DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS-R8-ES-2007-0022]
[MO 92210-0-0008-B2]

Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Pygmy Rabbit as Endangered or Threatened

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of a 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 pygmy rabbit (*Brachylagus idahoensis*) as endangered or threatened under the Endangered Species Act of 1973, as amended. After review of all available scientific and commercial information, we find the listing of the pygmy rabbit is not warranted at this time. However, we ask the public to submit to us any new information that becomes available concerning the threats to the pygmy rabbit or its habitat at any time.

DATES: The finding announced in the document was made on September 30, 2010.

ADDRESSES: This finding is available on the Internet at *http://www.regulations.gov* at Docket Number FWS-R8-ES-2007-0022. Supporting documentation we used to prepare this finding is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, 1340 Financial Boulevard, Suite 234, Reno, NV 89502. Please submit any new information, materials, comments, or questions concerning this species to the Service at the above street address.

FOR FURTHER INFORMATION CONTACT: Robert D. Williams, State Supervisor, U.S. Fish and Wildlife Service, Nevada Fish and Wildlife Office (see **ADDRESSES**); by telephone (775) 861-6300 or by facsimile (775) 861-6301. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at (800) 877-8339.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*), requires that, for any petition to revise the List of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information that the listing may be warranted, we make a finding within 12 months of the date of the receipt of the petition. In this finding, we will determine that the petitioned action is either: (1) Not warranted, (2) warranted, or (3) 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 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 November 21, 1991, we added the pygmy rabbit to our list of candidate species as a category 2 candidate species (56 FR 58804). A category 2 candidate species was a species for which we had information indicating that a proposal to list it as threatened or endangered under the Act may be appropriate, but for which additional information on biological vulnerability and threat was needed to support the preparation of a proposed rule. In the February 28, 1996, Candidate Notice of Review (CNOR) (61 FR 7595), we adopted a single category of candidate species defined as follows: "Those species for which the Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list but issuance of the proposed rule is precluded." In previous CNORs, species matching this definition were known as category 1 candidates for listing. Thus, the Service no longer considered category 2 species as candidates and did not include them in the 1996 or any subsequent CNORs. The decision to stop considering category 2 species as candidates was designed to reduce confusion about the status of these species and to clarify that we no longer regarded these species as candidates for listing.

On April 21, 2003, we received a petition dated April 1, 2003, from the Committee for the High Desert, Western Watersheds Project, American Lands Alliance, Oregon Natural Desert Association, Biodiversity Conservation Alliance, Center for Native Ecosystems, and Mr. Craig Criddle requesting the pygmy rabbit found in Oregon, Idaho, Montana, Wyoming, California, Nevada, and Utah be listed as endangered or threatened in accordance with section 4 of the Act (Committee for the High Desert *et al.* 2003, entirety). The petition was clearly identified as a petition and contained the names, signatures, and addresses of the requesting parties. The petitioners requested designation of critical habitat concurrent with the listing. Included in the petition was supporting information regarding the species' taxonomy and ecology, historical and current distribution, and perceived threats to the pygmy rabbit.

On June 10, 2003, we acknowledged in a letter the receipt of the petition and stated we determined an emergency listing was not warranted for the pygmy rabbit. We also stated if our ongoing status review of the species indicates that an emergency listing is warranted, we would act accordingly. In addition, we advised the petitioners that we would not be able to process the petition in a timely manner. On May 3, 2004, we received a 60–day notice of intent to sue, and on September 1, 2004, we received a complaint regarding our failure to carry out the 90–day and 12–month findings on the status of the pygmy rabbit. On March 2, 2005, we reached an agreement with the plaintiffs to submit to the **Federal Register** a completed 90–day finding by May 16, 2005, and to complete, if applicable, a 12–month finding by February 15, 2006 (*Western Watersheds Project et al.* v. *U.S. Fish and Wildlife Service* (CV-04-0440-N-BLW) (D. Idaho).

On May 20, 2005, we published a 90–day finding in the **Federal Register** (70 FR 29253) stating that the petition did not present substantial information indicating that listing the pygmy rabbit may be warranted. On March 28, 2006, we received a complaint regarding alleged violations of the Act and the Administrative Procedure Act with regard to our May 20, 2005, 90–day finding (*Western Watersheds Project et al. v. Gale Norton and U.S. Fish and Wildlife Service* (CV 06-CV-00127-S-EJL) (D. Idaho)). On September 26, 2007, the court issued an order remanding our May 20, 2005, 90–day finding and required the Service to issue a new 90–day finding on or before December 26, 2007. On January 8, 2008, we published a new 90–day finding (73 FR 1312), and determined that the petition presented substantial information indicating that the petitioned action may be warranted. Additionally in that notice, we indicated that we would be initiating a status review of the pygmy rabbit and opening a 60–day public comment period.

This finding does not address our prior listing of the Columbia Basin distinct population segment (DPS) of the pygmy rabbit which occurs in the State of Washington. On November 30, 2001, we published an emergency listing and concurrent proposed rule to list this DPS of the pygmy rabbit as endangered (66 FR 59734 and 66 FR 59769, respectively). We listed the Columbia Basin DPS of the pygmy rabbit as endangered in our final rule dated March 5, 2003 (68 FR 10388). This finding addresses the petitioned action that requests listing of the pygmy rabbit as endangered or threatened in the remainder of its range in Oregon, Idaho, Montana, Wyoming, California, Nevada, and Utah.

Species Information

Species Description

The pygmy rabbit is the smallest North American Leporid. Adult weights range from 0.54 to 1.2 pounds (245 to 553 grams); adult lengths range from 9.1 to 12.1 inches (in) (23.1 to 30.7 centimeters (cm)) (Dice 1926, p. 28; Grinnell *et al.* 1930, p. 554; Bailey 1936, p. 110; Orr 1940, p. 194; Janson 1946, pp. 21, 23; Durrant 1952, p. 88; Ingles 1965, p. 143; Bradfield 1974, pp. 10-11; Holt 1975, pp. 125-126; Campbell *et al.* 1982, p. 100). Adult females are generally larger than adult males. The species can be distinguished from other rabbits by its small size, gray color, short rounded ears, small hind legs, and the absence of white on the tail (66 FR 59734).

Taxonomy

The pygmy rabbit is a member of the family Leporidae, which includes rabbits and hares. This species has been placed in various genera positions since its type specimen was described in 1891 by Merriam (1891, pp. 76-78), who classified the "Idaho pygmy rabbit" as *Lepus idahoensis*. Currently, the pygmy rabbit is generally placed within the monotypic genus *Brachylagus* and classified as *B. idahoensis* (Green and Flinders 1980a, p. 1; Washington Department of Fish and Wildlife (WDFW) 1995, p. 1); this is the taxonomy accepted by the Service. The analysis of blood proteins (Johnson 1968, cited in WDFW 1995, p. 1) suggests that the pygmy rabbit differs greatly from species within both the *Lepus* and *Sylvilagus* genera. Halanych and Robinson (1997, p. 301) supported the separate generic status as *Brachylagus* for the pygmy rabbit based on phylogenetic position and sequence divergence values. The pygmy rabbit has no recognized subspecies (Grinnell *et al.* 1930, p. 555; Davis 1939, p. 364; Larrison 1967, p. 64; Green and Flinders 1980a, p. 1; Janson 2002, p. 4).

Ecology and Life History

Pygmy rabbits are typically found in areas of tall, dense *Artemisia* spp. (sagebrush) cover and are considered a sagebrush obligate species because they are highly dependent on sagebrush to provide both food and shelter throughout the year (Dice 1926, p. 27; Grinnell *et al.* 1930, p. 553; Orr 1940, pp. 194-197; Hall 1946, p. 615; Janson 1946, pp. 39-40, 53; Wilde 1978, p. 46; Green and Flinders 1980a, pp. 1-3 and b, pp. 137-141; Weiss and Verts 1984, pp. 569-570; Katzner *et al.* 1997, p. 1,053). Anthony (1913, p. 22) also mentioned he found pygmy rabbits in "little draws and flats" in Oregon, where the tall sagebrush was thick and where *Chrysothamnus* spp. (rabbit brush) grew in extensive patches, and occasionally they were found on "sparsely brushed flats and hills."

The winter diet of pygmy rabbits is composed of up to 99 percent sagebrush (Wilde 1978, p. 46; Green and Flinders 1980b, p. 138), which is unique among leporids (rabbits and hares) (White *et al.* 1982, p. 107). During spring and summer in Idaho, their diet consists of approximately 51 percent sagebrush, 39 percent grasses (particularly native bunch-grasses, such as *Agropyron* spp. and *Poa* spp.), and 10 percent forbs (Green and Flinders 1980b, p. 138). There is evidence that pygmy rabbits preferentially select native grasses as forage over other available foods during this period. In addition, total grass cover relative to forbs and shrubs may be reduced within the immediate areas occupied by pygmy rabbits as a result of their use during spring and summer (Green and Flinders 1980b, pp. 138-141). The specific diets of pygmy rabbit likely vary by region (68 FR 10388).

Pygmy rabbits may be active at any time of the day or night, and appear to be most active during mid-morning (Anthony 1913, p. 23; Bailey 1936, p. 111; Bradfield 1974, pp. 14-15; Green and Flinders1980a, p. 3; Gahr 1993, pp. 45-46). Flinders *et al.* (2005, p. 27) found pygmy rabbits to be 72 percent more active during twilight. Larrucea (2007, p. 79) found pygmy rabbits were most active during dawn and dusk (a bimodal diel activity pattern). Activity at dawn was greatest except for during winter when dusk activity was higher. Lee (2008, p. 33) found pygmy rabbits were active during all time periods of the day, but the greatest activity occurred at night.

Pygmy rabbits maintain a low stance, have a deliberate gait, and are relatively slow and vulnerable in more open areas. They can evade predators by maneuvering through the dense shrub cover of their preferred habitats, often along established trails, or by escaping among their burrows (Anthony 1913, pp. 22-23; Bailey 1936, p. 111; Severaid 1950, p. 3; Bradfield 1974, pp. 26-27). Due to their small size, behavior, and habitat, these small rabbits can be easily overlooked (Merriam 1891, p. 75; Grinnell *et al.* 1930, p. 553; Janson 1940, p. 1; Severaid 1950, p. 3; Holt 1975, p. 135; Janson 2003, p. 71).

The pygmy rabbit is one of only two rabbits in North America that digs its own burrows (Nelson 1909, p. 22; Bailey 1936, p. 111; Hall 1946, p. 617; Janson 1946, p. 43; Bradfield 1974, p. 28; Wilde 1978, p. 17). Pygmy rabbit burrows are typically found in relatively deep, loose soils of wind-borne or water-borne (e.g., alluvial fan) origin. Pygmy rabbits, especially juveniles, likely use their burrows as protection from predators and inclement weather (Bailey 1936, p. 111; Bradfield 1974, pp. 26-27). Some burrows have only one entrance. Others have multiple entrances, some of which are concealed at the base of larger sagebrush plants (Dice 1926, p. 27). A single entrance burrow may be referred to as a "burrow" while single entrance burrows, multi-entrance burrows, or an entire site may be referred to as a "burrow system". Burrows are relatively simple and shallow, often no more than 2.2 yards (yd) (2 meters (m)) in length and usually less than 1.1 yd (1 m) deep with no distinct chambers (Bailey 1936, p. 111; Bradfield 1974, pp. 29-30; Green and Flinders 1980a, p. 2; Gahr 1993, p. 63). Burrows are typically dug into gentle slopes or mound or inter-mound areas of more level or dissected topography (Wilde 1978, p. 26; Gahr 1993, pp. 77-80).

In general, the number of active burrows in an area increases over the summer as the number of juveniles increase. However, the number of active burrows may not be directly related to the number of individuals in a given area because some individual pygmy rabbits appear to maintain multiple burrows and some individual burrows are used by multiple individuals (Janson 1940, p. 21; Janson 1946, p. 44; Gahr 1993, pp. 66, 68; Heady 1998, p. 25).

Pygmy rabbits may also be using more than one burrow or burrow system at a specific time or during different times of the year (Purcell 2006, p. 96). In Idaho, Sanchez and Rachlow (2008, p. 1306) found the number of burrows used by individuals increased with home range size. Patterns of burrow system use varied by study area, sex, and season (Sanchez and Rachlow 2008, pp. 1306-

1307). Larrucea (2007, pp. 96-97) found annual and intra-annual changes at three study sites during a 3–year period in the Reese River Valley, Nevada. During two of the three years, one site showed lack of activity during winter and spring. Pygmy rabbits returned to this site in June and many new burrows were found. This site may have been marginal habitat and rabbits using the area in June may have been dispersing juveniles from other areas. At the other two sites where pygmy rabbits were observed year-round, the fewest active burrows were found from July to October. With the return of cooler weather in the fall, the number of active burrows again increased. Many of these new active burrows were ones that had previously been inactive or collapsed.

Flinders *et al.* (2005, p. 25) reported distances between burrow systems. They found burrow systems with multiple entrances averaged 124.6 yd (114.0 m) away from the next nearest multiple entrance system, while distances between systems with multiple entrances to single entrance burrows averaged 57.1 yd (52.2 m) away. Single entrance burrow systems averaged 14 yd (12.8 m) away from the nearest single entrance system.

Pygmy rabbits occasionally make use of burrows abandoned by other species, such as the yellow-bellied marmot (*Marmota flaviventris*), badger (*Taxida taxus*), or Utah prairie dog (*Cynomys parvidens*) (Borell and Ellis 1934, p. 41; Hall 1946, p. 617; Bradfield 1974, p. 28; Green and Flinders 1980a, p. 2; Flinders *et al.* 2005, p. 30). As a result, they may occur in areas of shallower or more compact soils that support sufficient shrub cover (Bradfield 1974, p. 29). Natural cavities (such as holes in volcanic rock), rock piles, stone walls, and areas around abandoned buildings may also be used (Janson 1946, pp. 44-46). During winter, pygmy rabbits make extensive use of snow burrows, possibly for access to sagebrush forage (Bradfield 1974, p. 17; Katzner and Parker 1997, p. 1,069), as travel corridors among their underground burrows, for protection from predators, and/or as thermal cover (Katzner and Parker 1997, pp. 1,063, 1,069-1,070).

Pygmy rabbits tend to have relatively small home ranges during winter, remaining within 98 ft (30 m) of their burrows (Janson 1946, p. 75). Bradfield (1974, p. 20), Katzner and Parker (1997, p. 1,066), and Flath and Rauscher (1995, p. 3) found pygmy rabbit tracks in snow indicating movements of 262 to 328 ft (80 to 100 m) or more from their burrows. They have larger home ranges during spring and summer (Janson 1946, p. 75; Gahr 1993, pp. 103-105). During the breeding season in Washington, females tend to make relatively short movements within a small core area and have home ranges covering roughly 6.7 acres (ac) (2.7 hectares (ha)); males tend to make longer movements, traveling among a number of females, resulting in home ranges covering roughly 49.9 ac (20.2 ha) (Gahr 1993, p. 118). Katzner (1994, pp. 14-15) found home range size extremely variable in Wyoming; home ranges were from 0.12 to 0.86 ac (0.05 to 0.35 ha) for females and 0.82 to 4.4 ac (0.33 to 1.8 ha) for males. Burak (2006, p. 22) found in Owyhee County, Idaho, that pygmy rabbit home range sizes based on Minimum Convex Polygons differed between the sexes and ranged from 49.9 to 69.7 ac (20.2 to 28.2 ha) for males and from 4 to 5.4 ac (1.6 to 2.2 ha) for females during the breeding season. Crawford (2008, p. 47) found that pygmy rabbit annual home ranges in southeastern Oregon and northwestern Nevada differed between the sexes and ranged from 1.2 to 25.8 ac (0.49 to 10.46 ha) for males and 0.27 to 18.7 ac (0.11 to 7.55 ha) for females. During the breeding season, home ranges for males ranged from 0.27 to 18.5 ac (0.11 to 7.49 ha) and from 0.15 to 17.5 ac (0.06 to 7.10 ha) for females.

Sanchez and Rachlow (2008, p. 1307) in Idaho found range use between consecutive seasons and between seasons over 2 years was highly variable; some pygmy rabbits shifted seasonal ranges markedly, but most ranges showed overlap between seasons and years. One male shifted his range center by 8,013.9 yd (7,332 m), but other males shifted their range centers between 33 and 122 yd (30 and 112 m). Females shifted their range centers between 58 and 144 yd (53 and 132 m) (Sanchez and Rachlow 2008, p. 1307). Distances shifted between like seasons over the 2 years were similar to those observed between consecutive seasons. Males showed a distance shift of between 47 and 269 yd (43 and 246 m) and females showed a shift of between 0 and 150 yd (0 and 137 m) (Sanchez and Rachlow 2008, p. 1307).

Earlier reports indicated pygmy rabbits were known to have traveled up to 0.75 mile (mi) (1.2 kilometers (km)) from their burrows (Gahr 1993, p. 108), and there are a few records of individuals moving up to 2.17 mi (3.5 km) (Green and Flinders 1979, p. 88; Katzner and Parker 1998, p. 73). Rauscher (1997, p. 5) reported that pygmy rabbits crossed 500 yd (457.2 m) of relatively open grassland habitat to reach a sagebrush stringer in Montana. Katzner (1994, p. 105) accounted for all the rabbits within a range of 0.62 mi (1 km) of his study area. When pygmy rabbits not previously observed appeared, he concluded these individuals must have traveled a "considerable distance." More recently, Estes-Zumpf and Rachlow (2009, p. 367) radio-tagged juvenile pygmy rabbits in Idaho and found median dispersal movements of 0.93 mi (1.5 km) and 3.9 mi (6.2 km) and maximum dispersal movements of 4.0 mi (6.5 km) and 7.4 mi (11.9 km) by male and female rabbits, respectively. Burak (2006, p. 27) indicated the maximum distance a male pygmy rabbit moved was 1,662.5 yd (1,521 m) and 1,112.7 yd (1,018 m) for a female. Crawford (2008, p. 54) in Nevada and Oregon reported that 24 radio-marked rabbits moved greater than 0.3 mi (0.5 km) with a maximum long-distance movement of 5.3 mi (8.5 km) recorded by a juvenile female. Twenty-one of the individuals that traveled greater than 0.3 mi (0.5 km) were juveniles.

Pygmy rabbits may begin breeding the year following their birth (Wilde 1978, pp. 64-66, 127; Fisher 1979, p. 13). In some parts of the species' range, females may have up to three litters per year and average six young per litter (Davis 1939, p. 365; Hall 1946, p. 618; Janson 1946, pp. 67-69; Green 1978, pp. 35-36; Wilde 1978, p. 69). Breeding appears to be highly synchronous in a given area and juveniles are often identifiable to cohorts (Wilde 1978, pp. 69-70). Prior to publication of a study in 2005, no evidence of nests, nesting material, or lactating females with young had been found in burrows (Bailey 1936, p. 111; Janson 1940, p. 23; Janson 1946, p. 69; Bradfield 1974, p. 29; Gahr 1993, p. 82 Rauscher 1997, p. 11). Recent studies have found that natal burrows are constructed by pygmy rabbits. Rachlow *et al.* (2005, pp. 137-138) provide information on seven natal burrows found in Lemhi Valley, Idaho. Females were observed digging and subsequently back-filling burrows with soil. Fine grasses, shredded sagebrush bark, and hair were the primary components used in the nesting material. Larrucea (2007, pp. 89-90) found three natal burrows in Reese River Valley, Nevada, but did not describe them. Burak (2006, p. 29) found female pygmy rabbits construct natal burrows outside of their original home range core area. Three of the four natal burrows he found were located outside of the core area; the fourth female stayed within a second core area that included the natal burrow and when the burrow became inactive, she returned to her original core area (Burak 2006, p. 29). Individual juveniles have been found under clumps of sagebrush, although it is not known if they are

routinely hidden at the bases of scattered shrubs or within burrows (Wilde 1978, p. 115).

A wide range of pygmy rabbit population densities has been reported. Janson (1946, p. 84) reported estimated pygmy rabbit densities of 0.75 to 1.75 per ac (1.9 to 4.3 per ha) and 3.5 pygmy rabbits per ac (8.6 per ha) in Utah. Flinders *et al.* (2005, p. 16) reported 0.3 rabbits per ac (0.79 rabbits per ha) in Grass Valley, Utah. Green (1978, p. 62) reported an estimate of 18.2 pygmy rabbits per ac (45 per ha) in Idaho. In Montana, Rauscher (1997, p. 10) estimated pygmy rabbit density as 0.67 rabbits per burrow or 1.2 per ac (3.0 per ha). Based on fecal dropping counts, Larsen *et al.* (2006, pp. 26-27) estimated rabbit density in Deep Creek watershed, Utah, as 0.07 per ac (0.17 rabbits per ha). Using line transects in Wyoming, Purcell (2006, pp. 100, 105) reported a range of burrow systems per mi (km) for systematic transects (1.7 to 18.2 per mi, 2.7 to 29.3 per km) and random transects (0.8 to 7.4 per mi, 1.33 to 11.97 per km) in 10 study areas. Larrucea (2007, p. 89) estimated, using transect counts, that the relative density at five study areas in California and Nevada ranged from 0.4 to 1.7 rabbits per ac (0.9 to 4.2 rabbits per ha).

The annual mortality rate of adult pygmy rabbits may be as high as 88 percent, and more than 50 percent of juveniles can die within roughly 5 weeks of their emergence (Wilde 1978, pp. 139-140). Estes-Zumpf and Rachlow (2009, p. 367) found mortality rates were 69.2 percent and 88.5 percent for male and female juvenile pygmy rabbits, respectively, in their study area in east-central Idaho. The mortality rate was highest within two months of emerging from the natal burrow. However, the mortality rates of adult and juvenile pygmy rabbits can vary considerably between years, and even between juvenile cohorts within years (Wilde 1978, pp. 85-95, 138-140). Predation is the main cause of pygmy rabbit mortality (Green 1979, p. 25). Sanchez (2007, pp. 90-91) attributed 42 percent of natural mortalities to mammalian and avian predation. She was unable to determine the cause of death in 58 percent of the mortalities.

Predators of the pygmy rabbit include badgers, long-tailed weasels (*Mustela frenata*), coyotes (*Canis latrans*), bobcats (*Felis rufus*), great horned owls (*Bubo virginianus*), long-eared owls (*Asio otus*), ferruginous hawks (*Buteo regalis*), northern harriers (*Circus cyaneus*), and common ravens (*Corvus corax*) (Borell and Ellis 1934, p. 42; Janson 1946, pp. 89-90; Gashwiler *et al.* 1960, p. 227; Green 1978, p. 37; Wilde 1978, pp. 96, 141-143; Johnson and Hanson 1979, p. 952; WDFW 1995, p. 6).

Sanchez (2007, p. 92) estimated that for known-aged rabbits, the average lifespan was 1.16 years. For rabbits captured as adults, assuming a birth date of May 1 of the previous year, estimated average life expectancy was 1.7 years, and the maximum lifespan achieved was 3.3 years.

Population cycles are not known in pygmy rabbits, although local, relatively rapid population declines have been noted in some States (Janson 1946, p. 84; Bradfield 1974, p. 39; Weiss and Verts 1984, p. 569). Janson (2003, p. 71) remarked that pygmy rabbits likely undergo local, if not regional, fluctuations. After initial declines, pygmy rabbit populations may not have the same capacity for rapid increases in numbers in response to favorable environmental conditions as compared to other rabbit species. This may be due to their close association with specific components of sagebrush ecosystems, and the relatively limited availability of their preferred habitats (Wilde 1978, p. 145; Green and Flinders 1980b, p. 141; WDFW 1995, p. 13). No study has documented rapid increases in pygmy rabbit numbers in response to environmental conditions (Gabler 1997, p. 95). Long-term population monitoring studies are not available indicating whether population fluctuations or cycles occur for pygmy rabbits or if seasonal or other habitat shifts or movements have been misinterpreted as declines.

Literature indicates that pygmy rabbits have never been evenly distributed across their range (Bailey 1936, p. 111; Janson 1940 p. 5; Holt 1975, pp. 133-134). While the species occurs throughout most of the Great Basin, they exhibit extremely specialized habitat requirements, and thus occupy only a small subset of locations within this range (Larrucea 2007, p. 2). They are found in areas within their broader distribution where sagebrush cover is sufficiently tall and dense, and where soils are sufficiently deep and loose to allow burrowing (Bailey 1936, p. 111; Green and Flinders 1980a, p. 2; Campbell *et al.* 1982, p. 100; Weiss and Verts 1984, p. 563; WDFW 1995, p. 15). Sagebrush- dominated communities are naturally subject to disturbances of various kinds resulting in a heterogeneous distribution of different stand sizes and age classes, and on the landscape scale, pygmy rabbit distribution is naturally disjunct (Himes and Drohan 2007, p. 380). Local distribution of this habitat and thus pygmy rabbit populations likely shift over time due to natural and human disturbances including fire, agriculture production, flooding, grazing, and weather patterns (Keinath and McGee 2004, p. 5). In the past, dense vegetation along permanent and intermittent stream corridors, alluvial fans, and sagebrush plains probably provided travel corridors and dispersal habitat for pygmy rabbits between suitable use areas (Green and Flinders 1980a, p. 1; Weiss and Verts 1984, p. 570; WDFW 1995, p. 15). Since European settlement of the western United States, dense vegetation associated with human activities (fence rows, roadway shoulders, borrow ditches, crop margins, abandoned fields) may have also acted as avenues of dispersal between local populations of pygmy rabbits (Green and Flinders 1980a, p. 1; Rauscher 1997, p. 16).

Distribution, Abundance, and Trends

The pygmy rabbit's general historical and current geographic range, excluding the Columbia Basin DPS, includes most of the Great Basin and some of the adjacent intermountain areas of the western United States (Green and Flinders 1980a, p. 1), and the boundaries can be described as follows: the northern boundary extends into southeastern Oregon and southern Idaho. The eastern boundary extends into southwestern Montana and south central Wyoming. The southeastern boundary extends into southwestern Utah. Central Nevada and eastern California provide the southern and western boundaries (Merriam 1891, p. 75; Nelson 1909, p. 275; Grinnell *et al.* 1930, pp. 553, 558; Bailey 1936, pp. 110-111; Janson 1946, pp. 32-33; Campbell *et al.* 1982, p. 100; WDFW 1995, pp. 1-2, Purcell 2006, pp. 1, 7-11, 30). Based on available information, the current distribution of the pygmy rabbit indicates a possible range contraction in northern California (Larrucea and Brussard 2008a, p. 696). Because uncertainty remains about whether this possible range contraction has occurred due to limited survey efforts in northern California both historically and recently, it is not shown in Figure 1. Figure 1 illustrates the approximate historical and current range of the pygmy rabbit in the seven States discussed in this finding.

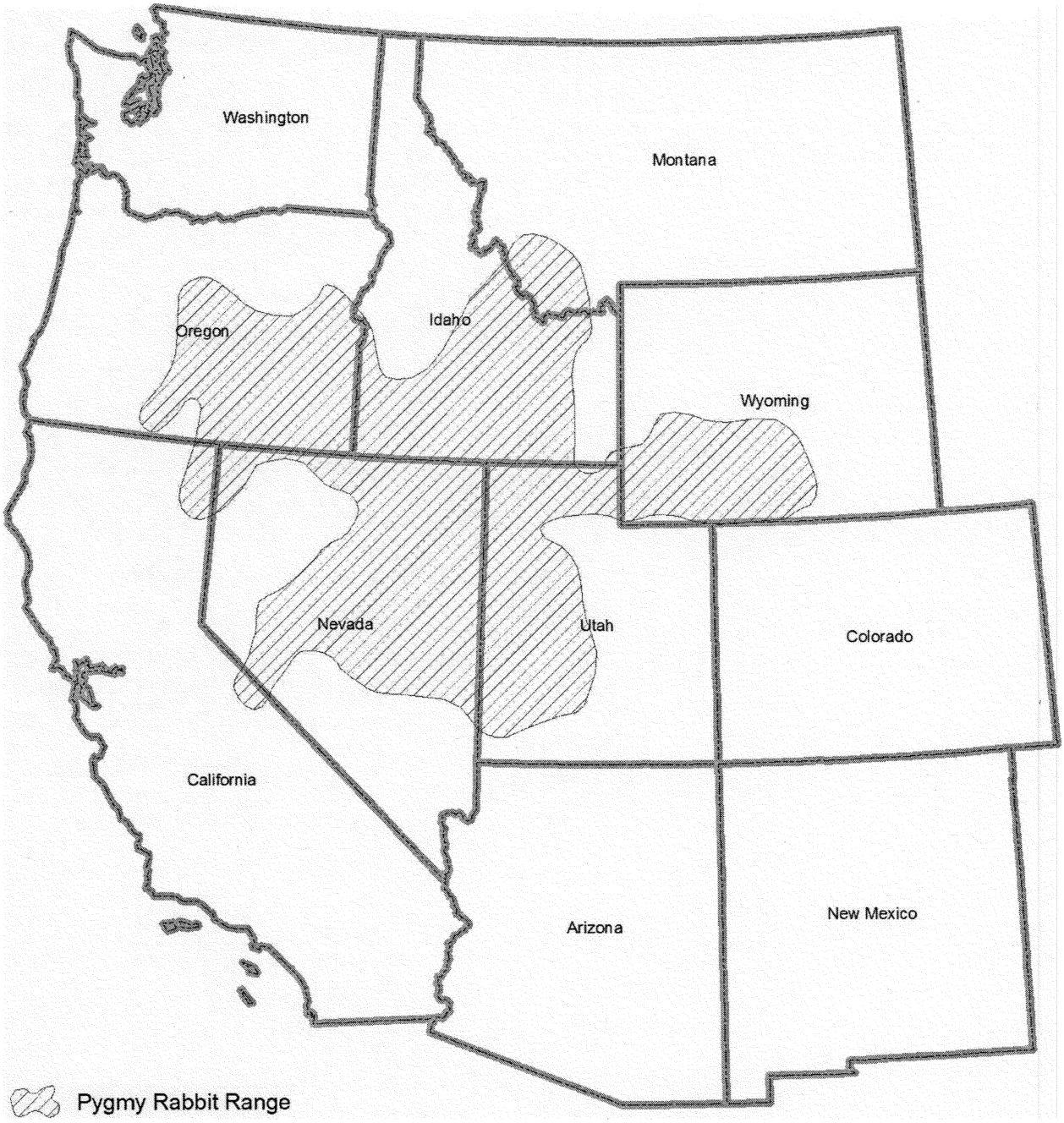

Figure 1. Approximate historical and current range (based on data from 1877 to 2008) of the pygmy rabbit (*Brachylagus idahoensis*) not including the Columbia Basin DPS in Washington State.

To determine the historical and current distribution and trend analysis for pygmy rabbits across the seven States discussed in this finding, we reviewed published scientific peer-reviewed literature; unpublished agency documents; dissertations; theses; databases maintained by State heritage programs, State wildlife agencies, and Federal agencies; survey data sheets; museum records; electronic mail records; and agency notes to the files. Older published literature (prior to the mid to late 1990's) generally focused on the species' life history, behavior, and some habitat relationships and provided location information of study areas. More recent unpublished literature (since the mid to late 1990's to 2008) has been primarily related to surveys conducted by government agencies or their consultants and universities to determine pygmy rabbit occurrence within portions of a State and some information regarding species' life history, behavior, and habitat relationships. Survey efforts have focused on location of pygmy rabbit signs rather than on documenting known or perceived threats to the species at these sites. Rarely has revisiting of sites occurred with the purpose of monitoring populations over time. While we consider this information of limited use to our finding due to its local, short-term nature, it is the best scientific information available to conduct our analysis.

We compiled a database of records (location points) of various pygmy rabbit signs for each State from these various data sources listed above. Some records were not entered into a State database if adequate information was

not provided (e.g., we could not determine a location point because the source map did not indicate location or survey data sheet location point information was unreadable). Once each State database was compiled, we reviewed each location point and eliminated its database record if it was not determined to be a reliable data point as discussed below. The final databases combined contain approximately 68 percent of all the location points compiled. We consider the location point data retained in these seven State databases to be the best scientific information available. We will refer to these created State databases as the Service's databases.

We are aware of concerns related to the use of anecdotal occurrence records to determine distribution of species (McKelvey *et al.* 2008, pp. 549-554). We are also aware of confidence levels related specifically to pygmy rabbit presence and level of activity at particular sites due to various factors (e.g., sighting of targeted species vs. only targeted species sign or potential targeted species sign observed; if burrow activity is uncertain, the site should be revisited; uncertainties due to other species or other rabbit species using burrows; pellets being misidentified) (Bartels 2003, pp. 47-49; Keinath and McGee 2004, pp. 32-34).

As a result of these concerns, we have based our analysis on what we considered to be the more reliable records indicating pygmy rabbit presence and activity level. The following types of records were not included in the Service's databases for our analysis: database records that showed some level of uncertainty for the information being provided (e.g., other leporid species data included; uncertainty about whether pygmy rabbit was observed or other leporid species; using words such as "possible", "potential", "maybe", "unsure"); records that only provided location data or indicated pygmy rabbit sign with no additional information indicating what type of sign (e.g., burrow, pellet, track, sighting of animal as relates to reliability) had been observed; records related to telemetry locations (while informative in determining an individual's distribution within its home range, this provides little information at the larger landscape scale used here; we did include the capture location of any individual pygmy rabbit trapped and fitted with a tradio collar); records based solely on pellets or tracks due to concerns with species misidentification; those lacking key information (e.g., year which is needed for trend analysis) and duplicate records.

For our analysis, we mapped records of "active" sites or burrows defined as those database records that indicated an activity level (at the time of the survey) of current, present, occupied, active, or recently active burrows; burrows in combination with fresh pellets; a visual sighting; photographic evidence; fecal DNA confirmation; specimen collected; trapping effort; in combination with tracks; or any combination thereof. All sighting records were included in our analysis even if no other information was provided, unless uncertainty was expressed about whether it had been a pygmy rabbit observed or another leporid species.

We also mapped records of "inactive" sites or burrows defined as those database records that indicated an activity level (at the time of the survey) of inactive, not recent, old, very old, collapsed, or burrow plus old pellets. In addition, we assumed "inactive" for site or burrow records that did not provide a status and did not provide information to support a determination of active, those with an "undetermined" activity status, or were unclear. We reviewed the mapped distribution for the "active" and "inactive" site categories across each State.

In addition, we mapped database records of "absent" areas defined as points where no sign of pygmy rabbit occupancy was evident. Most databases do not include records of areas surveyed but where no pygmy rabbit sign was observed. We believe this type of information can be valuable; however, we do not assume that pygmy rabbits were or should have been present in areas where they were determined to be absent. It is possible that an area is unsuitable for pygmy rabbits while appearing suitable to surveyors. Conversely, it is possible an area that appears unsuitable to surveyors for pygmy rabbits may actually be so (Ulmschneider *et al.* 2004, pp. 2-3). On the ground surveying is necessary to positively indicate pygmy rabbit occupancy (Bartels 2003, pp. 92-94; Lenard *et al.* 2005, p. 1; Meisel 2006, pp. 26, 48). The "absent" information indicates locations where survey efforts were conducted but pygmy rabbit sign was not evident. Limited "absent" information was obtained for the States of Oregon, California, Nevada, and Wyoming.

During our analysis we encountered some difficulties in adapting data collected for another's purpose for our species' status review, and there were several limitations. Overall, survey information collected over the years reflects different surveyors, different survey methods, different levels of survey intensity, and different amounts and types of information recorded. We generally accepted the information indicated in a report, data sheet, or database and tried to do as little interpretation as possible. For some locations, we replaced locational descriptions (Township, Range and Section or a narrative description) with Universal Transverse Mercator (UTM) coordinates or a center point for a section surveyed or a point was buffered to indicate an approximate location. For a portion of records from Oregon, we created a point representing the center of a study area and "active" and "inactive" burrows were separated.

We encountered some difficulties with interpreting data provided under different reporting techniques. In general, most surveys for pygmy rabbits report location information in terms of point data (i.e., legal description or Global Positioning System (GPS)) with qualifiers or descriptions for sign, such as burrows (present, absent), activity level (occupied, unoccupied, active, inactive, current, recent, old, very old), pellets (fresh, old), sightings (actual sightings of pygmy rabbits, specimen collection, capture, photographic record), and tracks. Some surveyors developed their own rating system or confidence level for burrow or site activity (Purcell 2006, p. 38; Himes and Drohan 2007, p. 375; Flinders *et al.* 2005, pp. 8-9). Some efforts reported only those sites that were considered positive (confirmed with photographic evidence), active, or occupied sites and did not include information for areas considered inactive or unoccupied. Location data may represent a burrow, a burrow system, or an entire site that was surveyed which represents one or more burrows or burrow systems.

Various techniques have been used to detect pygmy rabbit evidence on the landscape. Techniques may include driving and walking transects in perceived suitable habitat, winter aerial flights over potential habitat with subsequent selection of areas for further ground surveys (Rachlow and Witham 2006, pp. 4-8), random searches in perceived suitable habitat, or spot lighting at night. Survey efforts have been made during all times of the year. It is advised that sites that indicate pygmy rabbit sign should be confirmed through sightings or photographic evidence; this may or may not have occurred. The Service has recommended using draft survey guidelines developed by Ulmschneider *et al.* (2004, entire) in conducting

pygmy rabbit surveys, but it has not always been used since its availability.

Larrucea (2007, p. 3) tested pellet, sighting, burrow, and camera survey methods at 20 locations in 4 known, active pygmy rabbit populations in California and Nevada. She also assessed road transect surveys for detecting and determining relative abundance in an area (Larrucea 2007, p. 3). Results indicated that pellets were found at all sites, but pellets determined to be fresh were found at only 70 percent of the sites. Sighting individual rabbits provided positive results 30 percent of the time. Burrows were located at 85 percent of the sites, but burrows determined to be active were found at only 55 percent of the sites. Cameras provided positive results 95 percent of the time (Larrucea 2007, p. 6). Photographs were taken of pygmy rabbits at all types of active sites including those with only burrows determined to be inactive and with pellets determined to be old (Larrucea 2007, p. 7). During the 10 transect counts, different rabbit and hare species were observed 569 times and 545 were identified to genus (Larrucea 2007, p. 7). *Lepus* was observed 491 times (90.1 percent); *Sylvilagus* 44 times (8.1 percent) and *Brachylagus* 10 times (1.8 percent) (Larrucea 2007, p. 7). Photographs taken from the camera locations provided 409 photos of rabbit and hare species; the number of photographs of *Lepus* was 199 (48.7 percent), *Brachylagus* 195 (47.7 percent), and *Sylvilagus* 15 (3.7 percent) (Larrucea 2007, p. 7).

Camera surveys are more effective than burrow, pellet, sightings, or road transect surveys for determining current pygmy rabbit activity at a site (Larrucea 2007, p. 7). Burrows are a good indicator that pygmy rabbits may be present, but locating one does not mean pygmy rabbits are currently using the site (Larrucea 2007, p. 8). Lack of active burrows may not mean that there are no pygmy rabbits in the area. Burrows may be used seasonally, may be difficult to locate, or may be lacking in dispersal areas (Larrucea 2007, pp. 8-9). Old pellets do not confirm current use of a site and pellets may be misidentified due to young rabbits of other species cohabiting a site. Not finding fresh pellets does not mean pygmy rabbits are not currently using a site as environmental conditions can influence how rapidly pellets dry and change color (Larrucea 2007, p. 9). Sightings of individual pygmy rabbits do confirm current activity, but observers should be experienced as the young of cottontails (*Sylvilagus* spp.) and jackrabbits (*Lepus* spp.) can be confused with pygmy rabbits. Sightings of pygmy rabbits are difficult and do not occur often due to the dense vegetation inhabited, limited home ranges, and their elusive nature (Larrucea 2007, p. 10). Road transect surveys are inefficient for pygmy rabbits due to their reluctance to cross open areas and roads (Bradfield 1975, p. 3). Pygmy rabbits are more likely to run a short distance, sit tight, or disappear into a burrow than to run for a long distance making detection more difficult (Larrucea 2007, p. 10).

We are also aware of difficulties in interpreting site activity during surveys. For example, in Montana, Lenard *et al.* (2005, p. 9) commented that comparisons of active to inactive burrows may be complicated, stating that burrows exhibiting current rabbit activity were easier to locate because tracks in the snow made them very apparent. The relative difference in abundance between currently active and recently active should not be interpreted to indicate any level of past versus current activity. Flinders *et al.* (2005, p. 33), in Utah, commented that single burrow systems are harder to detect than multiple entrance burrow systems. The Bureau of Land Management (BLM) (2007a, p. 1) used the Ulmschneider *et al.* (2004, entire) method and noted that this type of inventory covered large expanses and typically found the larger pygmy rabbit populations and a small subset of the actual burrow systems on a particular site. However, when sites were re-inventoried intensively, BLM found numerous additional burrow systems. Lee *et al.* (2008, pp. 4-5), in Utah, commented that using criteria from Rachlow and Witham (2004b, pp. 6-7) or Ulmschneider *et al.* (2004, entire) is somewhat inaccurate in predicting current pygmy rabbit burrow utilization. Lee *et al.* (2008, p. 5) used remote cameras to verify the presence or absence of pygmy rabbits in comparison to burrow classification. By using both burrow classifications methods along with remote cameras, refinement of burrow classifications and census techniques may be possible in the future.

Bartels (undated) compared active and passive survey methods for detecting pygmy rabbit burrow occupancy at what she considered isolated and low density sites. She compared the use of an active survey method (peeper probe) and a passive survey method (surface classification of burrows using sign (burrows, pellets) to determine occupancy by pygmy rabbits (Bartels undated, pp. 3-4). A total of 233 burrows were compared on 27 sites in Oregon and Idaho. Under the passive method, all 233 burrows were considered occupied (Bartels undated, p. 5). Under the active survey method, 122 (52.4 percent) of the burrows were classified as occupied and as recently occupied, and 111 (47.6 percent) were classified as unoccupied (Bartels undated, p. 5). Bartels (undated, p. 7) recommended use of an active survey method in areas where pygmy rabbit numbers appear to be low and isolated sites are found. Viewing the internal attributes of burrows and establishing a standard for occupancy increases survey accuracy and could lead to greater accuracy when monitoring pygmy rabbit occupancy over time.

We must also take into consideration complicating factors when interpreting current distribution and/or status as we do not have a complete understanding of pygmy rabbit habitat use. For example, it appears that some habitat use may be seasonal and pygmy rabbits may be somewhat migratory as some burrow systems appear occupied during certain times of the year and inactive during others, or from year to year (Flinders *et al.* 2005 p. 35; Bockting 2007 p. 2; Larrucea 2007, pp. 96-97). Flinders *et al.* (2005 p. 35) reported that areas where pygmy rabbits were relatively abundant in Utah suddenly became sparse after the juveniles dispersed. Other areas then appeared to indicate an increase in the numbers of pygmy rabbits. In Utah, Flinders *et al.* (2005, p. 32) found active burrows were more common than the other activity classifications (i.e., recent, old, very old), and thus support statements that pygmy rabbits use more than one burrow system. He thought inactive burrows likely play an important role in providing escape cover. Cameras placed on burrows classified as old or very old documented use by pygmy rabbits. Larrucea (2007, p. 7) also photographed pygmy rabbits at sites where burrows were determined to be inactive.

After reviewing the available information, we consider our approach in using information to determine the status of the pygmy rabbit to be conservative. We have used these data to compare historical (1999 and earlier) to current (2000 and later) distribution patterns. We have used the data to compare activity levels (active; inactive) of sites or burrows during these two time periods. Questions have been raised regarding surveyors' abilities to accurately determine activity level due to possible detection differences, absence of long-term site monitoring, and our incomplete understanding of the pygmy rabbit's life history requirements (e.g., possible seasonal use of some areas or periods of burrow non-use). We are also aware that some

survey techniques provide better data than others. Though these data are limited in their usefulness for our purposes due to their local, short-term nature, they are understood, by the Service to be the best available information. This data does provide baseline information that could be the foundation for future survey and monitoring efforts.

Models

To facilitate pygmy rabbit surveys in recent years, models of potential habitat have been developed for some States or study areas. Eliminating areas in these models that are unsuitable can be important as it can concentrate efforts and resources in areas that are more likely to support pygmy rabbits (Gabler *et al.* 2000, p. 763). Large areas that seem to be appropriate pygmy rabbit habitat may not be suitable based on the specific habitat characteristics needed for pygmy rabbits (Gabler *et al.* 2000, p. 763). To aid pygmy rabbit research in Oregon, modeling efforts have been conducted by the following researchers: Bartels (2003, p. 35) for the BLM Burns District using GIS; Meisel (2006, p. 4) for the Hart Mountain National Antelope Refuge; and Hager and Lienkaemper (2007, pp. 1-2) for large blocks of State land.

In Idaho, modeling efforts have been conducted by Rachlow and Svancara (2006, p. 828); Bartels (2003, pp. 35-38), and Gabler *et al.* (2000, pp. 762-763; 2001 entirety). In Montana, Lenard *et al.* (2005, p. 1) reported on the development of four predictive models in Montana. In Wyoming, Purcell (2006, p. 28) used a probabilistic distribution map developed by Keinath and Thurston (2005, cited in Purcell 2006, p. 28) using the combination of two models, DOMAIN (environmental similarity method) and CART (classification and regression tree analysis). Based on data collected during Purcell's study, a new predictive distribution model was created (Purcell 2006, p. 31).

In Nevada, a predictive equation was produced based on habitat data collected and used as a model to characterize habitat where pygmy rabbits or sign occurred. The model explained the occurrence of pygmy rabbits or their sign on 56.7 percent of transects (Himes and Drohan 2007, p. 376). Larrucea and Brussard (2008a, p. 693) used GIS coverages. In Utah, Lee *et al.* (2008, p. 3) used vegetation data from the 2004 Southwestern Regional Gap Analysis Project. In general, these models are helpful in focusing survey efforts over a large area; however, researchers also recognize that due to scale and available data for particular attributes such as soils and vegetation, only on the ground surveying can positively indicate pygmy rabbit presence (Bartels 2003, pp. 92-94; Meisel 2006, pp. 26, 48; Lenard *et al.* 2005, p. 1).

We believe our large-scale, rangewide analysis, based on the Service's databases, represents the best scientific and commercial information available on the distribution of pygmy rabbits. As mentioned above, many individual records were considered but not included in the Service's databases for the following reasons: database records showing some level of uncertainty for the information being provided (e.g., other leporid species data included; uncertainty about whether pygmy rabbit was observed or other leporid species; using words such as "possible", "potential", "maybe", "unsure"); records that only provided location data or indicated pygmy rabbit sign with no additional information indicating what type of sign (e.g., burrow, pellet, track, sighting of animal as relates to reliability) had been observed; records related to telemetry locations (while informative in determining an individual's distribution within its home range, this provides little information at the larger landscape scale used here; we did include the capture location of any individual pygmy rabbit trapped and fitted with a radio collar); records based solely on pellets or tracks due to concerns with species misidentification; those lacking key information (e.g., year which is needed for trend analysis); and duplicate records.

Eliminating records with these types of concerns provides for a more accurate representation of pygmy rabbit range-wide distribution rather than including all records without considering some level of reliability of the data. While pygmy rabbits likely occur in additional unsurveyed areas and even in some areas that have been surveyed (pygmy rabbit sign can be easily overlooked), we have made our finding based on our review of these databases, which represent the best scientific and commercial information available.

Distribution by State

The following distribution and trend discussion is based on information obtained from published and unpublished literature and an interpretation of the survey location point data compiled in the Service's databases. The following review does not discuss every document from the various information sources due to the volume, but a selection of literature that provides substantive historical information and survey information on a large scale. The literature is generally, but not entirely, associated with records included in the Service's databases. This is because not all reports provided specific location points and not all location points are associated with a report, and as stated earlier, some records are not included in the Service's databases. This analysis compares our understanding of the historical and current ranges of the pygmy rabbit discussed in this finding.

Oregon

The earliest pygmy rabbit records for the State of Oregon include: two specimens collected in Callow Valley, Harney County, Oregon (Nelson 1909, p. 278); specimens collected near Ironsides, Malheur County, Oregon in 1911-1912 (Anthony 1913, pp. 20-21); and 10 specimens collected near Baker, Baker County, Oregon (Dice 1926, p. 27).

Bailey (1936, pp. 110-111) indicated that pygmy rabbits in Oregon extended from the southern foothills of the Blue Mountain Plateau and eastern base of the Cascade Range over the southeastern quarter of the State. He reported that they were absent from areas of open country where sagebrush and rabbit brush were not abundant. As a result, there are numerous wide gaps in their range.

Brodie and Maser (1966, pp. 11-12) reported the contents from owl pellets collected in 1966 at Lower Bridge, Deschutes County, Oregon. Prey animals consisted of pygmy rabbits. This location was reported as a new location for the pygmy rabbit as the nearest previously documented location was Redmond, Oregon (Hall and Kelson 1959, cited in Brodie and Maser 1966, p. 12) about 10 miles (16.1 km) east of Lower Bridge.

Olterman and Verts (1972, p. 25) listed 37 museum records for Oregon which occurred in general near the following areas: Baker, Baker County; Paulina, Crook County; Redmond, Deschutes County; Beakley, Beaties Butte, Burns, Rock Creek Ranch, Crane, Drewsey, Narrows, Sageview, Mud Lake, Steens Mountain, Voltage, and Waverly, Harney County; Fremont and Klamath Falls, Klamath County; Adel, Ft. Rock, Guano Creek, Guano Valley, Rabbit Creek, andSilver Lake, Lake County; and Cold Springs, Cow Creek Lake, Ironside, Mahogany Mountains, Malheur, McDermitt, Riverside, and Rome, Malheur County. At the time of their writing, Olterman and Verts (1972, p. 25) indicated recent observations by biologists demonstrated that pygmy

rabbits were occurring over the same area as in the past. Pygmy rabbits were observed near Hines, Wagontire, Lakeview, Hart Mountain National Antelope Refuge, Hampton, Ft. Rock, and Lower Bridges.

Bradfield (1974, p. 39) also spent time at Ironside, in Malheur County, Oregon. He found evidence of previous pygmy rabbit use, but no fresh sign of use or rabbits, which supported his belief that they were in decline on a larger geographic scale.

Weiss and Verts (1984, p. 563) attempted to search for pygmy rabbits in Oregon based on museum record information for sites listed in Olterman and Verts (1972, p. 25). Because of the generality of the location descriptions provided, they also reviewed aerial photography and soil maps to assist in narrowing searches in the areas described where pygmy rabbits had been collected previously (Weiss and Verts 1984, p. 564). Evidence of pygmy rabbits was found at 51 of 211 areas searched in 1982 (Weiss and Verts 1984, p. 566). In 1983, only 5 of the 15 sites that had been sampled for soil and vegetation information in 1982 showed recent pygmy rabbit activity (Weiss and Verts 1984, p. 566). Of 51 burrows found at 5 of the sites occupied in 1982, 19 burrows were found open in 1983 and 8 had fresh pellets (Weiss and Verts 1984, p. 568). Only the locations of the 15 occupied sites in Grant and Lake Counties where Weiss and Verts (1984, p. 566) recorded vegetation and soil data are provided in their document.

Since 2000, additional survey efforts have been conducted. Bartels (2003, p. 70) visited 54 previously known pygmy rabbit sites located on BLM lands in 2000 and 2001 in Harney, Malheur, Lake, and Deschutes Counties, Oregon. Results from these visits showed 12 sites were occupied, 8 were of undetermined occupancy, and 34 showed no occupancy. Three additional sites were surveyed off of BLM lands. One site was occupied, one showed no evidence of pygmy rabbit use, and one was considered undetermined and warranted further investigation (Bartels (2003, p. 86). Some of these sites included those visited by Weiss and Verts (1984, p. 564) (Bartels 2003, p. 91).

BLM conducted surveys on their Lakeview and Vale Districts in Harney and Lake Counties, Oregon in 2002 and 2003 (BLM 2003a, p. 1). Forty-five sites were surveyed in fall of 2002 and winter 2003 on the Lakeview District with 19 sites indicating pygmy rabbit activity (10 active, 9 inactive). Twenty sites were surveyed in fall of 2002 and winter 2003 on the Vale District with two sites indicating pygmy rabbit activity (1 active, 1 inactive). The remaining sites surveyed (44) on the two districts in fall of 2002 and winter 2003 showed no evidence of pygmy rabbit use (BLM 2003a, p. 1). During the summer of 2003, 23 additional sites were surveyed and 19 showed pygmy rabbit activity (11 active, 8 inactive); 4 sites showed no evidence of pygmy rabbit use (BLM 2003a, no page number provided). BLM continued to conduct surveys on their Burns and Lakeview Districts in Harney and Lake Counties, Oregon, respectively, in 2005 and 2006 (BLM 2006a, pp. 3-4); active pygmy rabbit use was found at four of the seven sites surveyed. In 2006 and 2007, BLM surveyed 12 additional sites on the Lakeview District, and active pygmy rabbit use was found at 8 sites (BLM 2007b, p. 1). Various numbers of burrow systems were found at the different sites (BLM 2003a, p. 3; BLM 2006a, pp. 3-4; BLM 2007b, pp. 3-6).

Meisel (2006, p. 4), improved the known distribution of pygmy rabbits at Hart Mountain National Antelope Refuge, Lake County, during 2004 and 2005. The sagebrush habitat on the refuge has been protected from development and other human disturbances for at least 70 years (Meisel 2006, p. 9). Remote infrared 35-mm cameras were used to confirm occupancy by pygmy rabbits (Meisel 2006, p. 12). Habitat characteristics were measured at 45 occupied burrows (Meisel 2006, p. 18). In 2005, refuge staff found approximately 99 occupied burrows near burrow locations that were found in 2004 by Meisel (R. Huddleston-Lorton, cited in Meisel 2006, p. 27). Location information on these 99 burrows was not included in Meisel (2006). It is possible that a large population inhabits the northeast portion of the refuge (Meisel 2006, p. 27). Meisel (2006, p. 27) recommends future research be conducted in areas of Wyoming big sagebrush to locate all burrows and document the population status on the refuge which is currently unknown.

Hager and Lienkaemper (2007, p. 1) conducted surveys to determine the presence or absence of pygmy rabbits on State lands in Malheur, Harney, Lake, and Deschutes Counties. One hundred and fifty-seven sites were ground surveyed during 2004 and 2005 (Hager and Lienkaemper 2007, p. 3). Of the 157 sites, 18 were determined to be active, 14 inactive, and 125 showed no evidence of pygmy rabbit presence (Hager and Lienkaemper 2007, pp. 4-5).

Most historical records (1999 and earlier) for Oregon occur in the following counties: Malheur, Harney, and Lake. A few historical records also occur in Baker, Grant, Crook, Deschutes, and Klamath Counties. There is also a 1992 database sighting record for Jefferson County. Current information (2000 and later) indicates Malheur, Harney, and Lake as well as Klamath and Deschutes Counties continue to support pygmy rabbit activity. We are unaware of information indicating any recent survey efforts have been conducted to determine pygmy rabbit activity for Baker, Grant, or Jefferson Counties. Baker County indicated some activity in 1926. Grant County indicated inactivity during 1982 and 1983. Jefferson County had some activity in 1992. The southeastern portion of Crook County was searched during 2005 by BLM, but pygmy rabbit evidence was not found. In general, pygmy rabbit activity continues to occur in southeastern Oregon in a similar distributional pattern as compared with historical information.

Idaho

Merriam (1891) was the first to describe the "Idaho pygmy rabbit (*Lepus idahoensis*)" based on a specimen collected on September 16, 1890, along the upper part of the Pahsimeroi River by Basil Dutcher (Merriam 1891, pp. 7, 13, 75-78). Merriam (1891, p 75) indicated that the general distribution for the pygmy rabbit was the "Sage Plains" along the Snake River, and in Birch Creek and Lemhi Valleys, Little Lost River Valley, Pahsimeroi Valley and Big Lost River Valley, Idaho and into northern Nevada to the south, and to the west "probably" into eastern Oregon and Washington.

Other early records include: six specimens collected from Big Lost River Valley, Birch Creek, Junction, Lost River Mountain, and Pahsimeroi Valley, Idaho (Nelson 1909, p. 278); and a report of two pygmy rabbits collected from 1 mi (1.6 km) west of Schutt's Mine in November 1930 (Whitlow and Hall 1933, p. 269). In May 1931, a female was collected near Trail Creek (Whitlow and Hall 1933, p. 270). These records extended the known range by 75 mi (120.7 km) to the southeast (Whitlow and Hall 1933, p. 270). Observations of pygmy rabbits in Idaho occurred near the head of the Pahsimeroi River, Idavada, Pahsimeroi Valley, Riddle, and Pocatello (Davis 1939, p. 364). Davis lists locations of 10 specimens examined: Owyhee County, near Riddle, 2; Cassia County, Elba, 1; Butte County, Craters of the Moon National Monument, 1; Power County, near Michaud, 3; Bannock County, near Schutt's Mine, 2; Trail Creek near Pocatello, 1. Additional records mentioned included Nelson's (1909)

records of Lemhi County, Junction; Custer County, Pahsimeroi Valley. Additional locations included Minidoka County, Minidoka (Seton 1929, cited in Davis 1939, p. 366); Cassia County, Burley (Grinnell *et al.* 1930, cited in Davis 1939, p. 366); Clark County, Birch Creek; Butte County, Big Lost River Valley; Lost River Mountains (Lyon 1904, cited in Davis 1939, p. 366). Lyon (1904, cited in Davis 1939, p. 366) also includes a record from Ione Valley. Davis (1939, p. 366) was unable to find Ione Valley in Idaho and thought the specimen may have been from Nevada.

Bradfield (1974, p. 39) speculated that the pygmy rabbit population was declining in his study area in Bingham County, Idaho. This was based on the number of abandoned burrows, number of skulls indicating death by predation or other means, and fewer observed rabbits.

In her Idaho study area in portions of Idaho National Engineering and Environmental Laboratory (Laboratory) in Butte and Jefferson Counties, Gabler (1997, p. 42) found 101 burrow sites, of which 26 were active. Gabler (1997, p. 94) also revisited Wilde's (1978) three study areas on Laboratory lands, and found two collapsed burrows with no sign of occupancy; four active burrows which were abandoned 10 months later; and 34 abandoned burrows, respectively.

Several surveys were conducted by Roberts between 1997 and 2004. In 1997 and 1998, Roberts (2001, pp. 4-6) conducted surveys on BLM lands administered by the Salmon and Challis Field Offices (FO) in Lemhi and Custer Counties. The 3 areas occurred in the upper Lemhi River and upper Birch Creek Valleys; upper Pahsimeroi River and upper Little Lost River Valleys; and the upper Warm Springs Creek and upper Big Lost River Valleys. He found that pygmy rabbits were found widely scattered in all 3 of these areas (Roberts 2001, pp. 10-11). In addition, Roberts (2001, p. 11) mentioned an occupied area in Railroad Canyon adjacent to Bannock Pass. This may be contiguous with habitat found in Horse Prairie Creek, Montana reported by Rauscher (1997, p. 13). Other areas of occupied rabbit habitat were found in Hawley Creek and in Bradshaw Basin (Roberts 2001, p. 11). During 2002, Roberts (2003a, pp. 3, 5) conducted surveys in the Snake River Plains area in southern Idaho. Surveys were conducted on BLM lands within Idaho Falls, Pocatello, Shoshone, Owyhee, Jarbidge, and Burley FO areas, on U.S. Forest Service (USFS) lands within Targhee, Caribou, Cache, Sawtooth, Salmon, and Challis National Forests, and the Curlew National Grasslands. Roberts (2003a, p. 6) found 9 currently active pygmy rabbit burrow systems. Four were found on the Owyhee FO, two on the Pocatello FO and one each in Idaho Falls and Jarbidge FO areas. One was found on the Curlew National Grasslands. Two systems were classified as recently active. One was found on the Owyhee FO area and the other on the Shoshone FO area.

During the summer of 2003, Roberts (2003b, p. 3) searched areas in Big Lost River Valley, Little Lost River Valley, Birch Creek, and Medicine Lodge Creek for pygmy rabbits. He found three currently and recently active burrow sites in Big Lost River Valley; seven currently and recently active burrows in Little Lost River Valley; seven currently active burrow sites in Birch Creek where five pygmy rabbits were observed; and one currently active burrow site at Medicine Lodge Creek area. Another active burrow site was found in upper Medicine Lodge Creek (Targhee National Forest 3 miles from Bannock Pass).

In 2004, Roberts (2004, p.2) continued to survey areas in Big Lost River Valley, Little Lost River Valley, Birch Creek, and Medicine Lodge Creek located in Butte and Clark Counties. He was unable to find pygmy rabbit evidence in the areas he searched in Big Lost River (Roberts 2004, pp. 3-4). He found 11 currently active sites in Little Lost River area. In the Birch Creek area he found 7 currently and recently used sites. He saw 6 pygmy rabbits at one of these areas. In this area, the pygmy rabbits were using cracks and crevices in and around large rocks and boulders as their burrows. In the Medicine Lodge Creek area he found 10 new burrow sites. He found 2 active burrows on the Targhee National Forest. Two additional active burrow sites were found on the U.S. Sheep Experiment Station.

White and Bartels (2002, p. 1) surveyed for pygmy rabbits on 11 grazing allotments in Twin Falls and Cassia Counties on BLM lands administered by the Burley FO. Results included 35 burrows found on 6 of the allotments (White and Bartels 2002, p. 5). Twenty-four of the burrows were revisited with a peeper probe and six burrows located on two allotments were considered occupied by pygmy rabbits (White and Bartels 2002, p. 5). In addition, White and Bartels (2002, p. 7) attempted to visit 31 historical locations for pygmy rabbits in Cassia, Minidoka, Blaine, Power, and Oneida Counties, Idaho. Eighteen sites were too vague to relocate, eight were disturbed due to various factors, and five were potentially suitable habitat (White and Bartels 2002, pp. 7-8). No active pygmy rabbit burrows were found on any of the 13 disturbed or potentially suitable sites visited.

Red Willow Research Inc. conducted several surveys between 1999 and 2004. In 1999, Red Willow Research Inc. (2000, pp. 5-6) reported on sightings of pygmy rabbits at five locations in Cassia and Oneida Counties. Red Willow Research Inc. (2002, pp. 99-100) reported that all nine study areas within the BLM Shoshone FO area showed presence of pygmy rabbit use. Recent or current signs of occupancy were found at five individual sites along transects within three of the nine study areas in 2001 and 2002. Red Willow Research Inc. (2004, p. 3) continued surveys in and adjacent to the nine study areas identified in the 2002 study. The 2004 survey resulted in one sighting and one possible sighting of a pygmy rabbit, one inactive burrow system, and identification of additional areas for future survey efforts (Red Willow Research Inc. 2004, p. 4).

North Wind, Inc. (2004, p. 2) surveyed for pygmy rabbits on BLM lands in eight areas located in the northern portions of the BLM Idaho Falls District. Five sites indicated recent or past pygmy rabbit use, including a pygmy rabbit sighting (North Wind, Inc. 2004, p. 13).

Rachlow and Witham conducted several surveys between 2003 and 2006. Rachlow and Witham (2004a, p. 2) surveyed 12 locations in Camas, Blaine, and Gooding Counties, south central Idaho that had been identified as potential habitat in 2003. Two sites were confirmed to support pygmy rabbit populations. Witham and Rachlow (2004, p. 3) surveyed three potential sites at Craters of the Moon National Monument and Preserve in 2004 and found no evidence of pygmy rabbit presence. Rachlow and Witham (2005, p. 1) conducted a pilot study to test whether pygmy rabbit sign could be detected during aerial surveys in the Camas Prairie of south central Idaho. The study area included the two previously known locations found in 2003 and confirmed in 2004 by Rachlow and Witham (2004a, pp. 2-3) (Rachlow and Witham 2005, p. 2). The aerial surveys identified 25 potential sites and 21 were ground checked (Rachlow and Witham 2005, p. 7). Seven of the 21 sites were confirmed to support pygmy rabbit populations (Rachlow and Witham 2005, p. 7). Rachlow and Witham (2006, p. 1) surveyed a portion of the Camas Prairie in south central Idaho by fixed-wing aircraft during February 2006. They identified 67 potential sites from the air and evaluated 64 of them on the ground. Presence of pygmy rabbits was

confirmed at 32 sites. Sign at the remaining sites was attributed to cottontail rabbits or other species. These new locations expanded the known distribution of pygmy rabbits in the Shoshone FO area.

BLM (2005a, p. 1) reported on surveys conducted between 2002 and 2005 on BLM lands within the Boise District (Owyhee FO). In 2002, four survey routes were walked and pygmy rabbit evidence was observed on each route (BLM 2005a, p. 2). Two sites were at or near previously known locations and two were new locations. One site was considered active. In 2003, 25 routes were walked and 12 locations found (7 active or recent, 5 inactive) (BLM 2005a, p. 2). In 2004, 14 routes were walked and 2 new populations were found (1 active or recent, 1 unrecorded activity level) (BLM 2005a, p. 2). In 2005, 242 routes were walked with 16 new populations found (9 active or recent, 7 inactive) (BLM 2005a, p. 2).

Bartels (2005, p. 2) conducted pygmy rabbit surveys in the southern portion of BLM's Jarbidge FO area during 2005. Sixteen pygmy rabbit burrows were identified with an additional 25 documented as potential pygmy rabbit burrows. Burrows were generally located near Coonskin Butte, Pigtail Butte, Dorsey Table, Worley Draw, and Signal Butte. During the survey four pygmy rabbits were confirmed observed. These rabbits were observed at Worley Draw and Coonskin Butte.

Waterbury (2005, p.3) conducted winter surveys in late 2004 and early 2005 for pygmy rabbits in areas previously identified as potentially suitable habitat but where their presence or absence had not been conclusively determined on BLM (Salmon and Challis FO) and USFS (Leadore, North Fork, and Challis Ranger Districts) lands. Of the 38 locations surveyed, pygmy rabbits were present at 12 of them (Waterbury 2005, p. 4). Waterbury (2006, p. 5) expanded search areas compared with previous efforts on BLM lands (Challis FO) located in Custer and Lemhi Counties. Surveys documented 269 positive detections of pygmy rabbits (burrows, tracks, pellets, sightings) over 20 areas (Waterbury 2006, pp. 9, 27-32). The areas of greatest concentrations occurred in Big Lost River Valley, Thousand Springs Valley, Pahsimeroi River Valley, Upper Spar Canyon, and Upper Road Creek (Waterbury 2006, p. 9). Forty-six pygmy rabbits were observed during the study (Waterbury 2006, p. 9). Of the 265 positive detections associated with burrow systems, 91 percent were at active or recently active systems (Waterbury 2006, p. 9). These surveys expanded the known pygmy rabbit locations in the Challis FO and confirmed the persistence of historical populations in the Upper Pahsimeroi and Thousand Springs Valleys (Waterbury 2006, p. 11).

Wackenhut (2008, pp. 4, 6, 7) conducted pygmy rabbit surveys across much of Bear Lake Plateau, Bear Lake County, Idaho between December 2006 and March 2007. Information was collected on 568 active burrows in 19 different locations across the plateau. Ten pygmy rabbits were sighted during the study. Fecal pellets were collected at 19 individual burrows. DNA analysis for pygmy rabbit was positive for 13 of these samples; 5 samples were positive for mountain cottontail and 1 sample failed (Wackenhut 2008, p. 4).

Most of the historical records (1999 and earlier) for Idaho occur in the following counties: Owyhee, Cassia, Minidoka, Bannock, Bingham, Butte, Custer, and Lemhi. Additional records are from Canyon, Ada, Twin Falls, Lincoln, Power, Oneida, Blaine, Bear Lake, and Clark. Current information (2000 and later) indicates the following 11 counties continue to support pygmy rabbit activity: Owyhee, Twin Falls, Cassia, Bear Lake, Lincoln, Blaine, Bingham, Butte, Custer, Lemhi, and Clark. Active areas were also found in the following counties without previous records: Washington, Gooding, Camas, Jefferson, and Fremont. Payette County indicated a recent inactive area.

We are uncertain of the current pygmy rabbit activity in Canyon, Ada, and Bannock Counties because we are unaware of any survey efforts in 2000 or later occurring in these counties. Limited recent survey effort in Minidoka, Power, and Oneida Counties indicate inactivity at previously known sites. Records from Canyon and Ada Counties indicate activity in 1915 and 1982, respectively. Power and Minidoka Counties indicate activity in the 1930's and 1940's, respectively. Both Bannock and Oneida Counties indicate activity in the 1990's. However, recent survey efforts have expanded the known distribution in this State. Numerous previously unknown locations currently show signs of pygmy rabbit occupancy including locations in previously undocumented counties.

Montana

The pygmy rabbit was first documented in Montana in 1918 (Hoffman *et al.* 1969, cited in Rauscher 1997, p. 1). In 1963, a specimen was collected in Big Sheep Basin (Rauscher 1997, p. 1). Between 1963 and 1997 no additional documentation regarding the pygmy rabbit in Montana occurred (Rauscher 1997, p. 1).

Rauscher (1997, entirety) documented the results of pygmy rabbit surveys in Montana during 1996 and 1997. Pygmy rabbits occupied suitable habitat in most of Beaverhead County, the extreme southern end of Deer Lodge County, and the western edge of Madison County (Rauscher 1997, p. 5). Because of the discontinuous distribution of pygmy rabbits, every occupied site may not have been found, and as a result pygmy rabbits may occur outside of this range (Rauscher 1997, p. 5). Five of six historical sites were searched and four showed signs of occupation (Rauscher 1997, p. 6). He mentioned some sites were found that no longer appeared to be occupied. These occurred west of Dillon, at the southern end of Dutchman Mountain, and at the northern edge of Frying Pan Basin (Rauscher 1997, p. 6). Rauscher concluded pygmy rabbits appeared to occupy much of the historical range (Rauscher 1997, p. 13).

Janson (2002, p. 33) wrote that the historical range in Montana continues to support pygmy rabbits, with some exceptions. This was based on his limited observations in Beaverhead County, Montana in 2001.

During 2004 and 2005, the Montana Natural Heritage Program conducted pygmy rabbit surveys for BLM (Dillon FO) to assess current distribution in the State (Lenard *et al.* 2005, p. 1). These surveys focused on Beaverhead (2004) and Madison (2005) Counties in areas of known use and areas where no activity had been previously documented (Lenard *et al.* 2005, p. 1). Due to snow, known locations in Horse Prairie, Medicine Lodge Creek (south of Ayers Canyon), Badger Gulch/Sagebrush Creek, and Upper Ermont Creek were inaccessible (Lenard *et al.* 2005, p. 1). New areas of pygmy rabbit activity were identified, expanding the current known distribution of the species (Lenard *et al.* 2005, p. 1). In 2004, five previously known locations were surveyed and four of the five indicated current activity in Beaverhead County. The fifth showed recent activity (Lenard *et al.* 2005, pp. 9-10). Seven new areas were surveyed and all showed current pygmy rabbit activity (Lenard *et al.* 2005, p. 10).

In Madison County, five areas were surveyed in 2005. Although a few pygmy rabbit locations had been previously documented in one of these areas, the remaining areas were previously unknown to surveyors regarding pygmy rabbit occupancy. Of these five areas, three areas showed current activity; two areas showed recent activity (Lenard *et al.* 2005, p. 12). Four new areas were surveyed and

three areas were reported as showing no pygmy activity; one area could indicate a dispersal area as pellets were found but no burrows (Lenard *et al.* 2005, pp. 12-13).

In Montana, during the winter of 2007, pygmy rabbit surveys were conducted in areas where no prior surveys had been conducted or where recent activity had not been documented in Beaverhead and Deer Lodge Counties (Hendricks *et al.* 2007, p. 3). Twenty-four sites were surveyed and four sites were found to have current pygmy rabbit activity (Hendricks *et al.* 2007, p. 9). Twelve sites had no evidence of pygmy rabbit activity, eight were considered unsuitable habitat for pygmy rabbits, and two were considered potential but were inaccessible due to snow (Hendricks *et al.* 2007, p. 9). Two active sites in Big Hole Valley were notable as they indicated current activity at sites that had not been resurveyed since they were active in 1997 (Hendricks *et al.* 2007, p. 10). The two other active sites were previously undocumented pygmy rabbit sites (Hendricks *et al.* 2007, p. 11). These new sites occurred in gaps between other locations suggesting additional locations may be found between those currently known (Hendricks *et al.* 2007, p. 13). The distribution and status of pygmy rabbits in Montana has become clearer since 1997 (Hendricks *et al.* 2007, p. 15). However, Hendricks *et al.* (2007, p. 15) suggested additional surveys should occur in Centennial Valley, Jefferson River corridor north of Twin Bridges, Frying Pan Basin west of Dillon, and the Ruby River and Sweetwater Creek corridors.

Most of the historical and recent records for Montana occur in the following two counties: Beaverhead and Madison. Current information (2000 and later) indicates these two counties, as well as Deer Lodge County, continue to support pygmy rabbit activity. There is a notable increase in the current distribution of the pygmy rabbit to the northeast in Madison County.

Wyoming

During the 1980's and 1990's a few reports documented pygmy rabbits in Wyoming. Campbell *et al.* (1982, p. 100) were the first to confirm the existence of pygmy rabbits in Wyoming. In 1981, 6 specimens were collected, 17 individuals were observed, and 2 skulls and many pellets were found at 2 sites in Uinta and Lincoln Counties in southwestern Wyoming (Campbell *et al.* 1982, p. 100). These two new locations found in Wyoming extended the known range of the pygmy rabbits about 149 mi (240 km) to the southeast and 90 mi (145 km) to the northeast (Campbell *et al.* 1982, p. 100). Clark and Stromberg (1987, p. 75) reported three sites from Lincoln and Uinta Counties located in southwestern Wyoming. Garber and Beauchaine (1992, p. 3) compiled previously reported observations from Campbell *et al.* (1982, p. 100) and information from the Wyoming Game and Fish Department database. Although, this report does not indicate locations, which ones were revisited, or their status, several sites were revisited and new sites were found in 1990. Eleven new observations were recorded which increased records to 50 site confirmations (Garber and Beauchaine 1992, p. 4). Documented observations expanded the known distribution in Wyoming by including two additional counties: Sublette and Sweetwater (Garber and Beauchaine 1992, p. 8).

In 2004 and 2005, Purcell (2006, pp. 1, 7-11, 30) conducted her study in 10 areas in Lincoln, Sublette, Sweetwater, Fremont, and Carbon Counties. She found pygmy rabbits more widely distributed in southwestern and south central Wyoming than formerly thought due to previously unknown locations being found in Fremont and Carbon Counties. Purcell (2006, p. 32) suggested pygmy rabbits in Wyoming could occur as far east as Rawlins, as far north as Riverton, and as far south as Baggs.

Western EcoSystems Technology, Inc. (2006, p. 1) conducted a pygmy rabbit survey in Lincoln and Uinta Counties, Wyoming. During the survey, 88 pygmy rabbit points indicating sign of pygmy rabbit presence were documented.

Aster Canyon Consulting, Inc. conducted several surveys between 2005 and 2007 in relation to proposed oil and gas facilities in Wyoming. These surveys provide pygmy rabbit sightings and signs in Lincoln, Sublette, and Sweetwater Counties.

Grasslands Consulting, Inc. (2007, pp, 1,2) conducted pygmy rabbit surveys in 2007 in relation to three proposed oil and gas facilities in Sweetwater and Uinta Counties, Wyoming. These surveys provided pygmy rabbit sightings and signs in these counties.

Most of the historical and recent records for Wyoming occur in the following four counties: Uinta, Lincoln, Sublette, and Sweetwater. Current information (2000 and later) indicates these counties continue to support pygmy rabbit activity. Recent survey efforts have expanded the known distribution in this State considerably as numerous previously unknown areas have been found in southern Sublette, southern Fremont, and eastern Sweetwater Counties. Areas in western Carbon County indicate a further range extension of the known distribution.

California

Early records indicate that pygmy rabbits were documented in eastern Modoc, Lassen, and Mono Counties. Henshaw (1920, p. 9) mentioned obtaining rabbit specimens in northeastern California at Goose Lake, Modoc County, in 1877 (at the time identified as Trowbridge's hare (*Lepus trowbridgei*) but later determined to be *Brachylagus idahoensis* as described by Merriam). Grinnell *et al.* (1930, p. 553) collected 20 pygmy rabbit specimens during 1926 and 1928 in the vicinity of Ravendale, Lassen County. Orr (1940, p. 195) observed pygmy rabbits on the south edge of the Madeline Plains, located east of Ravendale, in October 1931. Severaid (1950, pp. 1-2) recorded observations and collection in 1948 of pygmy rabbits at Bodie, a famed gold mining ghost town, located in northern Mono County. The southern limit of their distribution in California was documented in 1955 in the vicinity of Crowley Lake in southern Mono County (Jones 1957, p. 274).

During 2004, surveys were conducted on lands managed by BLM (Eagle Lake FO) in northern California (Sequin 2004, entirety). Twenty historical records are documented within the boundaries of the Eagle Lake FO and were located near Ravendale based on information provided by Grinnell *et al.* (1930) and Orr (1940). Pygmy rabbits were not found at any of the historical sites; no evidence of old or fresh pellets or burrows were seen (Sequin 2004, p. 6). Sequin (2004, p. 6) also surveyed 356 potential sites for pygmy rabbit sign within the Eagle Lake FO boundary. No pygmy rabbit activity, either old or current, was found at any of these potential sites (Sequin 2004, p. 6). As all potential pygmy rabbit habitat was not surveyed, it is possible that pygmy rabbits may still be found within the Eagle Lake FO boundary (Sequin 2004, p. 8).

Larrucea and Brussard (2008a, pp. 692, 694-695), surveyed locations in Nevada and California between 2003 and 2006 which includes information reported in Sequin (2004). In California, active sites were found in Mono County, but not in Modoc or Lassen Counties (Larrucea and Brussard 2008a, p. 694). This area is on the edge of the pygmy rabbit's western range (Larrucea and Brussard 2008a, p. 694). It is possible that pygmy rabbits have been extirpated from Modoc and Lassen Counties. A range contraction would be more expected in a peripheral area, such as northern California, if it were to occur

(Larrucea and Brussard 2008a, p. 696). The Mono County populations may be isolated from other known populations because they appear to be separated by a distance of approximately 100 mi (162 km) from the nearest known populations in Nevada (Larrucea and Brussard 2008a, p.694). These pygmy rabbit populations may have become isolated from more eastern populations at the end of the Pleistocene (Grayson 2006, pp. 2969-2970).

There are only a few historical (1999 and earlier) records for California which included Modoc, Lassen, and Mono Counties. Current information (2000 and later) indicates that while pygmy rabbit activity continues to occur in Mono County, pygmy rabbits may have been extirpated from both Modoc and Lassen Counties in northeastern California. Due to limited survey efforts in northern California overall, uncertainty remains whether this contraction has actually occurred. Therefore, Figure 1 does not depict this possible range contraction.

Nevada

The earliest pygmy rabbit records for Nevada include a collection of 12 pygmy rabbits from Paradise, Humboldt County, Nevada in 1908 and 1909 (Nelson 1909, p. 278). Nelson also indicated he examined 23 additional specimens from Halleck, Ione Valley, Monitor Valley, Reese River, and Skelton, Nevada.

Hall (1946, p. 618) indicates he examined 56 pygmy rabbit specimens and sight records from several locations throughout the State. The years of these collections and sightings are not included but were recorded for the following eight counties: Washoe, Humboldt, Pershing, Churchill, Lander, Nye, Elko, and White Pine. The range map for Nevada also included Eureka County and a portion of Lincoln County (Hall 1946, p. 615).

During 1993 and 1994, surveys were conducted on Sheldon National Wildlife Refuge lands located in Washoe and Humboldt Counties. Twenty-four surveys were completed; 17 locations were found to be occupied by pygmy rabbits (Service 1995, p. 1). In 2002, surveys were conducted on the refuge and locations reported in 1993 and 1994 were also revisited (Service 2004, p. 1). In total, 41 sites were surveyed for pygmy rabbits and 18 had pygmy rabbit sign of which 15 sites were confirmed with photography (Service 2004, p.2). Ten of the sites from the mid 1990's had pygmy rabbit sign in 2003. Fifteen new sites were surveyed in 2003; eight of these showed pygmy rabbits and/or their sign (Service 2004, p. 2).

Marriott (2005, p. 4) reported conducting surveys for pygmy rabbits in all or portions of 23 units on the Ruby Lakes National Wildlife Refuge and an area immediately adjacent to refuge lands, located in Elko and White Pine Counties in 2004 and 2005. Evidence of pygmy rabbits was found in seven units. The populations reported by Ports and Ports (1989, p. 127) were found in the sand dune area adjacent to two of the refuge units (Marriott (2005, p. 4). It was confirmed that at least 27 burrows were active (Marriott (2005, p. 4). Three pygmy rabbits were observed (Marriott 2005, p. 5). The surveyors were confident that they had not found all the burrow systems within the refuge boundaries (Marriott 2005, p. 7). They also suspected that more pygmy rabbits occur in the sand dune area as they were unable to survey the entire area (Marriott 2005, p. 8). In 2006, Wienke (2006) reported conducting pygmy rabbit surveys in two areas of the Ruby Lakes National Wildlife Refuge and adjacent BLM lands. The sand dune area survey found 44 pygmy rabbit burrow systems of which 20 appeared to be active (Wienke 2006, p. 2). Three pygmy rabbits were observed (Wienke 2006, p. 2). In the Unit II-D area, 162 burrow systems were found; 53 were active (Wienke 2006, p. 2). Ten pygmy rabbits were observed (Wienke 2006, p. 2).

Etzelmiller (2003, p. 1) conducted 33 survey transects in northwestern Nye County, Nevada in 2003 and 10 showed evidence of pygmy rabbit sign. Pygmy rabbits appear to be concentrated in Indian, Eastern Ione, and Upper Reese River Valleys (Etzelmiller 2003, p. 3).

In 2003 Himes and Drohan (2007) surveyed for pygmy rabbits in White Pine, Lincoln, and Nye Counties in eastern and central Nevada. Pygmy rabbit sign (individuals, burrow, pellets) was found along 261 of 642 transects (40.7 percent) walked (pygmy rabbits and/or fresh burrows and pellets on 89 transects (13.9 percent); fresh pellets only on 33 transects (5.1 percent); old burrows and pellets on 113 transects (17.6 percent); old pellets only on 26 transects (4.0 percent)). No sign was observed on 381 transects (59.3 percent) (Himes and Drohan 2007, p. 376). The southern limit of the previously known record in Nevada was extended by about 7.5 mi (12 km) south (Himes and Drohan 2007, p. 376). All transects where pygmy rabbits and/or sign of pygmy rabbit presence were observed in the study area were considered new locations. Due to the extreme remoteness and fairly inaccessible terrain in the survey area, additional localities are almost certain to remain undocumented (Himes and Drohan (2007, p. 380).

During surveys conducted between 2003 and 2006, a total of 1,474 locations were surveyed in Nevada and California (Larrucea and Brussard 2008a, pp. 692, 694-695). Pygmy rabbits were documented at 258 sites (Larrucea and Brussard 2008a, p. 694). The current distribution of active sites in Nevada is similar to the historical distribution (Larrucea and Brussard 2008a, p. 694). Active sites were found throughout the historical range (Larrucea and Brussard 2008a, pp. 694-695). Positive (confirmed) locations for pygmy rabbits in Larrucea (2007) should be considered as minimum occurrence because it occurred on a large, state-wide basis (Larrucea 2007, p. 28). Information from Larrucea (2006) was incorporated into the Larrucea (2007) study. Associated with the previous study (Larrucea 2007), Larrucea and Brussard (2008b, p. 1638) revisited 105 sites based on 118 historical records from Nevada (109) and California (9) dated between 1877 and 1946 for current pygmy rabbit presence. Pygmy rabbits were found to be present at 36 percent of the historical sites (Larrucea and Brussard 2008b, p. 1638). When a radius (buffer) around a positive location was increased to 3.1 mi (5 km) around a historical site, positive locations increased to 48 percent, and when a radius of positive location was increased to 6.2 mi (10 km) around a site, positive locations increased to 60 percent (Larrucea 2007, p. 56). As indicated in Larrucea and Brussard (2008a) many additional sites were found throughout the historical range.

The Southern Nevada Water Authority (2007, p. 5) conducted pygmy rabbit surveys in 2005 and 2006 in Dry Lake, Cave, Lake, and Hamlin Valleys in Lincoln County and Spring, Snake, and Steptoe Valleys in White Pine County, Nevada. Fifty-six locations were surveyed and 15 had pygmy rabbit sign (SNWA 2007, p. 5). There was one confirmed and one potential pygmy rabbit sightings observed (SNWA 2007, p. 5). Pygmy rabbit sign occurred in Cave, Dry Lake, and Lake Valleys, Lincoln County and Spring Valley, White Pine County (SNWA 2007, pp. 5-10).

Most of the historical records (1999 and earlier) for Nevada document occurrences in the following counties: Elko, Eureka, Lander, White Pine, and Nye Counties. There are fewer records from Washoe, Humboldt, Pershing, and Churchill Counties. Current information (2000 and later) indicates all of these counties, with the exception of Pershing County, continue to support pygmy

rabbit activity, and across a broader area within those counties than historically noted. Pershing County is an exception because we are unaware of any recent survey efforts being conducted in the County, and therefore do not know if pygmy rabbits continue to exist there. In addition, pygmy rabbit activity has been found in Lincoln County. The recent survey efforts have located populations over a greater area within the State and the expansion of the known range has occurred most notably in Washoe, Lincoln, and Nye Counties.

Utah

Early reports of pygmy rabbits occurring in Utah include the first reporting in 1932 after having been detected in 1931 (Stanford 1932, cited in Oliver 2004, p. 14). Janson (1940, p. 6) collected pygmy rabbits from Blue Creek Hills 10 miles (16.1 km) west of Tremonton and in Iron County about 5 miles (8 km) west of Cedar City. He observed them in the valley bottom west of Parowan. Anecdotal reports to Janson indicated that pygmy rabbits occurred at the foot of Lake Mountains west of Utah Lake. Janson (1940, p. 6) thought it was "probable" the pygmy rabbit occurred in "a more or less broken strip through the Upper Sonoran sagebrush areas of western Utah from the northern boundary of the State nearly to the Iron-Washington County line southwest of Cedar City." In 1946, Janson (1946, p. 32) wrote that the pygmy rabbit "appears" to extend through Utah west of the Wasatch Mountains from the Idaho border to the northern border of Washington County. He reported specimens had been collected near Clarkston, Cache County; Blue Spring Hills and Grouse Creek, Boxelder County; and near Modena, Lund, Kanarraville, and Cedar City, Iron County. Pygmy rabbits or their sign had been observed near Snowville, Lucin, and Promontory, Boxelder County; and Parowan, Iron County. He mentioned a reliable report of their presence west of Utah Lake, Utah County, and a questionable report west of Trout Creek (county unknown). Schantz (1947, p. 187) noted, based on three specimens collected by Janson in 1938, a 270 mile (434.4 km) southern expansion of known pygmy rabbit distribution in Utah from Promontory, Boxelder County, to Cedar City, Iron County.

Janson (1946, p. 84) reported that in the winter of 1946, pygmy rabbits appeared to be more scarce than in 1941 based on two study areas in Utah (near Cedar City, Iron County; near Tremonton, Box Elder County). Areas where he considered pygmy rabbits common in Utah in 1941 were found to have no pygmy rabbits occupying them in 1946.

Durrant (1952, p. 88) reported that the pygmy rabbit range in Utah included Boxelder, Cache and Iron Counties and "probably" occurred between areas along the eastern margin of Pleistocene Lake Bonneville. He also listed additional records provided by Janson (1946, pp. 32-33) and included Juab County (Durrant 1952, p. 89).

Holt (1975, p. 131) indicated considerable information was obtained that altered the distributional range of the species. Populations from Sevier River tributaries and surrounding areas indicated that the pygmy rabbit was not restricted to the Upper Sonoran life zone (Holt 1975, p. 132). Holt (1975, pp. 136-138) indicated additional specimens have been examined from Boxelder, Tooele, Millard, Sevier, Beaver, Piute, Garfield, and Washington Counties. These are in addition to Janson's (1946, pp. 32-33) records or sightings from Boxelder, Cache, Utah, Juab, and Iron Counties.

Pritchett *et al.* (1987, p. 231) reported pygmy rabbit records outside of the published range in the Bonneville Basin. One record is near Panguitch, Garfield County (Stephenson 1966, cited in Pritchett *et al.* 1987, p. 231). They mention Holt's (1975, p. 137) record of a population south of Fish Lake on Parker Mountain and a collection and sighting of pygmy rabbits south of Fish Lake Ranger Station and west of Loa, Wayne County. In addition, Pritchett *et al.* (1987, p. 231) reported collecting six live individuals and two skulls from the Parker Mountain region of the Awapa Plateau, Wayne County. The Awapa Plateau is part of the Fremont River watershed and is outside of the Pleistocene Lake Bonneville drainage. During 1986, Pritchett *et al.* (1987, p. 233) looked for pygmy rabbits or their sign and were able to find evidence from Burrville, about 0.5 mi (0.8 km) northwest of Parker Mountains, south through Grass Valley to north of Otter Creek Reservoir. They were unable to find Holt's (1975, p. 137) population west of Otter Creek Reservoir Pritchett *et al.* (1987, p. 233). They wrote that the valley between Kingston and Otter Creek is narrow and disturbed. They found no evidence of pygmy rabbits from Sigurd to Burrville or through Emery Valley.

Based on the two previous study areas in Utah between 1938 and 1946, and limited observations in Utah (near Clarkston, Cache County; near Snowville and Grouse Creek, Box Elder County) in 2001, Janson (2002, p. 32) wrote that recent information indicated pygmy rabbit populations had declined in some areas where they were previously more abundant, mostly as a result of human actions. He states that residential and commercial development, farming, and range improvements for grazing, especially near Cedar City, had impacted the sagebrush habitat. He found no recent sign of occupancy near Cedar City, Utah.

Oliver (2004 pp. 16-18) provides a review of pygmy rabbit in Utah and lists location records for the pygmy rabbit between 1946 and 2003 which includes the following 14 counties: Washington, Boxelder, Garfield, Piute, Iron, Sevier, Cache, Beaver, Rich, Wayne, Toole, Millard, Juab, and Utah.

In 2005, Welch (2005, pp. 15-17, 36) conducted walking surveys of 48 big sagebrush stands or sites in Utah (41 sites in Box Elder, Rich, Tooele, Davis, Utah, Wasatch, Duchesne, Uintah, Juab, Carbon, Sevier, Beaver, Piute, Wayne, Iron, and Washington Counties), Idaho (4 sites in Cassia and Oneida Counties), and Nevada (3 sites in Elko and White Pine Counties) in 2003 and 2004. Twelve of these sites were known to have supported pygmy rabbits in the past, 26 possibly supported pygmy rabbits in the past, and 10 sites had no record of past use (Welch 2005, p 2). Of the 12 sites known to have supported pygmy rabbits in the past, 4 were found to support pygmy rabbits or current sign (Cassia County, Idaho; Piute and Rich Counties, Utah; Elko County, Nevada); of the 26 possible historical sites, 1 was found to support current pygmy rabbit activity during his study (Iron County, Utah) (Welch 2005, pp. 9, 14-17, 36). In addition, he surveyed 13 other sites previously listed by Janson (2002, pp. 10-11) (Welch 2005, p 2). Of these 13 sites, none showed signs of current use; only 5 had some remaining suitable habitat (Welch 2005, p 10).

Flinders *et al.* (2005, p. 7) surveyed habitat in Grass Valley in Piute, Sevier, and Wayne Counties located in south central Utah. Pygmy rabbit surveys were conducted in areas slated for sagebrush treatment but where pygmy rabbit surveys had not been previously conducted as well as revisiting areas where pretreatment pygmy rabbit surveys had been completed by BLM employees (Flinders *et al.* 2005, p. 13). According to Flinders *et al.* (2005, p. 13), BLM surveys identified 118 active burrow systems and 85 inactive ones. Flinders *et al.* (2005, p. 13) found 14 locations with active burrow systems and all others found in treatment areas were determined to be inactive.

During 2005 and 2006, Larsen *et al.* (2006) surveyed for pygmy rabbits in Deep Creek watershed, Tooele County.

This watershed is located on the Utah-Nevada border and the closest known extant pygmy rabbit population in Nevada occurs about 52 miles (84 km) to the northwest (Larsen *et al.* 2006, p. 4). The Nevada population had been surveyed within the past 5 years (Larsen *et al.* 2006, p. 4). Four historical (1905-2002) sites showed no evidence of present occupation by pygmy rabbits (Larsen *et al.* 2006, p. 5). In addition, three active pygmy rabbit locations (confirmed with photography) and three inactive ones were found within the watershed (Larsen *et al.* 2006, pp. 5-6). Pygmy rabbits were not photographed at the inactive sites and fresh pellets were lacking; however, given the recent activity and the potential for reoccupation, the authors believed these inactive sites are important to the species in the watershed (Larsen *et al.* 2006, p. 15). Interestingly, based on the map provided by Larsen *et al.* (2006, p. 16), the three inactive sites and the three active sites are located north and south of the historical sites, respectively.

Flinders (2007, pp. 2-3) indicates discovery of fairly extensive populations in Hamlin Valley located on the Utah-Nevada border in Iron and Beaver Counties. Numerous burrows systems classified as current or recently current have been found in the area. This area may provide a corridor between Utah and Nevada pygmy rabbit populations. Pygmy rabbit use was found on both sides of the border.

In summary, most historical records (1999 and earlier) for Utah occurred in the following six counties: Boxelder, Iron, Washington, Garfield, Piute, and Wayne Counties. Fewer records occurred in Beaver, Millard, Juab, Tooele, Sevier, Utah, Rich, and Cache Counties. Current information (2000 and later) indicates Boxelder, Tooele, Beaver, Iron, Washington, Garfield, Piute, Wayne, Sevier, and Rich Counties continue to support pygmy rabbit activity. Current pygmy rabbit activity is uncertain in Cache, Utah, and Juab because we are unaware of any recent survey efforts occurring in these counties. A new area in Millard County was searched in 2003 and activity was not observed. The recent survey efforts have located active population in Sanpete County and in additional areas previously unknown within the other counties where surveys have occurred.

Abundance

We are unaware of any historical or current population estimates being made for the pygmy rabbit by individual States or for the range considered in this finding. Any figures related to numbers of pygmy rabbits provided in the literature have been reported as individuals collected (Dice 1926 p. 27 (10 in Oregon); Grinnell *et al.* 1930, pp. 553-554 (20 in California), p. 555 (35 in Nevada); Bailey 1936, p. 111 (8 in Oregon); Severaid 1950, p. 2 (4 in California); Borell and Ellis 1934, pp. 41-42 (7 in Nevada)), or individuals observed (Grinnell *et al.* 1930, p. 553 (1 in California); Bailey 1936, p. 111 (40 in Oregon); Jones 1957, p. 274 (1 in California); Bartels 2003, p. 88 (5 in Oregon); Rachlow and Witham 2004a, p. 3 (20 in Idaho); Flinders *et al.* 2005 p. 45 (250 in Utah)), or individuals photographed (Flinders *et al.* 2005 p. 45 (241 in Utah)) or individuals live trapped (Rauscher 1997, p. 9 (58 in Montana); Rachlow and Witham 2004a, p. 3 (25 in Idaho); Crawford 2008, p. 22 (337 in Nevada and Oregon)), or mortalities reported related to study efforts (Rauscher 1997, p. 9 (11 in Montana)) in various parts of its range by researchers.

Other authors used qualifying statements to indicate abundance (Anthony 1913, p. 22, in Oregon wrote, "On account of the thick growth and the animal's habit of circling about under cover an accurate count of the inhabitants of such a locality was difficult to obtain." Anthony (1913, p. 21) also stated that the species was "not uncommon" around Ironside, Malheur County, Oregon; Bailey (1936, p. 111) stated that Oregon pygmy rabbits are locally abundant only where conditions are favorable. Janson (1940, p. 41) wrote that pygmy rabbits in Utah occur in scattered communities which are limited by characteristics favorable to the pygmy rabbit. In these areas where characteristics favorable to the pygmy rabbit are found, the pygmy rabbit may be quite abundant.

Under the species description provided above, several researchers have reported a variety of density estimates for pygmy rabbits on individual sites. However, the number of active burrows may not be directly related to the number of individuals in a given area because some individual pygmy rabbits appear to maintain multiple burrows, while some individual burrows are used by multiple individuals (Janson 1940, pp. 21, 29; Janson 1946, p. 44; Gahr 1993, pp. 66, 68; Heady 1998, p. 25). It is not appropriate to extrapolate any of these reported densities beyond the local scale due to the patchy distribution of suitable habitat and the variable amount of habitat actually occupied (Keinath and McGee 2004, p. 20). Efforts to model the amount and distribution of suitable habitat have met with minimal success and are useful mainly for focusing future survey efforts (Keinath and McGee 2004, p. 20).

More recently, attempts have been made to estimate pygmy rabbit abundance by different methods. Rachlow and Witham (2004b, pp. 2-13) in Idaho evaluated several census techniques for pygmy rabbits (thermal imagery, burrow surveys, live trapping, line transect surveys, fecal pellet counts). They found several techniques were infeasible due to cost or the likelihood of providing imprecise estimates. Surveys of burrow systems provide an obtainable index of activity, but more work is needed to associate this index with population density estimates (Rachlow and Witham 2004b, p. 13). Price (2008, p. 2) in Idaho is attempting to develop a standardized method to monitor abundance of pygmy rabbits. Price is attempting to calibrate an index of abundance based on burrow systems by correlating the index with estimates of population density. Sanchez (2007, p. 108) states that tools used for estimating relative abundance of pygmy rabbits rely on locating and assessing burrows and fecal pellets. Sanchez evaluated the temporal changes in fecal pellets and burrow systems to assess their potential usefulness as indicators of relative abundance of pygmy rabbits (Sanchez *et al.* 2009, p. 427). The persistence and detectability of pellets and burrows over time may be influenced by factors such as weather, soil microorganisms, invertebrates, vertebrates, vegetative growth, or the soil's susceptibility to slumping or compaction (Sanchez *et al.* 2009, p. 427). Sanchez *et al.* (2009) determined that next to actual sightings of pygmy rabbits, burrow systems and pellets are the most reliable evidence of pygmy rabbit presence in an area; together they may provide an indirect index of population trend but depend on the objectives of the investigator as multiple factors can affect changes in pellets and burrows over time (Sanchez *et al.* 2009, p. 433). Therefore, reliably estimating the abundance of pygmy rabbits on a statewide or range wide basis is not currently possible.

Trend

Population trends are normally defined in terms of distribution or abundance. In the case of the pygmy rabbit, the available scientific information does not allow for an analysis of abundance over time. Abundance trends for the pygmy rabbit in each State and throughout its range are unknown and how impacts to the sagebrush habitat from various events or actions have affected pygmy rabbit abundance remain unclear.

Distribution information obtained from early literature and records represent a collection of sightings documented by different individuals over time. These early records were not collected in a systematic, comprehensive manner with the goal of determining the pygmy rabbit's distribution. However, they do reflect the species historical distribution known or suggested at that time, which was modified as previously unknown locations were found. Our understanding of the distributional trend throughout the species' range has improved only recently.

Surveys have concentrated on documenting populations within a particular State by revisiting historical sites and looking for previously unknown sites. It is important to understand that considering only contemporary surveys of historical sites is likely to result in an apparent loss of a species from any number of locations regardless of whether the species has suffered a decline in numbers or not (Shaffer *et al.* 1998, cited in Larrucea and Brussard 2008b, p. 1639). Populations naturally fluctuate locally so some historical sites are expected to disappear due to chance alone (Hanski 1991, cited in Larrucea and Brussard 2008b, p. 1639). In addition, it is often difficult to determine whether pygmy rabbit activity continues in a particular area because many historical site descriptions are vague.

With the possible exception of California and Nevada, recent survey efforts have not been comprehensive in individual States. Due to funding limitations, various individuals from various agencies have selected different areas in each State to survey. As a result, different methodologies were developed for these surveys. Some individual sites or locations have been destroyed while some populations may have relocated to other areas across the landscape because of various factors. Appropriately, surveys have also expanded into new areas and have found previously undocumented pygmy rabbit populations. These efforts have improved our understanding of the species' current distribution across its range. Because of the emphasis in determining where pygmy rabbits occur on the landscape, monitoring of known sites over time has essentially not occurred for pygmy rabbit populations.

Historical records provide no information on the amount of area where pygmy rabbits were collected or observed. Rarely do recent survey efforts report the amount of acreage attributed to occupied or unoccupied pygmy rabbit burrow systems. Therefore, we are unable to compare changes in the amount of acres used historically or currently by pygmy rabbits.

Because of this lack of long-term distributional data, we have compared active and inactive (occupied versus unoccupied) records in the Service's databases from 1877 to 1999 to active and inactive records from 2000 to 2008. Based on a comparison of these two groups of records, the distribution of pygmy rabbits is quite similar to our understanding of the historical range in all States except California as discussed in more detail above. Not only do pygmy rabbits continue to occupy the general areas previously known, new areas of current activity have been documented due to increased survey efforts in recent years. We are encouraged by recent survey efforts and that researchers continue to find populations where they occurred historically. These survey efforts have also lead to the discovery of active areas in previously unknown or undocumented locations, and assist in improving our understanding of the distribution of the pygmy rabbit across its range.

In some States (Montana, Nevada, and most notably Wyoming) these increased survey efforts have led to an extension of the current distribution of pygmy rabbits within these States. We are not suggesting that these populations have expanded in these States, only that increased survey efforts have located previously unknown or undocumented populations of this species. It appears that recent survey efforts have not occurred in the peripheral counties in Oregon so we are unsure of current pygmy rabbit activity in these areas. Idaho also shows some uncertainties because of some inactive areas and we are unaware of previous areas being revisited; however, active areas have also been found in previously unknown areas and counties. Utah shows some uncertainties because we are unaware of previous areas being revisited. Active areas have been found in previously unknown areas and counties in Utah. It is possible that California has experienced a relatively small range contraction in the northeast in Modoc and Lassen Counties. Because we eliminated undesirable records from our analysis, as explained above, we believe we have presented a conservative look at our current understanding of the distribution of the pygmy rabbit across its range. The pygmy rabbit not only occurs generally throughout its historical range, it also occurs in previously unknown or undocumented areas, thus increasing our understanding of the species' current distribution.

Habitat

Sagebrush is the most widespread vegetation in the western United States' intermountain lowlands (West and Young 2000, p. 259). A number of species and subspecies of sagebrush are recognized (Connelly *et al.* 2004, p. 5-2) and each has unique habitat requirements and responses to disturbances (West and Young 2000, pp. 259-261). Sagebrush species and subspecies occur in areas dictated by local soil type, soil moisture, and climatic conditions (West 1983, pp. 333, 355-357; West and Young 2000, pp. 259-261). The degree of dominance by sagebrush varies with local site conditions and disturbance history. Plant associations, typically defined by perennial grasses, further describe distinctive sagebrush communities (Miller and Eddleman 2001, p. 14; Connelly *et al.* 2004, p. 5-3) and are influenced by soil type, elevation, topography, and precipitation.

Sagebrush species are long-lived with some surviving to 100 years (West and Young 2000, p. 259). Allelopathic chemicals are produced that reduce seed germination, seedling growth and root respiration of competing plant species and inhibit the activity of soil microbes and nitrogen fixation. Sagebrush species are resistant to environmental extremes, with the exception of fire and on occasion defoliating insects (West 1983, p. 341). Most species of sagebrush are killed by fire (Miller and Eddleman 2001, p. 17; West and Young 2000, p. 259). The natural re-colonization of sagebrush in burned areas depends on the presence of adjacent live plants for a seed source or on a seed bank, if present (Miller and Eddleman 2001, p. 17).

Sagebrush species are typically divided into two groups, tall sagebrush (also known as "big") and low sagebrush, based on their affinities for different soil types (West and Young 2000, p. 259). Within tall sagebrush, there are three subspecies, *Artemesia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush), *A. t.* ssp. *tridentata* (basin big sagebrush), and *A. t.* ssp. *vaseyana* (mountain big sagebrush) which are the most widely distributed (Knick *et al.* 2003, p. 614). There are two primary species in the low sagebrush group: *A. arbuscula* (low sagebrush) and *A. nova* (black sagebrush) (Knick *et al.* 2003, p. 614). Big sagebrush occurs in coarse-textured and/or well drained sediments, while low sagebrush typically occurs where erosion has exposed clay or calcified soil horizons (West and Young 2000, p. 261). Big sagebrush will die if saturated long

enough to create anaerobic conditions for 2 to 3 days (West and Young 2000, p. 259). Some low sagebrush species are more tolerant of occasionally supersaturated soils, and many low sagebrush sites are partially flooded during spring snowmelt. Sagebrush species do not tolerate high salinity soils (West and Young 2000, p. 270).

Sagebrush and sagebrush ecosystem response to natural and human influenced disturbances varies based on the sagebrush species and its understory, as well as abiotic factors such as soil type and precipitation. Mountain big sagebrush, for example, generally can recover more quickly and robustly than Wyoming big sagebrush following a disturbance (Miller and Eddleman 2001, p. 22) likely due to its occurrence on moist, well drained soils as compared to the very dry soils typical of Wyoming big sagebrush communities. Soil associations have resulted in disproportionate levels of habitat conversion across different sagebrush communities. Basin big sagebrush occurs at lower elevations, in soils that retain moisture two to four weeks longer than in well drained, but dry and higher elevation soils typically occupied by Wyoming big sagebrush. As a result, sagebrush communities dominated by basin big sagebrush have been converted to agriculture more extensively than communities found on poorer soils (Winward 2004, cited in 70 FR 2254). The effects of disturbance on sagebrush species are not constant across their range.

Within the sagebrush ecosystem, there are two primary features of pygmy rabbit habitat: relatively taller and denser big sagebrush and deep soils (Ulmschneider *et al.* 2004, p. 2). Pygmy rabbit burrows are usually found in the taller and denser sagebrush within an area. The height of the sagebrush can vary greatly, from approximately 1.5 to 7 ft (0.46 to 2.1 m). Sagebrush density can also vary, but it is common that the sagebrush canopy cover at burrows is greater than 30 percent (within a 20-ft (6.1 m) radius of burrow) (Ulmschneider *et al.* 2004, pp. 2, 23). Occupied habitat includes various subspecies of sagebrush, including Wyoming, mountain, and basin. Other shrub species may also be present, including *Purshia tridentata* (bitterbrush), rabbit brush, *Sarcobatus vermiculatus* (greasewood*), Symphoricarpos* spp. (snowberry), and *Juniperus* spp. (juniper). In Oregon and Nevada, some areas occupied by pygmy rabbits include rabbit brush as dominant or co-dominant with sagebrush and burrows have been found under large, dense rabbit brush and greasewood (Ulmschneider *et al.* 2004, p. 2).

Pygmy rabbits can also occupy habitat that does not appear ideal. These areas include sagebrush that is short in height and "bad" soil. In east central Idaho, pygmy rabbits occupy "mima mounds" (mounds of soil several feet (ft) high and approximately 20 to 30 ft (6.1 to 9.1 m) in diameter) with taller and denser sagebrush dotted in a landscape of shorter and thinner sagebrush. In Montana, the average sagebrush height in occupied sites can be about 15 in (38.1 cm). In Montana, pygmy rabbits have been found in areas where the sagebrush is not very dense and is about 30 in (76.2 cm) high, especially in mountain bowls and where sagebrush has been manipulated. In Utah, pygmy rabbits have been found to occupy 12 to 120-inch (30.5 to 304.8 cm) tall sagebrush. Regardless of the absolute height of the vegetation, pygmy rabbits will almost always burrow in the tallest and densest sagebrush on the landscape (Ulmschneider *et al.* 2004, pp. 2-3).

Generally, pygmy rabbits burrow in loamy soils deeper than 20 in (50.8 cm). Soil composition needs to be soft enough for digging, yet be able to support a burrow system. In southwest Idaho, pygmy rabbits occur in areas with soils classified as stony sandy loam, and sandy loam over sandy clay and clay loam. In east central Idaho, soils are gravelly outwash plains with lime-coated rocks. On the lava plains of southeast Idaho, rabbits will often burrow between or under lava boulders. In Nevada, soils are light-colored and friable (easily crumbled) (Ulmschneider *et al.* 2004, p. 3).

Occupied pygmy rabbit habitats in Oregon are very similar to those in Idaho (below). Most habitat occurs where big sagebrush inclusions are mixed with low sagebrush, rabbit brush, or shorter stature big sagebrush. Mounding similar to "mima mounding" occurs in most of these sites. Sagebrush on the mounds is usually 1 to 3 ft (0.30 to 0.91 m) taller than those in the surrounding area. Another common type of occupied habitat in Oregon is small draw bottoms where deeper soils have collected. Most of these sites are vegetated with basin big sagebrush in the drainage bottom, surrounded by Wyoming big sagebrush, low sagebrush, or mountain big sagebrush in the surrounding uplands. Some areas utilized by pygmy rabbits are dominated by rabbit brush. Some soil mounding can occur in these areas, but can be subtle. Burrows in these areas seem to be restricted to the very bottom of the drainages or the lower inside slopes of the drainage (Ulmschneider *et al.* 2004, p. 4).

In Oregon, Weiss and Verts (1984, p. 567) found mean shrub cover in areas occupied by pygmy rabbits was about 29 percent and mean shrub height was about 33.1 in (84 cm). Mean shrub cover best distinguished occupied sites from adjacent sites (29 versus 18 percent), followed by mean soil depth (51 versus 31 cm), and mean shrub height (84 versus 53 cm). Percent basal area of perennial grasses, density of annual grasses, density of forbs, and components of soil texture were found to contribute little to the difference between occupied areas and adjacent sites. Meisel (2006, p. 21) found average sagebrush height 2.1 ft (0.65 m) and percent sand content in the soil (50.2 percent) as the two variables that determined occupied burrows. Unoccupied burrows had an average sagebrush height of 1.0 ft (0.32 m) and 45.5 percent sand in the soil sample.

In Idaho, pygmy rabbits are found in mima mound areas. In the Salmon, Idaho area, pygmy rabbits are found on alluvial plains dotted with mounds about 20 to 30 ft (6.1 to 9.1 m) in diameter, 1 to 2 ft (0.3 to 0.61 m) tall, several hundred ft or yd apart, where the sagebrush is taller than in the surrounding inter mound spaces. In southwest Idaho, a similar habitat is occupied by pygmy rabbits where big sagebrush islands are intermingled with low sagebrush. In the Owyhees of southwest Idaho, pygmy rabbits are found in swales of taller sagebrush. Soil mounding is present, but it does not form distinctive mima mounds. In the Bruneau Plateau, pygmy rabbits are found in the bottoms and lower slopes of small drainages where the sagebrush is denser and taller, indicating deeper soils (Ulmschneider *et al.* (2004, p.3). In the Owyhees of southwestern Idaho, Burak (2006, pp. 63-64) found occupied pygmy rabbit areas had significantly greater total shrub, sagebrush (*A. t.* ssp. *vaseyana*), forbs, and litter cover, and significantly less bare soil and rock than in unoccupied areas. Total shrub, sagebrush (*A. t.* ssp. *vaseyana*) and snowberry cover was greater in occupied pygmy rabbit habitat. Height of total shrubs and sagebrush was also significantly higher in occupied areas. Total shrub cover values ranged from 41 to 67 percent. Sagebrush cover values ranged from 12 to 60 percent. These differences in total shrub cover and sagebrush cover suggest that total shrub cover does not need to be comprised of sagebrush primarily. It is unknown what minimum amount of sagebrush cover is needed for pygmy rabbit survival. Burak (2006, p. 65) found in his study areas

average total shrub and sagebrush height to be 160 in (63 cm) and 167.6 in (66 cm), respectively.

Pygmy rabbits in Montana are found in habitats similar to those in Idaho and Oregon- large intermountain valley bottoms, alluvial fans, mountain valleys and bowls, drainage bottoms, plateaus, rolling sagebrush plains and isolated patches of sagebrush in grasslands. Preferred habitat in Montana appears to be gently sloping or nearly level floodplains where adequate sagebrush and appropriate soils exist. However, many occupied sites have marginal sagebrush cover and shallower soils. If pygmy rabbits are found in areas containing mima-like mounds, they generally occur throughout the continuous sagebrush coverage at varying densities and into sagebrush drainages (Ulmschneider *et al.* 2004, p. 4).

In Wyoming, pygmy rabbits occur in swales of taller, denser sagebrush in a setting of hillsides with thinly distributed, shorter sagebrush. The general areas used by pygmy rabbits have evenly distributed, taller, and more structurally diverse sagebrush with a dense canopy. Three subspecies of big sagebrush can be present, basin, Wyoming, and mountain (Ulmschneider *et al.* 2004, p. 5). In Wyoming, Purcell (2006, p. 62) found that the proportion of bare ground and shrub cover may influence habitat features used by pygmy rabbits. Of the 10 study areas, 6 had significantly less bare ground at use sites than at non-use sites. Six of the 10 study areas had significantly greater shrub cover at use sites compared with non-use sites. Although sagebrush was the dominant shrub in all study areas, other shrubs contributed to the shrub cover. In relation to soils, Purcell (2006, pp. 64-65) found 8 of the 10 study areas showed a higher fine fraction of soil in both the surface and subsurface levels at use sites. The amount of coarse material in the soil may not inhibit digging if the soil is soft. Both surface and subsurface samples indicated that softer soils occurred at the use sites compared with the non-use sites. There did not appear to be a relationship between soil texture and areas used by pygmy rabbits (Purcell 2006, p. 65).

Western EcoSystems Technology, Inc. (2008, pp. 18, 20, 22-23) found the dominant habitat types within 6.6 ft (2 m) of pygmy rabbit burrows along three pipeline routes in 2007 were tall sagebrush (42 percent), low sagebrush (48 percent), and desert scrub (10 percent). The average percent of different shrub types located within 16 ft (5 m) of pygmy rabbit burrows along two of the pipeline routes in 2006 indicated tall sagebrush at 56.6 percent, low sagebrush at 34.7 percent, and greasewood at 7.7 percent. Average percentages of shrub cover within 6.6 ft (2 m) of burrows along the three routes in 2007 show 58 percent of burrows had between 26 and 50 percent shrub cover. Twenty-eight percent had a shrub cover of between 11 and 25 percent. Along two of the routes in 2006, pygmy rabbit burrows were found in 33.3 percent loam, 30.2 percent clay, and 20.3 percent sand.

In California, pygmy rabbits occupy areas near Mono Lake in islands of big sagebrush and loamy soils, similar to areas in Nevada, but with sandier soils. Burrows tend to be in sandy loam soils, which are often surrounded by very sandy soils. Near Bodie, an abandoned mining town approximately 10 mi (16.1 km) north of Mono Lake, the habitat includes shorter, more uniform sagebrush, often less than 3 ft (0.9 m) tall, with less clumping of the sagebrush. Pygmy rabbit habitat in northeastern California is very similar to habitat in adjacent Nevada (Ulmschneider *et al.* 2004, p. 5).

In Nevada, pygmy rabbits are found in broad valley floors, drainage bottoms, alluvial fans, and other areas with friable soils. Burrows can be located in mounds (either natural or human caused) when they are available in these types of soils. Pygmy rabbit burrows are easiest to find in light colored, friable soils. These soils are usually found in valley bottoms and can be associated with rabbit brush or sagebrush vegetation. The understory of grasses and forbs can vary from almost none to dense (Ulmschneider *et al.* 2004, p. 4). In California and Nevada, Larrucea and Brussard (2008a, pp. 695-697) found mean sagebrush cover at occupied sites was 44.7 percent. Mean sagebrush height at occupied sites was 38.8 in (98.4 cm), but it was not found to be a significant factor. Pygmy rabbits were more likely to occupy sites within clusters of sagebrush located higher than the surrounding sagebrush or in sagebrush islands. These islands occurred in a range of surrounding sagebrush heights of 4.7 to 46.1 in (12 to 117 cm). These islands also had greater sagebrush cover. Occupied sites were located on loamy soils with a mean sand and clay content of 39.1 percent and 20.4 percent, respectively. Pygmy rabbits occupied sites with little or no understory.

In Utah, site characteristics inhabited by pygmy rabbits vary considerably, because they occupy three different ecoregions: Central Basin and Range, Wyoming Basin, and the Wasatch and Uintah Mountain. These ecoregions vary in latitude, elevation, precipitation, and geologic history. Pygmy rabbits are found in the western half of the state in alluvial deposits and in favorable micro sites on "bench tops". Habitat in northern Utah is characterized by Wyoming, mountain, and basin big sagebrush, and bitterbrush and snowberry present at the higher elevations. Pygmy rabbit habitat in southern areas is often limited to the bottom of gentle drainages supporting Wyoming sagebrush with black sagebrush, *Atriplex confertifolia* (shadscale), and *Kochia americana* (gray molly) community of minimal height (11.0 in, 28 cm) (Ulmschneider *et al.* 2004, p. 5).

Evaluation of Information Pertaining to the Five Threat 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 determine to be endangered or threatened on the basis of 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 pygmy rabbit 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 the petition, we considered and evaluated the best scientific and commercial information available.

In considering what factors might constitute threats to a species, we must look beyond the exposure of the species to a factor to evaluate whether the species may respond to the 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 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.

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

The following potential factors that may affect the habitat or range of the pygmy rabbit are discussed in this section, including: (1) Habitat conversion, (2) agriculture, (3) sagebrush treatment, (4) livestock grazing, (5) nonnative invasive plants, (6) fire, (7) pinyon-juniper woodlands encroachment, (8) urban and rural development, (9) mining (10) energy exploration and development, (11) habitat fragmentation, (12) habitat manipulation conducted to benefit greater sage-grouse (*Centrocercus urophasianus urophasianus*), and (13) conservation strategies and actions.

Habitat Conversion

Sagebrush once covered approximately 270 million ac (109 million ha) in western North America within 13 States (Washington, Oregon, Idaho, Montana, Wyoming, North and South Dakota, Colorado, New Mexico, Arizona, Utah, Nevada and California (American Lands Alliance 2001, p. 3). Today, because of various land uses, about 150 million ac (61 million ha) of sagebrush habitat remain (American Lands Alliance 2001, p. 3). Pygmy rabbits occur within a portion of this area, but they are not known to occur in Arizona, Colorado, North or South Dakota, or New Mexico. The amount of sagebrush acres suitable for supporting pygmy rabbits is a subset of the remaining acres in the states they are known to occur, based on the species' specific habitat needs within the range of the sagebrush ecosystem. Therefore, the amount of suitable sagebrush habitat for pygmy rabbits has always been less than the total amount of sagebrush acreage distributed across western North America.

A number of activities have been identified as potentially impacting pygmy rabbit habitat and individuals or populations across the species' range. These activities most commonly include land management practices which result in the direct loss of sagebrush habitat (e.g., conversion of sagebrush habitat to agricultural purposes, sagebrush treatment to increase forage for livestock); livestock grazing; invasive nonnative plant species; fire; urban and rural development; mining; energy exploration and development; fragmentation of sagebrush habitat, and sagebrush modification for other species such as greater sage-grouse (Roberts 2001, p. 17; Red Willow Research Inc. 2002, pp. 58-59, 64-65; Bartels 2003, pp. 101-104; Keinath and McGee 2004, pp. 14, 23-25; Hayden Wing Associates, Inc. 2008b, p. 1; Larrucea 2006, p. 7; Larrucea and Brussard 2008b, p. 1636).

As discussed in the background section, the pygmy rabbit is a sagebrush obligate, but it occurs within a subset of the sagebrush ecosystem within its range. Pygmy rabbits are found where sagebrush cover is sufficiently tall and dense and where soils are sufficiently deep and loose to allow burrow construction (Bailey 1936, p. 111; Green and Flinders 1980a, p. 2; Campbell *et al.* 1982, p. 100; Weiss and Verts 1984, p. 563; WDFW 1995, p. 15). Thus, pygmy rabbits are not distributed uniformly across the full range of the sagebrush shrub-steppe ecosystem. In large areas of the sagebrush habitat, pygmy rabbits are not known to occur, and in those areas where it does occur it is patchily distributed. For each of the following potential threats listed in Factor A, the available information provides general characteristics of sagebrush habitat degradation or provides examples of impacts in site-specific areas resulting in possible impacts to pygmy rabbits.

Agriculture

Large-scale conversions of western rangelands to agricultural lands began under the Homestead Acts of the 1800's (Todd and Elmore 1997, cited in Braun 1998, p. 4). More than 70 percent of the sagebrush shrub-steppe habitat has been converted to agricultural crops in some States (Braun 1998, p. 2). Hironaka *et al.* (1983, cited in 70 FR 2255) estimated that 99 percent of basin big sagebrush habitat in the Snake River Plain has been converted to cropland. Across the Interior Columbia Basin of southern Idaho, northern Utah, northern Nevada, eastern Oregon and Washington, about 15 million ac (6 million ha) of shrub-steppe habitat has been converted to agricultural cropland (Altman and Homes 2000, p. 10). Development of irrigation projects to support agricultural production also resulted in sagebrush habitat loss (Braun 1998, p. 4). Reservoirs have been constructed to facilitate these irrigation projects, impacting native shrub-steppe habitat adjacent to rivers, as well as supporting the conversion of more upland shrub-steppe habitat to agriculture. As irrigation techniques have improved, additional land has been irrigated, and more big sagebrush (*A. tridentata*) cleared. Shrub-steppe habitat continues to be converted to dry land and irrigated cropland but at a much lower rate (Braun 1998, p. 4).

Review of current sagebrush steppe habitat and agricultural lands within Great Basin sagebrush among states within the range of the pygmy rabbit show that less than 10 percent is impacted by agriculture for Oregon, Montana, Wyoming, California, Nevada and Utah. Only Idaho has a greater percentage of agricultural lands within Great Basin sagebrush at about 18 percent (75 FR 13925).

The loss or modification of sagebrush habitat due to agricultural conversion and impacts to pygmy rabbits across its range could include injury or death at the time of vegetation clearing, reduction in forage and shelter, temporary or permanent home range abandonment, increased habitat fragmentation, increased dispersal barriers, increased predation, and population declines. As a sagebrush-dependent species, complete loss of sagebrush over a large area could have long-term impacts to pygmy rabbits. According to Roberts (1998, p. 11), of the 583,600 ac (236,180 ha) he inventoried in Lemhi and Custer Counties, Idaho for pygmy rabbit occupancy, 122,300 ac (49,494 ha) had been permanently removed due to agriculture conversion. However, the acreage or percentage of land that had been occupied by pygmy rabbits is unknown. White and Bartels (2002, pp. 7-8) believe that the pygmy rabbit historically was impacted by sagebrush removal for agricultural purposes in Idaho as 3 of 13 historic sites they visited were disturbed by agriculture, and pygmy rabbit activity was not observed at these sites.

In Utah, Pritchett *et al.* (1987, p. 233) reported that a portion of the Sevier River Valley between Kingston and Otter Creek, containing one of the last large patches of sagebrush, had been plowed. They speculated this may previously have been a dispersal route for pygmy rabbits from Iron County to Wayne County, Utah. Janson (2002, pp. 31-32) reported in 2001 that he found wheat acreage had expanded in the Blue Springs Hills of Box Elder County and that the sagebrush was almost gone. He also stated that the foothills area near Clarkston, Cache County had experienced increased farming activity which had eliminated sagebrush. Larsen *et al.* (2006, p. 5) visited four historical pygmy rabbit sites in Tooele County, Utah which were unoccupied. Some of them (number not indicated) showed evidence of conversion to farmland.

In Utah, Idaho, and Nevada, Welch (2005, p. 10) visited historical pygmy rabbit sites in 2003 and 2004. He mentioned 7 of 13 were impacted or likely impacted by agricultural conversion to farmland including wheat and alfalfa fields.

In Montana, Rauscher (1997, p. 16) thought conversion of sagebrush to agriculture was minimal in southwest Montana because of the large expanses of public land. He documented that the suspected location for one historical pygmy rabbit record had been converted to irrigated farmland (Rauscher 1997, p. 14).

In California, Williams (1986, p. 51) indicated that loss of sagebrush habitat in California to agriculture was less of a concern than loss of habitat to overgrazing. Larrucea and Brussard (2008b, p. 1638) revisited 105 of 118 historical pygmy rabbit sites from Nevada (109) and California (9) dated between 1877 and 1946 to document current pygmy rabbit presence. They determined the presence or absence of current land use (agricultural conversion, livestock grazing, fire, urbanization and presence of pinyon-juniper) at each site. This was to determine what type of impacts were presently occurring, and they do not imply that these land use practices are what led to the loss of pygmy rabbits at any of the extirpated sites (Larrucea and Brussard 2008b, p. 1638). Larrucea and Brussard (2008b, p. 1639) found agricultural fields at 6 of the 105 historical sites. Most historical sites occurred in the foothills and not on valley floors where vegetation was more meadow-like. This may have changed after 1880 as excessive grazing reduced grasses, increased erosion, and lowered water tables and fire suppression allowed sagebrush to increase on valley floors (Miller and Rose 1999, cited in Larrucea and Brussard 2008b, p. 1640), creating pygmy rabbit habitat at these lower elevations.

Summary of Agricultural Impacts

Information indicating loss of sagebrush due to agricultural conversion in specific portions of the pygmy rabbit's range has been documented. However, because of the pygmy rabbit's patchy habitat distribution across the landscape, as discussed earlier, the scope of loss or modification of sagebrush habitat in general due to agricultural conversion does not equally relate to the loss or modification of pygmy rabbit habitat. Based on information in site-specific areas, agricultural conversion has resulted in some loss of sagebrush habitat used by pygmy rabbits and likely has resulted in some localized population declines in areas of Idaho, Montana, California, Nevada, and Utah.

As presented above, the examples of conversion of sagebrush habitat are few in number across the range and do not indicate a systematic or widespread loss of habitat that may have been or is now suitable for pygmy rabbits. While there has been some documented loss of historical pygmy rabbit sites due to agricultural conversion, the best available scientific information does not indicate a significant loss or modification of habitat, and measureable population decreases attributed to habitat loss or modification due to agriculture impacts are not occurring across the range. While sagebrush habitat will continue to be converted to agricultural lands in the future, it will occur at a much lower rate as much of the appropriate habitat has already been converted. Therefore, based on the best available scientific information, we conclude that sagebrush loss or modification due to agriculture is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Sagebrush Treatment

Treatment of sagebrush by mechanical (mowing, rotobeating, roller chopping, grubbing, chaining, bulldozing, cabling, raking, railing, and plowing) and chemical methods (herbicide) primarily for rangeland improvement and grazing management to increase forage production for domestic and wild ungulates has been common in sagebrush ecosystems (Connelly *et al.* 2004, pp. 7-46 to 7-47). Over 5 million ac (2 million ha) of sagebrush habitat was mechanically or chemically treated or burned by the 1970s (Crawford *et al.* 2004, p. 12). According to Braun (1998, p. 9) mechanical treatments began in the 1930s and continued at relatively low levels until the late 1990s. While many square miles of sagebrush habitat have been lost during the last 150 years due to conversion for agriculture (discussed above), today this conversion occurs at relatively low levels (70 FR 2255).

Possible effects to pygmy rabbits of mechanical or chemical sagebrush treatments include injury or death at the time of treatment, reduction in forage and shelter, temporary or permanent home range abandonment, increased habitat fragmentation, increased dispersal barriers, increased predation, and population declines. As a sagebrush dependent species, complete loss of sagebrush in a large area could have long-term impacts to pygmy rabbits. Olterman and Verts (1972, p. 25) and Wilde (1978, p. 120) cautioned that the practice of sagebrush removal from some livestock ranges in Oregon and Idaho, respectively, could be a threat to the pygmy rabbit in the future. The researchers noted that land changes should be monitored and adequate "safeguards" implemented to reduce excessive clearing of large areas.

Roberts (1998, p. 11) calculated that of the 583,600 ac (236,180 ha) he inventoried for pygmy rabbit occupancy in Lemhi and Custer Counties, Idaho, 49,000 ac (19,830 ha) (8 percent) were lost due to sagebrush eradication; Roberts (1998, p. 11) did not estimate the amount of lost pygmy rabbit habitat. In Oregon, BLM (2007b, pp. 5-6) documented active pygmy rabbit use at one of eight sites that had sagebrush strips removed by mowing. It appeared that pygmy rabbits had been there prior to the mowing (as evidenced by burrows), with residency continuing following mowing. Mowing may have opened the area for new growth of herbaceous vegetation which can be beneficial to pygmy rabbits (BLM 2007b, p. 7).

In Montana, Rauscher (1997, pp. 13-14) reported that sagebrush removal was a "popular" rangeland improvement practice in the southwestern portion of the State. Sagebrush in the Coyote Creek area of the Big Sheep Creek Basin has been extensively treated, and only one active burrow was located. In nearby areas where sagebrush had not been treated, pygmy rabbits were more abundant. In lower Badger Gulch, BLM lands border private lands, and pygmy rabbits were found on the public lands but absent on the private lands where sagebrush had been removed. However, it is unclear how much sagebrush removal had occurred on the private lands and whether pygmy rabbits had previously occupied these same lands.

In Wyoming, Katzner (1994, p. 106) mentioned that sagebrush eradication may have significant adverse effects on the pygmy rabbit where they were known to occur in southwestern Wyoming at that time. He recommended that if sagebrush management is "mandated," management plans should consider the pygmy rabbit and retain large patches of sagebrush or corridors connecting areas of suitable habitat.

Welch (2005, p. 10) visited 13 historical pygmy rabbit sites in Utah and Idaho. He indicated one site was no longer occupied by pygmy rabbits and had been impacted by range improvement.

In Utah, Holt (1975, p. 159) mentioned a concern that removing large areas of sagebrush by chaining and spraying in order to plant grass would harm rabbits, including the pygmy rabbit. Flinders *et al.* (2005, p. 7) surveyed habitat in Grass Valley in Piute, Sevier, and Wayne Counties located in south central Utah. Pygmy rabbit surveys were conducted in areas slated for sagebrush treatment, but

where pygmy rabbit surveys had not been previously conducted. Areas where pretreatment pygmy rabbit surveys (Oak Springs and Praetor Slopes) had been completed by BLM employees (Flinders *et al.* 2005, p. 13) were revisited, as well. According to Flinders *et al.* (2005, p. 13), BLM surveys identified 118 active burrow systems and 85 inactive ones. Flinders *et al.* (2005, p. 13) found 14 locations with active burrow systems and determined all other burrows in treatment areas to be inactive. BLM surveyed sites recorded as active were found to be "abandoned" or plowed when revisited (Flinders *et al.* 2005, p. 13).

Where pygmy rabbits were still occupying treatment areas, they were in wide sections of sagebrush that was intact and connected to adjacent remaining sagebrush (Flinders *et al.* 2005, p. 13). In undisturbed sagebrush, pygmy rabbits were in isolated patches (Flinders *et al.* 2005, p. 13). Flinders *et al.* (2005, p. 36) thought treatment projects could be beneficial to pygmy rabbits if the sagebrush stands were left in wide, connected corridors as this would provide forage as well as cover. BLM treatment areas revisited found active burrows only where the sagebrush treatment occurred in mosaics that were connected to other sagebrush stands or the areas of removal were much smaller and distances between the treatments were minimal. Patchy, smaller sagebrush removal more likely mimics the natural historical fire regime. Flinders (2007, p. 3) reported on his preliminary results from a multi-year pygmy rabbit study in Grass Valley, Utah and found a reduction in suitable pygmy rabbit habitat due to sagebrush treatments. He found pygmy rabbit activity was restricted to a narrow band adjacent to mature stands of sagebrush and showed significantly decreased activity within the treated areas. Burrow abandonment was noted following treatment, and he suggested a 131.2 ft (40 m) buffer between active burrows and habitat treatment. In Grass Valley, Piute and Sevier Counties, and Parker Mountain, Wayne County, Utah, Lee (2008, pp. 4, 7) found lower fecal pellet counts in mechanically-treated sagebrush areas as compared to untreated sagebrush areas. Average pygmy rabbit fecal pellet counts decreased with distance from sagebrush (Lee 2008, p. 10). Lee (2008, p. 11) recommended avoiding treatments of big sagebrush in areas occupied by pygmy rabbits and in areas with all suitable habitat conditions. If treatments cannot be avoided, they should leave intact large swaths of undisturbed mature big sagebrush (Lee 2008, p. 11). Lee (2008, p. 14) recommended that corridors between residual stands of sagebrush within a treatment area be maintained for connectivity and dispersal. Lee (2008, p. 13) recommended that stands of remaining mature big sagebrush be about 54 yd (490 m) across in any direction, and the areas of big sagebrush removed should be narrow (44 yd; 40 m).

BLM has proposed a national program to treat vegetation across several western States to reduce hazardous fuels, control unwanted vegetation and improve habitat and resource conditions through the use of prescribed fire, wildland fire, herbicides, manual and mechanical methods, and biological controls (BLM 2007c, p. 1-3 Abstract, Executive Summary, Chapters 1 through 7, and Appendices). BLM manages approximately 261 million ac (105.6 million ha) in 17 western States including Alaska (BLM 2007c, p. 1-1 Abstract, Executive Summary, Chapters 1 through 7, and Appendices). States encompassing the range of the pygmy rabbit are included in this program. BLM estimated that 6 million ac (2,428,166.7 ha) of vegetation would need to be treated annually over the next 10 years (BLM 2007c, p. 1-7 Abstract, Executive Summary, Chapters 1 through 7, and Appendices). Estimated acres treated annually by the various methods include: 2.2 million ac (890,327.8 ha) by mechanical means; 2.1 million ac (849,858.4 ha) by fire; 932,000 ac (377,175.2 ha) by herbicides; 454,000 ac (183,731.3 ha) by biological control; and 271,000 ac (109,672.2 ha) by manual means (BLM 2007c, p. ES-2 Abstract, Executive Summary, Chapters 1 through 7, and Appendices). The implementation of this program, methods, acres treated, and locations are yet to be determined.

Summary of Sagebrush Treatment Impacts

Although loss of sagebrush due to sagebrush treatment for rangeland and grazing management in specific portions of the pygmy rabbit's range has been documented, the examples presented above are few in number across the range and are not indicative of a systematic or widespread loss of habitat that may have been or is now suitable for pygmy rabbits. Because of the pygmy rabbit's patchy habitat distribution across the landscape, the scope of loss or modification of sagebrush habitat in general due to treatments does not equally relate to loss or modification of pygmy rabbit habitat. Sagebrush treatment has been documented to be responsible for loss of sagebrush habitat used by pygmy rabbits in a few specific areas of Oregon, Idaho, Montana, Wyoming, Utah and may have resulted in localized population declines. The known presence of pygmy rabbits prior to treatment is not documented in all cases and some areas show continued occupancy or use by pygmy rabbits at some level after treatments were conducted (e.g. Flinders *et al.* 2005; Lee 2008).

Depending on the design and size of the sagebrush treatment, impacts to pygmy rabbits may be minimized, and if designed appropriately, sagebrush treatments may be beneficial to pygmy rabbits. We are aware of a BLM proposal to implement sagebrush treatments that could impact sagebrush habitat in the western United States, however no actions have been implemented at this time (BLM 2007c). Available information indicates that a significant loss or modification of habitat, and measureable population decreases attributed to habitat loss or modification due to treatment impacts and impacts to the pygmy rabbit with regard to injury or death, temporary home range abandonment or permanent shift to adjacent areas, habitat fragmentation, or increased predation are not occurring across the range. Therefore, based on the best available scientific and commercial information, we conclude that sagebrush loss or modification due to treatments is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Livestock Grazing

Livestock grazing is the most widespread land use type across sagebrush communities (Connelly *et al.* 2004, p. 7-29). Excessive grazing by domestic livestock during the late 1800s and early 1900s, along with severe drought, significantly impacted sagebrush ecosystems and the long-term effects involving plant community and soil changes, continue today (Yensen 1981, cited in Knick *et al.* (2003, p. 616). By the 1940s, animal unit months (AUM) on all Federal lands were estimated to be 14.6 million, increasing to 16.5 million in the 1950s, however estimated AUMs decreased to 10.2 million by the 1990s (Miller and Eddleman 2001, p. 19). Grazing impacts may be associated with the direct loss of sagebrush vegetation through physical damage by rubbing, battering, breaking and trampling of seedlings, or habitat degradation due to associated facilities or actions such as: construction of fences; wells; water tanks; pipelines which concentrate livestock or redistribute livestock;

seeding of crested wheatgrass to increase livestock forage; and weed infestations.

Impacts of livestock grazing on the arid west include selective grazing for native species, trampling of plants and soil, damage to soil crusts, reduction of mycorrhizae fungi, increases in soil nitrogen, increases in fire frequency, and contribution to nonnative plant introductions (Belsky and Gelbard (2000, pp. 12-18); Paige and Ritter (1999, pp. 7-8)). When sagebrush-grass habitats are overgrazed, native perennial grasses can be eliminated, and shrubs, such as big sagebrush, tend to form dense monotypic (single species) stands (Blaisdell 1949, cited in Yensen 1982, p. 25; Tisdale and Hironaka 1981, cited in Paige and Ritter 1999, p. 7). In addition, the understory becomes sparse with unpalatable perennials (Tisdale and Hironaka 1981, cited in Paige and Ritter 1999, p. 7) and invasions of annual species like *Bromus tectorum* (cheatgrass) can occur (Gabler 1997, p. 96; Rauscher 1997, p. 14). Reduction of native grasses and increases in invasive plant species may reduce habitat quality and suitability for pygmy rabbits by reducing summer forage and impeding their movements or ability to see predators.

Possible effects of livestock grazing include direct injury or death due to trampling, degradation of sagebrush plant structure resulting in reduced forage and shelter, habitat fragmentation, increased predation, reduced grasses and forbs resulting in loss of summer forage, increased visual capabilities and ease of movement, trampling of burrows, increased invasive plant species resulting in reduced visual capabilities and ease of movement, and population declines. However, livestock grazing in pygmy rabbit habitat has been noted in the early literature. For example, Dice (1926, p. 27) in Oregon, found pygmy rabbits near Baker in an area that was overgrazed by domestic sheep. He stated very little vegetation remained except for sagebrush and rabbit brush. The patch of habitat being used was about 300 yd long (274.2 m) by 50 yd (45.7 m) wide and was surrounded by low sagebrush (Dice 1926, p 27).

Flath and Rauscher (1995, p. 2) and Purcell (2006, p. 33) found that areas of tall, dense sagebrush inhabited by pygmy rabbits were typically located along streams. Livestock can impact these areas disproportionately by concentrating in riparian areas where trampling and vegetation removal can occur (Red Willow Research Inc. 2002, p. 107). These researchers do not indicate any specific pygmy rabbit locations along streams that have been impacted by livestock grazing.

In Oregon, Hager and Lienkaemper (2007, p. 6) reported that all 157 sites, located mostly on State lands, surveyed for pygmy rabbits had evidence of cattle grazing. Many areas showed heavy use by cattle which had resulted in a decrease in shrub cover. Additionally, many of the areas where no evidence of pygmy rabbit presence was found may have had potential to support pygmy rabbits, as predicted by a habitat model, but the habitat may have been rendered unsuitable due to grazing reducing shrub cover (Hager and Lienkaemper 2007, p. 6). However, it is unknown whether pygmy rabbits were present previously or were absent from these areas based on other factors. The BLM (2007b, p. 4) reported livestock use at one of eight occupied sites surveyed in Oregon.

In Idaho, Red Willow Research Inc. (2000, p. 8) documented pygmy rabbit sightings on two separate BLM grazing allotments which demonstrated historical and current grazing activities. Another sighting occurred on private land subjected to grazing and was also close to dwellings and agricultural activities (Red Willow Research Inc. 2000, pp. 8, 11). In Idaho, Roberts (2001, p. 18) concluded that there was no clear evidence that livestock grazing is detrimental to pygmy rabbits. In Idaho, White and Bartels (2002, pp. 6, 15) surveyed 11 grazing allotments. Of the 6 allotments where pygmy rabbit sign was observed, 2 allotments supported active burrows, 2 allotments contained inactive burrows, and 2 allotments supported burrows of undetermined status. BLM (2005a, p. 2) found during their surveys, conducted between 2002 and 2005 that pygmy rabbits occurred on their lands containing portions of grazing allotments. In Idaho, North Wind (2004, p. 12) mentioned livestock grazing occurred in all areas where pygmy rabbit sign or sightings occurred. In Idaho, Waterbury (2005, p. 9) mentioned that an occupied site where a pygmy rabbit was observed (Goldburg site) in the upper Pahsimeroi Valley was subjected to livestock grazing.

In Montana, Rauscher (1997, pp. 14, 17) found that most pygmy rabbit sites were grazed to some extent. Pygmy rabbits were found to be "surviving and even thriving" at current grazing levels in certain areas.

In Wyoming, Katzner reported that according to Dorn *et al.* (1984, cited in Katzner 1994, p. 5), pygmy rabbits did not occur in his study area (Historical Quarry Trail region) at Fossil Butte National Monument, Lincoln County in 1983 at the time when domestic livestock grazing was terminated in the monument. Katzner and Parker (1997, p. 1071) stated that the apparent dependence of pygmy rabbits on a dense understory, provided in part by dead shrubs and extensive canopies, may explain population declines in the pygmy rabbit in grazed sagebrush-steppe habitat in the western United States. Lands grazed intensively by domestic herbivores often have relatively low structural complexity and may not support pygmy rabbit populations adequately. The physical destruction of dense, structurally-diverse patches of sagebrush, and the corridors that connect them, result in fragmented, unsuitable big sagebrush habitat for pygmy rabbits (Katzner and Parker 1997, p. 1071). For a species that eludes predators in sagebrush habitat, a reduction in canopy cover would increase the vulnerability of pygmy rabbits to predation (Bailey 1936, p. 111; Orr 1940, p. 197; Wilde 1978, pp. 115-116; Katzner 1994, pp. 50, 52-53). Clark and Stromberg (1987, p. 76) remarked that overgrazing, which has increased the sagebrush-grass ratio, may decrease pygmy rabbit populations.

In Nevada and California, Larrucea (2006 p. 8) stated that livestock grazing at inappropriate levels can be detrimental for the degradation of sagebrush habitat. At reasonable levels it may be beneficial (Larrucea 2006, p. 8; Larrucea 2007, p. 34). Most of the pygmy rabbit burrows on the BLM lands in the Surprise FO were in areas available to grazing (Larrucea 2006, p. 8). In Nevada and California, Larrucea and Brussard (2008b, p. 1638) found cattle grazing occurred at 83 percent of historical pygmy rabbit sites; 38 percent showed current pygmy rabbit activity. If sites with additional impacts were eliminated and only cattle grazing impacts are considered, this increased to 62 percent of sites that supported current pygmy rabbit activity (Larrucea and Brussard 2008b, p. 1639). Grazing was compatible with pygmy rabbits if grazing occurs at levels that left sagebrush plants intact and soils were not overly compacted (Larrucea 2007, p. 58). Larrucea and Brussard (2008a, p. 697) found increasing amounts of understory stem density was associated negatively with current pygmy rabbit presence at a site. Pygmy rabbits, by foraging for forbs and grasses near their burrows, may create areas of little understory. An understory that is free of grasses and forbs may be beneficial by reducing movement restrictions and increasing pygmy rabbit's ability to detect predators (Weiss and Verts 1984, p. 568). The Southern Nevada Water

Authority (SNWA) (2008, p. 15) stated that data collected during their surveys conducted in 2005 and 2006 in Nevada (SNWA 2007, entirety) found 84 percent of the sites with documented pygmy rabbit occurrence existed in areas of moderate grazing. SNWA (2008, p. 15) suggested that given that recent occurrence data overlaps with grazing practices, there is little evidence to suggest that light to moderate grazing is significantly detrimental to pygmy rabbit in Nevada.

In Utah, Janson (2002, p. 31) did not attempt to measure grazing intensity during his earlier studies. While he observed a scarcity of grasses and forbs in the Cedar City area compared to the Blue Springs area, efforts to collect and observe pygmy rabbits seemed to be similar on either site. The difference between the amount of shrubs to herbaceous vegetation between the two sites, due to grazing or some other factor, did not seem to affect the populations. He did state that grazing intensities high enough to break down the sagebrush plants and reduce their density would be detrimental to pygmy rabbits. Although it is unclear how many of the four sites he considered overgrazed, Larsen *et al.* (2006, p. 5) found historical pygmy rabbit sites in Tooele County, Utah that showed evidence of overgrazing.

Trampling of burrows by livestock has been reported in Montana by Rauscher (1997, p. 14) and in Idaho by Red Willow Research Inc. (2002, p. 54). This could cause the death of young rabbits in natal burrows or injury or death of adults. Red Willow Research Inc., (2002, pp. 54-55) reported a burrow system in Idaho that was subjected to cattle trailing on at least two separate occasions within a period of two months or less. After the initial event, only two of ten active burrows were still open. A second visit showed additional trailing activities, and no open burrows or recent sign were found, indicating "that domestic livestock can have an immediate and detrimental effect upon burrow systems" (Red Willow Research Inc., 2002, pp. 54). This assumes that no other influences were involved, and there was no further monitoring of the area to determine if pygmy rabbits returned to the area at a later date.

Summary of Livestock Grazing Impacts

Livestock grazing occurs in all seven States where pygmy rabbits occur. Researchers suggest that livestock grazing, particularly overgrazing, may negatively impact some sagebrush habitat used by pygmy rabbits and may result in some localized population declines. The potential effects of livestock grazing on sagebrush habitat and pygmy rabbit populations, while widespread across the pygmy rabbit's range have not been documented to impact pygmy rabbits at the population level or result in documented measurable population declines as a result of overgrazing.

As described above, there are several examples where pygmy rabbits have been document to continue to occupy areas grazed by livestock, which may indicate an apparent compatibility between livestock grazing and area use by pygmy rabbits under certain grazing conditions. Other documentation suggests possible habitat loss or degradation, site abandonment, habitat fragmentation, increased predation, or injury of pygmy rabbits due to livestock overgrazing and trampling. However, based on survey information, there is no indication of a causal relationship between livestock grazing and pygmy rabbit site abandonment or avoidance. Studies do not indicate that there is a level of livestock grazing that influences pygmy rabbit site occupancy. While the Service is aware of a report of burrow trampling, we are not aware of any studies relating actual site abandonment, increased predation, death, or injury due to livestock grazing or trampling. Reduced grasses and forbs may increase the pygmy rabbits' ability to see and evade predators. Some survey reports suggest that livestock grazing is degrading pygmy rabbit habitat in some locations. Our review of the best available scientific data indicate that measureable population decreases attributed to habitat modifications from livestock grazing are not occurring across the range. Therefore, we conclude that livestock grazing is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Nonnative Invasive Plants

Paige and Ritter (1999, p. 8) suggest that the greatest change to sagebrush shrub lands has been the invasion of the nonnative grasses and forbs, especially cheatgrass. Cheatgrass is a rapid colonizer of disturbed areas and is persistent in replacing native species (Mack 1981, Yensen 1981, and Whisenant 1990, cited in Paige and Ritter 1999, p. 8). Cheatgrass alters fire and vegetation patterns in sagebrush habitats as it creates a continuous fine fuel that easily carries fire (Paige and Ritter 1999, p. 8). Where it dominates, it can carry fires over large distances, and it burns more frequently than native vegetation (Paige and Ritter 1999, p. 8). It also matures and dries earlier than native vegetation, increasing the likelihood of a fire earlier in the season (Young and Evans 1978, Whisenant 1990, and Knick and Rotenberry 1997, cited in Paige and Ritter 1999, p. 8).

The total acreage of invasive plant infestations has been reported with varying estimates. Pellant and Hall (1994, p. 109) reported on the 1992 distribution of cheatgrass and *Taeniatherum asperum* (medusa head), the primary alien grass invaders of disturbed and fire-altered rangelands in the Intermountain area of the western United States. Approximately 3.3 million ac (1.3 million ha) of rangeland administered by the BLM in Nevada, Oregon, Utah, Washington, and Idaho are dominated by these two species (Pellant and Hall 1994, p. 109). Another 76.1 million ac (30.8 million ha) of public rangeland was classified as infested or susceptible to infestation by these two species (Pellant and Hall 1994, p. 109). It has been estimated that 3 million ac (1.2 million ha) of public lands in the Great Basin have been converted to a cheatgrass monoculture with another 14 million ac (5.7 million ha) assumed to be infested, and it is likely that conversion is inevitable (Knapp 1996, West 1999, cited in Larrucea 2007, p. 61). Though estimates of total area supporting cheatgrass vary widely, cheatgrass is a significant presence in western rangelands (75 FR 13935).

BLM (1996, p. 6) estimated invasive plant species covered at least 8 million ac (3.2 million ha) of BLM lands as of 1994 and predicted 19 million ac (7.7 million ha) would be infested by 2000. A qualitative BLM survey in 1991 covering 98.8 million ac (40 million ha) of BLM-managed land in Washington, Oregon, Idaho, Nevada, and Utah reported introduced annual grasses were a dominant or significant presence on 17.2 million ac (7 million ha) of sagebrush ecosystems (Connelly *et al.* 2004, pp. 5-10). In reference to the same BLM survey, Zouhar (2003, p. 3 cited in 75 FR 13935) estimated an additional 62 million ac (25 million ha) had less than 10 percent cheatgrass understory, but were considered to be a risk of cheatgrass invasion. BLM has reported that as of 2000, invasive plants occupied about 29 million ac (11.7 million ha) of BLM lands in the Washington, Oregon, Idaho, Utah, Nevada (BLM 2007a, pp. 3-28 as cited in 75 FR 13935).

Connelly *et al.* (2004, p. 7-15) estimated the risk of cheatgrass invasion into sagebrush and other natural vegetation in a portion of the southern and northern Great Basin. They projected, based on elevation, landform, and south-facing slope parameters, that 80 percent of the land area in the Great Basin is susceptible to displacement by

cheatgrass and of that area, greater than 65 percent is estimated to be at moderate or high risk within 30 years (Connelly *et al.* 2004, pp. 7-16 to 7-17). Wyoming-basin big sagebrush and salt desert scrub, which occupy over 40 percent of the Great Basin, are the vegetation types most susceptible to cheatgrass displacement (Connelly *et al.* 2004, p. 7-17).

Restoration or rehabilitation of areas to sagebrush after invasive plant species, especially annual grasses, become established is difficult. Only about 3 to 34 percent of recent vegetation treatments performed by BLM in areas of annual grassland monocultures were successful (Carlson 2008b, pers. comm., cited in 75 FR 13937). The success of treatments often depends on factors such as precipitation received at the treatment site (Pyke, in press, p. 30).

Nonnative invasive plant species may impact pygmy rabbits throughout their range by replacing native grasses and shrubs used by pygmy rabbits, hindering their ability to see or move, and increasing detection by predators. In Oregon, only 2 of 51 sites occupied by pygmy rabbits in 1982 contained appreciable amounts of cheatgrass (Weiss and Verts 1984, p. 568). This led the authors to suspect that pygmy rabbits avoid areas containing annual grasses because it can restrict their movements or ability to see, especially when they are attempting to escape predators. However, it is unclear whether annual grasses are playing a role in pygmy rabbits not occupying a site. The authors did not indicate whether or not unoccupied sites surveyed had cheatgrass.

In Idaho, invasive plants were reported at all nine study areas investigated by Red Willow Research Inc. (2002, pp. 38, 45, 59, 65, 72, 80, 87, 92, 97). Gabler (1997, p. 94) predicted 10 study sites would be used by pygmy rabbits, but later found large patches of cheatgrass on 8 of those sites, and that the pygmy rabbit did not use these sites. Other factors, such as large amounts of dead sagebrush, and/or sparse, short sagebrush, and thick grass cover, may have contributed to pygmy rabbit absence in those sites (Gabler (1997, p. 94). BLM (2005a, p. 2) indicated that no evidence of pygmy rabbits was found at any of the sites (no number provided) in Idaho surveyed in 2005 where cheatgrass was a major component of the understory. Burak (2006, p. 68) found that cheatgrass made up little of the grass community within his entire study area; areas occupied by pygmy rabbit had approximately 1 percent cheatgrass cover and unoccupied areas had less than 1 percent.

In Nevada and California, Larrucea and Brussard (2008b, p. 1641) stated that wide expanses of cheatgrass monocultures may provide a barrier to pygmy rabbit dispersal as they rely on shrub cover for protection from predators. Larrucea and Brussard (2008a, p. 697) found cheatgrass presence was negatively associated with pygmy rabbit presence at a site. Once established it may be difficult for pygmy rabbits to burrow into the dense root mats (Larrucea and Brussard 2008a, p. 697). SNWA overlaid a Nevada Natural Heritage Program invasive annual grass index map (most of which was cheatgrass) (NHP 2006, cited in SNWA 2008, p. 14) with 2000 to 2007 pygmy rabbit occurrence data from various sources. The overlay indicates a large portion of pygmy rabbit occurrences are within areas of relatively low cheatgrass cover. This map serves as a relative density index of cheatgrass rather than actual current ground cover because of the remote sensing and statistical models from which it is derived. While the underlying models tend to underestimate index values for sites with high invasive annual grass densities, the general pattern of low to high densities is well represented on the map. The map is quite accurate for sites where invasive annual grass cover is low or nonexistent. SNWA concluded that cheatgrass has not had a major impact on pygmy rabbit occurrence or geographic range in east-central Nevada (SNWA 2008, p. 14).

Larsen *et al.* (2006, p. 5) visited four historical pygmy rabbit sites in Tooele County, Utah that were unoccupied by pygmy rabbits. They mentioned these sites showed evidence of cheatgrass invasion, but it is unclear if all four sites supported cheatgrass.

Summary of Nonnative Invasive Plant Impacts

Based on information for a few specific areas, presence of invasive plant species has been documented and may have some impact on pygmy rabbit presence or their movements in Oregon, Idaho, Nevada, California, and Utah. These examples, as discussed above, are few in number and are not considered to be indicative of a widespread habitat condition. It is unclear whether the presence of cheatgrass or other invasive plant species caused pygmy rabbits to not occupy an area or if other factors may have also played a role. The scope of loss or modification of sagebrush habitat in general due to nonnative plant invasion does not equally relate to the loss or modification of pygmy rabbit habitat because pygmy rabbit's habitat is patchily distributed across the landscape.

Varying estimates have been made regarding the amount of area invaded by invasive plant species in the western United States, and some predictions indicate it could take decades for cheatgrass to invade sagebrush and other natural vegetation in a portion of the Great Basin. The Service recognizes that invasion of sagebrush habitat by nonnative plant species is a concern based on their ability to outcompete sagebrush, the difficulty in controlling them once established, and their interaction with other threats, such as fire. However, there is no indication of a significant loss or modification of habitat, and measureable population decreases attributed to habitat loss or modification due to nonnative plant species, especially cheatgrass, and pygmy rabbit site abandonment or avoidance are not occurring across the range. Available information does not provide a causal relationship between a reduction in pygmy rabbit visual capabilities and ease of movement due to nonnative plant species. Therefore, based on the best available scientific and commercial information, we conclude that nonnative invasive plant species in pygmy rabbit habitat is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Fire

The effect of fire on sagebrush habitats depend on the sagebrush species present, the composition of understory species, and the size, frequency, and intensity of the fire. Estimates of mean fire intervals indicated in the literature vary widely: 12 to 15 years for mountain big sagebrush (Miller and Rose 1999, p. 556), 13 to 25 years (Frost 1998, cited in Connelly *et al.* 2004, p. 7-4), greater than 50 years for big sagebrush communities (Whisenant 1990, cited in McArthur 1994, p. 347), 20 to 100 years (Peters and Bunting 1994, p. 33), 35 to 100 years (USFS 2000, p. 7), and 10 to 110 years depending on sagebrush species and geographic area (Kilpatrick 2000, p. 1).

Natural fires in sagebrush stands characteristically result in incomplete burns leaving areas of unburned sagebrush (Huff and Smith 2000, cited in 70 FR 2264). These unburned areas appear to be important in the future recolonization of the sagebrush community by providing sources of sagebrush seed (Huff and Smith 2000, cited in 70 FR 2264). Prior to European immigrant settlement, fire patterns in sagebrush communities were patchy,

particularly in Wyoming big sagebrush, due to the limited and discontinuous fuels and unburned areas that remained after a fire (Miller and Eddleman 2001, p. 17).

In parts of the Great Basin, a decline in fire occurrence since the late 1800's has been reported in several studies coinciding with fire suppression and reduction of fuels by introduced livestock (Miller and Rose 1999, pp. 556-557; Kilpatrick 2000, p. 6; Connelly *et al.* 2004, p. 7-5). Long fire intervals and fire suppression can result in increased dominance of conifer species, such as western juniper (*Juniperus occidentalis*) (Wrobleski and Kauffman 2003, p. 82) resulting in almost complete loss of shrubs in localized areas (Miller and Eddleman 2001, p. 20).

Burning can also damage perennial grasses, allowing cheatgrass to increase (Stewart and Hull 1949; Wright and Britton 1976, cited in Yensen 1982, p. 28). The presence of cheatgrass extends the fire season and carries a fire into areas where burning would not normally occur or can make fires difficult to control (Yensen 1982, pp. 28-29; Billings 1994, p. 24). The invasion of nonnative annuals, such as cheatgrass and medusa head has resulted in increases in the frequency and number of fires within sagebrush habitats (USFS 2000, p. 153; Connelly *et al.* 2004, pp. 5-9 to 5-10). Sagebrush does not quickly re-establish after fires, while nonnative grasses can recover quickly and increase, effectively preventing sagebrush return. Due to this relationship between fire and the spread of invasive plants, large areas of sagebrush in the western United States have been converted to cheatgrass (Connelly *et al.* 2004, p. 7-14).

Generally, fire tends to extensively reduce the sagebrush component within the burned areas. The most widespread species of sagebrush, big sagebrush (*A. tridentata* spp.) (McArthur 1994, p. 347), is killed by fire. It does not re-sprout after burning (Agee 1994, p. 14; Braun 1998, p. 9) and can take over 30 years to recolonize an area (Wambolt *et al.* 2001, pp. 244, 247). Depending on the species, sagebrush can reestablish itself within 5 years of a burn, but it may take 15 to 30 years to return to pre-burn densities (Bunting 1984; and Britton and Clark 1984, cited in Paige and Ritter 1999, p. 6). Billings (1994, p. 26) documented slow shrub succession following a burn in western Nevada, with little sagebrush recovery after 45 years. This suggests that these sagebrush subspecies evolved in an environment where wildfire was infrequent (30 to 50 year intervals) and patchy in distribution (Braun 1998, p. 9).

Connelly *et al.* (2004, p. 7-6) summarized fire statistics from records of wild and prescribed fires in the sagebrush biome and found the total area burned and the number of fires increased from 1960 to 2003. In the 100 million ac (40.5 million ha) sagebrush-steppe ecoregion or drier sagebrush areas, fire regimes have become more frequent (USFS 2000, p. 195). Miller *et al.* (2008, p. 39) also mapped fires from 1960 through 2007 and found that the number of fires and total area burned across the Greater Sage-grouse Conservation Area increased in each of the geographic subdivisions except the Snake River Plain from 1980 through 2007. Average fire size increased only in the Southern Great Basin during this period. Location of fires since 1960 was related to cheatgrass distribution particularly within the Snake River Plain and Northern Great Basin (Miller *et al.* 2008, p. 39).

Wildfires have removed large areas of sagebrush in recent years. Although fire occurs throughout the sagebrush ecosystem, fire has disproportionately affected Idaho, Nevada, Oregon, and Utah (Baker, in press, p. 20). In these states combined, about 27 percent of the sagebrush habitat has burned since 1980 (Baker, in press, p. 43). Total area burned each year on or adjacent to BLM-administered lands was variable from 1997 through 2006 (Miller *et al.* 2008, pp. 39-40); most total area burned was in cheatgrass regions in Oregon, Idaho, and Nevada (Miller *et al.* 2008, p. 40). A number of fires have occurred in Idaho that have exceeded 100,000 ac (40,469 ha) (Roberts 2003a, p. 14). The largest contiguous patch of sagebrush habitat in southern Idaho covered about 700,000 ac (283,000 ha) (Michael Pellant, BLM, quoted in Healy 2001, p. 3), and during 1999 to 2001 about 500,000 ac (202,000 ha) of this area burned. In Nevada, 1,277 fires in 2001 impacted 654,253 ac (264,773 ha) on public and private lands (BLM 2001, p. 3). In 2002, BLM reported 771 fires that impacted 77,551 ac (31,384 ha) on public and private lands in Nevada (BLM 2002, p. 3). In 2006, over 988,400 ac (400,000 ha) of sagebrush steppe and potential pygmy rabbit habitat was burned in Elko County (Larrucea and Brussard 2008b, p. 1641). Over 9 fire seasons in Nevada (1999-2007), about 2.5 million ac (1.0 million ha) of sagebrush habitat were burned. This represents about 12 percent of the extant sagebrush in Nevada (Espinosa and Phenix 2008, p. 3). Most of these fires occurred in northeast Nevada (75 FR 13933). The amount of occupied pygmy rabbit habitat impacted by these fires is unknown.

Sagebrush restoration efforts following fire are complicated by invasive, nonnative, annual plant species, costs, equipment limitations, availability of suitable seeds, limited knowledge of appropriate methods, and abiotic factors (Hemstrom *et al.*, 2002, pp. 1250-1251, Pyke, in press, p. 29). Habitat rehabilitation following fire has increased in recent years from 69,436 ac (28,100 ha) in 1997 to 3.9 million ac (1.6 million ha) in 2002 with treatments primarily occurring in Oregon, Idaho, and Nevada (Connelly *et al.* 2004, p. 7-35). While not all burned habitat is rehabilitated, fires which occur on public lands will likely experience some level of post-fire restoration (75 FR 13934).

Fire, either wild or prescribed, has been documented within the range of the pygmy rabbit and could result in long-term habitat loss or modification of pygmy rabbit habitat across its range. Possible impacts to pygmy rabbits include injury or death, reduction in forage and shelter, increased habitat fragmentation, increased predation, barriers to movement, or home range abandonment. Although information is available relating fire and its impact to pygmy rabbits, several studies have shown pygmy rabbit presence after fires.

In Idaho, researchers have noted burn areas on the lands they have surveyed for pygmy rabbits. For example, Roberts (1998, p. 11) stated that of the 583,600 ac (236,175 ha) he inventoried, about 2,500 ac (1,012 ha) had been temporarily removed due to fire (a loss of 0.4 percent). White and Bartels (2002, pp. 8-9) indicated of the 133,067 ac (53, 851 ha) they surveyed, 23,660 ac (9,575 ha) had been affected by wildfire within the last 15 years and that historical pygmy rabbit locations had been impacted. The sagebrush had been burned and habitat for the pygmy rabbit was not available. In these studies, researchers did not indicate how much of this acreage might have been occupied by pygmy rabbits and the number of historical sites where habitat may have been removed is unknown. However, Welch (2005, p. 10) visited historical pygmy rabbit sites in Utah and Idaho and documented some sites (2 of 13) were, or were likely impacted by fire.

Other researchers have reported impacts of fire on local pygmy rabbit populations. For example, Gates and Eng (1984, cited in Tesky 1994, p. 8) reported the deaths of "several" pygmy rabbits in an area where the fire advanced rapidly within a prescribed burn in Idaho. They thought pygmy

rabbits may be capable of escaping slow-moving fires but could be burned or die of asphyxiation in others (Gates and Eng 1984, cited in Tesky 1994, p. 8). Gates and Eng (1984, cited in Tesky 1994, p. 9) also reported that 2 months following a fire in big sagebrush-grassland community, only 3 of 11 radio-collared pygmy rabbits were alive. Of the eight lost, seven were due to predation. They speculated that the loss of big sagebrush from their home ranges probably increased vulnerability to predation. Some of the surviving pygmy rabbits (presumably other uncollared pygmy rabbits) abandoned their home ranges and moved to new home ranges in adjacent unburned sites (Gates and Eng 1984, cited in Tesky 1994, p. 9). Roberts (2001, p. 17) mentioned a 1966 burn near Gilmore Summit, Idaho, that had not regenerated to suitable habitat, and pygmy rabbits had not recolonized the area. Rachlow and Witham (2006, p. 6) suggested that large fires that removed sagebrush in the Camas Prairie of south central Idaho near the locations of known populations may reduce or eliminate successful movement of pygmy rabbits among some populations.

In Nevada, the Service (1995, p. 2) reported that a survey conducted after a prescribed fire on the Sheldon National Wildlife Refuge in an area previously inhabited by pygmy rabbits found no evidence of their use afterwards. Larrucea (2006, p. 5) found no active pygmy rabbit sites in areas burned between 1981 and 2002 within the Surprise FO boundary; however, few fires occurred, and they were small in size (Figure 5 in Larrucea 2006, p. 14). Larrucea and Brussard (2008b, p. 1641) found 16 percent of the 105 historical pygmy rabbit sites in Nevada and California had been impacted by fire. Larrucea (2007, p. 61) found fire to be the strongest predictor of loss of pygmy rabbits from a site in Nevada and California; the greater the fire's intensity, the fewer the patches of intact sagebrush will remain. Pygmy rabbits were found on the edges of large burned areas (Midas-Tuscarora Road, NV), but the burned areas had not reverted to suitable pygmy rabbit habitat (Larrucea 2007, pp. 61-62).

In contrast to the above studies, other researchers have mentioned burned areas that showed use by pygmy rabbits. In Idaho, a pygmy rabbit sighting reported by Red Willow Research Inc. (2000, p. 8) on BLM lands that had been impacted by wildfire in 1999 showed active use of the site. White and Bartels (2002, p. 13) mentioned that wildfires in the 1990's severely affected the pygmy rabbit population, though some individuals remained. At one of her study sites, Waterbury (2005, p. 11) found occupied burrows in an area where prescribed burns had occurred during 1993 to 1995. Waterbury (2006, p. 13) discovered a pygmy rabbit population in an old burn area in upper Spar Canyon.

In Montana, Rauscher (1997, p. 14) reported that a prescribed burn in 1980 near Badger Pass, Montana, had been recolonized by pygmy rabbits. He did not know how long this process had taken or if pygmy rabbit densities had reached preburn levels. Bockting (2007 p. 1) found prescribed burns of about 500 ac (202 ha) have been implemented in pygmy rabbit habitat to reduce *Pseudotsuga menziesii* (Douglas fir) encroachment. Fire patterns minimized burning in the dense sagebrush. A mosaic burn pattern was allowed. Mechanical treatments (chainsaws) have also been used to remove Douglas fir. Within one unit, pygmy rabbit burrows were identified prior to the burn and revisited after the burn. Where the sagebrush habitat was not burned over, the burrows were still occupied (Bockting (2007 p. 1). It appears that small burns that create a mosaic do not significantly impact pygmy rabbits as long as surrounding habitat is maintained and the entire population is not lost.

In Nevada, SNWA (2008, pp. 14-15) overlaid BLM's 1980 to 1996 and 1997 to 2007 wildlife data (BLM 2007b, cited in SNWA 2008, p. 14) with Nevada's 2000 to 2007 pygmy rabbit occurrence data from various sources. They stated that review of their map indicates that a large portion of Nevada pygmy rabbit occurrence data falls in areas with relatively low numbers and sizes of wildfires, especially in east-central Nevada. Large numbers and sizes of wildfires have not occurred throughout most of the historical and current pygmy rabbit range in east-central Nevada. They concluded that wildfires have not caused major declines in pygmy rabbits or their habitat, or pygmy rabbit occurrence or geographic range in east-central Nevada.

Summary of Fire Impacts

Fire has impacted sagebrush ecosystems in the past and will continue to do so in the future, likely in increasing frequency and size of burned area. This increase in frequency is likely to be attributed to increases in invasive plant species cover, especially cheatgrass, as discussed above, as well as possible impacts of climate change as discussed below. Some studies summarized above have shown pygmy rabbits to have been negatively affected in some specific areas within their range. However, other studies have shown pygmy rabbits are not affected or are able to recolonize burned areas. Based on reports from site-specific areas in Idaho, Montana, California, Nevada, and Utah, fire has resulted in some loss of sagebrush habitat used by pygmy rabbits and has likely resulted in some population declines. Of the available examples showing loss of habitat, these are few in number across the range and are not indicative of systematic or widespread loss of habitat that may have been or is now suitable for pygmy rabbits. The scope of loss or modification of sagebrush habitat in general due to fire does not equally relate to loss or modification of pygmy rabbit habitat because the pygmy rabbit habitat occurs in a patchy distribution across the landscape. Some fires have resulted in loss of individuals, forage, and shelter for pygmy rabbits which may have led to an increased vulnerability to predation (Gates and Eng 1984, cited in Tesky 1994, pp. 8-9). Abandonment of home ranges has been indicated at some specific sites but with the surviving individuals moving to adjacent unburned areas (Gates and Eng 1984 cited in Tesky 1994, p. 9).

Recolonization or use of burned areas has occurred in other site-specific areas. It also appears that the adverse impacts of fire may be minimized if burns are small, reducing possible habitat fragmentation and barriers to movement; if they occur in a mosaic pattern; if surrounding habitat is maintained to provide habitat; and if all members of a population are not lost. Additionally, studies in Montana and Idaho have indicated previously burned areas used or recolonized by pygmy rabbits (Rauscher 1997, Red Willow Research Inc. 2000, White and Bartels 2002, Waterbury 2005, 2006). Also in Montana a study indicated that a small mosaic fire, leaving some surrounding habitat, remained occupied by pygmy rabbits (Bockting 2007). Fire effects on sagebrush habitats depend on the sagebrush species, the composition and density of understory species, as well as the size, frequency, speed, burn pattern, and intensity of the fire. While it is not possible to predict the location or extent of future fires within pygmy rabbit habitat, the numbers of fires are likely to increase in the future; however, pygmy rabbits have shown an ability to survive and recolonize areas after some fire events. Based on our review of the best available scientific information, we conclude habitat loss or modification as a result of fire is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Pinyon-Juniper Woodlands Encroachment

Pinyon-juniper woodlands have increased in the Intermountain West an estimated 10 fold since European immigrant settlement (Miller and Tausch 2001, p. 15) resulting in the loss of many sagebrush-bunchgrass communities. The major factor cited for this increase is the decrease in fire return intervals (Miller and Tausch 2001, p. 25). Other factors attributed to this expansion include historical livestock grazing patterns, which reduced fine fuel buildup that more readily carried fire, and possibly climate change (Miller and Rose 1999, p. 551; Miller and Tausch 2001, p. 15).

Connelly *et al.* (2004, pp. 7-8 to 7-12) estimated the risk of pinyon-juniper displacement of sagebrush within 30 years for a large portion of the Great Basin based on site elevation, proximity to extant pinyon-juniper, precipitation, and topography. They projected that 60 percent of the sagebrush in the Great Basin was at low risk of being displaced by pinyon-juniper, 6 percent was at moderate risk, and 35 percent was at high risk (Connelly *et al.* 2004, p. 7-12). It appeared that mountain big sagebrush was the type most at risk for pinyon-juniper displacement (Connelly *et al.* 2004, p. 7-13). They cautioned that additional field research is necessary to support their projections (Connelly *et al.* 2004, pp. 7-14).

Surveys (BLM 2006a, pp. 4-5) conducted in Oregon found junipers at 6 of 7 sites surveyed, and pygmy rabbits occupied 5 of these sites with an additional site being inconclusive in terms of occupancy. In areas where pygmy rabbit burrows were found close to junipers, tree density ranged from 5 to 15 mature (70 to 120 years old) trees per ac (2 to 6 per ha), and trees more than 20 years old were common. The areas still had a sagebrush and grass understory. Burrows were within 50 yd (45.7 m) of junipers. . BLM (2007b, pp. 7-8) mentioned juniper control may benefit the pygmy rabbit populations at two of the eight occupied sites surveyed in Oregon. Juniper control may benefit pygmy rabbit populations at these sites before canopy closure affects the understory (BLM 2006a, p. 4; 2007b, p. 7).

Welch (2005, p. 10) indicated 1 of 13 historical pygmy rabbit sites visited in Utah and Idaho were impacted by juniper encroachment. Larsen *et al.* (2006, p. 5) found historical pygmy rabbit sites in Tooele County, Utah, showed evidence of pinyon-juniper encroachment, but he did not indicate if all four sites had been encroached by pinyon-juniper or whether there was remaining suitable pygmy rabbit habitat.

Pinyon-juniper encroachment may have a negative impact on pygmy rabbits. In Nevada, pinyon-juniper woodland populations have increased almost 250 percent in distribution during the last 150 years (Tausch *et al.* 1981, cited in Larrucea and Brussard 2008b, p. 1640). These conifers slowly replace the sagebrush and convert it to woodland habitat, eliminating the understory (Miller *et al.* 2000, cited in Larrucea and Brussard 2008b, p. 1640).

Larrucea and Brussard (2008b, p. 1640) found that a few of these trees at a site generally meant that pygmy rabbits were not present. Larrucea and Brussard (2008b, p. 1639), surveying sites in California and Nevada, showed that 14 percent of historical pygmy rabbit sites showed signs of pinyon-juniper woodland conversion. Of these sites, only one had current pygmy rabbit activity (Larrucea and Brussard 2008b, p. 1639). At 6 of the 14 extirpated pinyon-juniper sites, pygmy rabbits were known to occur lower in the valley where sagebrush habitat existed (Larrucea and Brussard 2008b, p. 1640). However, based on the information available a significant loss or modification of habitat and measureable population decreases from site abandonment or avoidance attributed to pinyon-juniper encroachment are not occurring across the range.

Summary of Pinyon-Juniper Woodlands Encroachment Impacts

Based on our review of the best available information, we found few studies which document negative effects of pinyon–juniper expansion on pygmy rabbit populations. Based on the studies cited above, pinyon-juniper expansion has occurred in some occupied pygmy rabbit habitat in Oregon, Idaho, California, Nevada, and Utah; however, pygmy rabbits continued to be present at a number of these sites. Larrucea and Brussard (2008b, p. 1639), surveyed sites in California and Nevada and found only 14 percent of historical sites showed signs of pinyon-juniper woodland conversion, and one had current activity. BLM (2006a, p. 4) conducted surveys in Oregon and found junipers at 6 of 7 sites, and pygmy rabbits continued to occupy a majority of these sites. Welch (2005, p. 10) found only 1 of 13 historical sites in Utah and Idaho showed signs of juniper encroachment. Larsen *et al.* (2006, p. 5) found four historical sites in Utah may have showed pinyon-juniper encroachment. The encroachment of pinyon-juniper into occupied pygmy rabbit habitat is a slow process, and pygmy rabbits may be able to inhabit those areas or shift their home range to adjacent areas if pinyon-junipers habitat becomes established at a site. Therefore, based on the best available scientific and commercial information, we conclude that pinyon-juniper expansion is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Urban and Rural Development

Historical destruction of sagebrush habitat for urban development has occurred (Braun 1998, pp. 6-7) with more recent expansion into rural areas causing additional loss (Braun 1998, pp. 6-7). Since 1950, the western United States has experienced rapid human population growth with regional rates higher than the national average (Brown *et al.* 2005 cited in Leu and Hanser in press, p. 4). Fifty percent of all population growth in the United States from 1990 to 2000 occurred in western states (Perry and Mackun 2001 cited in Anderson and Woosley 2005, p. 6). The amount of uninhabited area in the Great Basin (Idaho, California, Nevada, and Utah) has decreased from 90,000 km^2 (34,749 mi^2) in 1990 to less than 12,000 km^2 (4.633 mi^2) in 2004 (Knick *et al.* in press, p. 20). The petitioner contended that power lines, fences, and roads that are associated with urban and rural development may have also resulted in the direct loss of sagebrush habitat and subsequently affected pygmy rabbits.

Urban and rural development has impacted and may impact pygmy rabbit populations on a local scale. Possible effects to pygmy rabbits include loss of food and shelter, home range abandonment, injury or death at the time of vegetation clearing, habitat fragmentation, and population declines. Power poles and fences can provide hunting and roosting perches and nesting support, for many raptor species that are known to prey upon pygmy rabbits. In addition to direct habitat loss, roads may disrupt pygmy rabbit dispersal movements, and exacerbate potential impacts due to habitat fragmentation.

Some research indicates that pygmy rabbits can occur where humans are present, while other research indicates that the human-developed habitat is not inhabited by pygmy rabbits. For example, Red Willow Research Inc. (2000, p 6) observed a pygmy rabbit under a conifer near a main ranch house in Idaho. In Nevada and California, Larrucea and Brussard (2008b, p. 1639) found 21 percent of historical sites showed signs of urbanization and still had pygmy rabbits present. White and Bartels (2002, pp. 7-8) found urban development had impacted 3 of 13

historical pygmy rabbit locations in Idaho, and no active pygmy rabbit burrows were found. Janson (2002, p. 32) discovered that one of his 1940's pygmy rabbit study areas was impacted by residential and commercial development near Cedar City, Utah, when it was revisited in 2001. He reported that his study area had been "taken over" by development and no pygmy rabbits or recent sign was seen.

The petitioners contend that power lines and fences associated with urban and rural development result in loss of pygmy rabbit habitat, predation, displacement, and creation of movement barriers to pygmy rabbit populations. The available information does not document that power lines or fences are causing these impacts to pygmy rabbit populations.

Estes-Zumpf and Rachlow (2009, p. 367) found that several radio-collared pygmy rabbits crossed gravel roads and creeks in Idaho. Rauscher (1997, p. 14) reported the use of a subnivian (layer between snow and soil surface) tunnel that extended across a back country road near Badger Pass, Montana. Western EcoSystems Technology, Inc. (2008, p. 28) reported observations of pygmy rabbits crossing open areas, including desert grasslands with limited shrub cover, roads, and between shrub lands surrounded by grasslands in Wyoming. These few studies indicate that roads do not significantly affect pygmy rabbit movements.

Summary of Urban and Rural Development Impacts

Although loss of sagebrush habitat due to development has been documented and will continue in the future, the amount of suitable or occupied pygmy rabbit habitat lost (or the magnitude of that loss across the range) is minimal in scale compared to overall sagebrush habitat and will likely remain so. Based on the best available information, pygmy rabbits have been reported to have been impacted by some development in a few site-specific areas in Idaho and Utah, but they have also continued to be present in some other areas. The scope of loss or modification of sagebrush habitat in general due to urban and rural development does not equally relate to the loss or modification of pygmy rabbit habitat because pygmy rabbits are patchily distributed across the landscape.

While power lines, fences, and roads associated with development are also known to occur across sagebrush habitat within the range of the pygmy rabbit, we have no information regarding the amount of pygmy rabbit habitat that has been impacted across the range. The best available scientific information does not indicate that power lines, fences, and roads are threats to the pygmy rabbit. We do not have reports of raptors associated with power lines or fences impacting pygmy rabbit populations. The best available scientific information indicates that pygmy rabbits will cross roads, suggesting roads may be less of a barrier to pygmy rabbit movements than previously thought. Therefore, based on the best available scientific and commercial information, we conclude that urban and rural development, including associated power lines, fences, and roads, in the sagebrush ecosystem are not significant threats to the pygmy rabbit now or in the foreseeable future.

Mining

Sagebrush habitat throughout the west has been impacted by gold, coal, and uranium mining (Braun 1998, pp. 5-6). Mining, livestock grazing, and ranching are decreasing as a percent of the economics in some parts of the western United States (Hansen *et al.* 2002, 2005 cited in Knick *et al.* in press, p. 56). Immediate impacts from mining to sagebrush habitat include direct loss from mining and construction of associated facilities, roads, and power lines (Braun 1998, pp. 5-6). In western North America, development of mines and energy resources began before 1900 (Robbins and Wolf 1994, cited in Braun 1998, p. 5).

While comprehensive information on the number or surface extent of mines across the range of the pygmy rabbit is not known, the development of mineral resources is occurring on a large-scale and important to the economies of a few of the states in the range. For example, Nevada ranked second in the United States in terms of value of overall nonfuel mineral production in 2006 (U.S. Geological Survey 2007, p. 10); Wyoming is the largest coal producer in the U.S. (Wyoming Mining Association 2008, p. 2).

Between 2006 and 2007, surface coal production increased by 1.6 percent in Wyoming (EIA, *http://www.eia.doe.gov/cneaf/coal/page/acr/table1.pdf*, accessed October 19, 2008). The number of Wyoming coal mines increased from 19 in 2005 to 23 in 2007 (Wyoming Mining Association 2005, p 5; 2008, p. 6). Most of these mines are located in the Powder River Basin (Wyoming Mining Association 2008, p. 2) which is not within the known range of the pygmy rabbit in that State.

Possible impacts from mining to pygmy rabbits could include injury or death, loss or reduction of forage or shelter, temporary or permanent home range abandonment, increased habitat fragmentation, increased dispersal barriers, increased predation, and population declines. Red Willow Research Inc. (2000, p. 6) reported a pygmy rabbit sighting near the Historical Tallman Pit on the Sawtooth National Forest, Idaho. The individual was observed entering the rocks and boulders on the east edge of the pit. In California, pygmy rabbits have been observed in the area around Bodie, a mining town that was abandoned in the mid 1930's (Severaid 1950, p. 2). In Oregon, two survey areas supported active pygmy rabbit burrows at inactive diatomaceous earth mines (BLM 2008d, pp. 3, 6). One pygmy rabbit was observed at one of the sites (BLM 2008d, p. 6). Still, the best available scientific information does not indicate whether pygmy rabbits occupied these areas prior to or during the active mining period or if the observed individuals colonized or recolonized the areas after mining activities ceased.

Summary of Mining Impacts

Though mining activities occur within sagebrush habitat, we do not have an estimate of habitat lost to mining impacts; however the impact to pygmy rabbit habitat is likely small compared to the overall range of the species and will likely continue to remain so in the future. Noted increases in the number of Wyoming coal mines occurred mostly in the Powder River Basin outside the known range of the pygmy rabbit in that State. We do have some information that indicates pygmy rabbits have been observed at specific mining areas in Idaho, California, and Oregon which may indicate pygmy rabbits are adaptable and can exist near mining sites or reestablish use of mining areas after mining activities have ceased. The best available scientific information indicates that significant loss or modification of habitat and measureable population decreases due to habitat loss or modification from mining impacts are not occurring across the range. Therefore, based on the best available scientific and commercial information, we conclude that habitat loss or modification due to mining is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Energy Exploration and Development

Energy exploration and development of non-renewable resources (oil, gas, coal) has occurred in sagebrush habitat since the late 1800's (Connelly *et al.* 2004, p. 7-38). Energy development and its associated facilities (well pads, access roads, pipelines, compressor

stations, pumping stations, and power lines) can impact sagebrush habitats.

The exploration and development of fossil fuels in sagebrush habitats has increased recently as prices and demand are spurred by geopolitical uncertainties and legislative mandates (National Petroleum Council 2007, pp. 5-7). Legislative mandates include those of the Energy Policy and Conservation Act of 1975 (EPCA), 42 U.S.C. 6201, *et seq.*, to secure energy supplies and increase the availability of fossil fuels. The EPCA was re-authorized and amended by the Energy Policy Act of 2000, P.L. 106-469, and the Energy Policy Act of 2005, PL 109-58, mandating inventory of Federal nonrenewable resources, economic incentives for energy development, identification of impediments to timely granting of leases and post-leasing development, and increased development of renewable energy resources (DOE 2005). In addition, the Energy Policy Act of 2005 mandated designation of federal lands for energy transport corridors (DOE 2005).

Present and future exploration and development is highly likely to focus on areas of highest potential return. Pursuant to the EPCA mandates, the BLM as lead Federal agency for EPCA implementation, released results in 2003 of the first of a 4-phase survey intended to identify onshore oil and gas resources. Phases II and III were published in 2006 and 2008, respectively. Phase III supersedes the previous phases (DOI *et al.* 2008, p. 6).

Available EPCA inventories indicate energy resources (oil and gas) in 11 geological basins within the range of the greater sage-grouse as identified in the 2006 Conservation Strategy (Stiver *et al.* 2006, p. 1-11) for the greater sage grouse. Some of these basins also correspond with pygmy rabbit range: the Wyoming Thrust Belt of Wyoming, Utah and Idaho; Southwestern Wyoming Basin including portions of Wyoming and Utah; and Eastern Great Basin in Nevada, Utah, and Southern Idaho.

We are aware that many land parcels within the range of the pygmy rabbit are leased for oil and gas development. Oil fields have been developed in east-central Nevada and western and central Utah. Major oil and gas production areas occur in eastern Utah, southwest Wyoming, and central California (USFS 2008a, p. 25). We are aware of a number of projects related to oil, gas, and coalbed methane production in sagebrush habitats—-most notably in Wyoming—-as can be seen from the following list of NEPA documents:

- Final Environmental Impact Statement (EIS) for the Jack Morrow Hills Coordinated Activity Plan/Proposed Green River Resource Management Plan Amendment, (BLM 2004a), for Sweetwater, Fremont and Sublette Counties, Wyoming;
- Scoping Notice for South Piney Natural Gas Development Project, (BLM undated), for Sublette County, Wyoming;
- Final Supplemental EIS for the Pinedale Anticline Oil and Gas Exploration and Development Project, (BLM 2008a), for Sublette County, Wyoming;
- Record of Decision Jonah Infill Drilling Project, (BLM 2006b), for Sublette County, Wyoming;
- Record of Decision EIS for the Atlantic Rim Natural Gas Field Development Project, (BLM 2007d), for Carbon County, Wyoming;
- Finding of No Significant Impact and Decision Record for the Bitter Creek Shallow Oil and Gas Project, Sweetwater County, Wyoming (BLM 2005b);
- Decision Record, Finding of No significant Impact and Environmental Assessment for the Copper Ridge Shallow Gas Exploration and Development Project, (BLM 2003b), for Sweetwater County, Wyoming;
- Environmental Assessment, Finding of No significant Impact and Decision Record for the Pacific Rim Shallow Gas Exploration and Development Project, Sweetwater County, Wyoming (BLM 2004b);
- Record of Decision for White Pine and Grant-Quinn Oil and Gas Leasing Project, (USFS 2007), for White Pine, Nye, and Lincoln Counties, Nevada;
- Final EIS Greater Deadman Bench Oil and Gas Producing Region, (BLM 2008b), for Uintah County, Utah.

Currently, pygmy rabbits could be most affected by an energy resources development concentration in the Southwest Wyoming Basin. For example, the BLM published the Record of Decision in 2008 for Pinedale Anticline Project Area in southwest Wyoming (BLM 2008e). The project description included up to 900 drill pads, including dry holes, over a 10 to 15–year development period (BLM 2008a, p. 4-4). Approximately 250 new well pads are proposed in addition to pipelines and other facilities (BLM 2008e, p. 36). Total initial direct disturbance acres for the entire Pinedale project are approximately 25,800 ac (10,400 ha) with over 18,000 ac (7,200 ha) in sagebrush land cover type (BLM 2008a, pp. 4-52).

The Jonah Gas Project also occurs in the Pinedale Anticline area of the Southwest Wyoming Basin. In 2006, the BLM issued a Record of Decision (BLM 2006b, entire) and a final EIS (BLM 2006c, entire) to extend the existing project to an additional 3,100 wells and up to 16,200 ac (6,556 ha) of new surface disturbance (BLM 2006c, p. 2-4). Specific features include: at least 64 well pads per 640 ac (259 km^2), up to 473 mi (761 km) of pipeline and roads, and 140 ac (56 ha) of new surface disturbance for ancillary facilities (BLM 2006c, pp. 2-4 to 2-5).

The Pinedale Anticline and Jonah Gas Field Projects as analyzed by the BLM's EISs are not the only oil and gas development occurring in Wyoming. According to the Wyoming Oil and Gas Commission completed wells in Wyoming counties with sagebrush habitats increased from a total of 37,144 in 2005 to 42,510 in 2007. An additional 6,209 applications for permit to drill were approved from January through September 2008 in these counties (WOGC 2008, *http://wogcc.state.wy.us*, accessed September 29, 2008).

The Ruby Pipeline Project, as proposed, involves the construction and operation of a 675-mi-(1,086-km)-42-inch (106.7-cm)-diameter natural gas pipeline. The pipeline would transport natural gas from western Wyoming, through northern Utah and Nevada, to south central Oregon (Federal Energy Regulatory Commission (FERC) 2010, pp. 1-2- 1-3). The project would cross known occupied pygmy rabbit habitat in Wyoming, Utah, and Nevada (FERC 2010, p. 4-126). Approximately 62 ac (25 ha) of suitable pygmy rabbit habitat was delineated along the pipeline route in these three states (FERC 2010, p. 4-147). The Applicant has committed to minimize impacts to pygmy rabbits by conducting preconstruction surveys, realignment of portions of the pipeline to avoid occupied habitat, construction buffers, construction timing restrictions, and specific re-vegetation activities, among other commitments (FERC 2010, pp. 4-132; 4-159; 5-9).

Possible impacts to pygmy rabbits due to nonrenewable energy exploration and development include injury or death, loss of habitat, habitat fragmentation, dispersal barriers, noise, and disturbance due to increased human presence. Lance (2008, pp. 5-6) provided information on oil and gas development in southwestern Wyoming as it relates to pygmy rabbits. He indicated that the greatest number of wells drilled to date has occurred in the Pinedale/Jonah fields in southern Sublette County (Big Piney area south to Granger; in the Overthrust Belt along the Wyoming/Utah border; the Wamsutter area). While oil and gas development has been intensive in some portions of

the pygmy rabbit's predicted range in Wyoming, the majority of the range has been subjected to scattered oil and gas exploration and/or development, or no exploration or development at all. The pygmy rabbit's predicted range in Wyoming is based on a predictive distribution model that uses habitat variables and confirmed pygmy rabbit records (sightings) from the Wyoming Natural Diversity database (Lance 2008, pp. 2-3). Lance (2008, p. 5) estimated that 9,200 oil and gas wells have been drilled within the predicted range. Based on an average disturbance of 25 ac (10.1 ha) per well (accounting for pad, production facility, roads, pipelines, etc.), it was estimated that 4 percent of the predicted range in Wyoming has been disturbed by conventional oil and gas development.

Coal bed methane development is expected in isolated portions of the pygmy rabbit's predicted range in Wyoming. The areas potentially suitable for coal bed methane development include the area around Atlantic Rim and Baggs in Carbon County, and in the vicinity of Hay Reservoir in Sweetwater County.

While some power lines may cross habitat occupied by pygmy rabbits, localized and insignificant impacts are expected given the linear nature of these projects (Lance 2008, p. 6). Power poles could be used as perches by avian predators preying on pygmy rabbits; however, as discussed above, we were not able to find evidence documenting this.

Purcell (2006, pp. 2, 34) expressed concern for loss of sagebrush communities at energy production sites in Wyoming. Purcell (2006, p. 110) mentioned that oil and gas development in southwestern and south central portions of Wyoming may contribute to degradation of suitable areas used by pygmy rabbits due to destruction of sagebrush and sodium contamination of the soil; and recommended that research be conducted to determine pygmy rabbit response to these disturbances.

In contrast, two studies indicate energy projects and pygmy rabbits can co-exist. Hayden-Wing Associates, Inc. (2008b, p. 2) compiled pygmy rabbit observations of all sign (visuals, burrows and pellets, burrows only, pellets only) they collected during 1994 to 2007 surveys in Wyoming. All of their observations were within 109 yd (100 m) of roads (Hayden-Wing Associates, Inc. 2008b, p. 3). Observations were recorded in the Continental Divide-Wamsutter and Creston-Blue Gap natural gas project areas in Carbon and Sweetwater Counties; Moxa Arch natural gas development area in Lincoln, Uinta, and Sweetwater Counties; Jonah gas field in Sublette County; and Lake Ridge 3D seismic area in Lincoln County (Hayden-Wing Associates, Inc. 2008b, p. 2). They recorded 1,151 pygmy rabbit observations (visuals, n=216; burrows and pellets, n=422, pellets only, n=513) (Hayden-Wing Associates, Inc. (2008b, p. 3). The majority of observations (50 percent) occurred in Moxa, 26 percent occurred within the Continental Divide-Wamsutter and Creston-Blue Gap areas, 17 percent in the Jonah gas field, and 6.5 percent in the Lake Ridge 3D seismic area (Hayden-Wing Associates, Inc. 2008b, p. 3). They acknowledge biases with road-based surveys and possible uncertainties in assigning pellets to pygmy rabbits, but concluded that energy development and pygmy rabbits do coexist throughout portions of Wyoming (Hayden-Wing Associates, Inc. 2008b, p. 3). Pygmy rabbit locations were farther away from well pads, but the analysis, in general, suggests that pygmy rabbits are capable of tolerating some level of disturbance (Hayden-Wing Associates, Inc. 2008b, p. 4). The authors suggest that research needs to be conducted to quantify the mechanisms that affect pygmy rabbits due to energy development, to understand thresholds at which negative impacts occur, and to determine ways the industry can avoid impacting populations (Hayden-Wing Associates, Inc. 2008b, p. 4).

Estes-Zumpf *et al.* (2009, p. 4) began a pygmy rabbit monitoring program in the Pinedale Anticline Project Area (PAPA) (359 plots) and in a neighboring Boulder reference area (85 plots), Sublette County, Wyoming, in 2009. Surveys confirmed recent or current pygmy rabbit use at 83 percent of the plots, and there were 120 confirmed pygmy rabbit sightings across both study areas (Estes-Zumpf *et al.* 2009, p. 9). The Boulder reference area contained a greater proportion of active plots (81 percent) compared to the PAPA (54 percent) (Estes-Zumpf *et al.* 2009, p. 9). One hundred and twelve plots were surveyed in the PAPA that occurred within the five oil and gas development areas (Estes-Zumpf *et al.* 2009, p. 10). The proportion of active (52 percent) and recently active (25 percent) plots within the development zone was similar to the proportion of active (54 percent) and recently active (26 percent) plots throughout the PAPA (Estes-Zumpf *et al.* 2009, p. 10). Thirty-two known plots were surveyed inside the development zone and 19 known plots were surveyed in the remainder of the PAPA; the proportion of known plots in the development zone that were still active (88 percent) was similar to the proportion of known plots still active (74 percent) in the remainder of the PAPA (Estes-Zumpf *et al.* 2009, p. 10). Only 2 (6 percent) of previously known active plots within the development zone showed recent, but not current, pygmy rabbit activity (Estes-Zumpf *et al.* 2009, p. 10).

Past and present renewable energy development (wind, solar, and geothermal) in sagebrush habitats could impact pygmy rabbits. Possible impacts to pygmy rabbits could include injury or death, loss of habitat, habitat fragmentation, dispersal barriers, noise, and disturbance due to increased human presence. The Department of Interior (DOI) and Department of Energy (DOE) (2003, pp. 2-17) assessed the potential for renewable energy being developed on public lands in 11 western States. This assessment also indicated which BLM planning areas within these States offered the highest potential for each type of renewable energy (DOI and DOE 2003, pp. 18-24).

BLM published a Final Programmatic EIS on Wind Energy Development on BLM-administered Lands in the Western United States (BLM 2005c, entire). This EIS addresses the environmental, social, and economic impacts associated with wind energy development on BLM-administered lands in 11 western States under the direction of increasing renewable energy production on public lands while minimizing environmental and socio-cultural impacts (BLM 2005c, p. ES-1). Future proposed wind energy projects may impact sagebrush habitats, and therefore, pygmy rabbits within the seven States. The 12–month finding for the greater sage-grouse (75 FR 13950) provides acreage of sagebrush habitat with wind energy development potential by Greater Sage-grouse Management Zone. Selecting those management zones that most appropriately overlap with the pygmy rabbit range, the estimated percent of sagebrush with developable wind potential in the species range is 3 to 9 percent (Greater Sage-grouse Management Zones III, IV, V). Greater Sage-grouse Management Zone II has 42 percent of sagebrush habitat with developable wind potential, but this incorporates a much larger area of Wyoming than is known to be occupied by pygmy rabbits.

Wind development could occur in the future in the eastern portion of the predicted range in Wyoming; most projects are expected to be located east of Rawlins, and some may occur between Rawlins and Wamsutter in pygmy rabbit habitat with localized impacts (Lance 2008, p. 6).

Eastern Nevada and the Pinedale area of Wyoming are the areas within the pygmy rabbit range with good potential for commercial solar development (EIA 2009e, entire cited in 75 FR 13953). The BLM is developing a programmatic EIS for leasing and development of solar energy on BLM lands (75 FR 13953).

Geothermal energy facilities occur in pygmy rabbit range in California, Nevada, Utah, and Idaho. Geothermal potential occurs across pygmy rabbit range in the four mentioned states above as well as in southeast Oregon and west central Wyoming (EIA 2009e, entire cited in 75 FR 13953).

A Programmatic EIS for the Designation of Energy Corridors on Federal Land in the 11 Western States (DOE 2008) was published in 2008. This EIS addresses section 368 of the Energy Policy Act of 2005 which directs the designation of corridors for oil, gas, and hydrogen pipelines, and electricity transmission and distribution facilities on Federal lands. Federal agencies are required to conduct environmental reviews to complete the designation and incorporate the designated corridors into agency land use and resource management plans or equivalent plans. This EIS proposes only designation of corridors, and no environmental impacts are attributed to this action. Section 368 does not require agencies to consider or approve specific projects, applications for rights-of-way (ROW), or other permits within any designated corridor nor does section 368 direct, license, or permit any activity on the ground. Any interested applicant would need to apply for a ROW authorization and the agency would consider each application under the requirements of various laws and related regulations (DOE 2008, S-1-S-2). The proposed action would designate more than 6,000 mi (9,600 km) with an average width of 3,500 ft (1 km) of energy corridors across the West (DOE 2008, p. S-17). Federal land not presently in transportation or utility right-of-way is proposed for use in Idaho (102 mi or 164 km), Montana (149 mi or 240 km), Nevada (373 mi or 600 km), Oregon (253 mi or 407 km), Utah (166 mi or 268 km), Wyoming (70 mi or 113 km), and California (unclear as miles in existing right-of-way is greater than miles of proposed corridors) (DOE 2008, p. S-18). Although we do not have data on how much of the corridor is in sagebrush habitat within the range of pygmy rabbits, based on the proposed location, habitat in Wyoming, Idaho, Utah, Nevada, and Oregon would be most affected.

Summary of Energy Exploration and Development Impacts

Energy (nonrenewable and renewable) exploration and development has been documented within sagebrush habitat. Pygmy rabbits have been reported to occur in areas impacted by energy development in Wyoming and have continued to be present in these areas but with unknown impacts to population trends and long-term population persistence. The scope of loss or modification of sagebrush habitat in general due to energy exploration and development does not equally relate to the loss or modification of pygmy rabbit habitat because of the pygmy rabbit's patchy habitat distribution across the landscape. Available information indicates that significant loss or modification of habitat and measureable population declines from injuries or mortalities, temporary home range abandonment or permanent home range shift to adjacent areas, increased habitat fragmentation, increased dispersal barriers, noise, or increased human presence due to energy development (nonrenewable and renewable) are not occurring across the range.

Energy exploration and development is occurring, especially within a portion of the pygmy rabbit's range in Wyoming. Yet, the available information does not indicate that this potential threat is negatively impacting pygmy rabbits. Therefore, based on the best available scientific and commercial information, we conclude that habitat degradation and loss due to energy exploration and development is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Habitat Fragmentation

Habitat fragmentation is the separating of previously contiguous, functional habitat components that are used by a particular species. Habitat fragmentation can result from direct losses that leave remaining habitat in discontinuous patches or from alteration of habitat such that the habitat becomes unusable to the species (i.e., functional habitat loss). This type of loss can result from disturbances that change a habitat's successional state or remove one or more of its habitat functions; barriers that prevent use of suitable areas; and activities that prevent use of habitat due to behavioral avoidance. Most extant sagebrush habitat has been altered since European immigrant settlement of the West (Braun 1998, p. 2; West and Young 2000, Miller and Eddleman 2001, cited in Knick *et al.* 2003, p. 614; Connelly *et al.* 2004, p. 7-1). Sagebrush habitat continues to be fragmented (Knick *et al.* 2003, p. 625) through various factors (natural and anthropogenic) and will into the future. Cumulative effects of habitat fragmentation have not been quantified over the range of sagebrush and most fragmentation cannot be attributed to specific land uses (Knick *et al.* 2003, pp. 614-616). Review of the human-footprint intensity within the greater sage-grouse management zones showed that the Northern and Southern Great Basin and Snake River Plain sage-grouse management zones contained a greater proportion of low-intensity human footprint area compared to the range-wide intensity (Leu and Hanser in press, p. 14). Sage-grouse management zones with a higher proportion of high-intensity human footprint area (Colorado Plateau, Great Plains, and Columbia Basin) compared to the range-wide intensity (Leu and Hanser in press, p. 14) occurred outside of the range occupied by the pygmy rabbit. Thus, in sage-grouse management zones, the range of the pygmy rabbit occurs mostly within a low-intensity human footprint area.

In general, habitat fragmentation has been mentioned as a potential threat to pygmy rabbits by several researchers (White and Bartels 2002, p. 13; Bartels 2003, p. 99; Roberts 2003a, p. 9). Potential impacts to pygmy rabbits include loss of habitat, increased dispersal distance, increased predation, and increased isolation. Weiss and Verts (1984, p. 570), in Oregon, stated that fragmentation of sagebrush posed a threat to pygmy rabbit populations by reducing the size of this vegetative community and increasing the distances between suitable areas; however, the severity of this threat to pygmy rabbits cannot be adequately assessed without improved understanding of the dispersal abilities of this species and minimum sagebrush patch size requirements. Katzner and Parker (1997, p. 1071) stated that fragmentation of habitat can influence size, stability, and success of pygmy rabbit populations because of their low dispersal capabilities. However, subsequent studies by researchers, as indicated below, demonstrate dispersal capabilities of pygmy rabbits are greater than initially thought and that potential barriers such as perennial creeks and roads do not appear to be barriers to gene flow among some populations.

Pygmy rabbits depend on sagebrush, but there is no information available to indicate minimum sagebrush patch size required to support populations. In Washington, the Service (2007, p. 54) estimated that a subpopulation of at least 500 Columbia Basin DPS pygmy

rabbits would need an area of between 454 and 3,250 ac (184 and 1,316 ha) of suitable habitat. Some studies indicate that pygmy rabbit populations may not be as isolated as previously thought. This has implications for recolonization and genetic exchange between nearby areas. In Montana, movement data has shown pygmy rabbits will cross relatively small open areas (1,500 ft (457 m)) to reach suitable habitat (Rauscher 1997, p. 5). In Wyoming, Katzner and Parker (1998, p. 73) reported a pygmy rabbit traveled long-distance (2.2 mi (3.5 km)) through open habitat likely unsuitable for long-term habitation. In Idaho, Estes-Zumpf and Rachlow (2009, p. 367) found median dispersal movements of 0.93 mi (1.5 km) and 3.9 mi (6.2 km) and maximum dispersal movements of 4.0 mi (6.5 km) and 7.4 mi (11.9 km) by male and female juvenile pygmy rabbits, respectively. Crawford (2008, p. 54) in Nevada and Oregon reported that 24 radio-marked rabbits moved greater than 0.3 mi (0.5 km) with a maximum long-distance movement of 5.3 mi (8.5 km) recorded by a juvenile female.

Continued survey efforts in recent years have found new populations throughout the pygmy rabbit's range. Rachlow and Witham (2006, p. 6) found that the locations of the 32 new sites in the Camas Prairie of south central Idaho indicated the possibility that movement can occur among several of these sites. The sites are separated by distances of less than 3.1 to 4.3 mi (5 to 7 km) which are within dispersal capabilities shown by Estes-Zumpf and Rachlow (2009) and Rachlow and Witham (2006, p. 6). Because most surveys for pygmy rabbits are limited to a single state, it is noteworthy that some reports mention occupied sites near state lines. This suggests the possibility that additional unreported genetic exchange may be occurring where ranges overlap two states. This would further reduce the concern of habitat fragmentation and isolation. Roberts (2003a, p. 9) reported that 6 of the 9 active burrow systems found were within 15 mi (24.1 km) of the Idaho State line. One was within 3 mi (4.8 km) of the Montana border at the head of Medicine Lodge Creek, Clark County. Two active burrow sites were within 8 mi (12.9 km) of both Wyoming and Utah borders on Pegram Creek, Bear Lake County. One active burrow site found on the Curlew National Grasslands was about 15 mi (24.1 km) north of the Utah border and two active burrows sites were about 15 mi (24.1 km) north of the Nevada border near Riddle, Idaho. In Montana, Hendricks *et al.* (2007, p. 13) mentioned that two new active sites found during their survey occurred in gaps between other locations and suggested pygmy rabbits may exist in additional locations in Big Hole Valley. Continued occupancy of previously known locations along the east side of Big Hole Valley may benefit through connectivity with populations in Grasshopper Valley, Argenta Flats, and Horse Prairie located to the south.

Estes-Zumpf *et al.* (2010, p. 212) obtained genotypes for 249 pygmy rabbits from 8 sample locations in Lemhi Valley (5) and Camas Prairie (3), Idaho. They did not document strong evidence of genetic substructure based on nuclear microsatellites among pygmy rabbit populations within the study areas (Estes-Zumpf *et al.* 2010, p. 215). Lack of strong population structure within the study areas indicates that perennial creeks and roads do not appear to create substantial barriers to gene flow (Estes-Zumpf *et al.* 2010, pp. 215-216). Levels of genetic diversity in pygmy rabbits were relatively high in the study areas (Estes-Zumpf *et al.* 2010, pp. 214). Sample locations within 8.1 mi (13 km) of one another in each study area showed sufficient gene flow to constitute single populations (Estes-Zumpf *et al.* 2010, pp. 215).

In Utah, Flinders (2007, pp. 2-3) found fairly extensive populations in Hamlin Valley located on the Utah/Nevada border in Iron and Beaver Counties (Utah). He thought that this area may provide an important habitat corridor between the two States as he found pygmy rabbit use for several miles on both sides of the border.

Summary of Habitat Fragmentation Impacts

Although we cannot estimate the amount of suitable or occupied pygmy rabbit habitat lost or the magnitude or extent of that loss due to habitat fragmentation, the habitat used by pygmy rabbits is naturally fragmented and populations occur in a patchy distribution across their range. Because of this patchy habitat distribution across the range, the scope of loss or modification of sagebrush habitat in general due to fragmentation does not equally relate to the loss or modification of pygmy rabbit habitat. Naturally fragmented sagebrush habitat occupied by pygmy rabbits may not have been more prevalent or more contiguous prior to human settlement. Local distribution of this habitat and the distribution of the pygmy rabbit likely shifts over time due to disturbances from factors such as fire, agriculture production, flooding, grazing, and weather patterns.

Pygmy rabbit populations may be less isolated than previously thought based on studies in Idaho, Montana, Wyoming, Nevada, and Utah. For example, studies related to movement data indicate pygmy rabbits, including juveniles, can move greater distances than initially thought (Green and Flinders 1979, p. 88; Gahr 1993, p. 108; Katzner and Parker 1998, p. 73; Crawford 2008, p. 54; Estes-Zumpf and Rachlow 2009, p. 367).

Other studies by Rachlow and Witham (2006, p. 6) and Roberts (2003a, p. 9) in Idaho, Hendricks *et al.* (2007, p. 13) in Montana, and Flinders (2007, pp. 2-3) in Utah, as detailed above, suggest connectivity may occur among several areas and between states. Understanding dispersal capabilities of pygmy rabbits plays an important role in addressing the possibility for genetic exchange among occupied sites as well as determining whether the characteristics of a metapopulation apply to this species.

The best available scientific information does not indicate that fragmented sagebrush habitat is negatively impacting pygmy rabbit populations across their range. Available information indicates through genetic analysis that current habitat sagebrush distribution does not appear to affect dispersal distances, predation, or isolation among pygmy rabbit populations. Although the necessary patch size to support pygmy rabbit populations has not been determined, this species has been reported to historically survive in a naturally fragmented habitat. Survey efforts demonstrate that pygmy rabbits have been found in areas impacted or fragmented by various potential threats as discussed in Factor A and continue to exist in or adjacent to many of these areas suggesting that habitat fragmentation is not a significant threat to this species. While its habitat may be impacted to some degree by current habitat fragmentation, based on the best available scientific and commercial information, we conclude that habitat fragmentation is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Habitat Manipulation Conducted to Benefit Greater Sage-Grouse

There has been a recent and widespread interest in the protection and restoration of sagebrush habitats with an emphasis on greater sage-grouse conservation (BLM 2004c). It is uncertain whether efforts implemented to improve greater sage-grouse habitat will benefit pygmy rabbits. Some habitat manipulation to benefit greater sage-grouse could benefit pygmy rabbit (e.g.,

pinyon-juniper removal) (Larrucea 2007, p. 127).

Connelly *et al.* (2000, pp. 977, 980) recommend managing sagebrush canopy cover for greater sage-grouse habitat at 10 to 25 percent for brood-rearing, 15 to 25 percent for breeding habitat, and 10 to 30 percent for winter habitat. Pygmy rabbits, in general, prefer taller, denser sagebrush cover relative to the surrounding landscape (Green and Flinders 1980b, p. 138; Weiss and Verts 1984, p. 567), which can be greater than the 10 to 30 percent range suggested for greater sage-grouse habitat needs during their various life history stages. Burak (2006, pp. 63-64) found total shrub cover values ranged from 41 to 67 percent and sagebrush cover values ranged from 12 to 60 percent in areas occupied by pygmy rabbits. Reducing dense sagebrush cover to benefit greater sage-grouse may be in conflict with habitat needs of pygmy rabbits.

In Nevada, Larrucea (2006, p. 7) raised a concern that sagebrush management plans which target areas of mature sagebrush for treatment to promote succession (e.g., Greater Sage-Grouse Conservation Plan for Nevada and Eastern California (NDOW 2004), cited in Larrucea 2006, p. 7) do not protect pygmy rabbit habitat. The goal of these plans is to create a mosaic of sagebrush stands of differing ages. These plans allow for mature sagebrush at the end of the succession, but pygmy rabbits use their burrows over many seasons and require stable, long lasting, mature sagebrush. Larrucea (2006, p. 7) suggested a modification of these plans which would allow protection of habitat for pygmy rabbits and recommends either: 1) surveying for areas to be managed for pygmy rabbit habitat; or 2) specifying areas of mature, clumped, larger than average sagebrush stands within the area to be managed and taking a portion of these areas to be mapped and managed as stable, mature sagebrush sites with no treatments applied. The combination of these two actions (successional and stable) would create a mosaic of ages. This would incorporate both the succession desired by other plans while protecting the stable type of habitat needed by pygmy rabbits. The stable, mature sagebrush would be available for colonization and the earlier successional stages would be available for pygmy rabbit dispersal. These untreated areas of late-successional sagebrush should be included in the actively managed rotational-successional plan (i.e., NDOW 2004). Larrucea (2006) does not provide details of any specific project implemented within sagebrush habitats to improve greater sage-grouse habitat and its possible impact to pygmy rabbits or their populations.

Summary of Habitat Manipulation Conducted to Benefit Greater Sage-Grouse

Sagebrush habitat manipulations to benefit greater sage-grouse have occurred within the range of the pygmy rabbit. Habitat manipulation to benefit greater sage-grouse or other species was raised as a concern by the petitioners and a researcher, but the available information does not provide an example of the effects of this activity on pygmy rabbits. Additionally, the available information does not indicate there has been a systematic or widespread loss of habitat due to habitat manipulation that may have been or is suitable habitat for pygmy rabbits. Because of the pygmy rabbit's patchy habitat distribution across the landscape, the scope of loss or modification of sagebrush habitat in general due to habitat manipulation for greater sage-grouse does not equally relate to the loss or modification of pygmy rabbit habitat.

Large-scale sagebrush manipulations to benefit greater sage-grouse may benefit pygmy rabbit. Based on the similarities with sagebrush treatments discussed earlier, the size and design of the manipulated area may minimize adverse impacts to pygmy rabbits. If designed appropriately, these projects may be beneficial to pygmy rabbits by opening up areas for new vegetation growth or to provide dispersal areas. Pygmy rabbits have been found in mosaics where large areas of sagebrush were left intact and remained connected to adjacent sagebrush or where treated areas were small and travel distances between them were minimal. Therefore, based on the best available scientific and commercial information, we conclude that habitat degradation and loss due to habitat manipulations for other species is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Conservation Strategies and Actions

All seven States mention the pygmy rabbit in their Comprehensive Wildlife Conservation Strategies. These strategies confer no regulatory mechanisms, but indicate that the species or its habitat deserves special management considerations (Oregon Department of Fish and Wildlife 2006; Idaho Department of Fish and Game 2005; Montana Fish, Wildlife & Parks 2005; Wyoming Game and Fish Department 2005; California Department of Fish and Game 2005; Nevada Department of Wildlife 2006; Utah Division of Wildlife Resources 2006).

We are not aware of any States implementing conservation actions specifically for the pygmy rabbit, though we are aware of initiatives to restore the sagebrush ecosystem within the range of the pygmy rabbit. For example, the State of Utah Division of Wildlife Resources launched the Watershed Initiative in 2003 to implement restoration projects designed to prevent and reverse habitat loss. Emphasis has been placed on restoration and protection of shrub-steppe and riparian habitats in Utah due to their importance to a diversity of wildlife species. Completed, current, and proposed projects within the range of pygmy rabbit total 35,335 ac (14,300 ha). Monitoring is an important component to assessing these treatments (Karpowitz 2008, p. 3). In addition, research is being conducted to address impacts of treatments for greater sage-grouse, mule deer, and pronghorn on pygmy rabbit populations. Preliminary results indicate that at least a 131.2 ft (40-m) buffer should be established between active pygmy rabbit burrows and treatments. Future designs should also implement a mosaic pattern and preserve long and wide swaths of undisturbed mature big sagebrush with corridors of connectivity between all residual stands. All current and future habitat projects in pygmy rabbit habitat follow these recommendations (Karpowitz 2008, p. 3). Although it is not known whether pygmy rabbits are benefiting from these types of habitat restoration actions across their range, some actions implemented for other species may benefit pygmy rabbits (e.g., pinyon-juniper removal for greater sage-grouse) (Larrucea 2007, p. 127).

At the State level, control of invasive plant species is sometimes encouraged. Some States require landowners to control noxious weeds on their property, but the types of plants considered to be noxious weeds vary by state. For example, only Oregon, California, Colorado, Utah, and Nevada list medusa head as a noxious, regulated weed, but medusa head can be problematic in other states (e.g., Idaho). Cheatgrass is not considered an official noxious weed within the range of the pygmy rabbit. Although we do not know how these regulations affect sagebrush habitats, States have regulations regarding invasive species in place.

Summary of Conservation Strategies and Actions

All seven States within the range of the pygmy rabbit mention this species in their Comprehensive Wildlife Conservation Strategies and indicate

that the species or its habitat deserves special management considerations now and in the future. While we are not aware of any States implementing conservation actions specifically for the pygmy rabbit, we are aware of initiatives to restore the sagebrush ecosystem within the range of the pygmy rabbit over time. Many states encourage the control of invasive plant species. Conservation strategies and actions carried out in consideration of the pygmy rabbit will benefit it now and in the future.

Therefore, based on the best available scientific and commercial information, we conclude that conservation strategies and actions for pygmy rabbits or their habitat do not pose a significant threat to the pygmy rabbit now or in the foreseeable future.

Summary of Factor A

We have assessed the best available scientific and commercial data on the magnitude and extent of the impacts of agriculture, sagebrush treatment, livestock grazing, nonnative and invasive plant species, fire, urban and rural development (and associated facilities), mining, energy exploration and development (and associated facilities), habitat fragmentation, greater sage-grouse conservation actions and other conservation actions on pygmy rabbit habitat. We find that these threats do not significantly, either singly or cumulatively, impact the pygmy rabbit to such an extent within the foreseeable future such that listing under the Act as an endangered or threatened species is warranted. While sagebrush habitat loss and fragmentation has occurred within the range of the pygmy rabbit due to various anthropogenic and natural activities as discussed above and likely will continue at some level in the future; our review of the best available information reveals only a handful of specific areas where sagebrush loss or degradation is occurring in occupied pygmy rabbit habitat. Due to the pygmy rabbit's patchy habitat distribution across the landscape, the scope of loss or modification of sagebrush habitat in general does not equally relate to loss or modification of pygmy rabbit habitat. The activities listed above are likely to continue into the future with some increases occurring. However, pygmy rabbit populations continue to occur throughout the species' current known range, including historically occupied locations, and some new populations have been found in recent years, despite numerous activities occurring within its habitat.

We conclude that the best scientific and commercial information available indicates that the pygmy rabbit is not now, or in the foreseeable future, threatened by the present or threatened destruction, modification, or curtailment of its habitat or range to the extent that listing under the Act as an endangered or threatened species is warranted at this time.

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

We have no information that the pygmy rabbit is being used for commercial or educational purposes.

Hunting

Impacts due to hunting include injury or death with the potential for impacting population numbers. Some individuals have suggested that pygmy rabbits were not readily hunted in the past. Bailey (1936, p. 112) indicated an individual from Nevada reported that pygmy rabbits were not eaten by locals because of the strong sage taste. Later Larrison (1967, p. 64) said, "[Pygmy rabbits] flesh tastes of sagebrush, rendering it unfit as food."

In Idaho, Fisher (1979, p. 29) recommended that bag limits be monitored, especially where habitat was declining, because with the pygmy rabbit's lower reproductive potential as compared to other rabbits, fewer surplus animals may be available to hunters. Sanchez (2007, p. 90) reports of an illegal harvest of two pygmy rabbits in her Idaho study area during 2004 to 2005. Rauscher (1997, pp. 10-11) reported pygmy rabbit hunting in southwestern Montana, but stated that hunting did not appear to be a significant mortality factor. Williams (1986, p. 52) stated that although hunting impacts were not known in California, he thought that hunters probably did not kill many pygmy rabbits because the species was quite secretive and rarely left dense brush. Pritchett *et al.* (1987, p. 231) reported that, according to locals near Loa, Wayne County, Utah, pygmy rabbits have been "extensively hunted" along with black-tailed jackrabbits (*Lepus californicus*) and cottontails. Where he was able to access portions of his previous study area outside Cedar City, Utah, Janson (2002, p. 32) found spent shotgun shells. He thought it was probable that some pygmy rabbits were shot because most hunters cannot distinguish between pygmy rabbits and cottontails.

We are aware that rabbit drives occurred (Bacon *et al.* 1959, p. 281; Jackman and Long 1964, p. no page number), but there is little documentation on the impacts to pygmy rabbits. For example, Bacon *et al.* (1959, p. 281) collected rabbits, mostly by organized drives of hunters who shot them, to gather ectoparasitic (parasite on outer surface of an animal) information on wild rabbits and rodents in eastern and central Washington between 1951 and 1956; of the 1,040 rabbits collected, representing four species, only one was a pygmy rabbit. It is unknown if the single collection indicates pygmy rabbits are less vulnerable to drives or if numbers were reduced in that area at the time.

Jackman and Long (1964, p. no page number) documented, with a photograph, that a rabbit drive occurred in Oregon in 1911. The drive resulted in 1,811 rabbits being captured, but the species of rabbits were not identified nor was the location of the drive. The photograph is courtesy of the Schminke Museum, Lakeview, Lake County, Oregon, so the drive could have occurred in that county. We do not have any additional information on rabbit drives occurring within the range of the pygmy rabbit.

Currently, only three (California, Nevada, and Montana) of the seven States within the species range allow hunting of pygmy rabbits. For these States, the State Wildlife Boards of Commissioners set hunting regulations yearly. In California, for the 2009 to 2010 Upland Game Season, hunting of pygmy rabbits is allowed from July 1 to January 31 with a bag limit of 5 per day and 10 in possession (California Department of Fish and Game 2010, *http://www.dfg.ca.gov/regulations/09-10-upland-sum.html*, accessed July 20, 2010). The 2009-2010 pygmy rabbit hunting season in Nevada opened October 10 and closed February 28 with a daily limit of 10 and a possession limit of 20 (Nevada Department of Wildlife, 2009, no page numbers). For Montana, the pygmy rabbit is considered a nongame species and there is no protection from hunting. Pygmy rabbits can be hunted year-round with no bag limits (Montana Department of Fish Wildlife and Parks 2010, http://fwp.mt.gov/wildthings/livingWithWildlife/rabbits/rab_ctrl.html). For these three States, harvest data are collected through hunter surveys but the various rabbit species are not distinguished from one another so the number of pygmy rabbits harvested in these States per year is not known.

Summary of Hunting Impacts

While it has been reported that pygmy rabbits have been hunted over the years and specifically in Idaho, Nevada, and Utah, only three (Montana, California,

and Nevada) of the seven States within the range of the pygmy rabbit currently allow hunting of this species. Historical harvest records are not available, but information indicates a reluctance to eat pygmy rabbits due to their strong sage taste as well as difficulty in hunting them due to their secretive nature. The number of pygmy rabbits taken more recently through hunting is not discernable because of the method by which present-day data are collected in States that allow hunting. Based on the best scientific information available, we conclude that hunting is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Research

Research activities on pygmy rabbits that involve trapping, handling, and holding them for a period of time can result in mortality from exposure, injury, trap predation, intra-specific fighting, and capture stress (Bailey 1936, pp. 111-112; Severaid 1950, p. 2; Wilde 1978, p. 96; Gahr 1993; Rauscher 1997, p. 9). Mortality rates for captured pygmy rabbits have been reported as 3 percent (Gahr 1993, p. 37), 5 percent (Wilde 1978, p. 96), and 19 percent (Rauscher 1997, p. 9). Individuals may be killed for specimen collections (Grinnell *et al.* 1930, pp. 553-555; Bailey 1936, p. 111; Severaid 1950, p. 2). Investigations may also involve digging out burrows, stepping on burrows accidentally, measuring vegetation and other site characteristics near burrows, and other general disturbance in the study area (Janson 1946, p. 69; Bradfield 1974, pp. 17, 21-22, 26; Green 1978, pp. 4-6; Gahr 1993, pp. 54-60; Katzner 1994, pp. 6-12; Rauscher 1997, pp. 6, 12). Katzner (1994, p. 111) reported that all of his collared rabbits (10) died. He suggested the weight of the radio collars, and increased grooming as a result of their presence, may have increased a rabbits' vulnerability to predation. Rachlow and Witham (2004a, p. 3) reported 1 pygmy rabbit mortality out of the 15 trapped during their survey efforts. The trap contained a long-tailed weasel (*Mustela frenata*), and it was unclear if the weasel killed the rabbit prior to entering the trap, entered the trap after the rabbit was captured in the trap, or entered the trap with the rabbit simultaneously. Sanchez (2007, p. 90) reported two deaths related to her study due to collars entrapping the lower jaw of the pygmy rabbit. Flinders *et al.* (2005, p. 36) captured two pygmy rabbits, placing radio-collars and ear tags on them. They reported one died due to a loose collar; the other bit the collar off but was captured by a remote camera 339 yd (310 m) away from the initial capture site.

Summary of Research Impacts

The documented mortalities due to research activities are relatively few in number, occur in limited areas, and occur over limited time periods. Most of these reported mortalities are documented in studies conducted before 1997 and few mortalities have been reported in recent documents. Therefore, based on our review of the best available scientific information, we conclude that research activities are not a significant threat to the pygmy rabbit now or in the foreseeable future.

Summary of Factor B

Currently only three States allow hunting of pygmy rabbits; this is a reduction from the historic condition where all of the states considered in this finding allowed hunting. We found no data regarding long-term historical or recent hunting data that would clarify past or current hunting pressure on the pygmy rabbit across its range. While there is a potential for populations at low levels to be harmed by hunting and poaching mortality, our review of the best scientific and commercial information indicates hunting is not a significant threat to the pygmy rabbit.

Research activities have been a source of mortality for pygmy rabbits, although our review of the best scientific information suggests this is a very minor level of mortality and does not pose a significant threat to the species.

We have assessed the best available scientific and commercial data on the magnitude and extent of the impacts of hunting and research activities on pygmy rabbits. Based on that information, we conclude that the best scientific and commercial information available indicates that the pygmy rabbit is not now, or in the foreseeable future, threatened by the overutilization for commercial, recreational, scientific, or educational purposes to the extent that listing under the Act as an endangered or threatened species is warranted at this time.

Factor C: Disease or Predation

Disease

Possible effects of disease include weakening of individuals which may increase their vulnerability to predation. Serious disease outbreaks can impact population size and number. Pygmy rabbits reportedly can harbor high parasite loads (Janson 1946, p. 90; Wilde 1978, p. 107; Gahr 1993; WDFW 1995; 66 FR 59734). These parasites include ticks (e.g., *Dermacenter paramapterus, D. anersoni*, *Haemaphysalis leporis-palustris*), fleas (e.g., *Cediopsylia inaequalis, Odontopysilys dentatus*), lice (not specified), and bot flies (e.g., *Cuterebra maculata*) (Davis 1939, p. 365; Janson 1940, pp. 25-27; Janson 1946, p. 90; Larrison 1967, p. 64; Wilde 1978, pp. 13-16; Gahr 1993; Rauscher 1997, p. 12) which can be vectors of disease.

Plague and tularemia can be found in leporid populations, but they have not been confirmed in pygmy rabbits. Plague is a bacterial disease that is transmitted by fleas infected with the bacterium, *Yersinia pestis.* Tularemia is caused by the bacterium *Francisella tularensis* and is commonly transmitted by ticks. These diseases often spread rapidly and can be fatal (Quan 1993, p. 54). Hall (1946, p. 618), in Nevada, thought that pygmy rabbits were killed by tularemia based on his general observations which were not specified. Gahr (1993, p. 22) found bot flies on two pygmy rabbits located in the grazed area of her study in Washington, indicating cattle may act as a vector for spreading parasites and possibly disease. She commented that parasitism by bot flies is not necessarily detrimental to the rabbit, and additional study is needed to determine if cattle presence increases the incidence of ectoparasites for pygmy rabbits.

Red Willow Research Inc. (2002, p. 108) expressed concern that the transport and transmission of diseases by domestic livestock to pygmy rabbits could be a threat. Red Willow Research Inc. (2002, p. 108) raised the concern that a calicivirus, such as Rabbit Hemorrhagic Disease (RHD), could explain declines in pygmy rabbit populations and suggests additional research is needed. The Committee for the High Desert *et al.* (2003, p. 150) indicated that West Nile Virus is a growing concern for native wildlife, including pygmy rabbits. We have no reports of disease epizootics (outbreaks) occurring in pygmy rabbits in the range considered in this finding. Janson (2002, p. 30) did not observe any obviously diseased pygmy rabbits in his earlier work in the 1940's. Oliver (2004, p. 36) reported that in Utah, the effects of parasites and disease on pygmy rabbit populations are not known. Parasites and disease have not been regarded as a major threat to pygmy rabbits (Wilde 1978, p. 141; Green 1979, p. 25). The final rule for the Columbia Basin DPS pygmy rabbit indicated disease, including plague, was a significant potential threat to the remaining, small populations (68 FR 10405). A number of captive Columbia Basin pygmy rabbits have died of mycobacteriosis and

coccidiosis (WDFW 2005a; Harrenstien *et al.* 2006 cited in Service 2007, p. 21). It is unclear if these two diseases were introduced into the captive breeding population from wild caught individuals or by some other means. Mycobacteriosis and coccidiosis have not been reported in pygmy rabbits occurring in the rest of its range.

Summary of Disease Impacts

Though pygmy rabbits can harbor high parasite loads, there is no evidence that this is negatively impacting pygmy rabbit populations. Through our review of the best scientific and commercial information we found no reports of disease epizootics occurring in pygmy rabbit populations anywhere within the range of the species. Therefore, based on our review of the best available information, we conclude that disease is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Predation

Predation of pygmy rabbits has been reported in Idaho, Nevada, and Utah. According to Green (1979, p. 25) predation is the main cause of pygmy rabbit mortality. The annual mortality rate of adult pygmy rabbits may be as high as 88 percent, and one researcher found that more than 50 percent of juveniles can die within about 5 weeks of their emergence (Wilde 1978, pp. 139-140). Estes-Zumpf and Rachlow (2009, p. 367) found mortality rates were 69 percent and 88.5 percent for male and female juvenile pygmy rabbits, respectively, in their study area in east-central Idaho. The mortality rate was highest within two months of emerging from the natal burrow. However, mortality rates for adult and juveniles can vary considerably between years and for juveniles between cohorts within years (Wilde 1978, pp. 85-95, 138-140).

While pygmy rabbits have numerous predators, they have adapted to their presence (Janson 1946, pp. 28-29; Gashwiler *et al.* 1960, p. 227; Green 1978, p. 37; Wilde 1978, pp. 141-143). Junipers provide perches for avian predators and may provide habitat for mammalian predators (Larrucea and Brussard 2008b, p. 1640). However, Larrucea and Brussard (2008b) do not provide actual losses of pygmy rabbits to predators utilizing pinyon-juniper habitat. If levels of predation are too high, local populations may be suppressed below a point at which they can be maintained. Sagebrush habitat with damaged structural components may increase the pygmy rabbit's vulnerability to predation. Weiss and Verts (1984, p. 569) thought that use of denser and taller sagebrush habitats by pygmy rabbits was related to predator avoidance. Katzner (1994, p. 52) documented that raptors were a cause of mortality and denser sagebrush cover deterred these avian predators. In Idaho, Sanchez (2007, pp. 90-91) attributed 42 percent of natural mortalities to mammalian and avian predation; the cause of death in 58 percent of the mortalities could not be determined.

Summary of Predation Impacts

Pygmy rabbits are a prey species and predation has been stated by some researchers as the main cause of mortality. Annual mortality rates for adult and juvenile pygmy rabbits can be high, but these rates can vary considerably between years and between juvenile cohorts within particular years. Predation is a natural part of population dynamics for any species and results in the death of individuals. Based on our review of the best available scientific information, we did not find any indication of predation being a significant threat to the pygmy rabbit in all or a significant portion of its range. The Service is not aware of any predators that potentially pose a significant threat to the species. We therefore conclude that the available information indicates that the pygmy rabbit is not threatened by predation now or in the foreseeable future.

Summary of Factor C

Disease and predation may be significant threat factors to local or isolated pygmy rabbit populations; however, based on our review of the best available scientific information, we did not find any information to indicate significant threats from either disease or predation Habitat degradation and fragmentation may increase the effects of parasites, disease, and predation on some populations. We do not have any reports indicating that RHD or West Nile Virus is a significant threat to pygmy rabbits, nor are we are aware of reports of disease epizootics occurring in wild pygmy rabbits anywhere within the species' range. Therefore, we conclude that the best scientific and commercial information available indicates that the pygmy rabbit is not now, or in the foreseeable future, threatened by disease or predation to the extent that listing under the Act as an endangered or threatened species is warranted at this time.

Factor D: Inadequacy of Existing Regulatory Mechanisms

Local Laws and Regulations

We are not aware of any county or city ordinances that provide protection specifically for pygmy rabbits or their habitat on private lands. We recognize that county or city ordinances that address agricultural lands, transportation, and zoning for various land uses have the potential to influence pygmy rabbits or their habitat (zoning that protects open space might retain suitable pygmy rabbit habitat; a housing development and associated roads might destroy or fragment habitat). We found no detailed information regarding the nature or extent of zoning efforts within the species' range and its direct or indirect effects on pygmy rabbit habitat or populations.

State Laws and Regulations

Currently, hunting of pygmy rabbits is allowed in three of the seven States within the species' range (California, Nevada, and Montana). In California, for the 2009 to 2010 Upland Game Season, hunting of pygmy rabbits is allowed from July 1 to January 31 with a bag limit of 5 per day and 10 in possession (California Department of Fish and Game, 2010, *http://www.dfg.ca.gov/regulations/09-10-upland-sum.html*, accessed July 20, 2010). In Nevada, the 2009-2010 pygmy rabbit hunting season opened on October 10 and closed on February 28 with a daily limit of 10 and a possession limit of 20 (Nevada Department of Wildlife, 2009, no page numbers). For Montana, the pygmy rabbit is considered a species of concern, nongame species and there is no protection from hunting. Pygmy rabbits can be hunted year-round with no bag limits (Montana Department of Fish Wildlife and Parks 2010, http://fwp.mt.gov/wildthings/livingWithWildlife/rabbits/rab_ctrl.html). Due to the manner of data collection, the numbers of pygmy rabbits harvested in these States each year is not known.

Hunting of pygmy rabbits is not allowed in Idaho or Wyoming where they are considered a species of special concern, or in Utah where they are considered a sensitive species. Nor is hunting allowed in Oregon where the pygmy rabbit is considered a sensitive species and protected under State law.

In Wyoming, many oil and gas development projects occurring on private lands fall under the jurisdiction of the Wyoming Industrial Siting Act (cited in Lance 2008, p. 6). This requires the Industrial Siting Administration to consult with Wyoming Game and Fish

Department to address impacts; and appropriate mitigation is required prior to issuance of permits (Lance 2008, pp. 5-6). As mentioned above, monitoring for restoration and mitigation activities are in the early stages. We do not know whether pygmy rabbits are benefiting from any mitigation that may have been required under reviewed projects, but restoration of sagebrush habitat is likely to positively impact pygmy rabbits.

Summary of State Laws and Regulations Impacts

Hunting of pygmy rabbits is allowed in three of the seven States. In Wyoming, many oil and gas projects located on private lands will be reviewed by that state's wildlife agency with appropriate mitigation required that may benefit pygmy rabbits. The best available information indicates that the inadequacy of existing State laws do not threaten the pygmy rabbit.

Federal Laws and Regulations

A large portion of the sagebrush community with the potential to support pygmy rabbits occurs on BLM lands. The Federal Land Policy and Management Act of 1976 (FLPMA) (43 U.S.C. 1701 *et seq.*) is the primary Federal law governing most land uses on BLM-administered lands. Section 102 (a)(8) of FLPMA specifically recognizes that wildlife and fish resources are the uses for which these lands are to be managed.

We acknowledge that data to evaluate the effectiveness of BLM's programs on pygmy rabbit conservation are not available. Whether the various BLM stipulations issued related to oil and gas activities specific to the greater sage-grouse (75 FR 13978) also reduce impacts from these activities to pygmy rabbits and their habitats is unknown. The BLM has management and permitting authorities to regulate and condition oil and gas lease permits under FLPMA and the Mineral Leasing Act (MLA) (30 U.S.C. 181 *et seq.*). BLM usually incorporates stipulations as a condition of issuing leases. The BLM's planning handbook has program-specific guidance for fluid materials (including oil and gas) that specifies that Resource Management Plan (RMP) decision-makers will consider restrictions on areas subject to leasing, including closures, and lease stipulations (BLM 2000, Appendix C, p. 16). The handbook also specifies that all stipulations must have waiver, exception, or modification criteria documented in the plan, and indicates that the least restrictive constraint to meet the resource protection objective should be used (BLM 2000, Appendix C, p. 16).

BLM's RMPs are the basis for all actions and authorizations involving BLM-administered land and resources. They establish allowable resource uses; resource condition, goals and objectives to be attained; program constraints and general management practices needed to attain the goals and objectives; general implementation sequences; and intervals and standards for monitoring and evaluating each plan to determine its effectiveness and the need for amendment or revision (43 CFR 1601.0-5(k)).

RMPs provide a framework and programmatic guidance for site-specific activity plans. These plans address livestock grazing, oil and gas field development, travel management (managing vehicle routes and access), wildlife habitat management, and other activities. Activity plan decisions normally require National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq.*) analysis.

BLM has designated the pygmy rabbit as a special status species/bureau assessment species in five (Idaho, Montana, Nevada, Oregon, and Wyoming) of the seven States in which it occurs. BLM policy and guidance for species of concern occurring on BLM managed land is addressed under BLM's 6840 Manual, "Special Status Species Management" (BLM 2008c entirety). This manual provides agency policy and guidance for the conservation of special status plants and animals and the ecosystems on which they depend, but it is not a regulatory document. The objectives for BLM special status species are " to conserve and/or recover ESA-listed species and the ecosystems on which they depend so that ESA protections are no longer needed for these species and to initiate proactive conservation measures that reduce or eliminate threats to Bureau sensitive species to minimize the likelihood of and need for listing of these species under the ESA." (BLM 2008c, p. 3).

There has been an increased focus on the roles that state, county, and private entities have in controlling invasive plants. For example, the Noxious Weed Control and Eradication Act was passed in 2004 and incorporated into the Plant Protection Act. This Act is intended to assist eligible weed management entities to control or eradicate harmful nonnative weeds on both public and private lands. Additionally, Executive Order 13112 was signed on February 3, 1999, establishing an interagency National Invasive Species Council in charge of creating and implementing a National Invasive Species Management Plan. The Management Plan directs federal efforts, including overall strategy and objectives, to prevent, control, and minimize invasive species and their impacts (National Invasive Species Council 2008, p. 5). However, the Order also directs the Council to encourage planning and action at local, tribal, state, regional, and eco-system levels to achieve the goals of the National Invasive Species Management Plan, in cooperation with stakeholders (e.g., private landowners, states) and existing organizations addressing invasive species.

Noxious and invasive weed treatments on BLM lands involving reseeding can occur through the Emergency Stabilization and Burned Area Rehabilitation Programs. Invasive species control is a stated priority in many RMPs. For example, 76 of the RMPs included in BLM's response to a data call claim that the RMP (or supplemental plans/guidance applicable to the RMP) require treatment of noxious weeds on all disturbed surfaces to avoid infestations of BLM-managed lands in the planning area (Carlson 2008a cited in 75 FR 13977). We also note that it is possible that more RMPs specifically address invasive species under another general restoration category (75 FR 13977).

BLM commonly uses herbicides on lands to control invasive plant species. In 2007, the BLM completed a programmatic EIS (BLM 2007c) and Record of Decision for vegetation treatments on BLM-administered lands in the western United States. This program approves the use of four new herbicides, provides updated analysis of 18 currently used herbicides, and identifies herbicides that the BLM will no longer use on public lands. Information is unavailable on how frequently the programmatic EIS has been used for most states or whether actions implemented under this EIS have been effective; and while not authorizing any specific on-the-ground actions, it guides the use of herbicides for field-level planning. Site-specific NEPA analysis is still required at the project level (BLM 2007c, p. ES-1 to ES-2).

Another voluntary approach to control invasive plant species is the development of Cooperative Weed Management Areas (CWMAs). CWMAs are partnerships between federal, state, and local agencies, tribes, individuals, and interested groups to manage both regulatory noxious weeds and invasive plants in a county or multi-county geographical area. They function under a mutually developed memorandum of understanding and a locally developed

strategic plan. The CWMAs can utilize federal funds for invasive plant control on non-federal land. As of 2005, Oregon, Nevada, and Utah had between 75 and 89 percent of their state covered by CWMAs and/or county weed districts, while Idaho, Montana, Wyoming, and California had between 90 and 100 percent coverage (Center for Invasive Plant Management 2008, *www.weedcenter.org/weed_mgmt_areas/wma_overview.html*).

BLM regulatory authority for grazing management is provided at 43 CFR part 4100 (Regulations on Grazing Administration Exclusive of Alaska). Livestock grazing permits and leases contain terms and conditions determined by BLM to be appropriate to achieve management and resource condition objectives on the public lands and other lands administered by the BLM, 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)). Grazing practices and activities include the development of grazing related portions of implementation or activity plans, establishment of terms and conditions of permits, leases and other grazing authorizations, and range improvement activities such as vegetation manipulation, fence construction, and development of water for livestock.

BLM grazing administration standards for a particular state or region must address habitat for endangered, threatened, proposed, candidate, or special status species, and habitat quality for native plant and animal populations and communities (43 CFR 4180.2 (d)(4) and (5). The guidelines must address restoring, maintaining or enhancing habitats of BLM special status species to promote their conservation, and maintaining or promoting the physical and biological conditions to sustain native populations and communities (43 CFR 4180.2(e)(9) and (10).

Information regarding assessments of rangelands is not available. During 2004 through 2008, BLM conducted a national data call to collect information on the status of rangelands, rangeland health assessments, and measures that have been implemented to address rangeland health issues under their jurisdiction. The information collected was unusable to make broad generalizations about the status of rangelands or management actions because of inconsistency across the range regarding how questions were interpreted and answered. This limited the ability to use this information in understanding habitat conditions on BLM lands (75 FR 13976).

Since 2005, the BLM has developed or is in the process of developing guidances to minimize impacts of renewable energy production on public lands. A Record of Decision for "Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendments" was issued in 2005. The Record of Decision outlines the Best Management Practices for the siting, development, and operation of wind energy facilities on BLM lands. A final programmatic EIS and Record of Decision for geothermal development were issued in 2008. The BLM is in the process of developing programmatic-level guidance for the development of solar energy projects. The draft programmatic EIS for solar energy is under development –available at *http://www.blm.gov/wo/st/en/prog/energy/epca_chart.html*).

Although we are uncertain which management direction the USFS is taking for the pygmy rabbit or whether pygmy rabbit habitat objectives and conservation measures have been incorporated into grazing allotment plans or Land and Resource Management Plan (LRMPs), the pygmy rabbit is designated as a USFS Sensitive Species in the Intermountain Region (R4) (USFS 2008b, p. 1). This includes southern Idaho, western Wyoming, Utah, and Nevada; the Northern Region (R1) which includes Montana (USFS 2005, p. 2); and the Pacific Northwest Region (R6) which includes Oregon (USFS 2008c, p. 2). Sensitive species receive special management to ensure viability and to preclude trends that may lead to the need for Federal listing. There must be no impacts to sensitive species without an analysis of the significance of adverse impacts on populations, habitat and on the viability of the species as a whole (USFS Manual 2672.1, cited in USFS 2008b, p. 1).

Management of Federal activities on National Forest System lands is guided principally by the National Forest Management Act (NFMA) 16 U.S.C. 1600-1614, August 17, 1974, as amended. NFMA specifies that all national forests and grasslands must have a LRMP (16 U.S.C. 1604(a)) to guide and set standards for natural resource management activities. NFMA also requires the USFS to incorporate standards and guidelines into LRMPs (16 U.S.C. 1604(c)). This has historically been done through a NEPA process. In order to meet overall multiple-use objectives, provisions are developed to manage plant and animal communities for diversity, based on the suitability and capability of a specific land area.

The 1982 NFMA implementing regulations for land and resource management planning under which all existing forest plans were prepared, requires the USFS to manage habitat in order to maintain viable populations of existing native vertebrate species on National Forest System lands (47 FR 43037, September 30, 1982). A new USFS planning regulation was published on April 21, 2008 (73 FR 21,468) which superseded the 1982 rule. Plans developed under the new regulations would be more strategic and less prescriptive in nature than those developed under the 1982 planning rule. However, on June 30, 2009, the U.S. District Court for the Northern District of California vacated the new rule, and as a result, the rule is not currently in use by the USFS.

Through the NFMA, LRMPs, and the On-Shore Oil and Gas Leasing Reform Act (1987; implementing regulations at 36 CFR 228, subpart E), the USFS has the authority to manage, restrict, or include protective measures to mineral and other energy permits on their lands. Similar to BLM, existing protective standard stipulations on USFS lands occur for greater sage-grouse (75 FR 13980). The USFS is a partner agency with the BLM on the draft programmatic EIS for geothermal energy development mentioned above. If finalized, the programmatic EIS will amend relevant LRMPs and will expedite the leasing of USFS lands with geothermal energy potential.

Pygmy rabbit habitat also occurs on lands managed by other Federal agencies such as the Service and National Park Service (NPS). The National Wildlife Refuge System Administration Act (16 U.S.C. 668dd-668ee) provides guidelines and directives for administration and management of all areas in the National Wildlife Refuge system. Refuges are managed for species conservation, consistent with direction in the National Wildlife Refuge System Administration Act, as amended, and related Service policies and guidance. The National Park Service Organic Act (16 U.S.C. §1, *et seq.*) states that the NPS will administer areas under their jurisdiction "*** by such means and measures as conform to the fundamental purpose of said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historical objects and the wildlife within and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Summary of Federal Laws and Regulations Impacts

A large portion of pygmy rabbit habitat occurs on lands administered by Federal agencies, including BLM, USFS, Service, and NPS. Numerous policies, guidance, and laws have been developed to assist the different agencies in management of these lands. The Bureau of Land Management policies and guidance address species of concern, actions covered by RMPs, and regulatory authority for grazing and oil and gas leasing and operating. The USFS policies and guidance address sensitive species and actions covered by LRMPs. The Service uses guidelines and directives under the National Wildlife Refuge System Administration Act for management of lands in the National Wildlife Refuge system. The National Park Service Organic Act provides management guidance to the NPS for management of lands administered by this agency.

As discussed under Factors A and E, the best available information indicates that activities such as livestock grazing, mining, energy exploration and development, and recreational activities that are regulated by various policies, guidance, and laws on Federal lands are not significantly impacting pygmy rabbits. Therefore, we conclude that available information indicates that the existence of inadequate Federal laws and regulations are not a significant threat to the pygmy rabbit.

Summary of Factor D

Our assessment of threats based on the best available scientific and commercial data regarding the past, present and future loss or modification of pygmy rabbit habitat as discussed in Factor A, hunting activities as discussed in Factor B, and intra and inter-specific competition or recreational and non recreational vehicle use as discussed under Factor E lead us to conclude that the inadequacy of existing regulatory mechanisms is not a threat to the pygmy rabbit. Therefore, the best available scientific and commercial information indicates that the pygmy rabbit is not now, or in the foreseeable future, threatened by the inadequacy of existing regulatory mechanisms to the extent that listing under the Act as an endangered or threatened species is warranted at this time.

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

Several other potential threats have been mentioned as possibly negatively impacting pygmy rabbit populations including: (1) intra- and inter-specific competition; (2) small or isolated populations; (3) natural stochastic (random) events such as floods and drought; (4) climate change; (5) recreational activities; (6) mortality caused by collisions with vehicles; and (7) life history traits of a habitat specialist.

Intra- and Inter-specific Competition

While intra-specific competition likely occurs both under normal and stressful environmental conditions, we are not aware of any scientific information documenting or suggesting that such competition for food and space is negatively impacting pygmy rabbits at this time.

As pygmy rabbits are habitat specialists, inter-specific competition with other herbivores for sagebrush such as jackrabbits, pronghorn, and mule deer could occur. Numerous researchers have mentioned other leporid species, namely black-tailed and white-tailed (*Lepus townsendii*) jackrabbits, and mountain cottontails (*Silvilagus nuttallii*) as occurring in the same areas with pygmy rabbits throughout their range.

In Oregon, Anthony (1913, p. 23) mentioned that cottontails and black-tailed jackrabbits were observed in the same areas with pygmy rabbits. Bartels (2003, p. 93) also mentioned these two species were observed in areas used by pygmy rabbits.

In Idaho, Merriam (1891, p, 13) mentioned white- and black-tailed jack rabbits and mountain cottontails in Pahsimeroi Valley where the pygmy rabbit also occurred. Roberts (2004, p. 4) mentioned that at one site in the Birch Creek area he flushed pygmy rabbits along with cottontails. Waterbury (2006, p. 10) found other rabbit and hare species (black-tailed and white-tailed jackrabbits, mountain cottontails) in association with pygmy rabbits in several locations, including Pahsimeroi and Big Lost River Valleys.

In Montana, Rauscher (1997 p. 11) mentioned mountain cottontails and jack rabbits were observed at most pygmy rabbit sites. It was unclear if cottontails and pygmy rabbits were sharing burrows, if cottontails were replacing pygmy rabbits at burrows, or if cottontails were taking advantage of burrow availability.

In California and Nevada, Larrucea and Brussard (2008a, p. 697) found cottontail rabbits may compete with pygmy rabbits and influence the relationship between understory growth and pygmy rabbit presence. Cottontails appear to occur more in areas with greater understory (Larrucea and Brussard 2008a, p. 697). Though pygmy rabbits consume primarily sagebrush, they will also eat forbs and grasses (Green and Flinders 1980b, p. 138).

In California, Severaid (1950, p. 4) commented that white- and black-tailed jackrabbits and cottontails occupied the same habitats as pygmy rabbits. In northern Utah, Janson (1946, p. 40) also mentioned that these three species were occupying the same areas as pygmy rabbits.

Grinnell *et al.* (1930, pp. 557-558) also noted the overlap of pygmy rabbit's range with other leporids, namely mountain cottontail and black-tailed jackrabbit ranges. The other species occurred within or near the same territories as pygmy rabbits throughout all of their ranges, but mountain cottontails and black-tailed jackrabbits ranged over a much larger area than the pygmy rabbit. They suggested that the differentiation of each is mainly due to conditions outside of the range of the pygmy rabbit and these conditions may limit the territory of the pygmy rabbit.

Conde (1982, p. 4) compared pygmy rabbit and black-tailed jackrabbit use in sagebrush-greasewood habitat in Cassia County, Idaho. She found in summer that pygmy rabbits selected areas with abundant grass while jackrabbits selected areas with abundant forbs. During the fall-winter period shrubs played an important role for both species, but pygmy rabbits fed on sagebrush leaves and young stems (Johnson 1979, cited in Conde 1982, p. 19) and jackrabbits on 2–year old woody stems (Currie and Goodwin 1966, cited in Conde 1982, p. 19). Spatial distribution and exploitation of different vegetation in the summer allowed a sympatric relationship to occur between these two species (Conde 1982, p. 3).

Grazing competition with livestock will depend on the range conditions and grazing practices that vary across the range of the pygmy rabbit. While researchers have documented pygmy rabbit in livestock use areas and the potential impacts to pygmy rabbits under Factor A, we are unaware of studies documenting aspects of potential forage competition between the two species within the range of the pygmy rabbit. We are aware of one study conducted at Sagebrush Flat, Washington, by Siegel Thines *et al.* (2004, p. 532) that found Columbia Basin pygmy rabbits selected ungrazed areas over grazed areas when constructing burrows. Livestock grazing during late summer and fall reduced the availability of grass (and likely forbs) by about 50 percent in the grazed units until the following growing season. Grasses provided greater than 50

percent and forbs greater than 30 percent of the pygmy rabbit's diet in winter at Sagebrush Flat. They did not find that Columbia Basin pygmy rabbits ate less grass in grazed areas or that they chose different diets relative to the availability between ungrazed and grazed areas before the yearly grazing. However, after yearly grazing the Columbia Basin pygmy rabbits may have had a harder time finding grasses and forbs in the grazed areas. Grazing reduced the nutritional quality of grasses in winter and spring. On grazed areas, grasses had less protein and more fiber than ungrazed areas. Shrubs were more fibrous in grazed areas than ungrazed areas in winter. However, grasses may not have been providing a more nutritious food source for Columbia Basin pygmy rabbits in winter as they provided about 50 percent less of the crude protein and 50 percent more fiber than sagebrush or rabbit brush. It is unclear why the Columbia Basin pygmy rabbits avoided grazed areas and may not be due to diet-related reasons not measured in the study. Other impacts of cattle grazing in pygmy rabbit habitat have been previously discussed under Factor A.

In Montana, there is spatial overlap between big game (elk *Cervus elaphus*, mule deer *Odocoileus hemionus*, antelope *Antilocapra americana*) winter range, jack rabbits and greater sage-grouse, and the range of pygmy rabbits. Hence, inter specific competition with pygmy rabbits may result (Janson 2002, pp. 16-17).

Summary of Intra- and Inter-specific Competition Impacts

Most authors only mention observing these other rabbit and hare species while they were studying or searching for pygmy rabbits in Oregon, Idaho, Montana, California, Nevada, and Utah; few authors suggest that there is possible competition between or among the species that negatively impacts pygmy rabbits. One study demonstrates a sympatric relationship between pygmy rabbits and black-tailed jackrabbits in Idaho. It has been suggested in Montana that competition may occur between big game species and pygmy rabbits where they coexist. While livestock grazing occurs throughout the range of the pygmy rabbit, its impact on the species remains unclear as discussed under Factor A. Any possible negative impacts to pygmy rabbits may be related more to loss or degradation of sagebrush structure as opposed to loss or reduction of the grass or forbs understory. The best scientific and commercial information available does not provide any documentation that pygmy rabbits are adversely affected by intra-specific competition for food or space across their range. We know from numerous reports that there appears to be a long history of pygmy rabbits co-existing across their range, with other species, especially other rabbit and hare species. The available information does not document adverse effects of inter-specific competition on pygmy rabbits from other species of rabbits or hares or other species. Therefore, based on the best available scientific and commercial information, we conclude that the intra- or inter-specific competition is a not a significant threat to the pygmy rabbit now or in the foreseeable future.

Small or Isolated Populations

Small, restricted populations are more vulnerable to risks and more susceptible to extinction from naturally occurring stochastic environmental causes than populations with large numbers occurring over a large area (Shaffer 1981, pp. 131-132). Small, isolated populations are also at a greater risk to the deleterious effects of demographic and genetic problems (Schaffer 1981, p. 133). Random demographic effects (e.g., skewed sex ratios) and loss of genetic variability may result in individuals and populations being less able to cope with environmental change.

As discussed in the Background Section, accurately estimating pygmy rabbit population size is complex because the number of active burrows may not be directly related to the number of individuals in a given area. Some individual pygmy rabbits appear to maintain multiple burrows and conversely some individual burrows are used by multiple individuals (Janson 1940, p. 21; Janson 1946, p. 44; Gahr 1993, pp. 66, 68; Heady 1998, p. 25). Pygmy rabbits may also use more than one burrow or burrow system at a specific time or during different times of the year (Purcell 2006, p. 96).

It is possible that pygmy rabbits have a metapopulation structure and therefore, populations located across the range are not small or isolated because they are able to interact with neighboring populations if distance is not too great. Recent studies as mentioned in the Background section above, indicate that pygmy rabbit home ranges and dispersal capabilities are greater than previously thought. Genetic research has occurred in some areas of the species' range, and we have information documenting little population substructure in areas supporting pygmy rabbit in Idaho indicating these populations are not isolated (Estes-Zumpf *et al.* 2010, p. 215).

Summary of Small or Isolated Populations

The impacts of various potential threats can be more pronounced on small or isolated populations. However, the best available scientific and commercial information does not indicate that pygmy rabbit populations are isolated or occurring in small populations across the range, or that these are significant threats now or in the foreseeable future.

Stochastic Events

Natural stochastic events can significantly impact populations if they result in high mortality, habitat loss, or offer little or no possibility of recolonization. They are most significant for small or fragmented populations (Gilpin and Soule 1986, p. 25). Flooding which may cause burrow abandonment, mortality, and erosion of deep soils has been mentioned as a concern for pygmy rabbits. Pygmy rabbits are known to use deeper soils found along drainages for their burrows (Flath and Rauscher 1995, p. 2). Bartels (2003, p. 103) mentions a large flood event in pygmy rabbit habitat in the Harney Basin, Oregon, in 1984, though it is not reported if animals were actually killed. Drought can reduce vegetative cover, potentially resulting in increased soil erosion and subsequent reduced soil depths, decreased water infiltration, and reduced water storage capacity (Connelly *et al.* 2004, p. 7-19), Pygmy rabbit populations could be impacted directly by loss of habitat (food and shelter) or indirectly through possible increased predation. Drought has not been reported as having a direct negative effect on pygmy rabbits.

Summary of Stochastic Events Impacts

While natural stochastic events most certainly have occurred within the range of the pygmy rabbit and may have impacted specific populations, such as in Oregon during a flood, they have not been documented as types of events that have played a significant role in population distribution, abundance, and/or trends for the pygmy rabbit within its range. The best available scientific and commercial information does not indicate that stochastic events are a significant threat to the pygmy rabbit now or in the foreseeable future.

Climate Change

The Service acknowledges that environmental changes resulting from climate change could facilitate invasion and establishment of invasive species or exacerbate the fire regime, possibly accelerating the loss of sagebrush habitats (Connelly *et al.* 2004, p. 7-18).

Increases in the expansion of pinyon and juniper woodlands in the Great Basin may have resulted from poor habitat management and climate change (Connelly *et al.* 2004, p. 7-7). However, the encroachment of pinyon-juniper into occupied pygmy rabbit habitat is a slow process, and pygmy rabbits may be able to inhabit those areas or shift their home range to adjacent areas if pinyon-junipers habitat becomes established at a site.

One researcher has addressed potential impacts to pygmy rabbits due to climate change. In California and Nevada, Larrucea and Brussard (2008b, p. 1640) found extant historical pygmy rabbit sites averaged 515 ft (157 m) higher than extirpated sites. With local downward shift effect accounted for, overall upward elevation shift of extant sites was 721.8 ft (220 m); the researchers attributed this to climate. Over the last century, a 0.7 degree Celsius temperature increase has occurred, which correlates with a predicted elevational shift upwards of 383.9 ft (117 m) (Peters 1989, cited in Larrucea and Brussard 2008b, p. 1640). Warmer temperatures are also expected to increase fire intensity and frequencies (Westerling *et al.* 2006, cited in Larrucea 2007, pp. 63-64). Warming temperatures may continue to shift upward the lower elevational boundary of habitable pygmy rabbit sites.

The prehistoric record for pygmy rabbits in the Great Basin indicates a wider distribution than today and declines have occurred since the end of the Pleistocene (Kurten and Anderson 1972, p. 21; Findley *et al.*, 1975, Gillespie 1984, Harris 1985, 1993a cited in Grayson 2006 pp. 2969-2970). The beginning of the middle Holocene in the Great Basin also saw a decline in pygmy rabbit abundance (Grayson 2006, pp. 2971-2972). The decline is attributed to this period experiencing elevated temperatures and decreased precipitation in the Great Basin (Grayson 2006, p. 2972). A third decline in pygmy rabbit abundance in the Great Basin is associated with the development of pinyon-juniper woodland within the region (Grayson 2006, pp. 2973-2974). Establishment of pinyon-juniper in this area and its associated decline in pygmy rabbit numbers is best explained by the loss of sagebrush-grass habitat (Grayson 2006, p. 2974). Pygmy rabbits occur in the prehistoric record in New Mexico (Grayson 2006, p. 2970), but they are not currently known to occur in the State, though sagebrush habitat does exist there. The habitat may have changed to such an extent since prehistoric times that it no longer provides appropriate habitat for pygmy rabbits. Butler (1972, p. 52) stated that the population of pygmy rabbits on the Eastern Snake River Plain was greater prior to 7,000 years ago. The decline in abundance of pygmy rabbits and pocket gophers (common in grassy meadows) at the beginning of the 7th millennium B.P. and accompanied by a proportional increase in the pygmy rabbit may indicate a change in climate that had more impact on grasses and forbs than on sagebrush (Butler 1972, p. 52).

A warming trend in the mountains of western North America is expected to decrease snow pack, accelerate spring runoff, and reduce summer flows (Intergovernmental Panel on Climate Change (IPCC) 2007, p. 11). Increased summer temperatures may increase the frequency and intensity of wildfires (IPCC 2007, p. 13). Recent warming is linked, in terrestrial ecosystems, to poleward and upward shifts in plant and animal ranges (IPCC 2007, p. 2). Climate projections predict the Great Basin region is likely to become warmer and drier (Peters and Lovejoy 1992, cited in Larrucea 2007, p. 63).

It is difficult to predict local climate change impacts due to substantial uncertainty in trends of hydrological variables, limitations in spatial and temporal coverage of monitoring networks, and differences in the spatial scales of global climate models and hydrological models (Bates *et al.* 2008, p. 3). Climate change models that are currently available are not yet capable of making meaningful predictions of climate change for specific, local areas (Parmesan and Matthews 2005, p. 354). Thus, while the best available information indicates that climate change has the potential to affect habitats used by pygmy rabbits in the Great Basin in the long-term, there is much uncertainty regarding which habitat attributes (including sagebrush, grass, and forbs communities) could be affected, and the timing, magnitude, and rate of their change as it relates to pygmy rabbits and their needs.

Summary of Climatic Change Impacts

Extant historical populations may indicate an upward shift in elevation due to climatic changes or this shift may be due to other unknown factors. The prehistoric record shows the range of the pygmy rabbit occurred over a larger area than today, and the range contraction has been attributed, in part, to increased temperatures and decreased precipitation. It is reasonable to assume that pygmy rabbits of today may be likewise affected in the Great Basin due to possible warmer and drier conditions. Climate change could also facilitate the establishment of invasive plant species or exacerbate the fire regime. Pinyon and juniper woodland expansion may increase, however this may be a slow process and may result in less sagebrush habitat being available for the pygmy rabbit in the future. However, while there is some evidence to suggest there may be an upward shift in elevation or contracted range due to climatic changes, we have no information to suggest that climate change will significantly affect the pygmy rabbit. Based on our review of the available information, there is no demonstrated direct link between predicted climate change and reduced abundance and survival of pygmy rabbits. The best scientific and commercial information currently available does not indicate that climate change is a significant threat to the species now or in the foreseeable future.

Recreational Activities

Recreational activities, especially off-highway vehicle/off-road vehicle (OHV/ORV) and snowmobile use, have the potential to be a threat to pygmy rabbits and their sagebrush habitat by disturbing individuals through excessive noise, damaging sagebrush, or damaging burrows or subnivian tunnels. Additionally, recreation could increase the spread of weeds, and human presence and pets in a particular area. Much of the sagebrush habitat across the range of the pygmy rabbit is open to recreational use. Based on our review of the best available information, we found one document that indicates pygmy rabbits occupy an area used by OHV/ORV users in Oregon (BLM 2008d, p. 6). In addition, in Idaho, Bradfield (1974, pp. 35-36) suggested that the pygmy rabbit depends on its hearing for predator detection and may be less active during windy periods when predator detection may be reduced. This study may suggest noise from a passing vehicle could make pygmy rabbits more vulnerable to predation.

Summary of Recreational Activities Impacts

Recreational activities occur in sagebrush habitat within the range of the pygmy rabbit, however, our review of the best scientific and commercial information available identified only one instance of recreational activities or areas where these activities may be directly or indirectly impacting pygmy rabbits. This area continued to support a number of active pygmy rabbit burrows. Therefore, we conclude that the best scientific and commercial information available does not indicate that recreational activities are a

significant threat to the pygmy rabbit now or in the foreseeable future.

Vehicle Collisions

Roads are known to exist throughout the range of the pygmy rabbit. Jones (1957, p. 274) mentions a pygmy rabbit winter road kill in California north of Crowley Lake, Mono County, and in Wyoming a study mentions a previously reported road kill near Pinedale (Purcell 2006, p. 8). Bradfield (1974, p. 3) suggested that pygmy rabbits were reluctant to cross open areas based on the lack of observed highway mortality (Gordon 1932, Sperry 1933, Smith 1943, cited in Bradfield 1974, p. 3). We are not aware of any documentation of pygmy rabbit mortalities due to snowmobiles or OHVs and ORVs. Additionally, there is no indication that vehicle mortalities have increased, or will increase in the future, as the density of roads have increased across the range of the species.

Summary of Vehicle Collisions Impacts

While we are aware of reports of road mortalities in Wyoming and California related to pygmy rabbits, they are few in number with low mortalities documented. We conclude that populations are able to recover from these types of limited, individual losses. Based on our review of the best available information, we conclude that mortality due to vehicular collisions is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Habitat Specialist

Because the pygmy rabbit is a habitat specialist and its habitat is fragmented across the landscape, the species' life history traits could affect population viability. Pygmy rabbits appear to have small home ranges, are not evenly distributed across the species' range, and may have poor dispersal capabilities (though recent information indicates home ranges and dispersal capabilities are greater than originally thought) influencing genetic diversity or its ability to move to a more favorable location if necessary in reaction to natural or manmade factors. Pygmy rabbits do not respond to abundant spring food supply by producing additional litters like other rabbits and therefore, may have lower reproductive capabilities (Wilde 1978, p. 145). These life history traits could contribute to population declines as habitat size and quality are reduced, however, they should not be a limiting factor to pygmy rabbits across large geographic areas when suitable habitat is extensive and in good condition.

Summary of Habitat Specialist Impacts

The pygmy rabbit is a habitat specialist. Life history traits such as small home ranges, uneven distribution across its range, poor dispersal capabilities and lower reproductive potential compared to other leporid species might suggest a concern for the long-term survival of the pygmy rabbit. However, recent studies as mentioned in the Background section above indicate that pygmy rabbit home ranges and dispersal capabilities are greater than previously thought. Genetic research (Estes-Zumpf *et al.* 2010, p. 214) has occurred in some areas of the species' range, and available information indicates the pygmy rabbit exhibits relatively high genetic diversity. The best available scientific and commercial information does not indicate that the pygmy rabbit is negatively impacted by current habitat fragmentation. The information available indicates pygmy rabbit populations continue to occur over a wide distribution of their current range.

The pygmy rabbit survives almost exclusively on sagebrush for food (especially in winter) and shelter. Sagebrush are long-lived, stable species, resistant to most environmental impacts, except fire and some insects, and thus do not fluctuate widely in availability. The best available information does not indicate how the lack of producing additional litters specifically during times of abundant plant growth is detrimental to the species. However, as indicated in the background section, female pygmy rabbits are capable of producing an average of six young per litter with three litters possible in a year. The best available information shows that the pygmy rabbit's natural life history characteristics have not limited the species across its range. Therefore, we conclude that being a habitat specialist is not a significant threat to the pygmy rabbit now or in the foreseeable future.

Other Potential Threats

In our 90–day petition finding, we identified other natural or manmade factors (facilities associated with grazing (tanks, pipelines, roads) may allow predators, OHV/ORV users, and hunters to access new terrain; activities on military facilities; and predator control to benefit livestock increases predation on pygmy rabbits) that might pose a threat to pygmy rabbits. However, for this analysis, we could find no supporting information to indicate that any of these factors are threatening pygmy rabbit populations.

Summary of Factor E

We have assessed the best available scientific and commercial data on the magnitude and extent of the potential threats of intra- and inter-specific relationships, small or isolated populations, stochastic events, climate change, recreational activities, vehicle collisions, and habitat specialist life history requirements of the pygmy rabbit. As discussed above, intra- and inter-specific relationships between and among pygmy rabbits and other species are natural and occur but do not constitute a significant threat to the species. The best available scientific and commercial information does not document that natural or anthropogenic pressures are negatively affecting these relationships. The best available information indicates that pygmy rabbit populations are not small or occurring in isolation across the range. While stochastic events have occurred and will continue to occur throughout the range of the species, there is no indication that these events are a significant threat to the pygmy rabbit largely due to the patchy distribution of the species and its preferred habitat. Vehicle collisions, while a potential threat, have been rarely reported, and we do not consider them to be a significant source of mortality. Projected climate change impacts across the range of the pygmy rabbit are generalized and are not considered to be a significant threat. The potential impact of pinyon-juniper woodland expansion into pygmy rabbit habitat is predicted to be slow with pygmy rabbits demonstrating a variety of responses. Recreational activities occur within the range of the pygmy rabbit, but no information is available to qualify or quantify the effect on populations, and we do not considered these activities to be a significant threat. There is no indication from the available information that the pygmy rabbit has been limited across its range based on its natural life history characteristics. There are many natural and manmade factors or activities that have occurred and will continue to occur within pygmy rabbit habitats within its range. As discussed in the distribution and trend section, the available information indicates pygmy rabbit populations continue to occur over a wide distribution of their current range, including historical locations, despite these various factors. Based on the best available scientific and commercial information, the pygmy rabbit is not now, or in the foreseeable future, threatened by other natural or manmade factors affecting the species to the extent that listing as endangered or

threatened under the Act is warranted at this time.

Finding

As required by the Act, we considered the five factors in assessing whether the pygmy rabbit is endangered or threatened throughout all or a significant portion of its range. We carefully examined the best scientific and commercial information available regarding the past, present, and future threats faced by the pygmy rabbit. We reviewed the petition, information available in our files, other available published and unpublished information, and we consulted with recognized pygmy rabbit experts and other Federal, State, and tribal agencies.

We have identified and evaluated the potential threats as discussed under Factor A (agriculture, sagebrush treatment, livestock grazing, nonnative invasive plants, fire, urban and rural development, mining, energy exploration and development, habitat fragmentation, and greater sage-grouse conservation actions), and we acknowledge that most of these threats have occurred within the range of the pygmy rabbit and may have impacted some areas known to be, or to have been, occupied by pygmy rabbits based on site-specific information. Some or all of these activities are likely to continue at some level in the future. Available information does not indicate that the sagebrush lost or degraded due to agriculture, sagebrush treatment, urban and rural development, mining, habitat fragmentation, greater sage-grouse conservation actions, or other conservation actions has impacted large areas of suitable or occupied pygmy rabbit habitat resulting in significant occupied habitat or population losses. The impacts attributed to livestock grazing, while widespread across the pygmy rabbit's range, have not resulted in documented measurable declines in pygmy rabbit numbers or populations. Based on the information available, we find that the potential threat of increasing energy exploration and development as well as the relationship between invasive nonnative plant species and fire regimes are not significant threats to the pygmy rabbit now or in the foreseeable future. There is no available information that indicates the magnitude or extent of pygmy rabbit sites that may have been lost or reduced in area or in population size due to these activities. Some of these events or actions that can result in the complete loss of sagebrush over large areas (i.e., sagebrush conversion to agriculture, sagebrush treatments, fire) likely resulted in the reduction of occupied habitat and loss of some pygmy rabbit populations. However, there is no evidence that this will significantly threaten the species in the foreseeable future. Therefore, based on our review of the best available scientific information, we find these potential threats, either singly or in combination with one another, are not significant threats now or in the foreseeable future, to pygmy rabbit habitat across its range.

We have identified and evaluated the risks from overutilization for commercial, recreational, scientific or educational purposes. Available information indicates that historical or recent hunting pressure has not played an important role in population dynamics for the pygmy rabbit across its range. Three of the seven States discussed in this finding currently allow hunting of pygmy rabbits; this is a reduction from the past. Based on the best available information we find that hunting was not and is not a significant threat to pygmy rabbit populations across its range nor will it be in the foreseeable future.

Research activities may result in adverse impacts to a species (e.g., injury, death, stress, or general habitat disturbance). Negative impacts to pygmy rabbits that have been caused by research activities have been few in number, occurred in limited areas, and occurred over short periods of time. We encourage research activities to continue in the future to increase our understanding of this species. With planning and care, adverse impacts of research activities can be minimized. Based on the best available information we find that research activities are not a significant threat now or in the foreseeable future, to the pygmy rabbit across its range.

Disease epizootics in pygmy rabbits have not been reported within its range considered in this finding. Research is needed to determine if disease could be a threat in the future. Predation has been reported as the main cause of mortality in pygmy rabbits. Numerous species have been identified as predators of pygmy rabbits. Based on the best available information, we find that neither disease nor predation are significant threats now or in the foreseeable future, to the pygmy rabbit across its range.

Based on our analysis of the existing regulatory mechanisms, we determined that States are managing pygmy rabbit hunting in three States while four others protect them hunting as species of concern or sensitive species. In Wyoming, many oil and gas projects will be reviewed and mitigation provided that may benefit pygmy rabbits.

A large portion of pygmy rabbit habitat occurs on lands administered by Federal agencies and numerous policies, guidance, and laws have been developed to assist in managing these lands. We determined in the evaluation that other threats would not significantly affect the pygmy rabbit now or in the foreseeable future. Thus, we find the inadequacy of existing regulatory mechanisms is not a significant threat to the pygmy rabbit across its range now or in the foreseeable future.

Other natural or manmade factors have occurred within the range of the pygmy rabbit, and these habitat impacts or actions will likely continue at some level in the future. As indicated above, intra- and inter-specific relationships between pygmy rabbits and among pygmy rabbits and other species are natural and occur across the range, but there is no indication that these relationships are negatively impacting the pygmy rabbit. Though impacts to pygmy rabbits have occurred related to stochastic events and vehicle collisions, they have been rarely reported. The best available information indicates that pygmy rabbit populations are not small or isolated across the range. Potential impacts due to climate change are general, and there is no demonstrated connection between climate change and reduced abundance or survival of pygmy rabbits. Recreational activities occur throughout the range of the pygmy rabbit, but there is no indication these activities are significantly impacting pygmy rabbit populations. The best available information indicates that the pygmy rabbit, as a habitat specialist, has not been limited across its range.

During our status review for this species, it has become evident that many of the threat issues raised have been speculative and direct impacts to historical and extant pygmy rabbit populations have not been documented. Threats exist but do not appear to be significant across the range of the species. While the sagebrush ecosystem has been and will continue to be impacted by various natural and manmade events and activities in parts of the pygmy rabbit's range, we have determined, based on the species' current range and distribution, that pygmy rabbit populations continue to persist in much of its range, despite the numerous activities occurring within their habitat. Pygmy rabbits are represented across their current range which is not dissimilar from what is known of their historical distribution as

discussed in the Distribution and Trend section. Our understanding of the pygmy rabbit's range has improved, and the current known range has been extended in Montana, Nevada, and most notably Wyoming based on recent survey efforts.

Based on our review of the best available scientific and commercial information, we find that the threats are not of sufficient imminence, intensity, or magnitude to indicate that the pygmy rabbit is in danger of extinction (endangered), or likely to become endangered within the foreseeable future (threatened) throughout its range. Therefore, listing the pygmy rabbit as an endangered or threatened species under the Act is not warranted at this time.

Distinct Vertebrate Population Segment (DPS)

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 taxon to which it belongs;

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

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

In this analysis, we will evaluate whether pygmy rabbits in Mono County, California, meet the criteria to be considered a DPS. This analysis is being conducted because studies have indicated that pygmy rabbit populations in Mono County may be separated from the rest of the pygmy rabbit range (Grayson 2006, pp. 2969-2970; Larrucea and Brussard 2008a, pp. 694, 696).

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.

We note that the standard set forth in the DPS policy is that a DPS be "markedly separated" from other populations—thus, while absolute separation is not required, neither are "large numbers" of individuals migrating between populations. Nor is absolute isolation required for populations to be markedly separated.

Pygmy rabbits in Mono County appear to be markedly separated from other pygmy rabbit populations. The nearest known populations to Mono County populations are in western Nevada, approximately 100 mi (162 km) away (Larrucea and Brussard 2008a, p. 694). There are no known historical pygmy rabbit records for Lyon, Mineral, and Emeralda Counties, Nevada, which could provide possible connections between California and Nevada in this area. Surveys conducted during 2003 and 2006 in Lyon and Mineral Counties did not find evidence of pygmy rabbits (Larrucea 2007, pp. 165-179). It is possible that the Mono County populations have been separated from the rest of the species' range since the end of the Pleistocene (Grayson 2006, pp. 2969-2970).

We determine, based on a review of the best available information, that the Mono County populations of pygmy rabbit are markedly separated from other pygmy rabbit populations as a consequence of physical factors and thus meet the discreteness criterion of the 1996 DPS policy.

There are no international governmental boundaries associated with this species that are significant. The pygmy rabbit 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 this determination.

Significance

If a population segment is considered discrete under one or more of the conditions described in our DPS policy, its biological and ecological significance will be considered in light of Congressional guidance that the authority to list DPSs be used "sparingly" while encouraging the conservation of genetic diversity. In making this determination, we consider available scientific evidence of the discrete populations segment's importance to the taxon to which it belongs. Since precise circumstances are likely to vary considerably from case to case, the DPS policy does not describe all the classes of information that might be used in determining the biological and ecological importance of a discrete population. However, the DPS policy does provide four possible reasons why a discrete population may be significant. As specified in the DPS policy (61 FR 4722), this consideration of the population segment's significance may include, but is not limited to, the following:

(1) Persistence of the discrete population segment in an ecological setting unusual or unique to the taxon;

(2) Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon;

(3) Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or

(4) Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

A population segment needs to satisfy only one of these criteria to be considered significant. Furthermore, the list of criteria is not exhaustive; other criteria may be used as appropriate.

(1) Persistence of the discrete population segment in an ecological setting unusual or unique to the taxon;

The available information does not suggest that the ecological setting occupied by pygmy rabbits in the Mono County, California, portion of its range is unusual or unique when compared to the remainder of its range. The available information does not suggest that the vegetation, elevation, topography, or climate of the habitat occupied by the Mono County, California populations of the pygmy rabbit is unusual or unique to the taxon; nor is there any information indicating there are physiological or behavioral factors of the Mono County populations that are unusual or unique to the taxon.

(2) Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon;

The Mono County populations are located on the western periphery of the pygmy rabbit's range. We have determined that they occupy less than 1 percent of the species' range. If the populations in Mono County were to be extirpated, the portion of the range lost would be small when compared to the remainder of the species' range. Loss of these populations would not result in a gap in the pygmy rabbit's range as they are located on the edge of the range and may not be providing connectivity to other portions of its range. Therefore, we conclude that loss of these populations would not be result in a significant gap in the range of the species.

(3) Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or

The Mono County populations do not represent the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range. The pygmy rabbit's current distribution is similar to its historic distribution, and the species has not been introduced to areas outside of its historic range. The Mono county populations represent a small portion of the total extent of the species' range.

(4) Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

As indicated above, pygmy rabbits in Mono County have not been genetically tested. Therefore, there is no information to indicate that these populations differ markedly from other populations of this species in its genetic characteristics.

We therefore conclude that pygmy rabbit populations in Mono County do not meet the significance element of the Service's DPS policy because they do not occur in an ecological setting unusual or unique to the taxon; their loss would not result in a significant gap in the range of the taxon; they do not represent the only surviving natural occurrence of the taxon; and there is no evidence available indicating that Mono County populations differ markedly in genetic characteristics.

Conclusion of Distinct Population Segment Review

Based on the best scientific and commercial information available, we find that pygmy rabbit populations found in Mono County, California, meet the discreteness element of our DPS policy but fail to meet the significance element of that policy. Since both discreteness and significance are required to satisfy the DPS policy, we have determined that Mono County pygmy rabbit populations do not 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 pygmy rabbit is not endangered or threatened throughout all its range, we must next consider whether there are any significant portions of the range where the pygmy rabbit is in danger of extinction or is likely to become endangered in the foreseeable future.

To identify those portions that may be significant portions of the range, we determine whether there is substantial information indicating that: (i) The portions may be significant, and (ii) the species may be in danger of extinction there or likely to become so within the foreseeable future. In practice, a key part of this analysis 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 be a significant portion of the range. Moreover, if any concentration of threats applies only to portions of the range that are unimportant to the conservation of the species, such portions will not be significant portions of the range.

If we identify any significant portions, we then determine whether the species is threatened or endangered in that portion of the range. Depending on the biology of the species, its range, and the threats it faces, the Service may address either the significance question or the status question first. Thus, if the Service considers significance first and determines that a portion of the range is not significant, the Service need not determine whether the species is threatened or endangered there. Likewise, if the Service considers status first and determines that the species is not threatened or endangered in a portion of its range, the Service need not determine if that portion is significant.

Based on our review of survey information, distributional data, and potential threats, we have determined that the pygmy rabbit range in Oregon, Idaho, Montana, Nevada, and Utah does not warrant further consideration to determine if it is a significant portion of the range that is threatened or endangered. We found no areas within this portion of the range where threats are geographically concentrated. The potential factors that may affect the species are essentially uniform throughout this portion of the range. However, we did determine that the Mono County, California, and the Wyoming portions of the pygmy rabbit's range warranted further consideration to determine if they are significant portions of the range that are threatened or endangered. The Mono County, California portion was selected due to the possible lack of connectivity to populations in Nevada, and therefore, threats to it may include population isolation. Regardless of the possible extirpation of pygmy rabbit populations in Modoc and Lassen Counties, California (Larrucea and Brussard 2008a, pp. 694, 696), populations in Mono County may be isolated from the rest of the range. There are no known historical pygmy rabbit records for Lyon, Mineral, and Emeralda Counties, Nevada, which could provide possible connections between California and Nevada in this area. Surveys conducted during 2003 and 2006 in Lyon and Mineral Counties did not find evidence of pygmy rabbits (Larrucea 2007, pp. 165-179). It is possible that the Mono County populations have been separated from the rest of the range since the end of the Pleistocene (Grayson 2006, pp. 2969-2970) (see our discussion regarding DPS above). The Wyoming portion was selected due to the concentration of energy exploration and development in the southwestern and south central areas of the State and the possible threat from these activities to pygmy rabbit populations in those areas.

To assess the significance of these portions of the range, we evaluated whether these two areas occupy relatively large or particularly high-quality, unique habitat that could be affected, or if their locations or characteristics make them less susceptible to certain threats than other portions of the species' range such that they could provide important population refugia in the event of extirpations elsewhere in the species' range. We determined that the Mono County populations occupy less than 1 percent of the species range, and the available information does not suggest that the habitat occupied by pygmy rabbits in this portion is particularly high quality or unique when compared to the remainder of the range. The pygmy rabbit, in addition to Mono County California, occurs in sagebrush habitats located in southeastern Oregon, southern Idaho, southwestern Montana,

western Utah, and northern and eastern Nevada. We did not find that the Mono County populations are less susceptible to certain threats than other portions of the range. We also evaluated the historical value of this portion and how frequently it is used by the species and whether the portion contains important concentrations 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. We found that the Mono County populations are not significant because the habitats necessary for breeding, feeding, dispersal, or wintering are utilized year round and are found throughout the pygmy rabbit's range. These necessary habitats are not concentrated in Mono County.

We determined that the Wyoming populations occupy about 11.5 percent of the species' range, and available information does not suggest that the habitat occupied by pygmy rabbits in this portion is particularly high quality or unique when compared to the remainder of the range. The pygmy rabbit, in addition to Wyoming, occurs in sagebrush habitats located in southeastern Oregon, southern Idaho, southwestern Montana, western Utah, and northern and eastern Nevada. We did not find that the Wyoming populations are less susceptible to certain threats than other portions of the range. We also evaluated the historical value of this portion of the range and how frequently it is used by the species and whether the portion contains important concentrations 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. We found that the Wyoming populations are not significant because the habitats necessary for breeding, feeding, dispersal, or wintering are utilized year round and are found throughout the pygmy rabbit's range. These necessary habitats are not concentrated in Wyoming.

Based on the discussion above, we determined that the Mono County, California, and the Wyoming portions of the current range of the pygmy rabbit are not significant to the species and therefore do not warrant further consideration to determine if they are a significant portion of the range that is threatened or endangered.

We do not find that the pygmy rabbit 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 pygmy rabbit as threatened or endangered under the Act is not warranted throughout all or a significant portion of its range at this time.

We request that you submit any new information concerning the status of, or threats to, the pygmy rabbit to our Nevada Fish and Wildlife Office (see **ADDRESSES** section) whenever it becomes available. New information will help us monitor the pygmy rabbit and encourage its conservation. If an emergency situation develops for the pygmy rabbit, 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 Nevada Fish and Wildlife Office (see **ADDRESSES**).

Authors

The primary authors of this document are the staff members of the Nevada Fish and Wildlife Office, U.S. Fish and Wildlife Service, Reno, Nevada.

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 20, 2010

Rowan Gould,

Acting Director, Fish and Wildlife Service.

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