

plovers forage and roost on grazed or sprouting alfalfa fields; 34 percent roost on short-term fallowed fields; and 13 percent forage on burned bermuda grass fields, while ungrazed alfalfa, unburned bermuda grass, melon and vegetable fields are rarely or never used (Wunder and Knopf 2003).

Other habitats within the historic wintering range of the mountain plover have been modified by modern livestock grazing practices that maintain grass height that is higher than what mountain plovers can use. This is the situation in the Carrizo Plain, which is recognized as a predictable wintering area and historically may have provided up to 50 percent of suitable plover wintering habitat. No more than 10 percent of the Carrizo Plain's 103,000 ha (254,000 ac) was suitable for mountain plovers in the early 1990s (S. Fitton, in litt. 1992; BLM *et al.* 1995), but that figure has increased in recent years due to lower precipitation (S. Fitton, pers. comm. 2003). Habitat availability there appears to be linked to a combination of livestock grazing management and precipitation.

We were unable to precisely quantify the acres of mountain plover wintering habitat converted to other uses annually because a data base quantifying mountain plover habitat does not exist. However, information from the California Department of Conservation confirms the routine conversion of existing croplands to vineyards, orchards, and other uses. For example, from 1990 to 2000, the acreage of vineyards in California nearly doubled to a total of 230,000 ha (570,000 ac) (M. Penberth, California Department of Conservation, in litt. 2003). In nine counties in the Central Valley where mountain plovers are now reported as "rare and local," the acres in vineyards increased by about 25 percent (31,000 ha (76,000 ac)) from 1990 to 2000 (Edson and Hunting 1999; M. Penberth, California Department of Conservation, in litt. 2003). Conversion to vineyards represents a loss of potential habitat, although the extent of use by plovers prior to conversion is unknown.

Urban development destroyed most noncultivated, historic coastal mountain plover winter habitat (Wunder and Knopf 2003), and anticipated urbanization and water transfers from rural to urban areas may impact the remaining natural habitats, as well as to existing cropland habitats in both the Central and Imperial Valleys. In California, the U.S. Census Bureau (2003) projected a 52 percent (17 million) population increase from 2000 to 2025. Based on past trends, considerable population growth is

expected to occur in the Central Valley (American Farmland Trust 2003, Hunting *et al.* 2001). The Imperial County population is expected to nearly double by 2020 (American Farmland Trust 2003). In the Imperial Valley, the North American Free Trade Agreement is expected to generate increased trade growth, and highway projects are now being planned to improve transportation efficiency (California Department of Transportation 2001). As a result of the anticipated population growth, the American Farmland Trust (2003) designated the Imperial and Central Valleys 2 of the top 20 threatened farming regions in the Nation. However, between 1982 and 1992, only 8,000 ha (19,000 ac) of land in Imperial County were converted to urban uses. The present impacts to farm land in Imperial County have had no measurable impact on wintering mountain plovers. For example, the Service completed a draft biological opinion for a proposed transfer of water from the Imperial Valley to southern California coastal communities (P. Sorensen, Service, in litt. 2003). It is presently estimated that if the water transfer occurs, 12,000 to 32,600 ha (30,000 to 80,500 ac) of bermuda grass sod farms and alfalfa could be fallowed each year (C. Roberts, Service, pers. comm. 2002; P. Sorensen, in litt. 2002), which we calculate would be from 15 to 39 percent of the available foraging habitat described by Wunder and Knopf (2003). However, because of the mild winter climate in the Imperial Valley, crops are not fallowed for long periods of time. Land that is fallow 1 month may be tilled the next, presenting a shifting mosaic of foraging habitat for plovers. Because it is unclear whether the water transfer will occur and whether it will reduce foraging habitat for mountain plovers in the Imperial Valley, we cannot conclude that loss of cropland or modification of current practices threatens the species in the foreseeable future.

In summary, although most natural habitat used by mountain plovers in California has been destroyed, some crops that have replaced it provide foraging and roosting habitat (Knopf and Rupert 1995, Wunder and Knopf 2003). Given a high over-wintering survival rate in the San Joaquin Valley and Carrizo Plain and the ability of the plovers to use croplands successfully, Knopf and Rupert (1995) concluded that a loss of a major proportion of native habitats in the wintering range has not limited plover populations.

Mountain plovers have been reported in winter in other States in the United States and Mexico, but in comparison to California their numbers are few, and

the threat of habitat destruction, modification, or curtailment is unknown with one exception. In the 1990s, the Ejido San Pedro CBC was initiated on a black-tailed prairie dog complex in northwestern Chihuahua, Mexico (birdsource.org 1992–2002). Mountain plovers have been reported in low numbers in most years, with no birds reported in some years (birdsource.org 1993–2002). Vegetation has been modified by livestock grazing to include woody shrubs, and prairie dog densities are low, which allows for increased vegetation height.

In conclusion, after reviewing the current and anticipated impacts to wintering habitat, we find that they do not pose significant threats to the mountain plover.

#### Effects of Range Management on Mountain Plover Habitat

Domestic livestock grazing is pervasive throughout the breeding range of the mountain plover. Currently accepted domestic livestock grazing management emphasizes a uniform grass cover to minimize grassland and soil disturbance, whereas the landscape created historically by native herbivores was a mosaic of grasses, forbs, and bare ground that changed frequently in time and location (Knopf 1996a, Knopf and Rupert 1999b). The shift to livestock grazing strategies that favor uniform cover is believed to be partly responsible for the decline of mountain plovers in the peripheral breeding areas of Oklahoma and Canada (Flowers 1985, Wershler 1989), but has only been assessed in limited, localized instances elsewhere within the major portion of the breeding range. Mountain plovers are no longer reported from the Lewis Ranch in central Montana since elimination of grazing there in 1993 (Knowles and Knowles 2001). The decline of mountain plovers on the Pawnee National Grassland in Colorado is due to multiple years of wet spring weather, persistent grazing systems, the apparent difficulty of adjusting domestic livestock stocking rates to accommodate years of increased forage, the lack of infrastructure to modify grazing systems, and the sparse application of grassland burning and mineral block placement to restore nesting habitat (Forest Service 1994; S. Currey, Forest Service, in litt. 2002; F. Knopf, in litt. 2002; R. George, in litt. 2002; E. Humphrey, Forest Service, in litt. 2003). These examples are localized and do not appear to exemplify practices in a substantial portion of the breeding range. If the impacts were significant, we would anticipate being able to detect a declining trend in