

livestock grazing may be compatible with pygmy rabbit conservation efforts over the long-term.

There are several past and ongoing studies that have investigated the effects of different livestock grazing strategies on Columbia Basin pygmy rabbits and their habitat (Gahr 1993; WDFW 1995a; Sayler *et al.* 2001; L. Shipley, pers. comm. 2001). Gahr (1993) found that male pygmy rabbits at the Sagebrush Flat site made longer movements during the breeding season, resulting in larger home ranges, in recently grazed areas as opposed to areas that had not been grazed for nearly 40 years. In addition, relative to unit size, there are more pygmy rabbit burrows in the ungrazed areas of Sagebrush Flat than the recently grazed areas (L. Shipley, pers. comm. 2001). Further evaluation of the distribution and availability of appropriate soils across the Sagebrush Flat site will help clarify these results. Nevertheless, they suggest that Columbia Basin pygmy rabbits may be more susceptible to predation in areas used for livestock grazing due to longer movements away from cover and fewer burrows available for escape.

Results of an ongoing study also indicate that Columbia Basin pygmy rabbits occupying grazed sites tend to have a greater proportion of their summer through winter diets composed of sagebrush as opposed to grasses and forbs (L. Shipley, pers. comm. 2001). In addition, the nutritional quality (*e.g.*, less protein and greater fiber content) of the available grasses and shrubs in recently grazed sites tends to be less from fall through spring (L. Shipley, pers. comm. 2002). These results provide support for the contention that livestock may compete directly with pygmy rabbits for available forage during these periods (Green and Flinders 1980b; Rauscher 1997). There is also evidence that cattle can directly damage pygmy rabbit burrow systems through trampling (Rauscher 1997; N. Siegel, WSU, pers. comm. 2001; M. Hallet, pers. comm. 2002). These impacts may be especially critical during the Columbia Basin pygmy rabbits' reproductive period.

Populations of pygmy rabbits have coexisted with various levels of livestock grazing activities throughout their historic range for many years (WDFW 1995a). However, due to the extremely low number and restricted distribution of Columbia Basin pygmy rabbits, any additional mortality or population stress associated with livestock grazing practices represents a significant threat to the security of the wild portion of this population segment.

Due to the combined influences described above, Washington's native shrub steppe habitats, including those considered essential to the long-term security of the Columbia Basin pygmy rabbit, are considered among the least protected areas in the State (Cassidy 1997).

*B. Over-utilization for commercial, recreational, scientific, or educational purposes.* Pygmy rabbits are often difficult to distinguish from species of cottontail rabbits (*Sylvilagus* spp.) (Garber 1993; WDFW 1995a). Because of this, accidental shooting of Columbia Basin pygmy rabbits may occur in association with hunting of other small game species in Washington (WDFW 1979). Due to their extremely low numbers, restricted distribution, and preference for dense habitats, combined with relatively few small game hunters at the Sagebrush Flat site, the risk from accidental shooting of Columbia Basin pygmy rabbits is currently considered relatively low (WDFW 1995a; D. Hays, pers. comm. 2001). However, in such reduced populations, accidental shooting could become a significant source of mortality if it is not carefully controlled.

Investigations that require trapping, handling, and captivity of pygmy rabbits can result in mortality from several causes, including exposure (due to excessively high or low temperatures); direct injury from entanglement in traps, trap predation, and intra-specific fighting; and capture stress (Bailey 1936; Severaid 1950; Wilde 1978; Gahr 1993; Rauscher 1997). Capture-related mortality rates (including recaptures) reported for pygmy rabbits are roughly 3 percent (Gahr 1993), 5 percent (Wilde 1978), and 13 percent (Rauscher 1997). The mortality rate for one study approached 20 percent when the total number of captured animals was considered (11 deaths of 58 individuals), and all of the mortalities in this study occurred in just one portion of the study area (Rauscher 1997). Trapping methods, daily and seasonal timing, study location, holding facilities and site security, and husbandry techniques may all affect the level of capture-related mortality incurred. In addition, vandalism of captive rearing facilities remains a threat following capture (L. Hardesty, pers. comm. 2002).

Currently, the WDFW is leading efforts to establish a captive breeding population of Columbia Basin pygmy rabbits (*see* Current Management Actions, above). To date, three capture-related deaths have occurred in this program. These deaths represent roughly a 14 percent mortality rate for the captured animals (3 of 21

individuals). While the captive propagation program is necessary to help ensure the long-term survival of the Columbia Basin pygmy rabbit, and we support these efforts, the potential for capture-related mortality to significantly affect the success of this program remains.

Some pygmy rabbit burrows are relatively shallow and may collapse when walked on by humans (Wilde 1978). Investigations of pygmy rabbits often entail the destruction of individual burrows, while measuring of the vegetation community and other site characteristics immediately surrounding burrow systems, and/or disturbance to the general area occupied by the pygmy rabbits (Janson 1946; Bradfield 1974; Green 1978; Wilde 1978; Gahr 1993; Gabler 1997; Rauscher 1997). Furthermore, various ongoing management and maintenance activities of the WDFW at the Sagebrush Flat site (*e.g.*, establishment of firebreaks, species and habitat surveys, fencing removal or construction) have the potential to directly or indirectly affect the Columbia Basin pygmy rabbit.

It is unlikely that any of the above activities alone has played a significant role in the long-term population decline and range reduction of the Columbia Basin pygmy rabbit. However, due to the current vulnerability of both the wild and captive portions of this population segment, any additional source of mortality may now play a significant role and could impair efforts to conserve the Columbia Basin pygmy rabbit.

*C. Disease or predation.* Pygmy rabbits often harbor a high parasite load (Gahr 1993; WDFW 1995a). Some of the parasites of pygmy rabbits, including ticks, fleas, and lice, can be vectors of disease. Episodes of plague and tularemia from these vectors have been reported in populations of a number of other Leporid species and are often fulminant (rapidly spreading) and fatal (Quan 1993). Severe disease epidemics have not been reported in pygmy rabbits, and parasites have not been viewed as a significant threat to the species (Green 1979; Gahr 1993). However, evidence of plague was reported in a coyote taken from the site of one of the recently extirpated subpopulations of Columbia Basin pygmy rabbits (WDFW 2001a). The potential occurrence of plague in this subpopulation is being investigated using blood samples obtained prior to its extirpation (D. Hays, pers. comm. 2001). Additional studies have been proposed to investigate the occurrence of plague and other diseases, and their possible control, in wild and captive