

be expected by chance and all previously vacant territories that were settled were adjacent to occupied territories. The percentage of territories occupied varied from 59 to 95 percent from year to year. During the study, young fledged from 28 percent of the 39 territories that were "frequently vacant," indicating that habitat at those sites was suitable to support California spotted owl reproduction.

Four color banded adults on the Sierra National Forest later shifted territories, moving 3.4 km (2.1 mi), 3.5 km (2.2 mi), 3.9 km (2.4 mi), and 7.1 km (4.4 mi) (Verner *et al.* 1992b). In a study of breeding dispersal of California spotted owls in the San Bernardino Mountains (LaHaye and Gutiérrez *in litt.* 2002), 46 females and 38 males dispersed, which were 22 percent and 17 percent of the total banded females and males, respectively. Among dispersing females, 70 percent were adults and 30 percent subadults; among males, 71 percent were adults and 29 percent were subadults. A significantly higher percentage of subadults dispersed (30 percent) compared to the territorial population as a whole (14 percent). Mean dispersal distances were 4.3 km (2.7 mi) for females and 3.0 km (1.9 mi) for males, which are significantly shorter than natal dispersal distances observed in the same population.

Interactions with Other Species and Natural Mortality. Spotted owls are mobbed by many species of diurnal birds (Gutiérrez *et al.* 1995). Red-tailed hawks (*Buteo jamaicensis*) and common ravens (*Corvus corax*) may take away prey items that are captured by spotted owls. The spotted owl's closest competitors are great horned owls (*Bubo virginianus*) and barred owls (*Strix varia*). Barred owls have recently colonized portions of the range of California spotted owls and are known to displace spotted owls from their territories (Verner *et al.* 1992b, Gutiérrez *et al.* 1995). Circumstantial evidence suggests that barred owls may kill spotted owls (Leskiw and Gutiérrez 1998). Northern goshawks (*Accipiter gentilis*), great horned owls, red-tailed hawks and potentially other birds of prey eat spotted owls (Verner *et al.* 1992, Gutiérrez *et al.* 1995). Fishers (*Martes pennanti*) have been observed in spotted owl nest trees and may take eggs or chicks (Gutiérrez *et al.* 1995).

Starvation (Verner *et al.* 1992b, Gutiérrez *et al.* 1995, Tibstra 1999) has been documented as a cause of death in California spotted owls. Starvation is more common in juveniles than adults and may result from low prey availability or lack of hunting

experience (Verner *et al.* 1992b). Dispersing juveniles sometimes roost in open habitats during inclement weather, which may result in exposure causing or contributing to their deaths (Gutiérrez *et al.* 1995). Accidents leading to death have been documented for spotted owls, including flying into obstacles and drowning (Verner *et al.* 1992b).

Feeding and Metabolism. Spotted owls are "perch and pounce" predators, hunting primarily by selecting an elevated perch, detecting prey by sight or sound, and swooping from the perch to capture the prey with their talons. Spotted owls are not fast fliers, but they are very agile and maneuverable. The flight pattern is a series of quick wing beats interspersed with gliding flight. Spotted owls use gliding flight when approaching prey. When gaining altitude in the forest canopy, they make a series of short climbing flights rather than one continuous flight. Flight is labored when attempting to fly to a higher perch or a nest sight. Flight above the forest canopy is probably rare, except during dispersal (Gutiérrez *et al.* 1995). If a potential prey item is inaccessible or at a considerable distance from an owl's perch, the owl may move closer before pouncing (Verner *et al.* 1992b). Spotted owls will forage at several sites within a single night (Gutiérrez *et al.* 1995). They also hunt by capturing in mid-air flying prey such as insects, bats, and birds (Verner *et al.* 1992b, Gutiérrez *et al.* 1995). California spotted owls forage primarily at night, but have been observed hunting during the day, especially while raising young (Laymon 1991, Verner *et al.* 1992). They may cache prey items on limbs, stumps, or the ground for later consumption (Gutiérrez *et al.* 1995). Prey items include mammals, birds, and insects.

Spotted owls have a high water need relative to their metabolic rate (Weathers *et al.* 2001), and have been observed drinking surface water from seeps and creeks (Gutiérrez *et al.* 1995). California spotted owls have a narrow thermal neutral zone (the ambient temperature range through which a bird or mammal can maintain its normal body temperature without expending energy to do so) relative to birds in general and are therefore especially subject to heat stress (Gutiérrez *et al.* 1995, Weathers *et al.* 2001). They roost higher in the forest canopy during winter and lower during the summer. They will also move during a day in response to changes in ambient temperature and sun exposure. The variety of microclimates available in mature and old growth forests has been postulated as an explanation for the

spotted owl's use of such habitats (Gutiérrez *et al.* 1995).

Distribution, Range, and Land Ownership

Grinnell and Miller (1944) described the range of the California spotted owl as "[I]n general, coastal slope of southern California from southern San Diego County northwest to Santa Barbara, Ventura, and western Kern Counties, and west flank of Sierra Nevada north from Tulare County to Tehama County" and noted that the southern California range was apparently separated from the Sierra portion of the range.

The mapped range of the California subspecies in Grinnell and Miller (1944) indicated a gap in the distribution of spotted owls in Shasta County, separating the California and northern spotted owl subspecies. However, based on newer records and the occurrence of apparently-suitable habitat in the area, more recent authors have concluded that this purported gap between the California and northern subspecies may not have actually existed (Detrich *et al.* 1993). For regulatory purposes, we established the "Pit River area" as the boundary between the northern spotted owl and the California spotted owl (55 FR 26114). No historic data are available regarding pre-European settlement population numbers of the California spotted owl.

The northern spotted owl ranges from southwestern British Columbia, Canada through western Washington, western Oregon, and northern California south along the coast to San Francisco Bay (Service 1990). The range of the Mexican spotted owl is disjunct from the other subspecies, from southern Utah and Colorado south through Arizona and New Mexico, and is discontinuous through the Sierra Madre Occidental and Oriental to the mountains at the southern end of the Mexican Plateau (Service 1993).

Today the California spotted owl still occurs throughout its historic range, including the west side of the Sierra Nevada from Shasta County south to the Tehachapi Pass, and all major mountains of southern California, including the San Bernardino, San Gabriel, Tehachapi, north and south Santa Lucia, Santa Ana, Liebre/Sawmill, San Diego, San Jacinto, and Los Padres ranges (Beck and Gould 1992). In addition, a few sites have been found on the eastern side of the Sierra Nevada and in the central Coast Ranges at least as far north as Monterey County.

Regarding the current distribution of the California spotted owl, Verner *et al.* (1992a) stated "in spite of the fact that