

are typically found in relatively deep, loose soils of wind-borne or water-borne (e.g., alluvial fan) origin. Pygmy rabbits occasionally make use of burrows abandoned by other species, such as the yellow-bellied marmot (*Marmota flaviventris*) or badger (*Taxidea taxus*) (Wilde 1978; Green and Flinders 1980a; WDFW 1995a) and, as a result, may occur in areas of shallower or more compact soils that support sufficient shrub cover (Bradfield 1974). During winter, pygmy rabbits make extensive use of snow burrows, possibly to access sagebrush forage (Bradfield 1974), as travel corridors among their underground burrows, and/or as thermal cover (Katzner and Parker 1997).

Pygmy rabbits, especially juveniles, likely use their burrows as protection from predators and inclement weather (Bailey 1936; Bradfield 1974). The burrows frequently have multiple entrances, some of which are concealed at the base of larger sagebrush plants (WDFW 1995a). Burrows are relatively simple and shallow, often no more than 2 meters (m) (6.6 feet (ft)) in length and usually less than 1 m (3.3 ft) deep with no distinct chambers (Bradfield 1974; Green and Flinders 1980a; Gahr 1993). Burrows are typically dug into gentle slopes or mound/inter-mound areas of more level or dissected topography (Wilde 1978; U.S. Department of Agriculture (USDA) 1991; Gahr 1993). In general, the number of active burrows in an area increases over the summer as the number of juveniles increases. However, the number of active burrows may not be directly related to the number of individuals in a given area because some individual pygmy rabbits appear to maintain multiple burrows, while some individual burrows are used by multiple individuals (Gahr 1993; WDFW 1995a).

Pygmy rabbits begin breeding their second year and, in Washington, breeding occurs from February through July (WDFW 1995a). In some parts of the species' range, females may have up to three litters per year and average six young per litter (Green 1978; Wilde 1978). Breeding appears to be highly synchronous in a given area and juveniles are often identifiable to cohorts (Wilde 1978). No evidence of nests, nesting material, or lactating females with young has been found in burrows (Bradfield 1974; Gahr 1993; WDFW 1995a). Individual juveniles have been found under clumps of sagebrush, although it is not known

precisely where the young are born in the wild or if they may be routinely hidden at the bases of scattered shrubs or within burrows (Wilde 1978).

Current information on captive pygmy rabbits indicates that females may excavate specialized "natal" burrows for their litters in the vicinity of their regular burrows (P. Swenson, Oregon Zoo, pers. comm. 2001; L. Shipley, Washington State University (WSU), pers. comm. 2001). Apparently, females begin to dig and supply nesting material (e.g., grass clippings) to these burrows several days prior to giving birth, and may give birth and nurse their young at the ground surface in a small depression near the burrow's entrance. After nursing, the young return to the burrow and the female re-fills the burrow entrance with loose soil and otherwise disguises the immediate area to avoid detection. Other "dead-end" burrows that females construct nearby are apparently associated with the natal burrows and may be important for providing proper aeration. Females may also alter their defecation and latrine habits while pregnant and nursing (P. Swenson, pers. comm. 2001). Further work with captive and wild pygmy rabbits should shed additional light on the details of their reproductive strategy.

Pygmy rabbits may be active at any time of the day or night and appear to be most active during mid-morning (Bradfield 1974; Green and Flinders 1980a; Gahr 1993). Pygmy rabbits maintain a low stance, have a deliberate gait, and are relatively slow and vulnerable in more open areas. They can evade predators by maneuvering through the dense shrub cover of their preferred habitats, often along established trails, or by escaping into their burrows (Bailey 1936; Severaid 1950; Bradfield 1974).

Pygmy rabbits tend to have relatively small home ranges during winter, remaining within roughly 30 m (98 ft) of their burrows (Orr 1940; Janson 1946; Gahr 1993; Katzner and Parker 1997), although some snow burrows may extend outward up to 100 m (328 ft) (Bradfield 1974). They have larger home ranges during spring and summer (Orr 1940; Janson 1946; Gahr 1993; Katzner and Parker 1997). During the breeding season in Washington, females tend to make relatively short movements within a small core area and have home ranges covering roughly 2.7 hectares (ha) (6.7 acres (ac)); males tend to make longer movements, traveling among a number of females, resulting in home ranges

covering roughly 20.2 ha (49.9 ac) (Gahr 1993). These home range estimates in Washington are considerably larger than for pygmy rabbit populations in other areas of their historic range (WDFW 1995a; Katzner and Parker 1997). Pygmy rabbits may travel up to 1.2 kilometers (km) (0.75 miles (mi)) from their burrows (Gahr 1993), and there are a few records of apparently dispersing individuals moving up to 3.5 km (2.17 mi) (Green and Flinders 1979; Katzner and Parker 1998).

The annual mortality rate of adult pygmy rabbits may be as high as 88 percent, and over 50 percent of juveniles can apparently die within roughly 5 weeks of their emergence (Wilde 1978; WDFW 1995a). However, the mortality rates of adult and juvenile pygmy rabbits can vary considerably between years, and even between juvenile cohorts within years (Wilde 1978). Predation was shown to be the main cause of pygmy rabbit mortality in Idaho (Green 1979). Potential predators include badgers, long-tailed weasels (*Mustela frenata*), coyotes (*Canis latrans*), bobcats (*Felis rufus*), great horned owls (*Bubo virginianus*), long-eared owls (*Asio otus*), ferruginous hawks (*Buteo regalis*), northern harriers (*Circus cyaneus*), and common raven (*Corvus corax*) (Janson 1946; Gashwiler *et al.* 1960; Green 1978; Wilde 1978; WDFW 1995a; D. Hays, WDFW, pers. comm. 2002; M. Hallet, WDFW, pers. comm. 2002).

Population cycles are not known in pygmy rabbits, although local, relatively rapid population declines have been noted in several States (Bradfield 1974; Weiss and Verts 1984; WDFW 1995a). After initial declines, pygmy rabbit populations may not have the same capacity for rapid increases in numbers as other Leporids due to their close association with specific components of sagebrush ecosystems, and the relatively limited availability of their preferred habitats (Wilde 1978; Green and Flinders 1980b; WDFW 1995a).

Distribution and Status

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 conterminous western United States (Green and Flinders 1980a), and included portions of Montana, Idaho, Wyoming, Utah, Nevada, California, Oregon, and Washington (Figure 1).

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