

poses a threat to California spotted owls by removing and fragmenting suitable habitat for the spotted owl and can remove habitat for prey species, especially woodrats. Residential developments also introduce and increase urban adapted predators (cats, dogs, skunks, racoons, ravens, crows) into spotted owl habitat; these predators may kill fledgling spotted owls in the nest or on the ground before they are capable fliers. Fires within the range of the California spotted owl, which could result in the loss of habitat, are more likely to be human caused, especially at the urban interface (NIFC 2002).

Development that is most likely to result in the loss of spotted owl habitat is occurring on private land in the lower elevation foothill areas of the Sierra Nevada and in southern California (Verner *et al.* 1992a). Statistics for nine of fifteen Sierra Nevada counties within the range of the California spotted owl show these counties are currently experiencing varying degrees of urban expansion, and have projected population growth rates from 0.7 percent in Sierra county to 6.2 percent in Calaveras county (Sierra Business Council 1997). The amount of private versus public lands in the Sierra Nevada and southern California portions of the range varies widely by county. The Sierra Nevada Ecosystem Project (1996) core analysis area encompassed almost 8.5 million ha (21 million ac) in the Sierra Nevada, of which 61 percent is Federal and 38 percent is nonfederal lands. Estimates from the Sierra Business Council (1997) indicate that for the nine Sierra Nevada counties in the range of the spotted owl they analyzed, an average of 46 percent is private land. These studies do not identify specific habitat types within ownerships; however, we assume higher elevation (greater than 3,000 ft) lands that are predominately in Federal ownership are at a lower risk of loss due to urbanization, while lower elevation (less than 3,000 ft) lands, in private ownership are more likely at risk of habitat loss. Some information is available on the "projected" amount of land planned for development by county as specified in their General Plans, however, these accounts are not sufficiently detailed to identify habitat types that are planned for development. McBride *et al.* (1996) looked at the impacts of development in specific habitat types in selected areas in five counties in the Sierra Nevada. Their results indicated there was a decrease in crown cover and tree density and an increase in impervious surface; however, no estimates were given for

the rate or amounts of habitat lost overall.

Direct and indirect loss and degradation of habitat of California spotted owls and their prey is expected to continue in mid and lower elevation zones of the Sierra Nevada and southern California ranges through residential development (Laymon 1988, Verner *et al.* 1992b), harvest of hardwoods for firewood production (Laymon 1988, Verner *et al.* 1992b), human disturbance, and other consequences of development because these are among the fastest growing areas in California (Laymon 1988, McKelvey and Weatherspoon 1992). Suitable habitat scattered among houses and housing developments was not found to be occupied by California spotted owls in southern California, although areas adjacent to these developments contained dense and productive populations of the subspecies (Gutiérrez 1994). As a result, development has the potential to further impair effective dispersal among isolated populations (Ruth and Standiford 1994). In the San Bernardino Mountains, development is likely to first occur at low elevations. Urbanization has similar negative implications for Sierra Nevada spotted owls that migrate to lower elevations in the winter (Laymon 1988, Verner *et al.* 1992b).

In southern California, the mountain ranges occupied by California spotted owls probably act as habitat islands with limited dispersal between them. Under natural conditions, if the spotted owl population of one island were reduced or eliminated, that population could be sustained or reestablished through immigration from another island. As a result, a concern is that individual populations of California spotted owls, for example, those in southern California, could become isolated from other parts of the subspecies' range, for example the Sierra Nevada. As urbanization between mountain ranges continues, habitats there may be made unsuitable to support dispersing California spotted owls, eliminating immigration and potentially leading to extirpation of one or more subpopulations (Verner *et al.* 1992).

It is evident urbanization and loss of spotted owl habitat is occurring, especially in the Sierra Nevada foothills and in southern California. This development is occurring within a variety of habitat types including agricultural, grassland, as well as woodlands, and conifer forest types used by spotted owls. Development is limited in some respects by county general planning efforts that guide

development for a specified planning period. Based on the limited amount of information available we cannot conclude the loss of spotted owl habitat is significant nor are the threats from urbanization immediate.

*Miscellaneous Habitat Factors.* There are several minor or lesser known factors that may influence spotted owl survival. Each is discussed below.

Riparian forests are important habitats for California spotted owls in southern California (Verner *et al.* 1992a). Diversion of surface waters and pumping of groundwater depletes water from streams upon which such habitats depend. Therefore, such development may lead to loss of habitat in some areas and therefore extirpation of California spotted owls in those areas (Verner *et al.* 1992a).

During the late 1800s, heavy grazing of surface fuels by livestock may have reduced the influence or extent of wildfires (University of California 1996), and subsequent ingrowth of vegetation on denuded soils may have contributed to the heavy fuel loading and tendency towards catastrophic fire now found in much of the California spotted owl's range. Currently, livestock grazing may impact spotted owls by removing cover used by prey species, especially brush used by woodrats (Verner *et al.* 1992b).

Recreation is the fastest growing use of the national forests (USFS 2001a). The construction of facilities used for recreation, including campgrounds, trails (foot, horse, and off highway vehicle), roads, ski resorts, and cabins has likely contributed to the destruction and fragmentation of California spotted owl habitat. In addition to habitat loss, recreational activities have the potential to disturb spotted owls and thereby adversely affect their survival and reproduction (Service 2001). The effect of recreation on owls is poorly understood and may be an increasing threat to California spotted owls, especially in southern California (Noon and McKelvey 1992).

Sudden oak death is a tree disease caused by the pathogen *Phytophthora ramorum*. It infects a variety of trees, including true oaks (*Quercus* spp.), California bay laurel, tanoak, and madrone (CDF 2002). Some trees are killed by the disease, while others survive but serve as hosts. The disease can be found in 11 coastal counties outside the range of the California spotted owl and only one within the range (Monterey) (CDF 2002, UC Berkeley, *in litt.* 2002, Endicott 2002). The extent to which the disease may spread and the number of tree species it may affect remain undetermined. California spotted owls are forest