PYGMY RABBIT PETITION

A Petition for rules to List the Pygmy Rabbit *Brachylagus idahoensis* occurring in the coterminous Intermountain and Great Basin region as Threatened or Endangered Under the Endangered Species Act 16 USC 1531 seq.

Submitted to the United States Fish and Wildlife Service.

I. PETITIONERS

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The Committee for the High Desert (CHD), Western Watersheds Project (WWP), American Lands Alliance (ALA), Oregon Natural Desert Association (ONDA), the Biodiversity Conservation Alliance (BCA) and the Center for Native Ecosystems (CNE) formally request U.S. Fish and Wildlife Service to list the indigenous pygmy rabbit (*Brachylagus idahoensis*) of the Intermountain and Great Basin region as threatened or endangered under the Endangered Species Act, and to designate critical habitat

concurrent with its listing. This petition is for all remaining pygmy rabbit populations outside the range of the Columbia Basin DPS. The pygmy rabbit in the lands subject to this listing is threatened with extinction by the continued destruction and modification of its habitat.

Petitioners file this rule under the Endangered Species Act (herein after the "Act" or "ESA"), 16 U.S.C. sections 1531-1543 (1982). This petition is filed under 5 U.S.C. section 553 (e), and 50 C.F.R. part 424.14 (1990), which granted interested parties the right to petition for the issue of a rule from the Assistant Secretary of the Interior. The petitioners request that Critical Habitat be designated pursuant to 50 C.F.R. 414.14, and pursuant to the Administrative Procedures Act (5 U.S.C. 553).

The United States Fish and Wildlife Service has jurisdiction over this petition. Petitioners understand that this petition sets in motion a specific process placing definite response requirements on the USFWS and very specific time constraints upon these responses. The petitioners are conservation organizations with a deep interest in protection of biodiversity and sagebrush ecosystems.

Failure to grant the requested petition will adversely affect the aesthetic, recreational, spiritual, commercial, research and scientific interests of petitioning organizations' members and of citizens of the United States. The public shows increasing demand for wildlife viewing opportunities, and increasing concern for biodiversity in general. The pygmy rabbit is an small endemic leporid that is an extreme sagebrush habitat specialist, dependent on sagebrush for 99% of its winter diet and for critical cover from predators, while requiring deep soil sites for construction of burrows. The pygmy rabbit, and its requisite big sagebrush habitats, have suffered dramatic degradation and declines. Future habitat loss is predicted.

Current populations occupy a geographic range estimated as well less than 10% of the known historic range, and perhaps as little as 5%. The historical geographic range of the pygmy rabbit spanned over 100 million acres of the American West. The geographic range has declined from at least 100 million acres to small portions of 7 or 8 million acres or less. Within its present greatly diminished geographic range, the pygmy rabbit occupies only a smaller subset of sites with essential habitat components. Current known larger populations are separated by a combination of impassable natural and human-caused barriers to dispersal. Only 3 larger populations are known, and it is very likely that these three larger populations are split into smaller populations by habitat fragmentation and natural and human-caused barriers to dispersal.

As this petition will demonstrate, *Brachylagus idahoensis* faces extinction without an Endangered or Threatened designation under the ESA.

Should populations of these indigenous leporids fall victim to extinction, no natural recolonization will be possible, due to great expanses of fragmented, inhospitable habitat and insurmountable barriers to dispersal. Without concerted and extensive effort to restore degraded and fragmented sagebrush habitats, re-stocking efforts from any captive populations will fail. Populations will remain subject to extinction, as small, increasingly isolated populations "blink out" over time.

Addressing the drastic decline of the pygmy rabbit over this large geographic area will therefore serve to substantially restore the health of these populations, and maintain

health and integrity of the threatened sagebrush ecosystems in the regions subject to this petition. No other terrestrial species with the terrestrial habitat requirements of the pygmy rabbit is protected by ESA listing.

Submitted by:

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I. PETITIONERS

The Committee for the High Desert (CHD) is a tax-exempt, non-profit grassroots organization whose over 200 members have a long-standing interest in wild lands protection and the conservation of biodiversity in shrub-steppe ecosystems.

Western Watersheds Project (WWP) is a tax-exempt, non-profit public interest organization with over 1000 members. WWP acts to raise public consciousness regarding the importance of our shared public lands, as well as the animals and plants that depend upon them. WWP has a particular interest in habitat protection for rare and declining species.

American Lands Alliance (ALA) is a national conservation organization that works with grassroots groups and individuals to protect wildlife and wild lands across the country. American Lands' Sagebrush Sea Project was specifically created to conserve and restore fish, wildlife and native vegetation in sagebrush habitats on public lands.

The Oregon Natural Desert Association (ONDA) is a non-profit public interest organization dedicated to the conservation of eastern Oregon's public lands. Founded in 1989, ONDA's mission is to protect, defend, restore forever the health of Oregon's native deserts. ONDA has a long history of interest and involvement in public land management activities with respect to grazing, riparian areas and wildlife. ONDA's staff and members regularly use and enjoy the public lands throughout the Oregon desert for observation, research, aesthetic enjoyment, and other recreational, scientific and educational activities.

Biodiversity Conservation Alliance is a Laramie, Wyoming based conservation group with the mission to protect and restore biological diversity, habitat for wildlife and fish, rare plants, and roadless lands. We concentrate our efforts on protection of ecosystems in Wyoming, western South Dakota and northern Colorado.

The Center for Native Ecosystems (CNE) is a non-profit advocacy organization dedicated to conserving and recovering native and naturally functioning ecosystems in the Greater Southern Rockies and Plains. CNE values the clean water, fresh air, healthy communities, sources of food and medicine, and recreational opportunities provided by native biological diversity. The sageland ecosystems of western Colorado, eastern Utah, and southern and central Wyoming, sometimes known as the Great Divide Ecoregion, are a conservation priority for CNE and its members. The region is high in biological diversity and is home to imperiled native species. The pygmy rabbit is one of many sagebrush ecosystem species facing severe threats from inappropriate livestock grazing, road construction, off-road vehicle use, and other activities.

Craig Criddle is a resident of Downey, Idaho with a long-time interest in the protection of sagebrush ecosystems and native wildlife.

II. EXECUTIVE SUMMARY

The pygmy rabbit is a member of the family Leporidae, which includes hares and rabbits. It is the smallest rabbit in North America, and one of the smallest leporids in the world (WDFW 1995, Katzner and Parker 1997). It weighs around one pound, and can fit in the palm of a hand. The pygmy rabbit is uniquely dependent on sagebrush, which comprises up to 99% of its winter diet. It is one of only two North American rabbits that digs its own burrows. It is a strict sagebrush obligate, inhabiting sagebrush dominated habitats in the Intermountain Region and Great Basin. The historical range of the pygmy rabbit encompassed more than 100 million acres in 8 western states (Montana, Idaho, Wyoming, Utah, Nevada, California, Oregon and Washington). Pygmy rabbits are one of a very few species, including pronghorn antelope and sage grouse, that can ingest large amounts of sagebrush leaves laden with terpenoids without major digestive disturbances and death (White et. al. 1982, Katzner 1994). It is the only species in the monotypic genus *Brachylagus.*

This combination of small body size, specialized feeding strategies, and unique habitat requirements are unusual among leporids. Pygmy rabbits have the greatest surface area to volume ratio (and thus heat loss) of any rabbit species in their known geographic range and endure harsh climatic extremes characterized by cold winters and dry summers where drought is common (Katzner 1994).

The pygmy rabbit is an extreme habitat specialist at all levels, from the landscape level to placement of burrows and use of surrounding areas (Gabler 1997, Heady 1998, Heady et. al. 2001). It is closely associated with clumps of tall dense sagebrush coupled with deep loose textured soils for burrow construction. Burrows are typically occupied by one individual that has particular feeding use areas. It is found in aggregations or colonies in areas of suitable habitat.

Pygmy rabbits are slow and vulnerable to predators in open areas. They elude predators by maneuvering in dense shrub cover (66 FR 231). Big sagebrush provides both essential year-round food and critical protection from predation. Habitat fragmentation readily isolates populations, as disruptions in sage brush cover and open areas provide barriers to dispersal. The pygmy rabbit has very limited dispersal abilities and is reluctant to cross open areas, amplifying the effects of fragmentation.

Once considered a "characteristic" small mammal by C. H. Merriam following travels across the sagebrush country of Idaho and Nevada (Merriam 1891), and described by others as "once common", OR FOIA 2002, "not uncommon" (Anthony 1913) and "coincident with the distribution of sagebrush … homogeneous and widespread throughout the northern Great Basin" Davis (1939), this small rabbit has progressively vanished from vast areas of the sagebrush sea landscape within the past 25 years. By 1990, numbers of rabbits were believed to be declining in all known populations (Katzner and Parker 1997 citing Dobler and Dixon 1990). The pygmy rabbit has been on the IUCN Red List of lagomorphs of concern since 1996. It is now described by scientists as having drastically declined in the past decade, even in protected areas like INEEL (ESER Stoller 2003).

For 85 years, from its discovery by Merriam's expedition in the majestic upper Pahsimeroi Valley of Idaho in 1890 until the mid-1970s, this species was almost entirely ignored by researchers, and was described primarily as part of broad mammal surveys by naturalists. Its behavior and ecology remained unstudied, with the exception of Reuel Janson' s Utah work. Starting in the 1970s, scientists strongly warned of the implications for the pygmy rabbit of the purposeful destruction and alteration of its big sagebrush habitat for livestock forage projects and agriculture, and chronic routine habitat degradation and destruction, often termed "over" grazing, by domestic livestock. Sadly, these warnings have gone unheeded by federal and state land and wildlife management agencies and the Fish and Wildlife Service. Land management agencies never measure or in any way address livestock structural alteration, simplification and destruction of pygmy rabbit big sagebrush habitat. Current land management practices perpetuate livestock degradation of all components of the sagebrush steppe ecosystem. FWS watched, taking no ESA listing action, while the separate Washington State Columbia Basin Distinct Population Segment (DPS) of pygmy rabbits vanished from the wild.

While hundreds of research papers and graduate student theses on sage grouse were being generated by state wildlife agencies and land grant colleges in 8 western states, the pygmy rabbit has been sliding, largely unheralded, unnoticed and unstudied, toward extinction throughout nearly its entire range.

The pygmy rabbit faces dire threats associated with chronic livestock degradation and destruction of sagebrush habitats, agency prescribed and wild land fire, purposeful agency vegetation manipulation for livestock forage, exotic species proliferation at alarming rates, altered fire cycles with subsequent unraveling of sagebrush ecosystems, intensification of agricultural activities, unfettered oil and gas and coal bed methane exploration and production booms, geothermal exploration and production, inappropriate siting of wind energy facilities in wild land settings, proliferating roading and OHV use, urban expansion and subdivisions, and other factors.

Fragmentation and loss of big sagebrush habitat are rampant throughout this species range. Commodity-driven management of public sagebrush wild lands dominates agency mindsets. Livestock grazing, which occurs near-universally in lands inhabited by the pygmy rabbit, radically alters and diminishes shrub structural diversity and grass understories. Grazing removes and destroys food, lowers nutritional value of grasses, causes inexorable exotic species invasions, collapses burrows, spreads diseases, and attracts predators (68 FR 43). Construction of new livestock facilities continues to extend livestock use into remnant less-grazed sagebrush habitats.

Rapid declines in pygmy rabbit populations have been noted by nearly all researchers. No evidence of population increase has been observed. Current investigators report large numbers of old or unoccupied burrows, evidence of a substantial and alarming decline (Bartels and Hays 2001, OR FOIA 2002, Crawforth et al. 2001, White and Bartels 2002, Austin 2002, Roberts 2002, Janson 2002).

The areal extent of pygmy rabbit range has drastically contracted (66 FR 231 Map figure 2, OR FOIA 2002, White and Bartels 2002, Roberts 2002). The pygmy rabbit now persists as a series of isolated and small populations, if it is present at all, throughout nearly all of its entire former range. Only three "larger" populations are known – and in reality these larger populations are very likely fractured by geographic and human-

caused dispersal barriers into a series of smaller isolated populations. A broad body of science, from the massive federal Interior Columbia Basin Ecosystem Management Project (ICBEMP) to current ecological literature, predicts continued declines, loss and fragmentation of sagebrush ecosystems rangewide.

No protection of any kind exists for the deep soil big sagebrush habitats required by the pygmy rabbit throughout nearly its entire range (WDFW 2003 www.wa.gov/WDFW/science/up_close/j_pierce.html). The multi-dimensional structural damage and simplification inflicted by domestic livestock grazing on big sagebrush is never recognized, measured or controlled by land management agencies.

The pygmy rabbit has captivated those who have knowledge of it - ranging from hard-core researchers to crusty cattlemen. "These entrancing little bright-eyed creatures are animated bundles of fur… there is no wild creature more deserving of the word 'cute' than these dwarves of the rabbit tribe" (Jackman and Long 1965 *The Oregon Desert*).

The decline of this appealing, small endemic rabbit, even in some the West's most magnificent wild landscapes, is symptomatic of the chronic and unrelenting abuse of the now-threatened and vanishing sagebrush steppe ecosystem. Austin (2002) observed: "Had we tried to deliberately eliminate these small creatures from our sagebrush habitats, it seems to me we could scarcely have done a more thorough job than has been accomplished throughout … our western sagebrush lands".

"If the pygmy rabbit goes extinct, the implications are much broader than just that species, because that means that the shrub-steppe is disappearing, and that in turn will affect all the other species that depend on it", John Pierce, Chief Scientist for the Wildlife Division of WDFW, in Fish and Wildlife Science www.wa.gov/WDFW/science/up_close/j_pierce.html.

III. NOMENCLATURE AND CLASSIFICATION

Characteristics of Lagomorphs and Leporids

The pygmy rabbit belongs to the mammalian order Lagomorpha. The Order Lagomorpha contains the families Ochotonidae (pikas) and Leporidae (nine genera of hares and rabbits). There are 80 recent species dispersed throughout the world. Lagomorphs occupy a wide variety of habitats on most continents. Female rabbits and hares are usually larger than males. They are defenseless against predators, and avoid predation and danger by their keen senses of hearing and smell, and behaviors such as burrow use. Within the family Leporidae, weak runners typically use burrows, and strong runners use forms. They are coprophagous, reingesting their own feces (Walker et al. 1975).

Taxonomic Status of the Pygmy Rabbit

The pygmy rabbit was first described in 1891 as *Lepus idahoensis* (Merriam), and later reclassified as *Brachylagus idahoensis* (Lyon) in 1904. In 1930, Grinnell placed this species in *Sylvilagus* (WDFW 1995). Verts and Carraway (1998) describe the taxonomic history of the pygmy rabbit as a tortuous path to the current name (citing Green and Flinders 1980). The pygmy rabbit was originally placed in the genus *Lepus* by Merriam, then 12 years later assigned to the monotypic genus *Brachylagus*, then *Brachylagus*

became a subgenus within the genus *Sylvilagus* for 33 years until it was returned to the generic rank where it is today.

Hibbard (1963) examined 2335 skulls from 9 extinct and extant leporid genera, and concluded that the pygmy rabbit is more closely related to the Sumatran hare *Nesolagus* than *Lepus* or *Sylvilagus*. Blood protein analysis has also found that the pygmy rabbit is different from other similar species of *Sylvilagus* (Johnson 1968). The pygmy rabbit is now referred to as *Brachylagus idahoensis* (Ingles 1973, Green and Flinders 1980) from WDFW (1995). The generic distinction between *Brachylagus* and and *Lepus* is based on morphological, serological, ecological, and behavioral information (Walker et al. 1975). Genetic analysis by Halanych and Robinson (1997) again confirms that separate generic status for the pygmy rabbit is warranted, based on its phylogenetic position and sequence divergence values.

Common names include pygmy rabbit and sage rabbit (Bailey 1936), bunny (Roberts various), brush bunny (Butte County Deputy Sheriff pers. comm. to Fite 2003 - noting "you don't see many of them anymore"). In California, this species has been called "brush rabbit". However, a separate rabbit species *Sylvilagus bachmani*, native to riparian thickets of western Oregon, California, and northern Baja California, more properly has this common name (Sevareid 1950).

The Piute name is Tse-gu-oo (Bailey 1936).

Washington Rabbits, Near Extinct in the Wild, Have Been Placed in A Separate Columbia Basin Distinct Population Segment

In 2001, FWS determined that the near-extinct population of the pygmy rabbit in Washington state was a Distinct Population Segment based on physical, genetic, and ecological factors of discreteness (66 FR 231). FWS published an emergency rule to list the Columbia Basin pygmy rabbit DPS as endangered on November 30, 2001 in response to settlement of litigation brought by the Center for Biological Diversity and several other conservation groups over the failure of USFWS to act on ESA listing of the Washington pygmy rabbit. Until litigation action was taken, the FWS did not act to list this vanishing rabbit, despite intensively studied, well-documented and irreversible population declines.

The emergency rule based its determination of DPS status on ecological, physical and genetic differences. No clear behavioral or morphological differences were found between the Columbia Basin DPS and pygmy rabbits throughout the vast Intermountain and Great Basin region.

On November 30, 2001 the FWS published an emergency rule to list the pygmy rabbit as Endangered (66 FR 231), and final listing action occurred with the publication of a Final Listing rule in the Federal Register on March 5, 2003 (68 FR 43), after the Emergency listing period had elapsed.

The pygmy rabbit is similar in physical characteristics throughout its entire range, and there are no apparent subspecies (Green and Flinders 1980, Janson 2002). The genetic separation between Washington rabbits and other populations was described in the Emergency Listing rule (66 FR 231). Inbreeding had already reduced genetic diversity of the Columbia Basin rabbits by the time genetic comparisons were made between

Washington and other populations (Warheit 2001). FWS acknowledged a number of broad habitat associations common between Oregon and Washington ecosystems, yet focused on small differences in ecosystem elements between regions in its DPS determination (66 FR 231).

IV. DESCRIPTION AND LIFE HISTORY

General Appearance

The pygmy rabbit is the smallest Leporid in North America (66 FR 231). Its body length varies from 23.5 to 29.5 cms. (9.3 to 11.6 in), and it weighs from 375 to 462 gms. (0.83 to 1.02 pounds) (66 FR 231). Pygmy rabbits can fit in the palm of a human hand,and has been described as around the size of a guinea pig. Females tend to be larger than males.

Distinguishing characteristics are short hind legs, comparatively broad hind feet, short and rounded ears, and a small and inconspicuous tail that is less than in inch in length with a buffy, not white, underside (Walker et al. 1975, Janson 2002). The skull is unusual for its short length, highly arched occipital region, shortened rostrum, very large tympanic bullae, and delicate supraorbital processes (Walker et al. 1975, Janson 2002). There are 10 mammae.

Young pygmy rabbits have noticeably smaller eyes, sharper noses, more upright ears and a “better proportioned and less awkward” appearance than young jackrabbits or cottontails (Janson 2002). The young are altricial.

The pelage color and length changes seasonally due to coat abrasion. Grinnell et al. (1930) demonstrated that only one annual molt occurs. New fall pelage is buffy gray above, and white below. By mid-winter, fur is worn silver gray with hints of sooty brown, and by spring the upper parts are dark grayish brown. The nape and anterior portions of the legs are cinnamon buff during all seasons (Janson 2002).

Movement – Low Scampering Gait and Vulnerability in Open Areas

Pygmy rabbits have a deliberate gait, and a stance that is low to ground. This has been described as a relatively ”slow, scampering gait” (Merriam 1891). Pygmy rabbits rely on their ability to maneuver through dense sagebrush, rather than on speed, to avoid predators (Merriam 1891, Davis 1939, Sevareid 1950, Green and Flinders 1980, WDFW 1995). This low scampering gait differs from the longer, higher jumps typical of other rabbits (Merriam 1891). Top running speed is estimated at 24 km per hour (Green and Flinders 1980, Janson 2002). Movement is usually confined to a small area around the burrow in winter, with larger movement in spring and summer (Green and Flinders 1980. Janson noted that a pygmy rabbit became exhausted after a run of about 100 meters, after which it would stop and allow the pursuer to pick it up.

Pygmy rabbits are **slow and vulnerable in open areas** (Weiss and Verts “Protective Comments” in Oregon Natural Heritage Program Records). Extensive **well-used runways interlace sage thickets and provide travel and escape routes** (Davis, 1939, Green and Flinders 1980), Pygmy rabbits also use a series of interlaced trails in the winter. Pygmy rabbits construct tunnels under snow cover (subnivian tunnels) for accessing food (sagebrush) when snow reaches sufficient depth (Katzner 1994). Pygmy

rabbits may climb into shrubs to feed (Bailey 1936, Katzner 1994, Janson 2002). Pygmy rabbits typically remain in close proximity of burrows. Winter activity centers around 30 m. near burrows (Janson 2002).

The Pygmy Rabbit Has A Limited Reproduction Potential

Pygmy rabbits breed during their second or third spring or summer. They do not breed during the year of their birth (Wilde 1978, Fisher 1979). Breeding appears to be highly synchronous (Wilde 1978, Fisher 1979). Photoperiod and vegetation condition affect breeding in pygmy rabbits, as well as most other lagomorphs (Wilde 1978, 1981). The quantity, quality and the time when forage are consumed are all important (Wilde 1981). The early availability of green vegetation in a drought year resulted in females conceiving a month earlier, and a period of June rain resulted in a sharp increase in juvenile growth rate (Wilde 1981). There is possible evidence of sex ratio alteration in response to harsh conditions, as more females were found in cohorts in a drought year (Wilde 1981).

Male sexual development begins in January, peaks in March and declines in June (WDFW 1995 citing Janson 1946 and Wilde 1978). Females were found to be fertile from late February through March in Utah (Janson 2002), and late March through late May in Idaho (Wilde et al.1976). Females in Washington have been found nursing young from March through September (Gahr 1993).

The gestation period is 27 to 30 days. There is an average of 6 young per litter – with a maximum of three litters per year. The female stays at the burrow, but males may go up to .25 mile away (OR FOIA 2002).

The young belong to recognizable cohorts, and individuals in succeeding cohorts are smaller in size, perhaps because later cohorts face poorer quality food (Wilde 1978). Growth rate of individuals was less in a drought year (Wilde 1978). The age structure of the population suggests that females tend to be older than males (Wilde 1978). Juveniles never accounted for more than 58% of the population in Wilde's study.

In instances were a third cohort has been observed, survival of the third cohort has been poor (Wilde 1978). Nest locations of young in the wild had not been discovered by reseachers (WDFW 1995, 66 FR 231). However, recent observations of captive pygmy rabbits indicate females excavate specialized natal burrows in the vicinity of their regular burrows, where they give birth and nurse the young at the ground surface in a small depression near the burrow's entrance, with the young returning to the burrow after nursing (68 FR 43). The female may block this burrow entrance with loose soil in her absence (66 FR 231, citing Swenson and Shipley pers. comm). Females may alter their defecation and latrine habits while pregnant and nursing (68 FR 43, citing Shipley pers.comm.). A vigorous defense of young by the mother has been observed.

Maximum adult mortality in Idaho was estimated at 88 percent (Wilde 1978). Juvenile survival is low with greater than 50 percent mortality in the first 5 weeks of life (Wilde 1978).

Janson (2002) found that female pygmy rabbits averaged 14% heavier than males, a phenomenon common in rabbits. Green and Flinders (1980) and Rauscher (1997) also found that females were larger than males.

Fisher (1979) noted that the reproduction potential of the pygmy rabbit is lower than most lagomorphs, and that fewer surplus animals may be available to sport hunters. **He recommended close monitoring of bag limits in areas where habitat is undergoing a "drastic" reduction**, and termed the pygmy rabbit **a species with a limited reproduction potential and restricted habitat preference where careful management is required to prevent decimation.**

Coprophagy Enhances Survival Under Stress

Pygmy rabbits, like other rabbits, consume fecal and cecal pellets, especially when under food stress (Katzner and Parker 1997). Leporids reingest hard and soft feces. Soft feces are reingested directly from the anus. Leporids deprived of soft feces suffer malnutrition (Hirowaka 2001). Hard feces are the pellets typically observed in the field. Reingestion of daytime hard feces promotes food digestibility, and the temporary use of night-time hard feces allows leporids to go without food for sometime (Hirowaka 2001). This provides behavioral flexibility (Hirowaka 2001).

Due to this reingestion, Leporids can live on fibrous, low-quality grasses and leaves and woody parts of plants. Smaller herbivores need to assimilate higher energy per unit capacity of the digestive tract than do larger mammals, and do this by quickly excreting poorly digestible material (Hirowaka 2001).

Captive pygmy rabbits produced an average of 868 pellets per day (Green and Flinders 1980).

Social Behavior and Interactions

Pygmy rabbits live in aggregations that have been termed colonies by some researchers. Within these aggregations, home ranges and use areas show some degree of overlap (Katzner 1994).

Wilde et. al. (1976) at the beginning of a period of research on pygmy rabbits at INEEL, discussed the use of these terms, noting that soil and suitable habitat characteristics affect burrow placement, these areas may be uncommon, and small pockets of suitable habitat may be the cause of colonies (usually thought of as having distinct limits).Thus pygmy rabbits might be better described as living in advantageous aggregations, and there was no innate tendency for social behavior.

Between 1890 when Merriam's expedition collected the type specimen to the mid-1970s, pygmy rabbit references mainly are found as surveys, notes, and incidental observations, with the exception of Janson's Utah work (Wilde et. al. 1976).

Recent studies of the pygmy rabbit appear to have been conducted in environments where populations are at low levels, compared to situations observed by Anthony (1913) and Janson (1946), with the exception of Green (1978). At Ironsides, Oregon, Anthony's 1913 observations indicate a possible degree of interaction: "… this rabbit seemed to be quite generally distributed throughout the district … one might be reasonably sure of seeing several in any extensive growth of rabbit-brush and tall sagebrush ... as many as 8 or 10 were seen in a forenoon … not infrequently two of the animals were put from the same clump of brush, and it was generally noted that the residents of each particular

area would be found more or less congregated at one part of their chosen district …this was not due to conditions of food supply for the next visit might reveal them at the opposite end ... when one rabbit was seen, more often than not, others would scurry out too …".

Due to extensive habitat degradation and destruction, as discussed throughout this petition, pygmy rabbit researchers by the mid-1970s may have been observing much-diminished populations in a sub-optimal social interaction environment. Higher population densities were likely far more common in the past in the ecological setting in which this species evolved prior to Euro-American settlement.

Pygmy rabbits have alarm vocalizations/alert calls, given when they are frightened (Green and Flinders 1981). These vocalizations may be a strategy for pygmy rabbit signaling in brushy habitats, where visual signals (like the tail alarm signals of desert cottontails) would not be effective. The adaptive advantages of giving alarm calls would be greatest in social settings where closely related individuals could respond by flight (Green and Flinders 1981). Alarm calls would be selected for in this aggregated species living in a habitat with poor visibility. Green studied pygmy rabbits in a habitat with densities of 45 rabbits per ha, a density far higher than reported by other recent researchers.

Other vocalizations that have been described include a loud, quavering squeal typical of lagomorphs when captured; a squeak of fright when pursued close; and a squeak and a chuckle (Janson 2002, Green 1978, Green and Flinders 1981).

Possible scent marking from chin glands, known from other rabbit species, may occur (Katzner 1994). Chasing during breeding season has been observed, as has play behavior (Katzner 1994).

The pygmy rabbit may be territorial in defense of its burrows, as typical burrow use is by only one rabbit except during breeding season, and a pygmy rabbit has been observed driving a young black-tailed jackrabbit out of an occupied burrow (Janson 2002). Janson also noted two males in separate branches of the same burrow, plus a young rabbit was present, indicating possible tolerance of rabbits in separate tunnels. Some males had scars on their sides apparently from fighting. When captive adults were placed in the same pen, they were very intolerant, and fought or killed one another. However, there appeared to be tolerance for young – an adult male placed with six young pygmy rabbits did not harm them until stressed for food (Janson 2002). When two half-grown rabbits were placed in a cage, the larger rabbit killed the smaller one, cutting deep into the flesh with knife-like hind toenails (Bailey 1936).

Periods of Activity

Different researchers in different sites and in different seasons of the year have drawn variable conclusions about peak activity periods in the pygmy rabbit. This species has been described as: Crepuscular, most active at dawn and dusk (Davis 1939, Janson 1946), crepuscular with some activity throughout the night (Heady 1998). Peak activity – 2 hours after sunrise to mid-morning (Bradfield 1975). Gahr (1993) said pygmy rabbits could be active during any time – day or night. Katzner (1994) found no distinct peaks in winter activity, with rabbits active throughout the day and night. Bradfield (1975) found

activity was highest in mid-morning, likely due to rabbits avoiding effects of temperature and wind velocity. Heady (1998) also noted avoidance of high temperatures.

Most researchers report inactivity in early afternoon, and during hottest periods of the day. Pygmy rabbits spend much of the day lying in forms in the shade of sagebrush near their burrows, and feeding at intervals (Janson 2002).

Pygmy rabbits have been seen at night in spotlight transects for jackrabbits (WDFW 1995 citing Doremus pers comm), and recently, have been seen at night during sage grouse trapping efforts in Nevada (Jeffers NDOW pers. comm. to Fite 2002, Stiver NDOW pers. comm. to Fite 2002, specifically noting the Montana Mountains).

V. SPECIALIZED HABITAT REQUIREMENTS

Pygmy rabbits inhabit the high desert country of the arid interior West, in climates with harsh extremes of hot and cold seasonal variation in temperature (Merriam 1891, Noy-Meir 1974, Trimble 1989, Katzner 1994, Anderson et al. 1996). Prolonged periods of drought are common. Drought effects winter snow cover and production of herbaceous vegetation.

Population cycles are unknown in pygmy rabbits, although in some years they are scarcer than others (Green and Flinders 1980). **Pygmy rabbits have a high population inertia, and respond very slowly to changes in the environment, with lower potential to increase than other leporids (Wilde 1978). This is due to their dependence on sagebrush – which is a long-lived, slow recovering species (Wilde 1978).**

Highly Specialized Diet

In a study conducted near Dubois Idaho, sagebrush *Artemisia spp*. comprised 99% of the winter diet, and 51% of the spring and summer diet of the pygmy rabbit (Green and Flinders 1980), based on fecal pellet analysis. Grasses comprised 39% of spring and summer diets, with forbs 10%. Bluebunch wheatgrass *Agropyron* and bluegrass *Poa* were eaten in greater proportion than their occurrence in the environment (Green and Flinders 1980). Washington fecal pellet analysis of pygmy rabbit pellets collected in November and December found that shrubs comprised 81.5 % of the diet, with big sagebrush *Artemisia* 67% of the shrub component, and rabbitbrush *Chrysothamnus* 12.8%, forbs 13.1%, and grasses 4.4% (WDFW 1995). Thus, there is a very strong and nearly complete reliance on sagebrush as winter food.

Pygmy rabbits prefer certain populations of big sagebrush over others (White et.al. 1982. Particular sagebrush plants may be used in winter (Bradfield 1975, Katzner 1994).

Pygmy rabbits preferentially select native grasses as forage during spring and summer, compared to other grasses (68 FR 430. Specific diets may depend on the region occupied. 66 FR43.

Pygmy rabbits do not require water free water. Morning activity may allow them to obtain moisture from dew (Bradfield 1975). Pygmy rabbits have been observed eating snow (Katzner 1994).

Specialized Summer Habitat Use

Janson (1946) and Weiss and Verts (1984) survey of pygmy rabbit sites substantiated the many previous observations that the pygmy rabbit inhabited dense stands of sagebrush or islands of dense shrubs, citing Dice 1926, Davis 1939, Orr 1940, or dense or clumped stands of sagebrush (Anthony 1913, Grinnell et al. 1930, Bailey 1936, Sevareid 1950, Bradfield 1975).

Summer habitat selection by the pygmy rabbit on landscape, habitat, and home range scales was investigated at INEEL in southern Idaho in ungrazed sites (Heady et al. 2001). Within potential habitat, vegetative and physiographic characteristics were analyzed to develop a Habitat Suitability Model. Suitable habitat areas had greater cover and density of total shrubs and big sagebrush, *Artemisia tridentata* and different soil texture. A GIS model predicted areas of pygmy rabbit non-use and identified potential habitat. Only 23.4% of INEEL was found to be suitable habitat by the model. The model accurately predicted non-use areas, but was less useful in predicting occupied sites (Heady et al. 2001).

Burrow sites were found to have 81% sandy soils vs. 51.6% at non-use sites. Relative cover and density of total live shrubs and big sagebrush were greater in occupied burrow sites than in non-use areas. Shrub height and relative forb cover were lower in non-use areas. Height of the short shrub community was greater at burrow areas than in high and low use areas. Relative cover of total live shrubs, total forbs, and big sagebrush were greatest at burrow areas. Density of the tall shrub component was lowest in low use areas. See Table 1, page 8 Heady et al. (2001).

Home range areas had structurally diverse stands of shrubs and sandy soils. **Burrow areas had greatest shrub cover and a higher forb component. High use areas had a complex vegetal profile. Low use areas had less vertical complexity. "Our results suggest that pygmy rabbits are extreme habitat specialists on all levels**" (Heady et al. 2001).

Roberts found the most preferred habitat was scattered low earth mounds (mima mounds – named after the Mima prairie in Washington) in *Artemisia tridentata* ssp. w*yomingensis* habitats at elevations between 6200 and 6500 feet, with sagebrush heights of 24 to 48 inches and **crown cover of 40 to 50 percent**, surrounded by expanses of 12 to 24 inch tall sagebrush with crown cover of 20 to 30 percent between mounds (Roberts 2001). Mima mounds are low earth mounds of deeper soils that support big sagebrush, and are typically surrounded by a matrix of low sagebrush. Mima mounds in the eastern Idaho mountain valleys are often very regularly spaced, and a distinctive visual feature of the landscape.

Gabler (1998) summarizes percent cover of shrubs found by various researchers near burrow sites: Oregon 28.8% (Weiss and Verts (1984); Washington 32.7% (Gahr 1993); Wyoming 42.9% (Katzner 1994; Idaho 46% (Green and Flinders 1980). Also, at the two extremely small occupied sites in Burley Field Office lands, White and Bartels (2002) measured 40% sagebrush canopy cover with an average height of 110.62 cm. on the Mule Creek allotment, and 33.54% sagebrush canopy cover with an average height of 78.74 cm.

Specialized Winter Habitat Use

Pygmy rabbit winter habitat use was studied in 1993 and 1994 in Fossil Butte National Monument in Wyoming (Katzner 1994, Katzner and Parker 1997). Livestock grazing had been terminated in the past decade, and pygmy rabbits had not been present when the Monument was established. **Big sagebrush areas used by pygmy rabbits had the greatest structural diversity and the densest stands of *Artemisia tridentata ssp. tridentata*, which accumulated more snow than areas of low use. Winter pygmy rabbit habitat had more, taller, and wider *Artemisia tridentata* shrubs, and less ground cover than non-use areas. Shrubs often had dead components**, perhaps from past rabbit feeding activity**. Within pygmy rabbit home ranges, the highest use occurred in areas with the greatest vertical structural diversity.** Pygmy rabbits ate all three species of big sagebrush and selected particular shrubs and would travel long distances (30 to 50 m) to feed on them (Katzner 1994).

Winter use areas had significantly denser canopies at all height classes (Katzner 1994). The percent shrub cover and sagebrush height at the Wyoming site – were very similar to values reported by Green and Flinders in Idaho (1980 – 46% cover, 56 cm. height). Snow cover provides a constant environment, and protection from predators and thermal extremes (Katzner 1994, Katzner et al. 1997). The subnivian environment provides protection from predators and thermal extremes, as well as a relatively constant food resource.

Winter areas inhabited by pygmy rabbits in Wyoming had more living and dead shrubs, with **shrub density more than 17 times greater in use areas.** Use areas also had a denser vertical profile, with shrub vegetation density higher 10 to 90 cm. above ground level. Non-use areas had more grasses, forbs and alkali sagebrush (Katzner 1994, Katzner and Parker 1997). Shrubs in low use areas were younger (had a greater proportion of living branches) than shrubs on other transects. **Habitat complexity was greatest in use areas, with a high variability in shrub height, more living *Artemisia tridentata ssp. tridentata*, generally taller shrubs, and low levels of forb cover** (Katzner 1994).

Snow depths in winter areas used heavily by pygmy rabbits increased as the season progressed, compared to non-use areas that did not accumulate snow (Katzner 1994). Wind-blown snow and tall sagebrush structure create a microclimate that leads, to soil build-up over time, as well as longer annual periods of moisture retention.

Winter home ranges often may overlap, and some rabbits have more than one use area (Katzner 1994). Janson (2002) found winter home ranges, by tracking, of only about 30 meters, but burrows within 50 meters of each other were commonly connected by trails. Rauscher (1997) noted that the use of subnivian tunnels may be an important method of secure foraging and dispersal, as he observed a tunnel crossing a backcountry road. Tunnels allow rabbits to exploit sagebrush somewhat distant from burrows.

Snow accumulation in winter may provide rabbits more ready access to distal parts of shrubs (Bradfield 1975, Weiss and Verts 1984).

Additional Habitat Components

Greasewood habitats with a sagebrush component were described by Davis (1939) in southern Idaho. Bitterbrush was a significant component of Dubois Idaho Sheep Station lands inhabited by pygmy rabbits, providing around half (19%) of the shrub canopy cover, and sagebrush 19% canopy cover also (Green 1978, Table 2), with a population of 45 rabbits/ha in ideal habitat. Rabbitbrush was noted by Anthony (1913), Sevareid (1950) and others. Several of Weiss and Verts (1984) Oregon sites had some western junipers present (Bartels pers. comm. to Fite 2003). 12/16/02 BLM Pygmy Rabbit Meeting Notes) list juniper/sage habitat types, as do California Department of Fish and Game (CDFG) habitat descriptions. Austin has observed pygmy rabbits in juniper-sagebrush vegetation (Austin pers. comm. to Fite 2003).

Mixtures of subspecies of big sagebrush can often be present within home ranges (Katzner 1994).

Complex Structural Attributes of Big Sagebrush

The three widespread subspecies of big sagebrush found across the range of the pygmy rabbit are Basin big sagebrush *Artemisia tridentata* ssp*. tridentata*, Wyoming big sagebrush *A. t*. *wyomingensis* and mountain big sagebrush *A. t. vaseyana* . These subspecies have inherently different growth forms and other characteristics. Differences in subspecies growth forms may affect the structure of the canopy cover they provide. Basin big sagebrush has a single main stem with branches at higher levels, and an uneven top. Its height is 2.5 to 6 ft., ranging to as much as 15 ft. tall. Wyoming big sagebrush has multiple main stems with a round top and height of 1 to 3 ft., ranging to 5 ft. tall. Mountain big sagebrush has multiple main stems, and a flat top (inverted candelabra, ranging from 1.5 to 3.5 ft. ranging to 5 ft. tall. (Field Identification Characteristics of Eight Sagebrush Taxa (undated key), Cronquist et al. 1994 *Intermountain Flora*).

Basin big sagebrush typically grows on deep, well-drained soils, Wyoming big sagebrush moderately deep to shallow soils, and mountain big sagebrush grows at higher elevation sites where soil moisture is available most of the growing season. All of the three subspecies of big sagebrush typically grow taller and more robust on better soils. With greater height comes greater livestock structural alteration. The most productive and optimal sites for sagebrush growth produce taller shrubs, which are the most susceptible to livestock damage. CDFG/ Williams (1986) describes livestock congregating in sagebrush and damaging shrub structure. As livestock damage taller sagebrush, pygmy rabbit use may be shifted to suboptimal sites where shrubs have lower stature and are typically slower growing, and where they are more vulnerable to predation, and/or food is less available.

The importance of the interaction between the inherent structure or size of sagebrush and its tendency to be damaged by livestock was repeatedly driven home to petitioners when viewing differences between mima mound sites occupied by pygmy rabbits near the Big Lost Earthquake Fault site (Idaho CDC occurrence record, and observations based on fresh tracks in snow and pellets at burrows, and visual sightings of rabbits), and unoccupied sites. The occupied mound sites had shorter stature old growth Wyoming big sagebrush, but because of its short height, the individual shrubs were less battered and broken by livestock and had greater structural integrity than unoccupied mounds with taller shrubs in a neighboring area. Taller Wyoming big sagebrush was battered and broken by livestock, with abundant broken stems strewn on the ground.

Cattle appeared have done considerably more damage to the taller Wyoming big sagebrush.

In many areas, mature and old growth Basin big sagebrush (which grows the tallest of all the subspecies, and thus serves as a very attractive rubbing post and windbreak for cattle) is severely damaged by livestock physical damage, and it is rare to see any shrubs that have not been rubbed, battered and broken with greatly diminished structural complexity. Only young rapidly growing Basin big sagebrush plants retain any of their natural structural complexity. Visual comparisons between grazed and ungrazed exclosure/fenced right-of-way sites vividly demonstrate livestock effects. An understanding of differences in subspecies growth form is important in understanding habitat alteration and fragmentation caused by livestock. In petitioners review of the research that has been conducted on pygmy rabbit habitat requirements, Katzner's 1994 work stands out for best describing and measuring the structural attributes of sagebrush cover required by pygmy rabbits.

Petitioners include this discussion to emphasize the complexity of the sagebrush ecosystem and its components, the need to very carefully examine shrub structural attributes in evaluating habitat suitability, to better describe some of the ways that annual mechanical treatment with domestic livestock fundamentally alters structural components and results in structural simplification of sagebrush communities. We are weary of reading survey reports where livestock structural damage to shrubs is overlooked or ignored, despite solid scientific and vivid visual evidence of its effects and importance.

Specialized Energy Conservation Strategies for Coping with Extremes of High Desert Climates

Subnivian and subterranean burrow use, behavioral modifications, and habitat selection are important energy conservation strategies for winter survival by the pygmy rabbit (Katzner 1994). The pygmy rabbit is North America's smallest leporid, and one of the smallest leporids in the world, yet it endures harsh winters in many portions of its range while subsisting on a diet of 99% sagebrush (Katzner 1994). It has no known torporous or food-caching abilities. Small variations in vegetation structure may have significant impacts on behavior and feeding, and the ability of the pygmy rabbit to conserve energy (Katzner 1994, Katzner et al. 1997).

Rabbits lack extensive fat reserves so they have little resistance to winter fasting and undernutrition. Pygmy rabbits have the greatest surface area to volume ratio (and thus heat loss) of any rabbit species in their known geographic range. (Katzner 1994, Katzner et al.1997). They use energy conservation rather than acquisition (Thomas 1987). Other lagomorph species have a variety of physiological and behavioral adaptations (low conductance, low winter metabolism, food caching) to cope with winter extremes. In contrast, pygmy rabbits have behavioral adaptations, and are active at nearly all temperatures, in day and night, but are less active at high and low temperatures and wind extremes. Burrow microclimates provide the combined benefits of warmer burrow environments and easy access to food. When winter snow accumulation is minimal, rabbits cannot feed in subnivian burrows and must expose themselves for prolonged periods to colder thermal environments and predation (Katzner 1994, Katzner et al. 1997).

When out of burrows, pygmy rabbits assumed a rounded posture, and rested in thermally sheltered microsites (leeward side of shrubs, southern exposures). Windspeeds measured under shrubs never exceeded 1.4 m/s, despite wind speeds being as high as 12.7 m/s in open areas. The presence of sheltered areas beneath the sagebrush canopy allowed pygmy rabbits to carry out daily activities under thermal extremes (Katzner 1994). Rabbits established trails immediately after snowfall, and may also conserve energy by repeated use of the same trail (Katzner 1994). Snow burrows extend from sagebrush plant to sagebrush plant (Bradfield 1975, Katzner 1994). Shrubs providing thermal and predator protection are important to other species of rabbits inhabiting different ecosystems (Katzner 1994).

Specific Soil Requirements for Burrows

Observers of the pygmy rabbit all agree that this species requires soft, deep soils for burrows and burrow excavation. Such soils are found throughout the Intermountain West and Great Basin on alluvial fans, in areas of deposition of windblown loess soils, in intermittent draws, on flats and lower sidehills bordering and intermingling with riparian areas, in inclusions/islands/ pockets/mima mounds of big sagebrush on deeper soils amidst low sagebrush communities, and other sites. Snow deposition or water or wind-borne soil deposition, and increased soil moisture retention, results in lusher vegetation growth in deeper soil sites over time. These soils typically support particular subspecies of big sagebrush, and the tallest big sagebrush in an area.

Weiss and Verts (1984) found soil depth was the second most important habitat variable, next only to sagebrush cover, in rabbit use sites. Sagebrush cover and soil depth were the only two significant habitat variables of the ten variables that were measured.

Sagebrush environments are typically more complex than is often recognized by many observers and researchers (Peterson/MDFWP 1995, Welsh 2002). Spatial and structural heterogeneity exists in sagebrush landscapes that may superficially appear uniform to some observers. Deep soils may not occur across large areas of the landscape, in many areas currently occupied by big sagebrush, soil depth varies depending on wind patterns, zones of moisture accumulation, etc. Over time deeper soils have developed (as in north and east lower slopes of hills and along draws), and in historically continuous deposition bands bordering intermittent and perennial drainages (now often much eroded by livestock-caused gullying).

The GIS model developed to predict pygmy rabbit occurrence on basis of soils and cover at INEEL did not accurately predict pygmy rabbit locations in Lower Snake River District lands due to its inability to detect smaller-scale variations and pockets of suitable habitat (Ulmschneider, pers. comm. to Fite 2003, and Idaho BLM Pygmy Rabbit Meeting Notes 12/16/02).

“If we are going to direct our efforts at protecting the rabbit, we must [do] something to provide a level of conservation for the deep-soil shrub-steppe system”, WDFW Pierce, WDFW Fish and Wildlife Science 2001.

Specific Burrow Location, Characteristics and Use

Pygmy rabbits dig clumped burrows – usually in aggregations in areas of suitable soils (Weiss and Verts 1984). Rabbits and burrows concentrated in suitable sites have been

termed colonies by several researchers, or described as aggregations, or advantageous aggregations (Wilde et al. 1976). Burrows are relatively simple to somewhat complex, and are dug in deep, friable soils. Extensive subnivian burrows are dug under snow in winter (Katzner 1994, Janson 2002). The pygmy rabbit usually digs its own burrows, unlike other North American rabbits (Borell and Ellis 1934, Walker et al 1975), but has been observed to use burrows of other species like badgers and burrows under rocks, or even old buildings (Janson 2002).

Janson (2002) described burrows dug into the bases of small knolls and lava ridges that rose about five meters above the surrounding plain at Dubois, as well as under old house foundations, and noted that in Montana areas of varied topography were used, but rabbits seemed to avoid the drainage bottoms with the deepest soils while using adjacent higher ground, and speculated that this was an adaptation to avoid burrow flooding during runoff, and stressed that connecting patches and stringers of sagebrush were important, as did Rauscher (1997).Petitioners note that drainage bottoms typically receive the most intensive livestock use and structural alteration of big sagebrush, a factor not discussed.

Burrows have two to ten openings, with the main entrance typically concealed at the base of a sagebrush plant. Gahr (1993) in Washington found an average of 2.7 entrances per burrow system (range of 1 to 10), with a small trench or terrace outside burrow entrances. Janson (1946) in Utah found four or five entrances, and Wilde (1978) in Idaho found two entrances. Maximum tunnel depth is usually no more than one meter.

Burrow entrance diameter ranges from 3 to 11 inches (Roberts 2001 citing Wilde 1978), with a mean height of five inches. Katzner (1994) found that burrows were always located under a big sagebrush. However, this may not be the case in the Lemhi mima mounds (Fite pers obs.) where burrow openings may be in open areas in mounds, rather than at the base of sagebrush. Here, the Wyoming big sagebrush is short-statured and very old in appearance, and burrows appear to have been used over a long period of time – many with rather enlarged entrances. Janson (1946) describes burrow systems in some Utah habitats as being occupied over an extended period of time, with enlargement and modification occurring.

Heady (1998) in a study of summer home range use patterns found that burrow areas had the greatest cover and density of the tall shrub component, and a higher forb component. Rabbit high use areas also consisted of a complex vegetal profile as well as greater cover of grasses. Burrows were located under clumps of big sagebrush. Gabler (1997) found sagebrush cover at burrow sites: 27.5%, compared to Oregon 28.8% (Weiss and Verts 1984), Washington 32.7%, somewhat lower than Wyoming (42.9%) and Idaho 46% (Green and Flinder 1980). Since pygmy rabbits appear to select for burrow locations on a very fine scale, then only a small proportion of areas may be suitable for burrow locations. Even slight habitat changes within smaller areas could have profound effects on this species (Gabler 1997).

Use of burrows may be an important energy conservation strategy in harsh winters – temperatures in burrows varied little (3 degrees C), in contrast to air temperatures ranging from –24.9 to 8.6 degrees C (Katzner 1994, Katzner et al. 1997).

Burrows may be used as refuges by other small mammals (Gabler 1997). Cameras placed at burrows have recorded sage thrasher, sage sparrow, black-tailed jackrabbit, mountain cottontail, Townsend's ground squirrel, least chipmunk, Ord kangaroo rat, western harvest mouse, deer mouse, long-tailed weasel, badger (Heady 1998). Janson (2002) reports dormant sagebrush lizards, and in the Blue Spring Hills found the same holes used by Uinta ground squirrels and pygmy rabbits. Gahr (1993) observed use of pygmy rabbit burrows by cottontails and least chipmunks, and speculated that competition with cottontails for burrows may exist.

Janson (2002) observed that both badgers and Richardson ground squirrels are able to dig in rockier soil, and that ground squirrel burrows are dug up by badgers, thus making them large enough for use by the pygmy rabbit. Roberts (2001) found Richardson ground squirrels (*Citellus richardsonii*) had taken over burrow systems likely created pygmy rabbits. A recent survey of Pinedale BLM Field Office lands found pygmy rabbits in a very atypical setting (Flat Top site), co-occurring with white-tailed prairie dogs in areas with little tall or dense sagebrush cover (McGee et.al. 2002).

Burrow use may be shared with other rabbits, but sharing does not occur at the same time (Gahr 1993). Janson (2002) described burrows being occupied by one rabbit at a time, except during the breeding season. However when rabbits were alarmed, he observed as many as three rabbits occupying the same burrow and during the breeding season, pairs of rabbits were seen occupying the same burrow. Individuals mainly showed allegiance to their own burrows, but would visit others (Heady et al. 1998).

The number of active burrows may not be directly related to the number of individuals in a given area, as some individuals may maintain multiple burrows, while some burrows are shared by individuals (68 FR 43). Individual pygmy rabbits may use as many as 10 burrows (Idaho BLM Pygmy Rabbit Meeting Notes 12/16/02). Pygmy rabbit numbers can not be determined by counting the number of burrows in an area. While the Washington population was disappearing, there were plenty of burrows, but few rabbits (Bartels pers. comm. to Fite 2003).

At present, empty, abandoned and inactive burrows are always noted by researchers conducting surveys for pygmy rabbits (Roberts 2001, Bartels and Hays 2001, OR FOIA 2002, Janson 2002, Austin 2002, Roberts 2002, Janson 2002). Large numbers of abandoned burrows are found in formerly occupied sites across vast geographic areas where pygmy rabbits appear to now be extirpated (Bartels and Hays 2001, OR FOIA 2002, Austin 2002).

There are large numbers and areas of abandoned burrows documented in recent surveys in comparison to a no, or few, occupied burrows (Oregon-Idaho: Bartels and Hays 2001, and OR FOIA 2002, Utah-Montana-Idaho Janson (2002), Idaho- Austin 2002), indicating a large-scale and rangewide trend. Populations with fewer than 100 active burrows are described as "very small" (68 FR 43). In all of these recent surveys, far fewer than 100 active burrows were found.

Use of burrows is critical to pygmy rabbits to escape predators and moderate thermal extremes. However, pygmy rabbits typically spend a significant amount of time outside burrows. They commonly rest in forms in sheltered sites in sagebrush (Janson 1946, Green 1978, Katzner 1994, Janson 2002).

The volcano rabbit, *Romerolagus diazi*, is the only other species of North American rabbit that digs its own burrows. This species lives on volcano slopes in Mexico, and is imperiled.

Use of Specific Topographical Features

Landform plays a role in burrow selection within sagebrush communities. Rabbits may dig into a slope, and use contours of the soil (Wilde 1978, Kehne 1991). In a survey of pygmy rabbit distribution, habitat associations and density in Salmon and Challis BLM lands, Roberts found the most preferred habitat (under present-day conditions) was scattered mima mounds with dense sagebrush cover of 40 to 50 percent (Roberts 2001). Mima mounds are described by Tullis (1995) cited in Roberts 2001 as follows: More and taller sagebrush on Snake River Plain is found on low earth mounds. Mounds are round or oblong with diameters ranging from 8 to 14 meters and are found on sedimentary deposits such as river terraces, alluvial fans and loess deposits. Mounds may be extensively occupied by other burrowing mammals. In Roberts study area, “very recognizable sagebrush-covered Mima mounds are dotted in a regular pattern over large portions of the study area”. Mounds appear on aerial photos as dotted areas, and on ground as raised mounds less than 1 foot in height and approximately 300 to 400 square feet in area (Roberts 2001).

Weiss and Verts (1984) found that pygmy rabbit burrows were often distributed along contours of slopes. Gahr (1993) observed that topography may influence the distribution and abundance of burrows. Kehne (1991 cited in WDFW 1995) found known pygmy rabbit sites were located in mound/intermound topography with dissected hillslopes adjacent to narrowly dissected alluvial soils. Kehne found 77% of 80 active burrows at Washington’s Sagebrush Flat were on mound/intermound or dissected topography. At level sites, rabbits may often use a small rise or change in contour for the burrow entrance. Topography and microtopography are important features in the location of burrow sites at Sagebrush Flat, with 75% of burrow sites located on mounds or drainage slopes, 15% on plateaus, 10% on hillsides and none on intermounds (Gahr 1993). In sagebrush-steppe or sagebrush-winterfat communities on the Snake River Plain at INEEL, burrows were constructed in association with lava flows and alluvial deposits, playa deposits and aeolian sand. Rabbits construct burrows in locations with zero to 49.7 percent slope – similar to findings of many other studies (Heady et al. 2001).

Burrow aspect may vary. The northeast burrow entrance at INEEL (Heady et al. 2001 agreed with Wilde’s results, but not burrows studied in Washington by Kehne (1993). Deep wind-deposited soils at INEEL are on the leeward (northeast slopes).

Like sage grouse, pygmy rabbits appear to avoid steep slopes – possibly related to increased vulnerability to predation from avian predators that can employ topography to surprise prey in steep terrain.

Limited Home Range and Use Areas

Pygmy rabbit home range and use areas may vary seasonally, as well as in relation to food availability and habitat condition. Home range size varies seasonally, and expands in spring and summer. In winter, pygmy rabbits are typically found within a 30 meter (98 feet) radius of their burrows (Green and Flinders 1979, Katzner 1994, Janson 2002). Size of winter home ranges was similar to predictions made from body-mass allometry

models (Katzner 1994). Spring and summer home ranges are larger (Orr 1940, Gahr 1993, Janson 2002, 68 FR 43).

In winter habitat studies in Wyoming, Katzner (1994) found smaller home range size (.48 ha) than Heady (1998) did in spring-summer study of home range and habitat use. Gahr (1993) found larger home range sizes than Heady – but Gahr's study site included both grazed and ungrazed areas. When data from Gahr (1993) ungrazed sites is compared to Heady 1998 – estimates are more similar to INEEL, particularly for females (Heady 1998). Katzner (1994) noted that Washington pygmy rabbits had greater home ranges than Wyoming rabbit did. This was perhaps due to studies having been conducted on summer vs. winter use, and/or the poor condition of the grazed habitat where the Washington rabbits may have had to travel longer distances food.
The size of core use areas in Washington was similar to preceding studies (Gahr 1993). Rabbits made infrequent movements away from the core area, and Gahr estimated average home range sizes up to 60 times greater than previously reported, with estimated average home range sizes of 2.7 ha (6.7 acres) for adult females, and 20.2 ha (49.9 acres) for males, and 7.1 ha (17.5 acres) for juveniles (WDFW 1995). Males had multiple home range centers, which corresponded to the locations of adult females. Juvenile home ranges centered around the natal area, with an area of resettlement following dispersal from the natal area. A long distance movement of juveniles took place (Gahr 1993).

In grazed habitats in Washington, males in breeding season had larger home ranges than in ungrazed habitats, suggesting a lower population density of females (Gahr 1993). Males made significantly longer movements in the breeding season, with females remaining in one small area, and males moved between areas of different breeding females, ranging over 10 times the area of females (Gahr 1993). Estimated home range size was 60 times greater for males than had previously been estimated. Core use area size was similar between the sexes.

In the years following Gahr's work at Sagebrush Flat, intensive analysis by Siegel found that significantly more burrows were located in the ungrazed portions of Sagebrush Flat than in the grazed area. Livestock grazing significantly alters the nutritional qualities of grass species that are eaten by the pygmy rabbit (Siegel 2002, Siegel et al. 2002). Siegel (2002) found lowered nutritional quality of grass species eaten by pygmy rabbits after grazing use occurred in the fall.

Weiss and Verts (1984) found that **only 2 of 51 occupied pygmy rabbit sites in Oregon had cheatgrass in the understory. Annual grasses may restrict movements or vision of pygmy rabbits and be avoided to increase chances of escaping from predation** (Weiss and Verts 1984). Cheatgrass thrives in understories of big sagebrush communities disturbed by livestock, or fire (Whisenant 1991, Billings 1994, Belsky and Gelbard 2000) and by 1994, was already known to threaten, infest, or dominate almost 80 million acres across the range of the pygmy rabbit (Pellant and Hall 1994).

Broad Array of Avian and Mammalian Predators Results in Specialized Behaviors

A principal predator of the pygmy rabbit is the long-tailed weasel *Mustela frenata* (Janson 1946, Wilde 1978, Green and Flinders 1980). Raptors including hawks and owls are important predators (Gahr 1993, Katzner 1994). Other predators include the

coyote *Canis latrans* and the badger *Taxidea taxus* (Wilde 1978, Janson 2002). Badgers may enter or dig up pygmy rabbit burrows, but pygmy rabbits also take up residence in old badger burrows. Other predator species include skunk, bobcat, golden eagle, red-tailed hawk, burrowing owl, ferruginous hawk, rough-legged hawk, northern harrier, possibly rattlesnakes and gopher snakes. Ground squirrels have recently been noted as a possible predator of the altricial young (OR FOIA 2002). Cameras placed at burrows by observed long-tailed weasels and badgers at burrow entrances (Heady 1998).

Janson (2002) observed that mammals significant in all areas as predators, competitors or buffer species of the pygmy rabbit were the coyote, long-tailed weasel, badger, ground squirrels, least chipmunk, deer mouse and other leporids, and characteristic birds, as predators or habitat indicators, were ferruginous hawk, rough-legged hawk, red-tailed hawk, golden eagle, great horned owl, raven and sage thrasher. He also noted that sage grouse were present in all areas he studied except Cedar City.

Green (1978) found the chief cause of mortality on his study site was predation, and the long-tailed weasel was the major predator. He observed many tracks of long-tailed weasels, and also signs of either coyote or badger predation. Gahr (1993) believed raptor predation was a cause of pygmy rabbit mortality at Sagebrush Flat in Washington. Petitioners note that a map in Gahr's 1993 thesis shows a powerline, which may have provided raptor perches, running through the southern (ungrazed) portion of her study site. There have never been any anti-perch devices installed on the powerline or fences at the Sagebrush Flat site (Siegel pers. comm. to Fite 2003).

Raptors were the primary predators observed in winter in Wyoming by Katzner (1994). Habitat characteristics of sites inhabited by pygmy rabbits enable them to move in areas with low cover at ground level, yet abundant and structurally diverse overhead shrub cover that provides protection from raptor predation (Katzner 1994). All rabbits in Katzner's Wyoming study died, and he observed that additional grooming related to collars may have enhanced their vulnerability to predators. Captive-reared pygmy rabbits released at INEEL were heavily predated by northern harriers (Breckenridge, pers. comm. to Fite 2003).

The large size of auditory bullae in the pygmy rabbit indicates reliance on hearing, and a keen sense of hearing would enable pygmy rabbits to hear the approach of ground predators, and to detect wing noise and other auditory cues from raptors (Bradfield 1975).

Pygmy rabbits have evolved a special adaptation for thwarting weasel predation. Weasels can readily enter burrows. The weasel killing technique consists of biting a victim on the back of its neck, or strangulation (Leopold 1937, cited in Rauscher 1997 and Janson 2002). Pygmy rabbits dig dead-end burrow tunnels where they may wedge themselves, facing inwards with only their backs exposed to weasels. This thwarts weasels trying to bite their necks. Thus, dead-end burrow chambers may be dug as a means to escape death by weasel predation (Rauscher 1997, Janson 2002). Janson (2002) describes these short dead-end tunnels in burrow systems as "emergency escape shelters".

Multiple burrow tunnel entrances/exits may help pygmy rabbits escape badger predation (Bailey 1936, Janson 2002). There are always two, and often more, entrances. Burrow diameters are smaller than a badger's body size, so while a badger is digging down to

capture a rabbit, the rabbit can “pop out and escape on the other side” (Bailey 1936). Jackman and Long (1965) observed that pygmy rabbits picked a spreading, healthy sage for burrow placement, and “as the coyote digs, the little rabbit slips out the other side and scurries silently away”.

The black-footed ferret (*Mustela nigripes*) once inhabited portions of the pygmy rabbit range in eastern Idaho (Kurten and Anderson 1972). Ferret remains have been found in Jaguar Cave in the upper Birch Creek Valley, in association with a stratum containing evidence of human occupancy dated to 10,370+/- before present. Pygmy rabbit bones have been found in this rockshelter, and pygmy rabbits still inhabit portions of the Birch Creek Valley.

Pygmy rabbits rely on a strategy of being inconspicuous and are often near-invisible to humans who are not familiar with their telltale burrow sign. Pygmy rabbits lived undetected along a well-used trail (Grinnell 1936). CDFG/Williams (1986) describes them as “secretive”.

Reaction to humans: Bradfield (1975) noted that rabbit-observer contacts typically ended in avoidance, where the rabbit would move to a burrow or hide behind a bush, depending on its degree of alarm and density of plant cover. Alarmed by a near and sudden disturbance, the rabbit would move into a burrow. A near disturbance that did not alarm resulted in the rabbit freezing in place with body crouched and ears held back. If the disturbance came closer, the rabbit would move into brush, and then if approached close would place more sagebrush between itself and the intruder.

Thus, pygmy rabbits face predation risk from many different kinds of predators. Under this **“landscape of fear”**, they must assess foraging profitability and risk (Heady 1998). Pygmy rabbit spatial behavior may be altered due to variation in predation risk, type of predator, and time of day (Heady 1998, citing Moreno 1996 and Laundre, pers. comm.). Alteration of shrub structural complexity alters the landscape of fear, and thus effects areas of suitable habitat use and behavior patterns.

Extreme Habitat Specialization of the Pygmy Rabbit

All researchers have noted that pygmy rabbits inhabit patches of the densest sagebrush, with the greatest canopy cover. The structural attributes of canopy cover of sagebrush at any site is partially a result of the inherent growth form of the particular sagebrush subspecies of sagebrush present, site soil and moisture characteristics affecting size and height, and past disturbance history of the site – with livestock grazing simplifying and destroying dense structural cover of shrubs at all levels.

Pygmy rabbits are not uniformly distributed over large areas but tend to be restricted or clumped, due to sagebrush and burrow requirements (Wilde 1978). In Oregon, rabbits inhabited soils that were deeper and looser than soils at adjacent sites (Weiss and Verts 1984).

Analysis at the home range scale of pygmy rabbit habitat in Idaho found evidence of very fine grain habitat selection. Pygmy rabbits selected microhabitat characteristics – burrow areas contained taller vegetation with greater cover (which may be related to the need for unobstructed protected movement around the burrow entrance). In contrast, low use areas provided little cover from short shrubs and had a shorter and less dense

tall shrub community – corresponding to Wyoming (Katzner and Parker 1997). Vegetation in high use areas was similar to burrow areas – but with less open ground-level layers (Heady et al. 2001).

Heady et.al. (2001) summarized a series of habitat use studies at INEEL and similarly concluded: **"The pygmy rabbit is a habitat specialist on all levels – from landscape to placement of burrows and use of home range**. **This species requires a rigid combination of shrub height and density and other vegetative components. Thus**, **even in a seemingly contiguous stand of big sagebrush, the landscape may seem highly fragmented for pygmy rabbits. Given their seemingly poor dispersal ability and low reproductive capabilities this may explain their slow recolonization of vacated habitat even under normal conditions. Coupling these factors with loss of sagebrush habitat due to fires, agriculture, and livestock grazing, has likely resulted in the general decline seen in this species".**

Areas used by pygmy rabbits had a substantial dead shrub component, and a greater proportion of Basin big sagebrush, with many shrubs in the high use areas being old basin big sagebrush, which had the largest number of dead shrubs and the greatest percent cove - "those characteristics that are traditionally associated with "decadent" sagebrush stands" (Katzner 1994, Katzner and Parker 1997). Occupied sites had taller shrubs, wider canopies, more dead shrubs, and more variable shrub heights (Katzner 1994, Katzner and Parker 1997). High-use areas were old basin big sagebrush (Katzner 1994), the subspecies with the tallest growth form.

As Katzner (1994) noted, **the shrub characteristics required by pygmy rabbits are precisely the characteristics that are associated with "decadent" sagebrush stands**. This derogatory term is used by those land managers, particularly range and fire personnel, who seek to thin or reduce old growth or mature sagebrush and other native shrubs for livestock forage or to further burn programs. Janson (pers. comm. to Fite 2003) also found tall big sagebrush with significant dead areas in individual shrubs in pygmy rabbit habitats. The dead layer and coverage – the amount of dead shrubs and twigs - provides structure at lower levels –this structure contributes to protection from predators and the maintenance of subnivian burrows (Katzner 1994).

Proponents of a "need" for livestock disturbance of understory to increase sagebrush density fail to consider critical elements of pygmy rabbit habitats. It has been proposed that livestock grazing enhances pygmy rabbit habitat through disruption (and degradation) of the herbaceous understory, creating openings in the understory that are then colonized by dense big sagebrush (Chilson 4/29/06 *High Country News*). Proponents of this theory are focusing on the number of individual sagebrush plants providing "density", and not on the structure of the individual plants providing essential deep, multi-dimensional protective cover.

Grazing radically alters the structure of big sagebrush plants – with resulting "lollipop" sagebrush in areas that are heavily used by livestock – which is nearly all the deeper soil sites in the pygmy rabbit range. In sharp contrast, ungrazed big sagebrush, as described in detail by Katzner (1994) and Katzner and Parker (1997) has structural complexity and denser canopies at all height classes. Structurally complex sagebrush provides more food and screens pygmy rabbits from both avian and many mammalian predators.

Idealized pygmy rabbit habitat, and search techniques have been described: Pygmy rabbits select **landscape** attributes, with sagebrush greater than 3 feet in height; a landscape with a dense cover of sagebrush (no ground should be observed between the sagebrush); sites with topographical relief of slopes, mounds, swales, and soil deposition; sites with no "decadent" sage (petitioners note that this is not the case in many areas used by pygmy rabbit across their geographic range); sites with no grass or forbs under clumps of clustered sagebrush on slopes. Then, search densest tallest sage clusters; clusters on top of mounds, upper slopes, swales, dense sage, drainages and draws with dense sage. Basically, in searching for pygmy rabbits, **find the densest of the densest big sagebrush** (OR FOIA 2002). This description of pygmy rabbit habitats differs in one major way from that of Janson (2002) and Katzner (1994). These researchers describe tall big sagebrush with dead portions – certainly what is typically described as "decadent". Old growth Wyoming big sagebrush of very dense growth form - of the type described as "decadent" - dominates the Lemhi mima mound occupied pygmy rabbit site of Roberts studies, with the dense, lower growing form appearing to be more resistant to livestock breakage (Fite pers observation of Lemhi, Pahsimeroi and Little Lost mima mound habitat and livestock structural damage to taller shrubs 2003). Thus, petitioners believe that the scientific literature and common sese field observations of what has been termed the "best" remaining pygmy rabbit habitat in Idaho strongly supports "decadent" sagebrush as a critical habitat component for the pygmy rabbit here as across its geographic range. It is important for those who might discount old growth, mature and decadent sagebrush to closely examine subtleties of subspecies growth form, site variations in soil moisture, and particularly site disturbance and simplification resulting from livestock damage and/or past vegetation manipulation projects. Sagebrush is a long-lives species. Damage accumulates over time. Plants that have been structurally maimed by the 1960s and 1970s vegetation manipulation projects are still alive. Livestock structural damage has long-term impacts to sagebrush growth form.

The high degree of habitat specialization in the pygmy rabbit greatly decreases what could be considered suitable habitat in the Intermountain and Great Basin region (Heady 1998). **The dependence of the pygmy rabbit on a long-lived, slow recovering food source (sagebrush) elevates their vulnerability to habitat degradation and loss** (Heady 1998).

Limited Dispersal Ability Amplifies Effects of Habitat Fragmentation on Increasingly Isolated Populations

The reluctance of the pygmy rabbit to cross open space was discussed by Bradfield (1975), citing old studies of its scarcity in animal highway mortality studies. Subsequent researchers have emphasized that the pygmy rabbit has a limited ability to disperse long distances and cross open habitat (Green and Flinders 1980, Weiss and Verts 1984, Katzner 1994, Katzner and Parker 1997, Heady et. al. 2001).

Katzner observed an ill-fated attempt at dispersal by a male pygmy rabbit over 3.5 km in 2 days, but the rabbit was then killed and eaten by a raptor. **This rabbit sought the densest shrub cover microsites, similar to use areas, for resting while attempting this ill-fated movement** (Katzner 1994). In all Oregon NHP records of Weiss and Verts extensive Oregon survey, specific comments stress that **the pygmy rabbit is "slow and vulnerable in open habitats; better able to elude pursuers amidst shrubs"**. In Montana, Rauscher (1997) warned about the need to retain connectivity of narrow sagebrush stringers that connect pygmy rabbits in high mountain valleys to floodplain

habitats (Rauscher 1997). A displaced captive rabbit returned 2.5 km to its capture location passing through suitable habitat enroute (Green 1978).

The limited dispersal ability of the pygmy rabbit has serious implications for the viability of populations throughout this species range that are increasingly isolated by a host of factors - everything from grazed and structurally simplified big sagebrush wild lands to vast wastelands of cheatgrass and crested wheatgrass seedings to broad roads and farm fields. Historically, more dense sagebrush vegetation along permanent and intermittent stream corridors, alluvial fans, and sagebrush plains provided travel corridors or dispersal habitat for pygmy rabbits (Green and Flinders 1980, Weiss and Verts 1984, WDFW 1995, 66 FR 231).

Habitat loss, and fragmentation of sagebrush communities, poses a serious threat to dispersal. **"Because of the specific nature of requisite soil and vegetative conditions, and because populations seem subject to perturbation and even local extirpation, successful dispersal of individuals from less affected populations into favorable habitats becomes crucial if pygmy rabbits are to persist as a component of the fauna of Oregon"** (Weiss and Verts 1994). Weiss and Verts (1984) also cite Bradfield 1975 and J.T. Flinders pers.comm. concerning reluctance of rabbits to cross open areas such as roads or lands cleared of sagebrush.

Due to habitat fragmentation and poor rates of immigration, many populations of pygmy rabbits are now isolated, existing in islands of sagebrush inside large areas of altered habitat (Gahr 1993). Large-scale habitat fragmentation now exists over vast geographic areas over significant portions of the species range (Janson 2002, Roberts 2002).

Green and Flinders (1980) warned of the need for understanding wildlife species habitat needs for food and cover before any manipulation of habitat. "Throughout the western US, there is an historical and present day practice of removing sagebrush (*Artemisia spp*.) by spraying, mechanical treatment, and burning to increase forage production." "Due to specialized habitat features selected for by pygmy rabbits, prudent consideration should precede sagebrush eradication where these animals occur".

The pygmy rabbit has low capabilities for dispersal and an apparent reluctance to cross open habitat (Katzner and Parker 1997). Dispersal from occupied sites to unoccupied sites, or to formerly occupied sites from which they have been extirpated may be difficult (Verts and Carraway 1998). Pygmy rabbits are reluctant to cross open spaces and roads (Weiss and Verts 1984). Because of its low dispersal capabilities and reluctance to cross open habitat, fragmentation can influence the size, stability and success of pygmy rabbit populations (Katzner 1994, Katzner and Parker 1997, citing Dobler and Dixon 1990, Weiss and Verts 1984, Green and Flinders 1980).

Pygmy rabbits may cross small open areas, but: **"Dense stands of sagebrush growing next to streams, along fence rows, and borrow ditches are essential avenues for pygmy rabbit dispersal (Rauscher 1997). Without these corridors, isolated populations become subject to principles of island biogeography and stochastic events** (Rauscher 1997). In areas undergoing sagebrush removal, **mountain slope and high mountain valley populations are vulnerable to extirpation, and these populations may perish if connections and dispersal corridors to larger expanses of sagebrush in the floodplains are severed.**

"Even in a seemingly contiguous stand of big sagebrush, the landscape may actually seem highly fragmented for pygmy rabbits. Given their seemingly poor dispersal ability and low reproductive capabilities, this may explain their slow recolonization of vacated habitat even under normal conditions. Coupling these factors with loss of sagebrush habitat due to fires, agriculture and livestock grazing, has likely resulted in the general decline seen in this species" (Heady et al. 2001).

Summary of Specialization

The pygmy rabbit has a limited reproduction potential and restricted habitat preference. It produces a limited number of litters each year, with young from later litters having poorer survival. The pygmy rabbit has small and specialized use and home range areas. It is reluctant to cross openings – greatly limiting dispersal and amplifying the effects of habitat alteration and fragmentation in isolating populations. Mature and old growth big sagebrush habitats take a very long time to recover from disturbance. The pygmy rabbit has a broad array of predators, and specialized behaviors for avoiding predation. Habitat disruption exposes the pygmy rabbit to predation, harsh weather and other factors.

The pygmy rabbit is an extreme habitat specialist at all levels. It requires dense sagebrush canopy cover and structural complexity at all heights, as well as suitable deep soils for burrow construction. Sagebrush is critical year-round for food. Grasses are also consumed in spring and summer. Cattle compete with pygmy rabbits for grass, and alter its nutritional quality. Pygmy rabbits avoid cheatgrass-infested sites. High desert big sagebrush environments of the American West are subject to temperature and moisture extremes, and the pygmy rabbit employs energy conservation strategies in behavior and habitat use to cope with these extremes. Livestock radically alter and simplify the complex structure of individual big sagebrush plants and sagebrush communities required by pygmy rabbits. They break sagebrush branches and simplify cover, alter soils and collapse burrows. This habitat alteration results in increased exposure to a wide array of avian and mammalian predators as well as a loss of essential food as sagebrush structure is simplified.

VI. HISTORICAL AND CURRENT DISTRIBUTION IN AREAS OF CONCERN AND DOCUMENTED DECLINES AND SOME FACTORS CONTRIBUTING TO CURRENT STATUS

Historic Geographical Distribution

The historic distribution of the pygmy rabbit included much of the semi-arid, shrub-steppe region of the Great Basin and adjacent intermountain zones of the coterminous western United States (66 FR 231). It included portions of California, Oregon, Idaho, Nevada, Utah, Montana, Washington and Wyoming. See 66 FR 231, Map Figure 1. Description of southeastern Nevada and western Utah occurrences in Janson (2002) extend the range further south in eastern Nevada and western Utah than shown in the Federal Register map. Likewise, Garber and Beauchaine (1993) and other Wyoming occurrence records extend the range eastward in Wyoming from the area depicted in the Federal Register map.

From review of Map Figure 1 in 66 FR 231, Garber and Beauchaine (1993) and more recent Wyoming information, USFWS Reno (1994), Janson (2002) and other sources, petitioners conservatively estimate that the historic range of the pygmy rabbit encompassed over 100 million acres of the Intermountain and Great Basin regions. This is discussed in greater detail following state distribution information.

The Pygmy Rabbit Has Long Been on the IUCN Red List

The pygmy rabbit has been on the International Union of Concerned Naturalists (IUCN) Red List for the order Lagomorpha since 1996. It was placed in the category "Near Threatened USA", and has continued in that category until the present. www.ualberta.ca/dhik/lsg/1996red.htm. The pygmy rabbit was placed on the list even before the many recent surveys that demonstrate broad-scale disappearance from vast areas of its former range. The pygmy rabbit was formerly a C2 species.

Current Population Distribution and Declines

Washington

The recent demise of the wild Columbia Basin pygmy rabbit DPS is discussed here as it illustrates the rapid decline and extinction of pygmy rabbit populations that occur once a population reaches low levels in degraded and fragmented habitats.

The paleontological record shows that the pygmy rabbit was present in the Columbia Basin for at least 100,000 years, and the species had a broader distribution in the mid-Holocene (7000 to 3000 BP) (WDFW 1995, 66 FR 231 citing Lyman 1991). Gradual climate change altered the distribution and composition of sagebrush communities. The Washington population likely has been disjunct from the rest of the species' range since the Holocene (10,000 to 7,000 years BP, 66 FR 231), and may have been larger in the post-glacial period 7000 years ago (Butler 1972). The pygmy rabbit's core range is believed to have shrunk southward to central Oregon as climate changes caused vegetation and thus habitat changes (Weiss and Verts 1984).

In Washington, the pygmy rabbit has been considered rare for many years, with areas of local occurrence (WDFW 1995, 66 FR 231). It is known to have occupied five counties – Douglas, Grant, Lincoln, Adams, Benton in the first half of the 1900s. Thought to have been extirpated, the pygmy rabbit was again found in 1979. Intensive surveys in the late 1980s located five small colonies, with three on State lands, and two on private lands. Since 1956, except for one sight record in Benton County, pygmy rabbits were found only in southern Douglas and northern Grant counties since 1956 WDFW 2000, 66 FR 231). There were six known colonies since 1987. Four of five colonies located in 1987 and 1988 were very small, with fewer than 100 active burrows. The largest colony at Sagebrush Flat contained 588 active burrows in 1993, and was estimated to support fewer than 150 rabbits (Gahr 1993, WDFW Status 1993, 66 FR 231). Three of the small colonies that were originally located became extirpated during the 1990s. Of three remaining sites (another had been discovered in 1997), one experienced a catastrophic fire. A newly discovered site declined to only two active burrows (66 FR 231, WDFW 2001). Sagebrush Flat is the last Washington site where pygmy rabbits were known to persist. Two other sites are now also thought extirpated. During the winter of 1997-1998, the number of active burrows at Sagebrush Flat declined by 50 percent, and continued to decline each year since (WDFW 2001).

Habitat loss and fragmentation are responsible for the long-term/historic pattern of decline (66 FR 231). The immediate cause of the post-1995 extirpations in Washington was the calamitously low population levels. **Once populations decrease below a certain threshold, they become at risk of extirpation from a variety of factors/forces: disease, predation, catastrophic events (fire), random environmental events like extreme weather** (66 FR 231). In 2001, as extinction of the Sagebrush Flat population became imminent, immediate intervention was undertaken in the remaining wild population. Rabbit numbers had dropped so low that all wild rabbits possible were captured to establish a breeding program to try to keep the Washington rabbits from becoming extinct.

Despite agency recognition as early at 1993 that the population at Sagebrush Flat was already likely too low to persist (WDFW Status Report 1993), FWS took no action to protect the pygmy rabbit under the ESA, and in fact eliminated the C2 status in 1996. In the 1995 WDFW recovery plan, it was acknowledged that: "**Even if the five existing rabbit habitats are maintained in their current condition, populations will remain vulnerable to extirpation**". Despite a documented 50% population decline, domestic livestock grazing was allowed to continue on 60% of the land area at the small Sagebrush Flat site, with 50% or higher herbaceous utilization by livestock commonly occurring on an annual basis (Siegel 2002). The ungrazed portion of Sagebrush Flat was crossed by a powerline – and no efforts were made to deter raptor perching on powerline or fences (Siegel pers. comm. to Fite 2003).

There are now no known wild populations of pygmy rabbits in Washington. The expensive captive breeding program faces problems of unexpected disease outbreaks and limited production of litters (*SF Gate* 1/18/03 "Limited Bunny Love").

The size of the populations reported in WDFW (1995) were described as follows: "Three of the populations are **extremely small** (estimated at fewer than 30 active burrows), and one is estimated to comprise from 70 to 80 active burrows". The Sagebrush Flat site, the largest, was estimated to have a population of between 55 to 142 rabbits (WDFW 1995).

It is very important that FWS note the numbers of active burrow numbers and the population size estimate for these Washington populations that quickly went into freefall and became extinct. Several recent surveys across the best remaining big sagebrush habitat over the vast geographic range of the pygmy rabbit, as discussed below, have found dramatically fewer active burrows in nearly all locations surveyed. Some of these surveys, such as Bartels and Hays (2001) and (OR FOIA 2002) have been known to USFWS for quite some time, yet no formal USFWS action has occurred.

Petitioner ONDA commented on the proposed rule for listing of the Columbia Basin DPS as endangered: "ONDA asks that FWS consider listing at this time all remaining populations of the pygmy rabbit in the western US" (7/26/02 letter of Mac Lacy to Upper Columbia Fish and Wildlife Office Supervisor). ONDA observed that the Federal Register notice for Emergency Listing, 66 FR 231, was deficient in information on the status and distribution of populations outside the Columbia Basin DPS, and that **the Federal Register documents provide no indication that populations outside Douglas County are not also in serious danger of extinction**. ONDA emphasized that the FWS made clear in 66 FR 231 that when a population falls below a certain threshold, it is vulnerable to an increased risk of extirpation from a number of sources. In its Final

Listing Rule (68 FR 43), FWS ignored ONDA's comment and ignored addressing the endangerment of the plummeting Oregon and other pygmy rabbit populations.

It must be emphasized that FWS publication of an Emergency and Final Listing rule only occurred as a result of a lawsuit brought by the Center for Biological Diversity. The agency did not act of its own volition.

The Federal Register rules for Emergency and Final Listing of the Columbia Basin DPS did the FWS do not suggest that behavioral characteristics or environmental threats to Columbia Basin pygmy rabbits differ in any way from the rest of the species. In fact, the FWS interchangeably used research citations and studies conducted on Intermountain/Great Basin populations throughout both rules. Thus, FWS determinations and analyses for Columbia Basin DPS are applicable to Intermountain/Great Basin populations.

Washington Summary: All known Washington populations declined in the 1990s, and the smaller populations were rapidly extirpated. The last remaining population, at Sagebrush Flat, became so small that all possible rabbits were captured to prevent extinction and to try to establish a captive breeding population. Livestock grazing had continued on 60% of the Sagebrush Flat site throughout this period. While the well-studied Washington rabbits were sliding towards extinction, USFWS eliminated the C2 status and took no action of any kind to protect the Washington Columbia Basin DPS, despite overwhelming evidence of declines and imperilment.

Montana

The historical range of the pygmy rabbit in Montana occupied only the extreme southwestern corner of Montana in Beaverhead County and into the southern edge of Deer Lodge County and the western edge of Madison County. It was first documented by Goldman in 1918 (Rauscher 1997). The historical distribution of the pygmy rabbit in Montana represents a small portion of the species total distribution. See 66 FR 231, Map Figure 1. Current occupancy (based on rabbits not just burrows) is confirmed only for Beaverhead County (White and Bartels (2002).

Pygmy rabbits have been described as inhabiting the majority of suitable sagebrush habitat in Beaverhead County, with **populations varying from secure in large areas of sagebrush to vulnerable** (Rauscher 2000). However, the author fails to map or specify how much area is "suitable". Extant populations are centered in the southern part of this small corner of Montana. See Map "Predicted pygmy rabbit habitat and observations" (Rauscher 2000). In portions of Deer Lodge and Madison County, their distribution is limited not only by sagebrush cover, but also by edaphic factors and habitat fragmentation, and pygmy rabbits do not occur in every sagebrush patch (Rauscher 2000). They are known in Dillon Field Office of BLM, and a few places in the Beaverhead National Forest. White and Bartels (2002) list only Beaverhead County as currently known to be occupied, based on actual presence of rabbits (not just burrows).

While claiming that "no evidence of a significant range decrease has been found" Rauscher (1997) noted **several sites that appear to have been occupied in the past but were found vacant** (Dutchman Mountain – northwest of Dillon, Frying Pan Basin – northwest of Dillon, McCartney Mountain –north of Dillon in Madison County) with no burrows, or with collapsed burrows. In the mid 1990s, only one open burrow was found

at a historical site near Red Rock Lakes (easternmost extent of pygmy sites in Montana shown on MDFWP 1996 map), and some other historical sites surveyed had only marginal habitat conditions.

MDFWP (1996) Figure 2 Map shows a historical location in Red Rock Lake National Wildlife Refuge and north of the Red Rock River in the Centennial Valley that lie east of known currently occupied sites. There is also a historical site a few miles west of Dillon. There are not currrent sites in these locations. This indicates a range contraction and loss of the most eastern Montana populations. There is also a gap in distribution in lands near Dillon. Also, Grzenda (1996) Memo states that "few places were found to have moderate activity" in the Medicine Lodge Creek area.

Previous distribution maps show pygmy rabbit occurrence in a larger area than historical records, and there has been some range contraction (Rauscher 1997, Rauscher 2000). Several sites that appeared to have been occupied in the past are now vacant. Populations appeared to vary from secure in large areas of sagebrush to vulnerable in islands of marginal habitat (Rauscher 2000). Pygmy rabbit habitat in Montana has slightly lower sagebrush cover than described in other areas, yet may have a higher population density than many areas (Rauscher 1997). Horse Prairie and Badger Gulch have been identified as strongholds (Rauscher 1997). In Coyote Creek in Big Sheep Basin, where sagebrush had been extensively treated, only one active rabbit burrow was found under a small clump of sagebrush (Rauscher 1997).

At least 50% (and probably more) of the Dillon Field Office lands have been treated (fire, chemical, disk, exotic seedings) in the past (Jim Roscoe, Dillon BLM biologist, pers. comm. to Fite 2003). Approximately 100,000 acres of big sagebrush habitat suitable for pygmy rabbits still likely occurs on Dillon BLM lands in Beaverhead County (Jim Roscoe, Dillon BLM biologist pers comm to Fite 2003). Rabbits are not found in equal numbers throughout this area, but are spotty and scattered (Roscoe pers. comm. to Fite 2003), and some burrow areas have been found abandoned (as also described by Janson after a visit to a "good" Rauscher site). Significant areas of unsuitable habitat (converted to meadow habitat) are found on private lands. Nearly all remaining habitat is on public lands. Horse Prairie probably has the most rabbits (Jim Roscoe, BLM pers. comm. to Fite 2003).

Dillon Field Office allotments that include known pygmy rabbit habitat are undergoing grazing analyses, and it is likely that further livestock developments in uplands will result from these decisions, in order to take pressure off the streams in the allotments (Roscoe, pers. comm. to Fite 2003). Completed and ongoing agency analyses demonstrate that intensified livestock use is indeed being shifted to sagebrush uplands, in an attempt to lessen stream damage.

Dillon BLM's 2003 "Upper Horse Prairie Watershed Assessment" includes lands in the current stronghold of the pygmy rabbit in Montana. The assessment documents the presence of knapweed, deems Wyoming big sagebrush as "more decadent than expected", states that approximately 40% of sagebrush habitat has been treated in the past and that private land is currently being treated, shows that riparian and wetland areas are nearly all in the degraded FAR (Functioning at Risk) condition, plans to deal with conifer encroachment of sagebrush sites with fire and mechanical means, and notes declining sage grouse numbers at nearly all leks. Pygmy rabbits are described as "widespread in low numbers with the greatest concentration on the Bannack/Badger

Gulch Area". The accompanying "Upper Horse Prairie Watershed Assessment Executive Summary and Authorized Officer's Determination" states: "This allotment [Bannack/Badger Gulch] appears as if it receives only light [grazing] use. However, BLM's "recommended action" for Bannack/Badger Gulch is to "**explore opportunities to develop water to relieve some pressure from the ... adjacent allotment**". Thus, BLM is planning to shift and extend livestock use and increase stocking into this Montana pygmy rabbit stronghold. Previous grazing analyses in big sagebrush habitats in Dillon BLM lands have done likewise.

In 2001, the Dillon BLM EA MT-050-01-01 for the Roe West allotment changed the season of livestock use in documented pygmy rabbit habitat in the vicinity of Limekiln Canyon from 7/25 to 1/31 to a **much-compressed period of 4/1 to 5/10 with the same number of AUMs** (Animal Unit Months). Plus, **the decision authorized construction of a division fence, pipelines and water troughs in big sagebrush uplands**. The EA states: Confirmed breeding use is documented for the pygmy rabbit". The EA admits new concentrations of livestock use and **"mechanical damage to sensitive basin big sagebrush communities is likely"**. There is no analysis whatsoever of impacts of intensive and concentrated spring livestock grazing and trampling inundation of pygmy rabbit habitats. Such concentrated livestock use now occurs during critical birthing and nursing periods for pygmy rabbits and vulnerable natal burrows. 68 FR 43 recognizes that livestock grazing can cause "take" of pygmy rabbits. Dillon BLM appears to have created the ideal situation for livestock to "take" the maximum possible number of newly born pygmy rabbits in shallow natal burrows.

The Dillon BLM East Grasshopper Analysis (2001) includes the Bannack AMP, Cold Spring, Bannack Road, Taylor-Buffalo, Taylor Creek, Red Mine, Mill Point, Red Mine Isolated, Flying N, Ermont, and Buffalo Creek grazing allotments**. Spotted knapweed has been identified throughout the area, and isolated whitetop colonies are present**. In some allotments, like Taylor/Buffalo allotment (pygmy rabbit documented as occurring): "**Habitat has been substantially altered by various range improvement projects and livestock use ... crested wheatgrass ... treatment interfaces are still evident ... water developments all along the ridge have allowed heavy livestock grazing that has affected species composition and vigor**". In the Bannack allotment (pygmy rabbit documented): Some portions still show the effects of widespread vegetation manipulation in the 1960s and 1970s. In the Red Mine/Mill Point allotment (pygmy rabbit documented): "Vegetation dominated by disturbance-induced species" along seasonally moist drainages. In Stonehouse/Ermont (pygmy rabbit documented), no information on vegetation condition is presented, but the EA notes: "**Placement of salt and supplements in these drainages is also altering herbaceous composition. Heavy use and trampling in drainages with good sagebrush canopy cover also risks collapsing pygmy rabbit burrows and available forage. Degrading the structure and canopy of these heavier sagebrush stands directly affects the availability of winter survival habitat for several hundred sage grouse** ". In the Bannack allotment (pygmy rabbit documented): "Patchiness of existing sagebrush stands represents fragmentation to many dependent species and increases their isolation and vulnerability". In Taylor-Buffalo: "**Sagebrush composition on adjoining private lands has been significantly reduced increasing the importance of these public land islands of remaining, relatively intact habitat**". Only minor grazing changes are proposed in the EA, despite the appalling ongoing degradation of public lands associated with livestock grazing.

Although a Sagebrush ACEC proposal for important Dillon BLM big sagebrush and pygmy rabbit habitats has been submitted to BLM (Hockett and Roscoe 2002), BLM has decided to include only tiny areas for rare plants as ACECs in an upcoming Draft Land Use plan, thus failing to act to put any special protective management for big sagebrush communities in place (Dillon BLM staff pers.comm. to Fite 2003).

In recent comments on the Beaverhead-Deer Lodge National Forest Antelope Basin/Elk Lake revised AMP, the Gallatin Wildlife Association describes foothill-sagebrush habitat types, and unoccupied sage grouse and pygmy rabbit habitat. **The comment letter notes livestock water tanks, pipelines, fences and salt grounds have left earth scars, and discusses severely trampled areas, soil erosion, soil compaction, weed infestations, severe trailing erosion and severe grazing impacts**. The GWA states that **the grazing alternatives merely redistribute problems identified in riparian areas to more arid and sensitive uplands**. The GWA also notes **the failure of the Forest to address cumulative effects of droughts, fire, severe winters, livestock grazing, stock tanks, pipelines, salt grounds, roads, burning, plowing, subdivision, hunting, disease on wildlife.**

Review of the 2001 DeLorme *Montana Atlas and Gazetteer* (depicts land ownership – BLM, private, state, Forest Service) shows that there is mixed land ownership, and expanses of private and state lands in Horse Prairie and Medicine Lodge Creek. Big Sheep-Muddy Creek area and Sage Creek area appear to have the largest contiguous blocks of BLM lands within pygmy rabbit range in Montana. Rauscher (1997) described sagebrush alteration in portions of the Sheep-Muddy Creek area. Interstate 15 slices north-south through occupied habitats, with most current known populations lying to the west (based on MDFW 1996, and Rauscher 2000 maps). The freeway parallels the Red Rock River, which is impounded at Lima Dam and Clark Canyon. Thus, multiple barriers (freeway, river) may serve to limit west-east dispersal here.

The continental divide, and the rugged and formidable Beaverhead Mountains, separate Idaho and Montana populations over significant areas. Connections between Idaho and Montana populations have been postulated. Roberts (2001) initially put forth a habitat connection between populations in the Bannock Pass area. Now, in BLM 12/16/02 pygmy meeting notes, it appears that Roberts suggests a possible connection in the Medicine Lodge area (Idaho BLM 12/16/02 pygmy meeting notes). Petitioners note that there are two separate Medicine Lodge watersheds on opposite sides of the Continental Divide that are located within the historic range of the pygmy rabbit in this geographic area – Idaho's Medicine Lodge Creek that drains southward, and Montana's Medicine Lodge Creek that drains northward into the Red Rock River that can cause confusion when reviewing Idaho and Montana documents.

In a recent visit to a "good" Rauscher site, Janson saw no rabbits and very little sign (Janson 2002). He stated: "Rauscher (1997) reported a density of 3.03 rabbits per hectare **in good habitat in Montana** during the summer of 1996" and continued: **"[In 2001], I spent four days walking through some of this same habitat and saw no pygmy rabbits and very little sign".** Janson termed Montana populations secure, but this does not appear to be based on his own observations, which found very little sign of the pygmy rabbit in what had been described by Rauscher as a good site. Instead, his conclusions appear to be based on Rauscher's work. Janson's recent failure to find rabbits in a formerly good rabbit site may indicate serious declines in Montana pygmy populations since the older Rauscher work of the 1990s.

Montana Summary

Pygmy rabbits had historically been found in portions of 3 counties in extreme southwestern Montana. The range has contracted, primarily to Beaverhead County. Within this geographic range, suitable pygmy rabbit habitat comprises a much smaller land area. Significant fragmentation from vegetation treatments and fire exists. Large areas of private lands are unsuitable, as sagebrush has been cleared. Recent and proposed BLM grazing decisions shift grazing impacts from streams into big sagebrush uplands, construct new projects that will extend and intensify livestock use, and concnetrate livestock use in sensitive spring birthing and nursing periods. Pygmy rabbits have recently disappeared from a formerly “good” site.