005 presentation) stated there is no documentation of the impact of predation by domestic cats on Mohave ground squirrels. Although it is likely that domestic cats have increased in the western Mojave Desert with the increased human population in the past few decades, we were unable to find information documenting that domestic cats prey on Mohave ground squirrels.

The common raven is a likely predator of the Mohave ground squirrel. Harris and Leitner (2005, pp. 190–191) found empty radio collars from Mohave ground squirrels under raven perch sites and concluded this was evidence of predation by common ravens on Mohave ground squirrels. Common ravens kill many types of animals for food, including ground squirrels (Boarman 1993, p. 2). Kochert *et al.* (1976, in Knight and Call 1980, p. 17) reported that Townsend ground squirrels (*Urocitellus townsendii*) in Idaho comprised 93 and 70 percent of the food biomass of nesting ravens during a 2-year study.

The common raven population increased more than 700 percent in the western Mojave Desert from 1986 to 2004 (Boarman and Kristan 2006, p. 2; Service 2008, p. A–16), likely in response to increased urbanization and recreational use, which provide common ravens with an artificial source of reliable and widespread food, water, nest sites, roost sites, and perch sites (Boarman 2002, p. 1). In most locations, human-created nest, roost, and perch sites, including transmission line towers, telephone and streetlight poles, buildings, billboards, and fences, provide the common ravens with previously unavailable high perches, which allow them to hunt and scavenge more effectively, or with less energy expenditure than required by flight or from a low perch (Boarman 1993, p. 2).

Although common ravens likely prey on Mohave ground squirrels, and the amount of predation has likely increased as the population of ravens has increased, the available information does not indicate that this level of predation is having an adverse effect on Mohave ground squirrel populations.

Summary of Factor C

In summary, we found no information that disease is a threat to the Mohave ground squirrel throughout its range. Regarding predation, beyond the general knowledge of natural and potential predators of the Mohave ground squirrel, we found no information on the observance or extent of predation by coyotes, domestic dogs or cats on the Mohave ground squirrel, and no information suggesting that predation is affecting Mohave ground squirrel abundance, distribution, or long-term survival. We did find circumstantial information that predation by the common raven likely occurs on the Mohave ground squirrel. We also found information that the number of common ravens in the western Mohave Desert has increased substantially in the last few decades. We acknowledge that the level of predation by the common raven on the Mohave ground squirrel may have increased, but the available information does not indicate that this level of predation is adversely affecting Mohave ground squirrel abundance, distribution, or long-term survival. Therefore, based on our review of the best available scientific and commercial information, we conclude that predation is currently not a significant threat to the Mohave ground squirrel throughout its range, nor do we anticipate predation posing a threat in the future.

Factor D: The Inadequacy of Existing Regulatory Mechanisms

The Act requires us to examine the adequacy of existing regulatory mechanisms with respect to those existing and foreseeable threats that may place the Mohave ground squirrel in danger of becoming either endangered or threatened. Existing regulatory mechanisms that provide some protection for the Mohave ground squirrel include local land use ordinances and processes, State laws and regulations, and Federal laws and regulations. The habitat of the Mohave ground squirrel spans private lands, local government lands, State lands (California State Parks, CDFG, and California State Land Commission), and Federal lands (BLM, DOD, National Park Service (NPS), and U.S. Forest Service (USFS)) in California.

Local Land Use Ordinances and Processes

Approximately 31 percent of the range of the Mohave ground squirrel is privately owned, or owned by local governments. We found little in the way of local planning and enforceable zoning regulations specific to the Mohave ground squirrel. Approximately 11.9 percent of the range of the Mohave ground squirrel lies within San Bernardino County, but the County has regulatory authority over only a portion of these lands. The County of San Bernardino online ''Biotic Resources Overlay Map'' includes information to assist both the property developer and County land use planner in identifying lands that may support the Mohave ground squirrel. If a proposed discretionary project is within this overlay area, the County would accept an application for development only after a focused survey for the Mohave ground squirrel has been completed (Zias-Roe 2010, pers. comm.). If the survey results are positive, the County would require demonstration of compliance with CESA. Similar planning tools are used by municipalities such as the Town of Apple Valley (2009, p. III–50 of the General Plan) for discretionary projects. The Mohave ground squirrel is usually not considered when implementing actions such as issuing building or grading permits.

State Laws and Regulations

California laws and regulations that may benefit the Mohave ground squirrel include CESA and the California Environmental Quality Act (CEQA) (Public Resources Code sections 21000–21177). These laws provide broad authority to regulate and protect wildlife within the State, specific authority for lands directly owned by the State, and specific authority to require reduction of take of the species through minimization and mitigation of impacts from discretionary actions at a local or State government level.

The State of California has broad authority to regulate and protect wildlife within its borders. The mission of the CDFG is ''to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public'' (CDFG 2005, p. 1). The CDFG does this through a variety of actions, including enforcing hundreds of laws and regulations related to fish, wildlife, and habitat; managing lands at wildlife areas, ecological reserves, and public access sites for ecological and recreational uses; and collecting and analyzing scientifically based data on the distribution and abundance of fish, wildlife, and native plant species and the natural communities and habitats in which they live. When implemented in the range of the Mohave ground squirrel, these actions benefit the species.

One California law that addresses the conservation and protection of the Mohave ground squirrel is CESA, which was enacted in 1985. The Mohave ground squirrel is listed as threatened under CESA; CESA defines a threatened species as a native species that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts. CESA also declares that it is the policy of the State to conserve, protect, restore, and enhance any endangered or threatened species and its habitat. Take, as defined under CESA, of a threatened or endangered species is prohibited without first obtaining authorization from the CDFG.

Because the Mohave ground squirrel is a threatened species under CESA, anyone wishing to capture or otherwise take a Mohave ground squirrel for scientific purposes must first obtain a memorandum of understanding (MOU) or a permit from the CDFG as described under California Fish and Game Code 2081(a) (CDFG 2003, p. 1). The issuance of the MOU or permit is a discretionary action by the CDFG. Under the California Fish and Game Code, the CDFG is charged with ensuring that any action it authorizes does not jeopardize the continued existence of the species. Therefore, the CDFG is not allowed by regulation to issue a permit that would result in the overutilization of the Mohave ground squirrel for scientific purposes.

California Fish and Game Code section 2081, enacted in 1999, states that the CDFG may authorize, by permit, the take of an endangered and threatened species, if the take is incidental to an otherwise lawful activity and the impacts of the take are minimized and fully mitigated. Although CESA does not apply to Federal land management agencies conducting actions on Federal lands, it generally does apply to actions taken by non-Federal entities. Therefore, compliance with CESA is needed for many actions occurring in the range of the Mohave ground squirrel, including on Federal land. In addition, the State listing of the Mohave ground squirrel helps focus Federal land managers' attention on the species and consider impacts to the species when developing actions. Most Federal land managers would prefer to manage for a species to ensure it does not require the protections of the Act.

Because CESA prohibits the taking of the Mohave ground squirrel without obtaining a permit, the CDFG requires that a standard survey protocol, which was developed by the CDFG in 1987 (Gustafson 1993, p. 463) and revised in 2003, be used to determine the presence or absence of the Mohave ground squirrel on lands proposed for development. Therefore, the results obtained with the protocol are a critical component of the decision making process, and most of the information available on the distribution and abundance of the Mohave ground squirrel is based on the same results. The survey protocol specifies that a CDFG-approved, qualified biologist conduct a visual survey of the proposed project site. If the results are negative, a series of live grid traps are set during three periods. If the results for Mohave ground squirrels are negative after implementation of the survey protocol, the CDFG stipulates that the project site contains no Mohave ground squirrels, and development may occur without an incidental take permit and mitigation (CDFG 2003, p. 3). If Mohave ground squirrels are present at a proposed development, then CESA and California Fish and Game Code section 2081 require that the impacts be minimized and fully mitigated. The CDFG generally requires securing and managing existing habitat at another location for the Mohave ground squirrel. Thus, for every discretionary project with positive survey results, implementation of the proposed development with mitigation yields a net loss of acres of habitat for the Mohave ground squirrel, but the lands acquired for mitigation are managed to improve their habitat value and are secured in perpetuity for the Mohave ground squirrel.

One major difference between CESA and the Act is that there is no requirement under CESA to develop and implement a recovery plan for a State-listed species. Consequently, with no recovery plan, there is no written guidance for Federal, State, and local agencies and the public to know what actions to implement and where to implement them to achieve the State's policy to conserve, protect, restore, and enhance the Mohave ground squirrel and its habitat.

In evaluating the Mohave ground squirrel protocol, some scientists have identified potential problems with the protocol that raise into question the accuracy of the current survey technique (Brooks and Matchett 2002, p. 172). The survey protocol may yield false negative results or undersample the population. Mohave ground squirrels are difficult to trap, even in locations where they have been sighted (Hoyt 1972, p. 7). Mohave ground squirrels have been observed approaching traps but not entering them (Leitner 2009, pers. comm.). In some cases, only a few squirrels have been trapped while several had been seen or heard calling in the same area (Urban *et al.* 2010, p. 1). In addition, the grid trap arrangement is not necessarily the best trapping method to use for detecting rare small mammals. For example, in comparing grid and transect trap arrangements for small mammals, transect arrangements yielded more total captures, more individual captures, and more species than grid arrangements (Pearson and Ruggiero 2003, p. 457). The differences between the two methods tend to be greatest when small mammals are least abundant (Pearson and Ruggiero 2003, p. 457), as may be the case with the Mohave ground squirrel. Recently, a video survey method was compared to the live trapping survey protocol at two locations. The Mohave ground squirrel detection rate for the video method was greater than for the trapping protocol (Delaney 2009, p. 12) (see ''Abundance and Trend'' section).

The CDFG acknowledges that a negative survey result does not mean that the Mohave ground squirrel does not occur on the site, or that take will not occur (CDFG 2003, p. 3). The survey protocol, including the trapping component of the protocol, may result in a false negative finding (*e.g.,* the Mohave ground squirrels may be present but the available data from the survey protocol indicates they are not present). The purpose of the survey protocol is to determine presence and therefore if take will occur. Its purpose is not to provide population information on population size, status, or trend.

In summary, CESA provides some protection for the Mohave ground squirrel from take and habitat loss. However, the benefit of CESA to the squirrel may depend on the ability to detect the species on a proposed development site. If squirrels are present on a site but not detected with the survey protocol, which is known to occur based on subsequent observations, then the project is implemented with no mitigation for the Mohave ground squirrel under CESA. If a project proponent assumes presence of the Mohave ground squirrel at a project site or if squirrels are detected during the survey protocol, then CESA requires mitigation for the take of the Mohave ground squirrel. Thus, CESA provides some benefit to the Mohave ground squirrel and its habitat.

CEQA is a regulatory mechanism that affords protection for the Mohave ground squirrel in certain circumstances. CEQA requires review of environmental impacts for any proposed discretionary project that is undertaken, funded, or permitted by a State or local governmental agency, and public disclosure of these findings. Section 15065 of the CEQA guidelines requires a finding of significance if the project has the potential to ''reduce the number or restrict the range of a rare (threatened) or endangered plant or animal.'' The Mohave ground squirrel is such a species, because as stated above it is listed as threatened by the State of California. In general, if a proposed project in Mohave ground squirrel habitat requires a discretionary permit from a State or local agency, that public agency is required to prepare a public document under CEQA that analyzes the impacts of the proposed action on the species and requires mitigation for the impacts. However, if economic, social, or other conditions make it infeasible to mitigate one or more significant effects of a project on the species, the project may nonetheless be carried out or approved at the discretion of a public agency if the project is otherwise permissible under applicable laws and regulations (CEQA Guidelines section 15093), even though the project may cause significant environmental damage, such as destruction of a listed species or its habitat.

Although CEQA may provide protection for the Mohave ground squirrel in certain circumstances, there are several statutory and categorical exemptions to CEQA which exempt proposed projects that are undertaken, funded, or permitted by local or State agencies from the requirements of public disclosure and mitigation. These include certain mass transit projects, certain planning documents, certain pipeline projects, certain ministerial (non-discretionary) projects (Title 14 California Code of Regulations, chapter 3, Article 18, sections 15260 to 15285), grazing (Rebecca Jones 2010, *in litt.*), and in-fill development projects (Article 19, sections 15300 to 15333). Also exempt are projects that are approved by popular vote that do not involve a public agency-sponsored initiative (Title 14 California Code of Regulations, chapter 3, Article 20, section 15378).

The exemption of ministerial-permitted projects is an important consideration in evaluating the level of protection of the Mohave ground squirrel and its habitat afforded by CEQA. On private land, CEQA applies only to discretionary actions, such as major changes in zoning or requests for a conditional use permit. Building or grading permits or other development projects with minor, or no, changes to existing land use or zoning designations are considered ministerial by the local development agencies and are not subject to CEQA. Although minor on an individual basis, cumulatively, these activities can result in the take of the species and the loss, fragmentation, and degradation of habitat with no mitigation under CEQA. These activities, however, would still be subject to the requirements of CESA.

Another California law that could benefit the Mohave ground squirrel is the Natural Communities Conservation Planning Act (NCCPA). NCCPA provides for voluntary cooperation among the CDFG, landowners, and other interested parties to develop natural community conservation plans (NCCPs) that provide for early coordination of efforts to protect listed species or species that are not yet listed. NCCPA identifies and provides for the regional or area-wide protection of plants, animals, and their habitats, including listed species, while allowing compatible and appropriate development activity. NCCPA could not only benefit the Mohave ground squirrel, but could also benefit local communities in the western Mojave Desert, which, under the NCCPA, could obtain authorization to take the Mohave ground squirrel while allowing for reasonable development. There is no NCCP for the Mohave ground squirrel at this time; however, there is one under development for renewable energy in the California desert. If the renewable energy NCCP is finalized and implemented, some areas inhabited by the Mohave ground squirrel would be included in the plan area.

In addition to these laws and regulations, California also manages lands in the range of the Mohave ground squirrel for native habitat. These lands include about 22,000 ac (8,900 ha) managed by the California Department of Parks and Recreation and 15,000 ac (6,070 ha) managed by the CDFG.

Federal Laws and Regulations

Federal agencies are responsible for managing approximately 66 percent of the range of the Mohave ground squirrel (Defenders of Wildlife and Stewart 2005, pp. 39–40). The Federal agencies with the largest land management authority for these lands are the BLM and the DOD (see Table 1 and Factor A).

Several Federal laws and regulations that may benefit the Mohave ground squirrel include the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), as amended (NEPA); Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 *et seq.*) (FLPMA); Public Rangelands Improvement Act of 1978 (43 U.S.C. 1752 *et seq.*); Wild Horse and Burro Protection Act of 1971 (16 U.S.C. 1331 *et seq.*); and the Sikes Act Improvement Act (16 U.S.C. 670a–670o), as amended (Sikes Act). These laws provide authority to conserve habitat and mitigate for adverse impacts to habitat, including habitat for the Mohave ground squirrel. In addition, if the Mohave ground squirrel occurs on the same patch of habitat as a federally listed species (*e.g.,* desert tortoise (*Gopherus agassizii*) or *Astragalus jaegerianus* (Lane Mountain milk-vetch)), the Mohave ground squirrel may benefit from the protections afforded these species under the Act.

Bureau of Land Management

About 37 percent of the land (1,804,139 ac (730,112 ha)) within the range of the Mohave ground squirrel is administered by the BLM (Defenders of Wildlife and Stewart 2005, pp. 39–40). As a Federal agency, whenever BLM proposes to implement or authorize any action on lands that it manages, it must comply with NEPA. NEPA requires all Federal agencies to formally document and publicly disclose the environmental impacts of their proposed actions and management decisions.

In addition, 40 CFR 1500.2 requires all Federal agencies, to the fullest extent possible, to use all practicable means, consistent with the requirements of NEPA and other essential considerations of national policy, to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects of their actions upon the quality of the human environment. When implementing NEPA within the range of the Mohave ground squirrel, all Federal agencies must consider their potential impacts on the species and identify and consider appropriate mitigation measures.

FLPMA is the primary Federal law governing most land uses on BLM lands. FLPMA established a public land policy for the BLM; it provides for the management, protection, development, and enhancement of the BLM lands. Public lands are managed for multiple use and sustained yield. Under its multiple use mandate, the BLM allows grazing, mining, OHV use, energy production, and other uses on public lands. The BLM also has the flexibility under FLPMA to establish and implement special management areas such as ACECs and research natural areas, where the BLM can limit or exclude surface disturbance activities that adversely affect sensitive species, such as the Mohave ground squirrel.

FLPMA directs the development and implementation of resource management plans (RMPs), which direct management at a local level, and requires public notice and participation in the formulation of such plans and programs for the management of BLM lands. RMPs authorize and establish allowable resource uses, resource condition goals and objectives to be attained, program constraints, general management practices and sequences, intervals and standards for monitoring and evaluating RMPs to determine effectiveness, and the need for amendment or revision (43 CFR 1601.0–5(k)).

Section 601 of FLPMA was written specifically for the CDCA, which includes the western Mojave Desert. In this section, Congress noted the fragility of the California desert ecosystem that is ''easily scarred and slow to heal; the historical, scenic, archeological, environmental, biological, cultural, scientific, educational, recreational, and economic resources in the California desert; and that certain rare and endangered species of wildlife, plants, and fishes, and numerous archeological and historic sites, are seriously threatened by air pollution, inadequate Federal management authority, and pressures of increased use, particularly recreational use, which are certain to intensify because of the rapidly growing population of southern California.'' Congress charged the BLM with developing and implementing an RMP for the CDCA that provides for the immediate and future protection and administration of the public lands in the California desert within the framework of a program of multiple-use and sustained yield, and the maintenance of environmental quality. Within the range of the Mohave ground squirrel, the current BLM land management documents are the California Desert Conservation Area (CDCA) Plan 1980, as amended (BLM 1999) and other amendments to the CDCA Plan, including the WEMO Plan and EIS (BLM *et al.* 2005). The WEMO Plan is the RMP for the western portion of the CDCA.

The Mohave ground squirrel is designated as a sensitive species on BLM lands. The management guidance for special status species under BLM Manual 6840–Special Status Species Management states that ''Bureau sensitive species will be managed consistent with species and habitat management objectives in land use and implementation plans to promote their conservation and to minimize the likelihood and need for listing under the ESA'' (BLM 2008, p. 05V). BLM Manual 6840 further requires that RMPs should address sensitive species, and that implementation ''should consider all site-specific methods and procedures needed to bring species and their habitats to the condition under which management under the Bureau sensitive species policies would no longer be necessary'' (BLM 2008, p. 2A1).

The WEMO Plan is the up to 30-year RMP whose boundary includes most of the current habitat of the Mohave ground squirrel. One of the purposes of the WEMO Plan was to develop and implement management strategies that would conserve the Mohave ground squirrel throughout the western Mojave Desert (BLM *et al.* 2005, p. ES–1). This RMP contains specific measures pertinent to the management of the Mohave ground squirrel and its habitat. The BLM designated the MGSCA, a wildlife habitat management area (WHMA), on BLM lands in the northern part of the species' range (BLM *et al.* 2005, chapter 2, p. 203; LaPre 2009, *in litt.*). Within the MGSCA boundary, land ownership is BLM (1,308,877 ac (529,686 ha)) with private land (420,000 ac (169,969 ha)) scattered among the BLM land (BLM *et al.* 2005, chapter 2, p. 203). Thus, about 75 percent of the land within the MGSCA is subject to the BLM's management protections for the MGSCA.

Within the central and southern portion of the range of the Mohave ground squirrel are three ACECs, the Fremont-Kramer DWMA (513,918 ac (207,976 ha)), the Desert Tortoise Research Natural Area (DTNA), which is contained within the Fremont-Kramer DWMA, and the Superior-Cronese DWMA (641,917 ac (259,776 ha)) (BLM *et al.* 2005, chapter 2, p. 13). About 55 percent of the Fremont-Kramer, 59 percent of the Superior-Cronese, and 92 percent of the DTNA lands within the ACEC boundaries are BLM lands. The BLM manages these ACECs at a greater level of protection for wildlife and habitat than the MGSCA. It does not allow certain land uses, such as solar energy development, in ACECs, and acquires private land within DWMA boundaries in areas that overlap the range of the Mohave ground squirrel (BLM *et al.* 2005, chapter 2, pp. 28, 70). The Mohave ground squirrel will benefit from the management of these three ACECs and the MGSCA because they are contiguous with each other, which will facilitate management of these lands as blocks of unfragmented habitat outside military bases (see Map 2).

The Public Rangelands Improvement Act established a national policy and commitment to improve the conditions on public rangelands. Its goal is to improve range condition, which relates to wildlife habitat and plant communities. The BLM has specific regulatory authority for grazing management provided at 43 CFR 4100 (Regulations on Grazing Administration Exclusive of Alaska). Livestock grazing permits and leases contain terms and conditions to achieve management and resource condition objectives on the BLM lands, and to ensure that habitats are, or are making significant progress toward, being restored or maintained for BLM special status species (43 CFR 4180.1(d)), which include the Mohave ground squirrel. Examples of the actions BLM has taken to accomplish this goal include: Closing some sheep allotments, removing sheep from allotments in the MGSCA when ephemeral plants are no longer the primary forage used by sheep, eliminating ephemeral grazing for cattle in the DWMAs, and excluding cattle grazing in the spring in DWMAs when annual plant productivity is low (BLM *et al.* 2005 chapter 2, pp. 131–135).

In 1964, Congress enacted the Wilderness Act, with the intent of establishing a National Wilderness Preservation System composed of federally owned wilderness areas to be protected in their natural condition for the use and enjoyment of the people of the United States. A variety of activities are prohibited by the Wilderness Act within designated wilderness areas.

As mentioned under Factor A, part or all of 14 designated wilderness areas are on BLM lands and in the range of the

Mohave ground squirrel. The Wilderness Act protects these areas from various forms of development and human activities that are stressors for the Mohave ground squirrel; however, the areas designated as wilderness within the range of the Mohave ground squirrel comprise about 4.6 percent of the species' range and are not contiguous. These areas include steep slopes and rocky substrates that would not provide suitable habitat for the Mohave ground squirrel but would contribute to connectivity among squirrel habitat.

The Wild Horse and Burro Protection Act directs the BLM to protect these animals on public lands where they occurred when the law was enacted, and to manage them by removing excess animals to restore a thriving natural ecological balance to the range. This law enables the BLM to remove nonnative wild horses and burros that are degrading or destroying habitat within the range of the Mohave ground squirrel.

To manage motorized access on BLM lands within the range of the Mohave ground squirrel, the FLPMA and its implementing regulations direct the BLM to locate trails in a manner to minimize impacts to the physical resources (*i.e.,* soils, watershed, vegetation, air, and other resources), and to minimize harassment of wildlife or significant disruption of wildlife habitats (43 CFR 8342.1). To manage for the Mohave ground squirrel and other species, the BLM has implemented a program of OHV route obliteration and restoration and the signing of open routes to keep OHV activities aligned with what is permitted. In the central portion of the Mohave ground squirrel's range, the BLM implemented the Rand Mountain Fremont Valley Plan (Rand Plan) on 65,020 ac (26,313 ha) between Ridgecrest and California City, which includes an area popular with OHV enthusiasts. The Rand Plan adopted a motorized vehicle access network, expanded the Rand ACEC by 13,120 ac (5,309 ha), reduced the multiple use class from Class M to Class L, acquired private lands, and withdrew land from mineral entry. Class L lands are intended to support limited use by activities that degrade the value of the land and to protect sensitive, natural, scenic, ecological, and cultural resource values. Class M lands have moderate use, and provide for a controlled balance between higher intensity uses and resource protection (BLM *et al.* 2005, chapter 3, p. 3). The BLM considered implementing the Rand Plan a high priority for Mohave ground squirrel conservation (BLM *et al.* 2005, chapter 3, p. 170) as it reduces impacts to the Mohave ground squirrel and its habitat from OHV recreation in the Plan area.

Both FLPMA and the Mineral Leasing Act give the BLM the legal authority to regulate and condition energy permits. The Energy Policy Act of 2005 (42 U.S.C. 15801 *et seq.*) orders the identification of renewable energy sources and provides incentives for their development (42 U.S.C. 15851). This law and Presidential Executive Order 13121 direct the production, purchase, and facilitation of development of renewable energy products by Federal entities and land management agencies. The ''Energy Development'' section of Factor A describes the development and operation of renewable energy projects, including recent increases in solar, wind, and geothermal energy development. All of these activities require ground disturbance, infrastructure, and ongoing human activities that could adversely affect the Mohave ground squirrel on the landscape.

In summary, the BLM manages about one-third of the range of the Mohave ground squirrel. Under FLPMA, the BLM has designated three ACECs and a MGSCA, which are contiguous and will facilitate management of these lands (see Factor E). The BLM has a mandate to manage BLM lands for multiple-use, and has broad regulatory authority to plan and manage all land use activities on public lands, including energy development, OHV recreation, grazing, and other activities. As described in Factor A, these activities have the potential to impact the Mohave ground squirrel and its habitat. The BLM has developed mitigation measures for many of these activities that will reduce or eliminate the magnitude and severity of the impacts to Mohave ground squirrel habitat. In some cases, the BLM limits or prohibits activities on BLM lands with special designations because of incompatibility with those designations.

Department of Defense

The U.S. Army's Fort Irwin, the U.S. Navy's NAWS, and the U.S. Air Force's EAFB include about 1,683,095 ac (681,127 ha) or 31.6 percent of the Mohave ground squirrel range. Additional DOD lands in the Mohave ground squirrel range (Air Force Plant 42 in Palmdale and Cuddeback Lake Air Force Range northeast of EAFB) comprises about 0.1 percent of the species' habitat. Three of the Mohave ground squirrel important population areas (Leitner 2008, p. 34) occur partly or entirely on these DOD lands (see Map 2). Part of the Coso Range-Olancha important population area is on NAWS, part of the Coolgardie Mesa-Superior Valley important population area is on Fort Irwin, and the EAFB important population area is within this military base.

As Federal agencies, these DOD bases must formally document and publicly disclose the environmental impacts of their proposed actions and management decisions. Fort Irwin recently expanded its boundaries. Much of the expansion area is in the range of the Mohave ground squirrel. During the NEPA process, DOD identified that the proposed expansion would impact about 123,000 ac (49,777 ha) of desert tortoise habitat, of which, about 83,000 ac (33,589 ha) is in designated critical habitat and within the Superior-Cronese DWMA (Charis 2005, p. ES–9). Of the four known populations of Lane Mountain milk-vetch, the expansion and operation of the NTC would not impact the 1,283 ac (519 ha) NASA–Goldstone population, but would impact 66 percent of the 5,499 ac (2,225 ha) Brinkman Wash-Montana Mine population and 20.25 percent of the 4,796 ac (1,941 ha) Paradise Valley population (U.S. Fish and Wildlife Service 2004, pp. 24, 53). The 9,775 ac (3,956 ha) Coolgardie Mesa population is located outside the Fort Irwin boundary.

To help offset the loss of habitat of the desert tortoise and Lane Mountain milk-vetch, the Army established two conservation areas for the Lane Mountain milk-vetch totaling 6,770 ac (2,740 ha) (Charis 2005, pp. 4–21 and 4–22); acquired private lands in the Fremont-Kramer and Superior-Cronese DWMAs (Fort Irwin 2003, pp. 2–31); and purchased fee land and associated assets and improvements associated with the 26,314 ac (10,649 ha) Harper Dry Lake grazing allotment and retired cattle grazing on these lands (Fort Irwin 2003 pp. 2–34). The acquired private lands in the Fremont-Kramer and Superior-Cronese DWMAs (see Map 2) and the grazing allotment comprise 8.2 and 0.5 percent of the range of the Mohave ground squirrel, respectively, whereas the expansion area comprises 75,300 ac (30,473 ha) or 1.4 percent of the range of the Mohave ground squirrel and the NTC including the expansion area within the range of the Mohave ground squirrel comprises 435,978 ac (176,435 ha) or 8.2 percent of the range of the Mohave ground squirrel (see Factor A, ''Military Operations''). When the total area of the acquired mitigation lands is compared to the total area of expansion lands, the mitigation ratio of acquired lands to expansion lands is about 5.8:1.

The DOD must comply with the Sikes Act and its implementing regulations. This law requires the DOD to develop cooperative plans for conservation and rehabilitation programs for natural resources on military bases and to establish outdoor recreation facilities. Each base prepares an Integrated Natural Resources Management Plan (INRMP) that provides for fish and wildlife habitat improvements or modifications; range rehabilitation where necessary to support wildlife; control of OHV traffic; and specific habitat improvement projects and related activities and adequate protection for species of fish, wildlife, and plants considered threatened or endangered.

Fort Irwin prepared an INRMP in 2006 that included conservation, protection, and management actions for the Mohave ground squirrel. The Fort Irwin INRMP recognized the expansion would adversely affect the Mohave ground squirrel (Fort Irwin 2006, pp. 135–136) and proposed measures in addition to the mitigation measures in the Fort Irwin Expansion FEIS. Some of these measures included retiring a grazing allotment near Harper Dry Lake in the central portion of the range of the Mohave ground squirrel; continuing research on Mohave ground squirrel populations at Fort Irwin and the Goldstone Complex, an area within Fort Irwin used by NASA and protected from military activities; and surveying for the Mohave ground squirrel in the east important population area (Fort Irwin 2006, pp. 136–146).

NAWS is currently revising its INRMP. Its current INRMP states that its objectives for the Mohave ground squirrel include ''maintain[ing] viable populations'' and ''minimize[ing] impacts and protect[ing] known and potential endangered and sensitive species habitats to the maximum extent practicable'' (NAWS 2000, pp. 126–127).

The Air Force completed its INRMP for EAFB in 2008. Based on this document, the Air Force is continuing its implementation of surveys for the Mohave ground squirrel and implementing specific management measures to minimize or eliminate impacts to Mohave ground squirrel habitat from ongoing military operations on the base (EAFB 2008a, pp. 73–76). Also, conservation measures for the federally threatened desert tortoise and its designated critical habitat included in the INRMP will benefit the Mohave ground squirrel.

Environmental Protection Agency

The Clean Air Act of 1970 (42 U.S.C. 7401 *et seq.*) directs the EPA to develop and enforce regulations to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health. In 2007, the U.S. Supreme Court ruled that gases that cause global climate change are pollutants under the Clean Air Act, and the EPA has the authority to regulate carbon dioxide and other heat-trapping gases (*Massachusetts et al.* v. *EPA* 2007 [Case No. 05–1120]). EPA policies to implement the Clean Air Act in addressing climate change caused by greenhouse gas emissions are still evolving. However, our status review did not reveal information that indicates that climate change is a significant threat to the Mohave ground squirrel throughout its range (see Factor A).

Other Federal Agencies

The USFS and NPS have management authority for less than 2 percent of the habitat of the Mohave ground squirrel. For the USFS, these lands are within Federal wilderness areas on the east side of the Sierra Nevada. For the NPS, these lands are within Death Valley National Park. Under the Wilderness Act of 1964 (16 U.S.C. 1131–1136), motorized activities, including motorized travel, energy development, mining, and other mechanized activities, are prohibited. Although grazing may be permitted in Federal wilderness areas, the USFS does not permit grazing in the Owens Peak and Sacatar Trail wilderness areas, which are within the range of the Mohave ground squirrel.

The amount of USFS lands within the range of the Mohave ground squirrel is very small, about 4,400 ac (1,781 ha) or 0.08 percent, and occurs at the west and northwest edge of the species' range. A strip of about 44,026 ac (17,824 ha), which is less than 1 percent of the range of the Mohave ground squirrel, occurs on NPS land along the northeast edge of the range of the species.

Summary of Factor D

Several laws and regulations, including CEQA, CESA, FLPMA, Sikes Act, and NEPA, provide varying levels and aspects of protection of or beneficial measures for the Mohave ground squirrel and its habitat at the local, State, and Federal level. Many of these regulatory mechanisms also encourage habitat protection for the Mohave ground squirrel and provide tools to implement these habitat protections. Although no single law or regulation provides overall protection of the Mohave ground squirrel and its habitat throughout its range, we find that, cumulatively, when implemented, existing regulations provide for the long-term survival of the species. Our assessment of threats based on the best available scientific and commercial information regarding the loss and degradation of the range or habitat of the Mohave ground squirrel under Factor A, and fragmentation and mortality as discussed under Factor E lead us to conclude that the inadequacy of existing regulatory mechanisms is not a threat to the Mohave ground squirrel. Therefore, based on our review of the best available scientific and commercial information, we conclude that the Mohave ground squirrel is not currently threatened by inadequate regulatory mechanisms throughout its range, nor do we anticipate inadequate regulatory mechanisms posing a threat in the future.

Factor E: Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Direct Mortality

As discussed in Factor A, several actions/stressors may result in mortality of the Mohave ground squirrel. Heavy equipment used in the construction of urban and rural development, roads, energy facilities, agricultural areas, and mines may crush Mohave ground squirrels above ground and in their burrows. The intensive use of vehicles in OHV management areas and wheeled and tracked vehicles used off road in military operations may have similar impacts. Although we recognize that mortality of Mohave ground squirrels from these sources occurs, we found few documented reports of Mohave ground squirrels being run over by vehicles (Threloff 2007, *in litt.*) or heavy equipment and no reports of them being killed in their burrows. The level of mortality is likely a function of a number of complex variables including squirrel density, habitat quality, time of year, and type and intensity of human activity. Mortality is probably highest in areas of preferred habitat where heavy equipment is used, habitat is cleared, and human activity is high (*e.g.,* urban development, road construction), as the entire area is graded and replaced with man-made structures. Roads may be another important source of direct mortality, and depending on factors such as location, road width, and traffic rates, roads could result in reduced Mohave ground squirrel abundance. However, Glista *et al.* (2008, p. 80) found that during a 17-month study in Indiana, only 3 percent of the animals killed on roads were mammals. Garland and Bradley (1984, p. 52) found no mortality within their study area during an 11-month study on the effects of a highway on Mojave Desert rodent populations, including the round-tailed ground squirrel. Also, Rosa and Bissonette (2008, p. 565) found that in a desert community in southern Utah, roads (specifically I–15) did not appear to affect small mammal abundance or diversity near or away from roads and concluded that the abundance and diversity of small mammals respond more markedly to habitat quality and complexity than to the presence of roads. Thus, road mortality does not appear to affect the abundance of small mammals, such as the Mohave ground squirrel.

In summary, although direct mortality has likely occurred and will continue to occur during construction, in high-use OHV areas, during military operations, and on highways, there is no evidence that mortality is having an impact on the Mohave ground squirrel or is a significant threat to the species. Although road mortality has not been studied for the Mohave ground squirrel, research on other species of small mammals has not found a relationship between road mortality and abundance. Therefore, we conclude that direct mortality is not currently a significant threat to the Mohave ground squirrel, nor do we anticipate it posing a threat in the future.

Habitat Fragmentation

As discussed in Factor A, urban and rural development, OHV recreational use, transportation infrastructure, military operations, energy development, and agriculture may cause or contribute to habitat fragmentation. Habitat fragmentation is the separation or splitting apart of previously contiguous, functional habitat components of a species. Habitat fragmentation can result from direct habitat loss that leaves the remaining habitat in noncontiguous patches, or from the alteration of habitat areas that render the altered patches unusable to a species (*i.e.,* functional habitat loss). Alterations that can result in functional habitat loss include: disturbances that change a habitat's successional state or remove one or more habitat functions, creation of physical barriers that preclude the use of otherwise suitable areas, and activities that prevent animals from using suitable habitat patches due to behavioral avoidance. When a habitat patch becomes isolated, the animal population is also isolated, and gene flow with other populations is reduced or eliminated. A small, isolated population may not be as able to survive environmental changes or stochastic events; may experience changes in gene frequencies due to genetic drift, diminished genetic diversity, and/or effects due to inbreeding (*i.e.,* inbreeding depression) (Lande 1995, p. 786); and may eventually be extirpated. Animals from nearby populations are unable to re-establish the lost population because the habitat is not accessible. The effects of fragmentation on a species such as the Mohave ground squirrel depend on a complex array of factors such as patch size, type of barrier, distance between populations, and condition of habitat between patches.

Most urban and rural development in the western Mojave Desert has occurred in the southernmost portion of the range of the Mohave ground squirrel. This development has destroyed habitat, leaving patches of various quality and size of Mohave ground squirrel habitat interspersed among developed areas. In the southernmost portion of the range, habitat has been severely fragmented, and we assume that any remaining small patches of Mohave ground squirrel habitat in the southernmost portion of the range that are surrounded by large areas of urban development no longer support Mohave ground squirrels. However, none of the eight important population areas is located in the southernmost portion of the range, and all eight are at least in part interconnected by Federal land, where urban development is heavily restricted. Also, urbanization outside the southernmost portion of the range is limited to only a few areas and is not a major barrier.

Vehicular recreation, specifically in OHV management and high-use areas, may cause fragmentation. As mentioned in Factor A, impacts in OHV areas include disturbance of soils and destruction of shrubs, both of which combine to reduce the number of native spring annual plants, which in turn reduces habitat suitability for the Mohave ground squirrel. We presume these areas are extensively degraded and provide little value to supporting populations of Mohave ground squirrels now, or in the future. However, some habitat remains within these areas as indicated by the occurrence of Mohave ground squirrels in the Dove Springs Open Area. The distance between squirrel populations, the distance between habitat patches that may support squirrels, and the condition of the area between patches are likely primary influences on the ability of squirrels to move through an OHV management area. Therefore, the larger management areas (*e.g.,* Spangler Hills) are more likely to be major barriers than the smaller ones (*e.g.,* Dove Springs). Regardless, there are relatively few intensively used OHV areas within the range of the Mohave ground squirrel, and with the possible exception of Spangler Hills, they do not limit movement between the eight important population areas (maps 1 and 2). Spangler Hills, the largest management area, lies between two of the important population areas and likely limits movement between them. However, these two population areas, as well as others, remain connected to the west and south by BLM lands that are closed to cross-country OHV use, including a portion of the MGSCA, and to the east by a combination of BLM and NAWS lands. Therefore, we conclude that OHV use does not constitute a major barrier to Mohave ground squirrel movement.

Transportation infrastructure may cause or contribute to habitat fragmentation when linear developments (roads) or transportation corridors substantially reduce or prevent the movement of a species from one location to another. Negative effects of corridors include mortality of animals along roadways (Rosen and Lowe 1994, as cited in Lovich and Bainbridge 1998, p. 331; Boarman and Sazaki 1996, as cited in Lovich and Bainbridge 1998, p. 331) and restriction of movements and gene flow (Nicholson 1978, as cited in Lovich and Bainbridge 1999, p. 313).

Radio-collared Mohave ground squirrels are known to have crossed four-lane, divided highways (Leitner pers. comm., as cited in Defenders of Wildlife and Stewart 2005, p. 22). However, highways with high traffic volume and multiple lanes (*e.g.,* I–15 and SR–14) (see Map 1) may reduce movements of Mohave ground squirrels from one side to the other. Some stretches of multi-lane highways (I–15 and portions of SR–14) that cross areas within the range of the Mohave ground squirrel have, on average, over 36,000 vehicles pass over them daily, while other multi-lane highways (rural parts of SR–14) and the smaller, two-lane highways within the species' range have roughly 3,100 to 7,800 vehicles per day, on average (Caltrans 2010c, pp. 33–34, 36–37). We assume that the increased level of vehicle traffic on the portions of the multi-lane highways, along with the greater number of physical hindrances that may result from multiple lanes, is more likely to serve as a barrier than the smaller, less-traveled two-lane highways. In these cases, squirrels may be limited to crossing under bridges and culverts.

Depending on how roads are constructed, they may serve as physical hindrances to the movement of Mohave ground squirrels. For example, a road with a roadway divider (*e.g.,* K-rail) may contribute to making a roadway a physically impassible barrier for Mohave ground squirrels. Although there are no studies on the impacts of roads specific to the Mohave ground squirrel, studies on other small mammals, including other species of squirrels in desert habitat, have found the following: roads may have a neutral or slightly positive effect on small mammals species; roads do not appear to affect small mammal abundance or diversity near or away from them; and the abundance and diversity of small mammals responds more markedly to habitat quality and complexity than to the presence of roads (Rosa and Bissonette 2007, p. 565). In addition, bridges and culverts, especially those with larger-sized openings, may allow Mohave ground squirrels to cross under roads (Painter and Ingraldi 2007, p. 17). Although it is not known whether the openings under such structures are used regularly by the Mohave ground squirrel, it is likely that undercrossings with natural substrates created by larger culverts and bridges are used to some extent.

Although the amount of contact needed to maintain population connectivity of Mohave ground squirrels is not known, Mills and Allendorf (1996, p. 1517) suggested that if 1 to 10 individuals per generation successfully cross, that level of movement is likely sufficient to maintain the connection between populations, provided the overall population is of sufficient size. Thus, a potential barrier would have to almost entirely eliminate Mohave ground squirrel movement throughout its length and at all times for it to be a complete barrier. In addition, Bell *et al.* (2006, pp. 18, 39, and 40) found low genetic diversity throughout the range of the species, suggesting that gene flow occurs throughout the range and roads are not complete barriers to Mohave ground squirrel movement.

Military operations, such as intense ground forces training activities on the NTC portion of Fort Irwin, may contribute to fragmentation of Mohave ground squirrel habitat. The recent expansion at Fort Irwin will bring the impacts of ground forces training activities into part of the Coolgardie Mesa-Superior Valley important population area identified by Leitner (2008, p. 1) (see Factor A, ''Military Operations''). Ground forces training in the expansion area may restrict Mohave ground squirrel populations to the south from accessing populations in the Goldstone Complex (see Map 1), thus isolating the Goldstone area (Defenders of Wildlife and Stewart 2005, p. 21). However, access for Mohave ground squirrels between the Goldstone Complex and other areas is available to the west and north through NAWS. Access from Coolgardie Mesa and Superior Valley to the west and south is available through the Superior-Cronese DWMA and NAWS (see Map 2). Although ground forces training will impact part of the Coolgardie Mesa-Superior Valley important population area, access to this area from the north, west, and south would not be disrupted by ground forces training.

Several renewable energy projects have been constructed in the range of the Mohave ground squirrel; these projects encompass about 2.2 percent of the squirrel's range. Additional renewable energy projects have been proposed in the western Mojave Desert, and depending on their size and location, they could reduce the ability of the Mohave ground squirrel to move between populations.

We know that future renewable energy projects on Federal lands, which make up about two-thirds of the range of the Mohave ground squirrel, are likely to be limited. Renewable energy projects proposed on DOD lands make up less than 0.01 percent of the range of the Mohave ground squirrel. The BLM has received applications that, if all were built, would encompass an additional 2.5 percent of the range of the Mohave ground squirrel. However, this is an overestimate because many of these proposals overlap and many would be constructed in areas that are not suitable habitat for squirrels. Also, energy development within the DWMAs or the MGSCA would be extremely limited because of the 1 percent cap on development and the 5:1 mitigation ratio. The mitigation in these areas and the 1:1 mitigation the BLM requires outside of these areas means that, although Mohave ground squirrel habitat may be lost, habitat would be acquired to add to the large blocks of habitat for the squirrel in the DWMAs and MGSCA or enhanced to increase the habitat value of the DWMAs and MGSCA. In addition, solar projects on BLM land may be more likely to occur in one of the four proposed SEZs, which are all outside the range of the squirrel. Most of the current and proposed wind energy projects are located along the western edge of the range of the Mohave ground squirrel, and many will be situated on ridges and hilltops, which are not the preferred habitat of the squirrel. Geothermal energy is available in only two areas within the range of the squirrel, and few new geothermal projects have been proposed. Thus, with only a few renewable energy proposals on DOD land and limited development in the MGSCA and DWMAs, connectivity will not be significantly degraded.

On non-Federal land, which comprises about one-third of the range of the Mohave ground squirrel, several solar and wind energy projects have been proposed that would encompass about 1.2 percent of the range of the squirrel. However, many of these projects are on lands previously converted to agriculture or are along the western edge of the Mohave ground squirrel's range on ridges and hilltops, which is not preferred habitat. Based on the best scientific and commercial information available on current management designations, development limitations, and required mitigation, we conclude that fragmentation of Mohave ground squirrel habitat is not likely to occur from energy development.

Agricultural development in the western Mojave Desert is concentrated in the western Antelope Valley, on the north side of the San Gabriel Mountains, and from the Mojave River Valley to the Lucerne Valley. New agricultural development is limited by the availability and cost of water to produce crops. We recognize that past agricultural development may have contributed to fragmentation of Mohave ground squirrel habitat (see Factor A, ''Agriculture'') and that agriculture in combination with other activities fragmented the habitat of the Mohave ground squirrel in the Mojave River and Lucerne Valleys. However, we do not believe that agriculture constitutes an absolute barrier to squirrel movement because habitat requirements for dispersing or moving through an area are likely very different than for those needed for long-term occupancy. Mohave ground squirrels are known to forage along the edges of alfalfa fields (Hoyt 1972, p. 10) and are therefore likely able to disperse through such fields.

The BLM and DOD have taken actions to reduce the impact of habitat fragmentation on Mohave ground squirrels on Federal lands. The BLM recently designated the MGSCA as a WHMA, two DWMAs as ACECs, and expanded the size of the DTNA, all of which are within the range of the Mohave ground squirrel (see Map 2). The DOD bases have ''off-limits'' areas in Mohave ground squirrel habitat, which reduce or eliminate ground disturbance from military activities. Under the Sikes Act, the DOD bases are obligated to develop cooperative management plans that reflect the mutual agreement of the CDFG ''concerning conservation, protection, and management of fish and wildlife resources,'' which includes the Mohave ground squirrel (see Factor D). The locations of these designated and ''off-limits'' areas form a contiguous area from the northern portion of the range of the Mohave ground squirrel to the southern portion. The MGSCA is contiguous with the NAWS and the Fremont-Kramer DWMA, which connects with the DTNA, EAFB, the Superior-Cronese DWMA, and the Goldstone Complex (BLM *et al.* 2005, Map 2–1) (see Map 2). Therefore, at a landscape scale, the major Federal land management agencies have identified large, contiguous blocks of habitat from the northern to the southern portion of the range with management prescriptions to help conserve the Mohave ground squirrel (see Map 2 and Table 1).

On private lands, we have no information about any landscape-scale plan that considers the Mohave ground squirrel (*e.g.,* NCCP Plan). Absent such a plan, private lands within the range of the Mohave ground squirrel will likely continue to be developed on a case-by-case basis in the future. Most of the development will likely occur near existing urban areas in the southernmost portion of the range of the Mohave ground squirrel, an area which has already been heavily fragmented. However, none of the eight important population areas are located in the southernmost portion of the range, and all eight are at least in part interconnected by Federal land, where development is limited. Urbanization outside the southernmost portion of the range is limited to only a few areas and is not a major barrier.

Future development on BLM lands is directed by the WEMO Plan, which limits development within the MGSCA and the DWMAs to 1 percent. The three DOD bases have not identified plans to increase their boundaries for future military missions. Rather, the DOD recently identified a growing conflict between implementing their military missions and incompatible residential/commercial development adjacent to their boundaries. These areas are within the range of the Mohave ground squirrel and most include native desert plant communities used by Mohave ground squirrels. Because much of the land on the DOD bases is not developed and not expected to be developed in the future, and the military installations' INRMPs have provisions to manage for Mohave ground squirrel habitat, establishing land buffers will help connect the Mohave ground squirrel habitat on the military installations with the DWMAs and MGSCA and increase the area being managed, in part, for the Mohave ground squirrel. This activity is another means of ensuring connectivity among the northern, central, and southern portions of the range of the Mohave ground squirrel and reducing the likelihood of fragmentation in the future.

In summary, severe fragmentation as a result of urban and rural development has occurred in the southernmost portion of the Mohave ground squirrel's range, and movement of the species in that area is greatly diminished or has been eliminated. However, urban and rural development in the rest of the range has occurred in only a few areas and has been more limited in extent. Other activities that may result in habitat fragmentation (*e.g.,* OHV recreational use, transportation infrastructure, military operations, and energy development) affect smaller areas within the range of the Mohave ground squirrel and do not constitute major barriers to movement, especially between the eight important population areas, all of which are at least in part interconnected by Federal land where development that would be a barrier to movement is not likely to occur. The ability of squirrels to move between populations is further indicated by recent genetic research that found low genetic diversity throughout the range of the species, which could suggest that gene flow occurs throughout the range (Bell *et al.* 2006, pp. 18, 39, 40). We therefore conclude that habitat fragmentation is currently not a threat to the Mohave ground squirrel, nor do we anticipate it posing a threat in the future.

Summary of Factor E

Although direct mortality has likely occurred and will continue to occur during construction, in high-use OHV areas, during military operations, and on highways, there is no evidence that mortality is having an impact on the Mohave ground squirrel or is a significant threat to the species. Although road mortality has not been studied for the Mohave ground squirrel, research on other species of small mammals has not found a relationship between road mortality and abundance.

Severe habitat fragmentation as a result of urban and rural development has occurred in the southernmost portion of the range of the Mohave ground squirrel and will likely continue to occur in that area. However, large, contiguous tracts of Federal land occur throughout the rest of the range of the Mohave ground squirrel, which will largely remain undeveloped. These lands support key Mohave ground squirrel population areas, including the eight important population areas, and provide connectivity throughout much of the range of the Mohave ground squirrel, both among these important population areas and from the northern portion through the central and southern portions of the squirrel's range. This connectivity helps ensure exchange of genetic material among the populations of Mohave ground squirrels and prevents the deleterious effects of small population dynamics such as inbreeding depression. Renewable energy projects are proposed for BLM land, but these will likely be very limited in the MGSCA and DWMAs in which development of all types is limited to 1 percent of the areas. Much of the range of the Mohave ground squirrel has not been developed, is not proposed for development at this time, or cannot be developed because of restrictions imposed by the BLM and DOD.

Therefore, based on our review of the best available scientific and commercial information, we conclude that the Mohave ground squirrel is not currently threatened by other natural or manmade factors throughout its range, nor do we anticipate other natural or manmade factors posing a threat in the future.

Finding

As required by the Act, we considered the five factors in assessing whether the Mohave ground squirrel is threatened or endangered throughout all or a significant portion of its range. We have assessed the best scientific and commercial information available regarding threats faced by the Mohave ground squirrel. We have reviewed the petition, scientific literature, information available in our files, and all information submitted to us following our 90-day petition finding (75 FR 22063, April 27, 2010). We also consulted with recognized Mohave ground squirrel experts, Federal and State land managers, and local governments to assess potential threats to the habitat and range of the species relative to current and planned land uses and occurrences of the species.

We analyzed the potential threats to the Mohave ground squirrel including: Habitat loss and habitat degradation from urban and rural development, OHV recreational use, transportation infrastructure, military operations, energy development, livestock grazing, agriculture, mining, and climate change; predation by native species and domestic dogs and cats; the inadequacy of regulatory mechanisms to control land use and development on private, State, and Federal lands; direct mortality; and habitat fragmentation. We found that the Mohave ground squirrel continues to be present throughout a large portion of its historical and current range.

Land ownership within the range of the Mohave ground squirrel is about one-third private land, one-third DOD land, and one-third BLM land. While much of the private land in the southernmost portion of the range of the Mohave ground squirrel has been developed or used for agriculture, little of the squirrel's range has been developed in the central and northern portions of its range where most is under Federal jurisdiction and is not subject to development.

Sources of threats on non-Federal lands include urban and rural development, transportation infrastructure, renewable energy, agriculture, and mining. We estimate that current and future development will comprise about 9–10 percent of the range of the Mohave ground squirrel, with most occurring in the incorporated areas. Although there is no information specific to the Mohave ground squirrel, roads are known in some cases to affect species and their habitat beyond the loss of habitat from construction of the road itself. As a worst case, we calculated a road-effect zone of about 0.7 percent of the range for the construction of a new major highway and the expansion of two existing major highways. However, research indicates that the effects of roads on small mammals in the desert are neutral to slightly positive; thus, there may be no negative road-effect zone for the Mohave ground squirrel. Several renewable energy projects have been proposed on private land, which would encompass about 1.2 percent of the Mohave ground squirrel's range, but many of these are proposed for land that has already been converted to agriculture. Although we estimate that about 1 percent of the range of the Mohave ground squirrel has been converted to agriculture, because of increasing costs for water and economic incentives to use this land for other purposes, agricultural lands are being converted to urban or rural development. There are few large mines on private land in the range of the Mohave ground squirrel.

On military lands, the impacts to the Mohave ground squirrel are mainly from the training of ground forces at the NTC along the eastern portion of the species' range. EAFB and NAWS conduct aircraft and weapons testing, which leaves most of the area and habitat on these two large bases ''off limits'' to ground forces operations. The Goldstone Complex is also off limits to such operations. There is limited development at the small cantonment area at each military base, OHV use is restricted to designated areas that total about 0.2 percent of the range of the Mohave ground squirrel, and two military bases have announced plans to construct renewable energy projects that could impact about 0.3 percent of the range of the Mohave ground squirrel. Mining is prohibited on military land.

Recently, the BLM has undertaken several conservation measures specific to the Mohave ground squirrel and its habitat or measures that benefit the species on its lands. The BLM designated the Fremont-Kramer and Superior-Cronese DWMAs as ACECs, increased the size of the DTNA and Rand ACEC, and established the MGSCA. These designations place additional restrictions on land use and require the BLM to manage these lands in part for Mohave ground squirrel habitat. One such restriction is a 1 percent cap on total new development within the MGSCA and DWMAs under the WEMO Plan with the requirement for 5:1 mitigation. On BLM land, cross-country OHV use is limited to a few specific areas, and the number of open roads and trails within the range of the Mohave ground squirrel has been reduced. The BLM is restoring habitat in areas with closed routes, signing open and closed routes, increasing enforcement of route designations, and implementing a monitoring plan to determine compliance with route closures and to identify whether any new illegal routes are being created. Future energy development is restricted or limited in its location and areal extent in much of the range of the Mohave ground squirrel. The BLM's 1 percent cap on total new development within the MGSCA and DWMAs, including energy projects, limits the impacts of proposed or future projects in much of the range of the Mohave ground squirrel.

Livestock grazing on BLM land has been reduced with the BLM's recent implementation of public land health standards and guidelines for grazing. The BLM has implemented a 33 percent reduction in the area authorized for grazing in the range of the Mohave ground squirrel, eliminated ephemeral grazing for cattle in the DWMAs, eliminated sheep grazing in most of the DWMAs, excluded cattle grazing in the spring in DWMAs in years when annual plant productivity is low, excluded cattle grazing on NAWS, and authorized the ability of permittees to voluntarily relinquish cattle and sheep allotments. Over time, these changes are likely to provide increased foraging opportunities for the Mohave ground squirrel and reduce the overall amount of time that livestock spend within these areas, thus reducing impacts to soils, vegetation, and dietary overlap.

Potential threats associated with climate change are a concern, but we do not have evidence to conclude that the threats rise to the level of potentially threatening the Mohave ground squirrel within the foreseeable future.

Overall, we estimate that in the next 20–30 years about one-third of the range of the Mohave ground squirrel could potentially be lost. However, because of a general lack of information on the species and uncertainty over future development we based this estimate on a series of worst-case assumptions (*e.g.,* we double-counted impacts, assumed impacts existed or were worse than the available information indicated, assumed all habitat within a project boundary would be lost), and we expect that the actual loss during this timeframe will be much less. In addition, we did not include the mitigation for the Mohave ground squirrel that would be implemented for project implementation. Even if the worst case occurs, we expect that most of the remaining area will remain relatively undisturbed and in the same condition as it is today. More than 80 percent of the remaining land is Federal, much of which (*e.g.,* EAFB, NAWS, Goldstone Complex, DWMAs, and MGSCA) is managed, at least in part, for the Mohave ground squirrel and its habitat. Of particular importance to the status of the Mohave ground squirrel, much of the remaining lands are contiguous and provide connectivity from the northern end of the range to well south of SR–58 in the southern portion of the range. More importantly, these lands contain most or all the habitat within the eight important population areas and include habitat that provides for connectivity among the eight areas. Therefore, we conclude that the present or threatened destruction, modification, or curtailment of the habitat or range of the Mohave ground squirrel is not a significant threat to this species now or in the foreseeable future.

We found no information that over-collection or overutilization for commercial, recreational, scientific, or educational purposes is a threat or will become a threat to the species in the future. Therefore, we conclude that overutilization for commercial, recreational, scientific, or educational purposes does not threaten the Mohave ground squirrel now or in the foreseeable future.

We also found no evidence suggesting that disease is affecting the Mohave ground squirrel, and therefore, conclude that disease does not threaten the Mohave ground squirrel. Similarly, we found no information suggesting that predation by domestic dogs or cats is affecting the Mohave ground squirrel. Information on the rate of predation by a native predator (coyote) was inferred in one study, but it did not show this rate to be a threat to the Mohave ground squirrel. Although the number of common ravens in the western Mojave Desert has increased substantially in the past few decades, we found no information suggesting that predation by the common raven on the Mohave ground squirrel has increased or is adversely affecting the squirrel. Therefore, we conclude that disease or predation are not significant threats to the Mohave ground squirrel now or in the foreseeable future.

The Mohave ground squirrel is listed as threatened by the State of California under the CESA. There are other regulatory mechanisms in place, such as CEQA, FLPMA, and Sikes Act that, when implemented, provide protections from threats to the Mohave ground squirrel on Federal, State, and private land. On Federal lands, agencies such as the BLM and DOD have implemented actions under these laws that provide for the conservation of the Mohave ground squirrel on much of the lands that they manage. We conclude the inadequacy of regulatory mechanisms is not a significant threat to the Mohave ground squirrel now or in the foreseeable future.

We considered direct mortality as a potential threat, and although direct mortality has likely occurred and will continue to occur during construction, in high-use OHV areas, during military operations, and on roads, there is no evidence that mortality is having an impact on the Mohave ground squirrel or is a significant threat to the species. Although road mortality has not been studied for the Mohave ground squirrel, research on other species of small mammals has not found a relationship between road mortality and abundance.

Severe habitat fragmentation as a result of urban and rural development has occurred in the southernmost portion of the range of the Mohave ground squirrel and will likely continue to occur in that area. However, large, contiguous tracts of Federal land occur throughout the rest of the range of the Mohave ground squirrel, which will largely remain undeveloped. These lands support many Mohave ground squirrel population areas, including the eight important population areas, and provide connectivity throughout much of the range of the Mohave ground squirrel both among these important population areas and from the northern portion through the central and southern portions of the squirrel's range. This connectivity helps ensure exchange of genetic material among the populations of Mohave ground squirrels and prevents the deleterious effects of small population dynamics such as inbreeding depression. Renewable energy projects are proposed for BLM land, but these will likely be very limited in the MGSCA and DWMAs in which development of all types is limited to 1 percent of the areas. Much of the range of the Mohave ground squirrel has not been developed, is not proposed for development at this time, or cannot be developed because of restrictions imposed by the BLM and DOD. We conclude that other natural or manmade factors are not significant threats to the Mohave ground squirrel now or in the foreseeable future.

Our review of the best available scientific and commercial information pertaining to the five factors, does not support a conclusion that there are independent or cumulative threats of sufficient imminence, intensity, or magnitude to indicate that the Mohave ground squirrel is in danger of extinction (endangered), or likely to become endangered within the foreseeable future (threatened), throughout its range. Therefore, listing the Mohave ground squirrel as endangered or threatened is not warranted at this time.

Distinct Vertebrate Population Segment

After assessing whether the species is endangered or threatened throughout its range, we next consider whether any distinct vertebrate populations segment (DPS) exists and meets the definition of endangered or is likely to become endangered in the foreseeable future (threatened). Under the Service's Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act (61 FR 4722; February 7, 1996), three elements are considered in the decision concerning the establishment and classification of a possible DPS. These are applied similarly for additions to or removal from the Federal List of Endangered and Threatened Wildlife. These elements include:

(1) The discreteness of a population in relation to the remainder of the species to which it belongs;

(2) The significance of the population segment to the species to which it belongs; and

(3) The population segment's conservation status in relation to the Act's standards for listing, delisting, or reclassification (*i.e.,* is the population segment endangered or threatened).

Under the DPS Policy, we must first determine whether the population qualifies as a DPS; this requires a finding that the population is both: (1) Discrete in relation to the remainder of the species to which it belongs; and (2) biologically and ecologically significant to the species to which it belongs. If the population meets the first two criteria under the DPS policy, we then proceed to the third element in the process, which is to evaluate the population segment's conservation status in relation to the Act's standards for listing as an endangered or threatened species. The DPS evaluation in this finding concerns the Mohave ground squirrel that we were petitioned to list as threatened or endangered.

Discreteness

Under the DPS Policy, a population segment of a vertebrate taxon may be considered discrete if it satisfies either one of the following conditions:

(1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.

(2) It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

Markedly Separated From Other Populations of the Taxon

As described previously (see *Species Information* above), the Mohave ground squirrel extends throughout the range except where the habitat has been lost due to human activities, primarily along the southern and eastern portion of its range. We found no information that any Mohave ground squirrel population is markedly separated from other populations as a consequence of physical, physiological, ecological, or behavioral factors.

There are no international governmental boundaries associated with this species that are significant. The Mohave ground squirrel is found wholly within the United States. Because this element is not relevant in this case for a finding of discreteness, it was not considered in reaching the determination.

We did not find any information that would indicate any DPS exists. Therefore, we determine, based on a review of the best available information, that there are no portions of the species' range that meet the discreteness criterion of the Service's DPS policy. The DPS policy is clear that significance is analyzed only when a population segment has been identified as discrete. Because both discreteness and significance are required to satisfy the DPS policy, we have determined that there are no populations of the Mohave ground squirrel that qualify as a DPS under our policy. As a result, no further analysis under the DPS policy is necessary.

Significant Portion of the Range Analysis

Having determined that the Mohave ground squirrel is not in danger of extinction or likely to become endangered within the foreseeable future throughout all of its range, we must next consider whether there are any significant portions of the range where the Mohave ground squirrel is in danger of extinction or is likely to become endangered in the foreseeable future.

Decisions by the Ninth Circuit Court of Appeals in *Defenders of Wildlife* v. *Norton,* 258 F.3d 1136 (2001) and *Tucson Herpetological Society* v. *Salazar,* 566 F.3d 870 (2009) found that the Act requires the Service, in determining whether a species is endangered or threatened throughout a significant portion of its range, to consider whether lost historical range of a species (as opposed to its current range) constitutes a significant portion of the range of that species. While this is not our interpretation of the statute, we first address the lost historical range before addressing the current range.

Historical Range

Available information provides no evidence of a significant loss of the historical range of the Mohave ground squirrel. Although the petition to list the Mohave ground squirrel indicated that the western Antelope Valley was no longer part of the species' current range, suitable habitat still remains in much of the western Antelope Valley and may be connected to habitat currently occupied by the Mohave ground squirrel. This information is supported by recent visual observations of Mohave ground squirrels in the western Antelope Valley (see ''Range and Distribution'' section). Additionally, although areas of natural habitat within the range of the Mohave ground squirrel have been lost or degraded from human activity (see Factor A), the boundary of the current range is larger than reported by Howell in 1938, and may even be larger than now defined by the Service, as there have been recent sightings beyond the area defined by the Service as the range of the Mohave ground squirrel (see ''Range and Distribution'' section).'' Therefore, there is no lost historical range of the Mohave ground squirrel that could constitute a significant portion of the range of the species.

Current Range

The Act defines ''endangered species'' as any species which is ''in danger of extinction throughout all or a significant portion of its range,'' and ''threatened species'' as any species which is ''likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' The definition of species is also relevant to this discussion. The Act defines ''species'' as follows: ''The term 'species' includes any subspecies of fish or wildlife or plants, and any distinct population segment [DPS] of any species of vertebrate fish or wildlife which interbreeds when mature.'' The phrase ''significant portion of its range'' (SPR) is not defined by the statute, and we have never addressed in our regulations: (1) The consequences of a determination that a species is either endangered or likely to become so throughout a significant portion of its range, but not throughout all of its range; or (2) what qualifies a portion of a range as ''significant.''

Two recent district court decisions have addressed whether the SPR language allows the Service to list or protect less than all members of a defined ''species'': *Defenders of Wildlife* v. *Salazar,* 729 F. Supp. 2d 1207 (D. Mont. 2010), concerning the Service's delisting of the Northern Rocky Mountain gray wolf (74 FR 15123, Apr. 12, 2009); and *WildEarth Guardians* v. *Salazar,* 2010 U.S. Dist. LEXIS 105253 (D. Ariz. Sept. 30, 2010), concerning the Service's 2008 finding on a petition to list the Gunnison's prairie dog (73 FR 6660, Feb. 5, 2008). The Service had asserted in both of these determinations that it had authority, in effect, to protect only some members of a ''species,'' as defined by the Act (*i.e.,* species, subspecies, or DPS), under the Act. Both courts ruled that the determinations were arbitrary and capricious on the grounds that this approach violated the plain and unambiguous language of the Act. The courts concluded that reading the SPR language to allow protecting only a portion of a species' range is inconsistent with the Act's definition of ''species.'' The courts concluded that once a determination is made that a species (*i.e.,* species, subspecies, or DPS) meets the definition of ''endangered species'' or ''threatened species,'' it must be placed on the list in its entirety and the Act's protections applied consistently to all members of that species (subject to modification of protections through special rules under sections 4(d) and 10(j) of the Act).

Consistent with that interpretation, and for the purposes of this finding, we interpret the phrase ''significant portion of its range'' in the Act's definitions of ''endangered species'' and ''threatened species'' to provide an independent basis for listing: a species may be endangered or threatened throughout all of its range; or a species may be endangered or threatened in only a significant portion of its range. If a species is in danger of extinction throughout an SPR, it, the species, is an ''endangered species.'' The same analysis applies to ''threatened species.'' Based on this interpretation and supported by existing case law, the consequence of finding that a species is endangered or threatened in only a significant portion of its range is that the entire species shall be listed as endangered or threatened, respectively, and the Act's protections shall be applied across the species' entire range.

We conclude, for the purposes of this finding, that interpreting the SPR phrase as providing an independent basis for listing is the best interpretation of the Act because it is consistent with the purposes and the plain meaning of the key definitions of the Act; it does not conflict with established past agency practice (*i.e.,* prior to the 2007 Solicitor's Opinion), as no consistent, long-term agency practice has been established; and it is consistent with the judicial opinions that have most closely examined this issue. Having concluded that the phrase ''significant portion of its range'' provides an independent basis for listing and protecting the entire species, we next turn to the meaning of ''significant'' to determine the threshold for when such an independent basis for listing exists.

Although there are potentially many ways to determine whether a portion of a species' range is ''significant,'' we conclude, for the purposes of this finding, that the significance of the portion of the range should be determined based on its biological contribution to the conservation of the species. For this reason, we describe the threshold for ''significant'' in terms of an increase in the risk of extinction for the species. We conclude that a biologically based definition of ''significant'' best conforms to the purposes of the Act, is consistent with judicial interpretations, and best ensures species' conservation. Thus, for the purposes of this finding, and as explained further below, a portion of the range of a species is ''significant'' if its contribution to the viability of the species is so important that without that portion, the species would be in danger of extinction.

We evaluate biological significance based on the principles of conservation biology using the concepts of resiliency, redundancy, and representation. *Resiliency* describes the characteristics of a species and its habitat that allow it to recover from periodic disturbance. *Redundancy* (having multiple populations distributed across the landscape) may be needed to provide a margin of safety for the species to withstand catastrophic events. *Representation* (the range of variation found in a species) ensures that the species' adaptive capabilities are conserved. Resiliency, redundancy, and representation are not independent of each other, and some characteristic of a species or area may contribute to all three. For example, distribution across a wide variety of habitat types is an indicator of representation, but it may also indicate a broad geographic distribution contributing to redundancy (decreasing the chance that any one event affects the entire species), and the likelihood that some habitat types are less susceptible to certain threats, contributing to resiliency (the ability of the species to recover from disturbance). None of these concepts is intended to be mutually exclusive, and a portion of a species' range may be determined to be ''significant'' due to its contributions under any one or more of these concepts.

For the purposes of this finding, we determine if a portion's biological contribution is so important that the portion qualifies as ''significant'' by asking whether without that portion, the resiliency, redundancy, or representation of the species would be so impaired that the species would have an increased vulnerability to threats to the point that the overall species would be in danger of extinction (*i.e.,* would be ''endangered''). Conversely, we would not consider the portion of the range at issue to be ''significant'' if there is sufficient resiliency, redundancy, and representation elsewhere in the species' range that the species would not be in danger of extinction throughout its range if the population in that portion of the range in question became extirpated (extinct locally).

We recognize that this definition of ''significant'' (a portion of the range of a species is ''significant'' if its contribution to the viability of the species is so important that without that portion, the species would be in danger of extinction) establishes a threshold that is relatively high. On the one hand, given that the consequences of finding a species to be endangered or threatened in an SPR would be listing the species throughout its entire range, it is important to use a threshold for ''significant'' that is robust. It would not be meaningful or appropriate to establish a very low threshold whereby a portion of the range can be considered ''significant'' even if only a negligible increase in extinction risk would result from its loss. Because nearly any portion of a species' range can be said to contribute some increment to a species' viability, use of such a low threshold would require us to impose restrictions and expend conservation resources disproportionately to conservation benefit: listing would be rangewide, even if only a portion of the range of minor conservation importance to the species is imperiled. On the other hand, it would be inappropriate to establish a threshold for ''significant'' that is too high. This would be the case if the standard were, for example, that a portion of the range can be considered ''significant'' only if threats in that portion result in the entire species' being currently endangered or threatened. Such a high bar would not give the SPR phrase independent meaning, as the Ninth Circuit held in *Defenders of Wildlife* v. *Norton,* 258 F.3d 1136 (9th Cir. 2001).

The definition of ''significant'' used in this finding carefully balances these concerns. By setting a relatively high threshold, we minimize the degree to which restrictions will be imposed or resources expended that do not contribute substantially to species conservation. But we have not set the threshold so high that the phrase ''in a significant portion of its range'' loses independent meaning. Specifically, we have not set the threshold as high as it was under the interpretation presented by the Service in the *Defenders* litigation. Under that interpretation, the portion of the range would have to be so important that current imperilment there would mean that the species would be currently imperiled everywhere. Under the definition of ''significant'' used in this finding, the portion of the range need not rise to such an exceptionally high level of biological significance. (We recognize that if the species is imperiled in a portion that rises to that level of biological significance, then we should conclude that the species is in fact imperiled throughout all of its range, and that we would not need to rely on the SPR language for such a listing.) Rather, under this interpretation we ask whether the species would be endangered everywhere without that portion, *i.e.,* if that portion were completely extirpated. In other words, the portion of the range need not be so important that even the species being in danger of extinction in that portion would be sufficient to cause the species in the remainder of the range to be endangered; rather, the complete extirpation (in a hypothetical future) of the species in that portion would be required to cause the species in the remainder of the range to be endangered.

The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose to analyzing portions of the range that have no reasonable potential to be significant or to analyzing portions of the range in which there is no reasonable potential for the species to be endangered or threatened. To identify only those portions that warrant further consideration, we determine whether there is substantial information indicating that: (1) The portions may be ''significant,'' and (2) the species may be in danger of extinction there or likely to become so within the foreseeable future. Depending on the biology of the species, its range, and the threats it faces, it might be more efficient for us to address the significance question first or the status question first. Thus, if we determine that a portion of the range is not ''significant,'' we do not need to determine whether the species is endangered or threatened there; if we determine that the species is not endangered or threatened in a portion of its range, we do not need to determine if that portion is ''significant.'' In practice, a key part of the determination that a species is in danger of extinction in a significant portion of its range is whether the threats are geographically concentrated in some way. If the threats to the species are essentially uniform throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats to the species occurs only in portions of the species' range that clearly would not meet the biologically based definition of ''significant,'' such portions will not warrant further consideration.

Through our range-wide analysis, we found that there is not one individual impact that occurs throughout the range of the species, that is, the threats are not uniform throughout the species' range, and that some areas receive a greater number of impacts, although the magnitude may vary. After reviewing the potential threats throughout the range of the Mohave ground squirrel, we determine that there may be two portions of the squirrel's range that could be considered to have concentrated threats for the species there: one area is in the southern portion of the range and the other is the central portion of the range where Fort Irwin is located. Impacts in the southern portion of the species' range include urban and rural development, recreation, transportation network, military operations, energy development, livestock grazing, agriculture, and mining. In the central portion, the impacts include urban and rural development, OHV recreational use, military operations, energy development, livestock grazing, and mining. Below, we outline the elevated threats found in these portions. We then assess whether these portions of the species' range may meet the biologically based definition of ''significant,'' that is, whether the contributions of these portions of the Mohave ground squirrel's range to the viability of the species is so important that without those portions, the species would be in danger of extinction.

Southern Portion of the Range: The impacts of urban and rural development and agriculture are concentrated in the southern portion of the range of the Mohave ground squirrel. This area is south of the Fremont-Kramer DWMA, south of EAFB, and south of SR–138 (see Maps 1 and 2). This area is the location of much of the urban and rural development and agriculture in the western Mojave Desert. Much of the western portion of the Antelope Valley south of SR–138, the area south of Littlerock and Pearblossom, and the Mojave River Valley have been developed for intensive agriculture (USGS 2000. p. 1). In addition, most of the human population in the western Mojave Desert is located in this area. As mentioned in the ''Urban and Rural Development'' section, about 300,000 ac (121,406 ha) south of SR–58, which is about 5.6 percent of the range of the Mohave ground squirrel, is incorporated (BLM 2005a, p. 3–2) and subject to future development. Additional acreage has been affected by rural development along the southern portion of the range of the Mohave ground squirrel, but data on this area are unavailable. More than 39,000 ac (15,700 ha) has been lost to agriculture including the Antelope Valley and Mojave River Basin (Gustafson 1993, p. 24). The known losses in urban and rural development and agriculture are about 6.4 percent of the range of the Mohave ground squirrel, but the actual losses would be larger when including the unincorporated areas of development. This urban and rural development and agriculture are mostly located along the southern edge of the range of the Mohave ground squirrel (Map 2). Their locations would not inhibit the movement of the Mohave ground squirrel among the important population areas.

Central Portion of the Range: The second area where impacts are concentrated is the Fort Irwin NTC, including the expansion area. The area is about 435,978 ac (176,435 ha) including the expansion area, or about 8.2 percent of the range of the Mohave ground squirrel. However, not all of this area is used for ground forces training so the area of impact is less. One of the Mohave ground squirrel important population areas, the Coolgardie Mesa-Superior Valley core area, is located on lands managed by the BLM and Fort Irwin (expansion area and Goldstone Complex). Although part of this important population area will be subject to ground forces training, part is an off-limits area to these impacts (Charis 2005, chapter 4, p. 14), part is located on lands managed by the BLM that include an ACEC for the federally endangered Lane Mountain milk-vetch (*Astragalus jaegerianus*), and the desert tortoise (BLM *et al.* 2005, chapter 2, pp. 15, 214–215), and part is in the Goldstone Complex which is off-limits to military training. The Army has designated areas within the expansion area that combined total 6,704 ac (2,713 ha) as off-limits ground forces training (Charis 2005, chapter 4, pp. 11, 21, 22).

For this analysis, we will look at the significance question first (*i.e.,* whether the concentration of these threats applies to portions of the range that are so important to the viability of the species that without those portions, the species would be in danger of extinction). To do so, we conduct an evaluation of resiliency, redundancy, and representation. The terms ''resiliency,'' ''redundancy,'' and ''representation'' are intended to be indicators of the conservation value of portions of the range.

Resiliency of a species allows the species to recover from periodic disturbance. A species will likely be more resilient if large populations exist in high-quality habitat that is distributed throughout the range of the species in such a way as to capture the environmental variability found within the range of the species. A portion of the range of a species may make an essential contribution to the resiliency of the species if the area is relatively large and contains particularly high-quality habitat, or if its location or characteristics make it less susceptible to certain threats than other portions of the range. When evaluating whether or how a portion of the range contributes to resiliency of the species, we evaluate the historical value of the portion and how frequently the portion is used by the species, if possible. In addition, the portion may contribute to resiliency for other reasons—for instance, it may contain an important concentration of certain types of habitat that are necessary for the species to carry out its life-history functions, such as breeding, feeding, migration, dispersal, or wintering.

Resiliency, as a measure of a portion of the range's contribution to the viability of the species, may apply if a portion occurs in an environment that is meaningfully different from the rest; that is, representing differences to capture the environmental variability within the range of the species. We found that there was a large, contiguous area with management guidance for the Mohave ground squirrel (*e.g.* the MGSCA, NAWS, Fremont-Kramer DWMA and DTNA, Superior-Cronese DWMA, Goldstone Complex, and EAFB) (see Map 2). This area occurs from the northern portion through the southern portion of the species' range, and represents a variety of latitudes, elevations, rainfall, temperatures, soils, and vegetation. Based on a review of the best available scientific and commercial information, we find no indication that any geographic area is different from the rest of the range of the Mohave ground squirrel regarding environmental variability, or that one portion of the Mohave ground squirrel's range exhibits ecological or environmental characteristics that differ from another portion. Therefore, we conclude that the Southern and the Central portions of the range of the Mohave ground squirrel, individually and in combination, do not provide an essential contribution to the resiliency of the species.

Redundancy of populations may be needed to provide a margin of safety for the species to withstand catastrophic events. This does not mean that any portion that provides redundancy is necessarily a significant portion of the range of a species. The idea is to conserve enough areas of the range such that random perturbations in the system act on only a few populations.

Therefore, each area must be examined based on whether that area provides an increment of redundancy that is important to the conservation of the species.

Redundancy is a measure to ensure that a species is able to withstand catastrophic events. If sufficiently large enough areas of the species are conserved, then random events would impact only a small portion of the species. Researchers have identified eight important population areas where Mohave ground squirrels are known to occur consistently (Leitner 2008, pp. 10–12). Mohave ground squirrels are also known to occur in many other areas, although less is known about those populations. These important areas occur throughout much of the range of the Mohave ground squirrel including the southern, central, and northern portions of the species' range. There may be more important population areas for the Mohave ground squirrel that have not been identified because much of the range of the species has not been surveyed to determine population location and trend. Based on the best available scientific and commercial information, we find that there is a large area being managed for the species (see Map 2) and that the eight important population areas and other potentially important population areas are well distributed across the species' range. Thus, there is no portion of the range of the Mohave ground squirrel identified as being necessary to conserve the species in case there is a catastrophic event. Therefore, we conclude that the Southern and the Central portions of the range of the Mohave ground squirrel, individually and in combination, do not provide an essential contribution to the redundancy of the species.

Adequate representation ensures that the species' adaptive capabilities are conserved. Specifically, the portion should be evaluated to see how it contributes to the genetic diversity of the species. The loss of genetically based diversity may substantially reduce the ability of the species to respond and adapt to future environmental changes. A peripheral population may provide an essential contribution to representation if there is evidence that it provides genetic diversity due to its location on the margin of the species' habitat requirements.

Representation includes the genetic diversity of the species. We found that, using mitochondrial DNA (a maternally inherited genetic marker), estimates of gene flow among the past few generations were low between some populations (Coolgardie Mesa and EAFB) but not others (Olancha and Freeman Gulch, Freeman Gulch and EAFB) (Bell 2006, pp. 42–44). This reduced gene flow may have been caused by the recent drought years in the western Mojave Desert or limited movements of female Mohave ground squirrels. However, when using nuclear DNA, which is inherited from both parents rather than just the mother, the results did not show that gene flow was low between populations of Mohave ground squirrels. Bell's genetic analysis of long-term levels of gene flow among Mohave ground squirrel populations found low levels of subdivision among Mohave ground squirrel populations including between Coolgardie Mesa and EAFB (Bell 2006, pp. 43, 72), indicating that gene flow among Mohave ground squirrel populations including from the Coolgardie Mesa population west to EAFB has occurred over the long term. In addition, we did not find any information that indicates the population in the southern portion, where impacts are concentrated, provides genetic diversity to the species as a whole. Bell (2006, pp. 18, 39, 40) found low genetic diversity throughout the range of the species, indicating that gene flow occurs throughout the range. Therefore, we conclude that the Southern and the Central portions of the range of the Mohave ground squirrel, individually and in combination, do not provide an essential contribution to the representation of the species.

Based on the discussion above, we have determined that the Mohave ground squirrel does not face elevated threats in most portions of its range, and that those portions of the Mohave ground squirrel's range that may have concentrated threats (the Southern and the Central portions of the range) do not contribute to the resiliency, redundancy, and representation of the Mohave ground squirrel such that without these portions, the species would be in danger of extinction. Accordingly, we find that the Mohave ground squirrel is not endangered or threatened in a significant portion of its range.

We do not find that the Mohave ground squirrel is in danger of extinction now, nor is it likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Therefore, listing the Mohave ground squirrel as endangered or threatened under the Act is not warranted at this time.

We request that you submit any new information concerning the status of, or threats to, the Mohave ground squirrel to our Ventura Fish and Wildlife Office (see **ADDRESSES** section) whenever it becomes available. New information will help us monitor this species and encourage its conservation. If an emergency develops for this or any other species, we will act to provide immediate protection.

References Cited

A complete list of references cited is available on the Internet at *http://www.regulations.gov* and upon request from the Ventura Fish and Wildlife Office (see **ADDRESSES** section).

Author

The primary authors of this notice are staff members of the Ventura Fish and Wildlife Office (see **ADDRESSES** section).

Authority: The authority for this action is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: September 23, 2011.

Gregory E. Siekaniec,

Acting Director, U.S. Fish and Wildlife Service.

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