

populations of pygmy rabbits (C. Brand, National Wildlife Health Center, pers. comm. 2001). Because so few Columbia Basin pygmy rabbits remain, the potential for disease outbreak represents a significant threat to both the wild and captive portions of this population segment.

Predation is thought to be a major cause of mortality among pygmy rabbits (Green 1979; Wilde 1978). However, pygmy rabbits have adapted to the presence of a wide variety of avian and terrestrial predators that occur throughout their historic distribution (Janson 1946; Gashwiler *et al.* 1960; Green 1978; Wilde 1978; WDFW 1995a). In relatively large, well distributed pygmy rabbit populations, predation is not likely to represent a significant threat to their long-term security. In contrast, due to the extremely small size and localized occurrence of the Columbia Basin pygmy rabbit population, altered predation patterns, or even natural levels of predation, currently represent a significant threat to both the wild and captive portions of this population segment and could impair ongoing conservation efforts.

Due to confirmed evidence of coyote predation on the Columbia Basin pygmy rabbit, the WDFW implemented a predator control program during the fall-winter periods of 1998–1999 and 1999–2000 (WDFW 2000a). Numerous coyotes and several long-tailed weasels were removed, by shooting, traps, or snares, over roughly 52 square kilometers (20 square miles) around and including the Sagebrush Flat site. The level of effort to control terrestrial predators varied among years and areas, and the efficacy of this program to protect the Columbia Basin pygmy rabbit is unknown. There are also a variety of avian predators that may occur at the Sagebrush Flat site. In an effort to help control the occurrence of common ravens and other predatory birds, the WDFW recently removed two obsolete windmills from the area that could have potentially been used as perching or nesting sites (M. Hallet, pers. comm. 2002).

Because of the relatively restricted distribution of the Columbia Basin pygmy rabbit, terrestrial and avian predators may also have a reduced search area and/or increased success rate at the Sagebrush Flat site. To further address the threat of predation on the Columbia Basin pygmy rabbit, additional measures are being considered by the WDFW for this area, such as controlling artificial food sources (*e.g.*, spilled grain, trash, carnivore baits), the removal of unnecessary fencing potentially used as

perch sites for avian species, and providing appropriate predator exclusion fencing (M. Hallet, pers. comm. 2002; D. Hays, pers. comm. 2002).

Several measures (*e.g.*, double fencing, monitoring) have been taken to reduce the risk of predation on the captive portion of the Columbia Basin pygmy rabbit population (R. Saylor, WSU, pers. comm. 2001; L. Shipley, pers. comm. 2001). In addition, captive animals are currently being held at multiple facilities, which reduces the risk of catastrophic loss at a single facility (D. Hays, pers. comm. 2002). However, while the risk has been greatly reduced, the potential for certain predators to access cages at the captive rearing facilities remains.

Due to the extremely small size of the Columbia Basin pygmy rabbit population, even low levels of predation represent a significant risk to the immediate security of both the wild and captive portions of this population segment.

D. *Inadequacy of existing regulatory mechanisms.* Washington State classification of the Columbia Basin pygmy rabbit as endangered makes it illegal to attempt to kill, injure, capture, harass, possess, or control individuals of the species (WDFW 1995a). However, illegal or accidental shooting of Columbia Basin pygmy rabbits may occur in association with hunting seasons for other small game species (*see* factor C above). In addition, State designation does not provide regulatory protection of the habitats considered essential to the long-term security of the Columbia Basin pygmy rabbit.

Pursuant to Washington State legislation passed in 1993 (HB 1309), the Washington State Conservation Commission (WSCC) oversaw the development and provided approval of ecosystem standards for State-owned agricultural and grazing lands (WSCC 1995). HB 1309 called for implementation of the ecosystem standards to maintain and restore fish and wildlife habitat within the State by improving overall ecosystem health. The standards developed under HB 1309 are mandated for lands under the jurisdiction of the WDFW and Washington Department of Natural Resources (WDNR). Application of the standards on lands managed by the WDNR must be consistent with the agency's fiduciary obligations.

Currently, we are assisting private landowners with development of a county-wide HCP to protect important plant and animal species on agricultural lands in Douglas County. However, there are no regulatory protections for

unlisted species during development of HCPs. Revegetation standards under the CRP promote the improvement of habitats potentially used by the Columbia Basin pygmy rabbit, and the CRP restricts livestock grazing on contract lands except under severe drought conditions (M. Ruud, Farm Service Agency, pers. comm. 2001).

E. *Other natural or human-caused factors affecting the species' continued existence.* The immediate concerns for the Columbia Basin pygmy rabbit are associated with the population's extremely small size, history of fragmentation and extirpation, and the recent, dramatic decline in its distribution and abundance. Small populations are susceptible to random environmental events (*e.g.*, severe storms, prolonged drought, extreme cold spells, volcanic fallout), abrupt changes in cover and food resources, altered predator or parasite populations, disease outbreaks, and fire. Small populations are also more susceptible to demographic and genetic problems (Shaffer 1981). These threat factors, which may act in concert, include natural variation in survival and reproductive success of individuals, chance disequilibrium of sex ratios, changes in gene frequencies due to genetic drift, and lack of genetic diversity caused by inbreeding.

Genetic indices indicate that the Columbia Basin pygmy rabbit had less genetic diversity historically than the remainder of the taxon. In addition, this population segment has undergone further loss of genetic diversity since roughly the mid-1900s. Severe loss of genetic diversity may make the Columbia Basin pygmy rabbit more susceptible to extinction due to inbreeding depression or, assuming inappropriate introduction of other pygmy rabbit genes, swamping of their unique genetic profile. Reduced genetic diversity, and the relatively few family lineages remaining in the Columbia Basin pygmy rabbit population, may also complicate captive breeding strategies conducted to reestablish a minimum effective population size. Ultimately, an appropriate effective population size will help ensure the maintenance and enhancement of the genetic heterogeneity that is still present within this population segment (K. Warheit, pers. comm. 2001, 2002).

In relatively large, well distributed pygmy rabbit populations, the above threats are not likely to represent a significant risk to their long-term security. However, due to the extremely small size and localized occurrence of both the wild and captive portions of the Columbia Basin pygmy rabbit