

Golden Eagle

(*Aquila chrysaetos*)

Legal Status

Federal: Bird of Conservation Concern (USFWS 2002).
Bald Eagle Protection Act

State: Fully Protected.



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Global and State Conservation Status: G5S3: Global Rank, G5 = Secure: Common; widespread and abundant; State Rank, S3 = Vulnerable: Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

Recovery Plan: None.

Species Description and Life History

The golden eagle (*Aquila chrysaetos*) is a large, dark-brown raptor with long, broad wings and a golden nape (Kochert *et al.* 2002). Total length ranges from 70-84 cm (28-33 inches) and wingspan ranges from 185-220 cm (73-87 inches) (Kochert *et al.* 2002). Weight of these large raptors ranges from 3,000 to 6,125 g (8.7 – 13.5 lbs), with females approximately 25% larger than males (Kochert *et al.* 2002). Males and females are otherwise identical. Juvenile birds have tails that are white at the base and dark at the tip, and have white patches on the underside of the wing (Kochert *et al.* 2002).

Seasonal Patterns

Throughout most of the western United States golden eagles are mostly year-long residents (Polite and Pratt 1999), breeding from late January through August with peak activity in March through July (Polite and Pratt 1999). Migratory patterns are usually fairly local in California where adults are relatively sedentary, but dispersing juveniles sometimes migrate south in the fall (Kaufman 1996). They may move altitudinally in response to changing weather conditions (USFS 2008). They may also move down-slope for winter or upslope after the breeding season (Polite and Pratt 1999).

Golden eagle populations in the northern portion of its range are generally migratory with populations in the extreme northern portion being entirely migratory (USFS 2008). Some northern populations winter in California.

Reproduction

Golden eagles construct a large nest of branches, twigs, and stems of any kind (Kochert *et al.* 2002). Maintenance on the nest can occur at any time of year (Kochert *et al.* 2002). Golden eagles often maintain alternate nest sites within a breeding territory, and old nests are refurbished and reused (Zeiner *et al.* 1990). Females lay 1-3 eggs in early February to mid- May (Polite and Pratt 1999). Incubation typically takes 43-45 days (Beebe 1974) and the nestling period usually 65-70 days (Polite and Pratt 1999). The male delivers food to the female, and the female feeds the young (USFS 2008). The young fly at about 50 days, remaining near the nest site for a few weeks (Baicich and Harrison 1997, Zeiner *et al.* 1990). Breeding site fidelity in adults is high (USFS 2008).

Golden eagle breeding success is variable and often fluctuates in close correlation with prey population abundance (USFS 2008). Annual reproductive success rates in Oregon were correlated with jackrabbit abundance, with a 15-year mean of 1.08 young fledged per breeding territory, 1.7 young fledged per successful nest, and 51% of the nests successful (Johnsgard 1990). More recently, Hunt *et al.* (1999) reported natality estimates of 0.64 and 0.58 young per pair for 57 and 59 pairs, respectively, in 1996 and 1997, within a 190-sq km (73 sq mi) study area in the central Coast Ranges.

Golden eagles are considered to be long-lived birds. Captive golden eagles have lived more than 40 years, and one captive bird reached 48 years of age (USFS 2008). There is one record of a wild golden eagle living at least 20. Another eagle (a female) was known to live for 30 years (Brown 1977, Roberson and Tenney 1993).

Home Range/Territory Size

Home ranges are likely the same as territory size (Polite and Pratt 1999). Size of home range related to prey density and availability, and openness of terrain (Polite and Pratt 1999). Territories are well defined and actively defended (USFS 2008). Pairs tend to nest on the periphery of their territories, often near an adjacent pair (USFS 2008). Golden eagle territories in southern California were found to average 93 km² (36 mi²) (Dixon 1937), while northern California territories average 124 km² (48 mi²) (Smith and Murphy 1973). Territories are generally larger in open grassland habitats than in more complex, mountainous terrain (Roberson and Tenney 1993). Territories are defended year-round by use of aerial behaviors such as undulating flight displays, dives, mock attacks, and soaring or "hanging on the wind" over the area (Johnsgard 1990).

Foraging Behavior and Diet

Golden eagles primarily prey on lagomorphs and rodents but will also takes other mammals, birds, reptiles, and some carrion (Polite and Pratt 1999). Studies of golden eagle diet indicate that mammals comprise 82 percent of the diet, supplemented by birds at 12.6 percent, with the remainder consisting of reptiles and fish (USFS 2008). Throughout its range, mammalian prey most commonly taken includes black-tailed jackrabbit, arctic ground squirrel (*Spermophilus parryi*), white-tailed jackrabbit (*Lepus*

townsendii), and yellow-bellied marmot (*Marmota flaviventris*) (Johnsgard 1990). Avian prey includes waterfowl and wading birds to the size of Canada goose (*Branta canadensis*), great blue heron (*Ardea herodias*), and cranes (*Grus* spp.) (Dunne *et al.* 1988).

Lagomorphs make up most of the diet of golden eagles throughout North America (Olendorff 1976). Several studies have suggested a relationship between golden eagle reproductive success and density of black-tailed jackrabbits (*Lepus Californicus*) (Murphy 1975, Kochert 1980, Thompson *et al.* 1982). In most areas, however, a wide range of prey species are taken (Thelander 1974, Olendorff 1976, Bloom and Hawks 1982, Collopy 1983). Some studies indicate that golden eagles shift their selection of prey species with changes in prey density (McGahan 1968, Bloom and Hawks 1982, Steenhof and Kochert 1988).

In the interior central Coast Ranges of California, golden eagles forage primarily in grazed grasslands, open shrublands, and oak savanna communities supporting large populations of ground squirrels (*Spermophilus* spp.) (Carnie 1954). Most studies of golden eagle foraging habits have shown that ground squirrels (*S. beecheyi*) are the principal prey item of golden eagles in the interior central Coast Ranges (Dixon 1937, Carnie 1954, Connelly *et al.* 1976, Hunt *et al.* 1999).

Golden eagles hunt by soaring high (30-90 m [98-295 feet]) along open ridges; they also make low (7-8 m [23-26 feet]), coursing flights (Polite and Pratt 1999). They will occasionally hunt from an exposed perch, where they initiate directed flights toward prey (Zeiner *et al.* 1990).

Habitat Requirements and Ecology

Golden eagles nest primarily on cliffs and hunt in nearby open habitats, such as grasslands, oak savannas, and open shrublands (Grinnell and Miller 1944). Rugged, open habitats with canyons and escarpments are used most frequently for nesting (Polite and Pratt 1999). Trees may also be used for nesting and are more commonly used in the interior Coast Ranges where suitable cliff nesting habitat is scarce. Nest trees include several species of oak (*Quercus* spp.), foothill pine (*Pinus sabianiana* and *P. coulteri*), California bay laurel (*Umbellularia californica*), eucalyptus (*Eucalyptus* spp.), and western sycamore (*Plantanus racemosa*) (Hunt *et al.* 1999). Nests are typically located 3-30 meters (10-100 ft) above the ground (USFS 2008). They are known to occur from sea level up to 3,833 meters (0-11,500 ft) (Grinnell and Miller 1944).

Important elements of suitable breeding habitat include 1) cliff ledges, rocky outcrops, or large trees for nesting; 2) open foraging terrain such as grassland, desert, savannah, and shrubland; and 3) availability of small to medium-sized mammalian prey, particularly ground squirrels and rabbits (Zeiner *et al.* 1990, Kochert *et al.* 2002). In southern California, golden eagles generally avoid heavily forested mountains, the coast, and urban areas (Ferguson-Lees and Christie 2001, Garrett and Dunn 1981). In central

California, golden eagles have nested primarily in open grassland and oak savannah, and occasionally in oak woodland and open shrubland habitats (Hunt et al. 1995, 1999).

Wintering golden eagles in the western United States use a variety of open habitats dominated by native vegetation and tend to avoid urban, agricultural, and forested areas (Craig *et al.* 1986, Marzluff *et al.* 1994, Kochert *et al.* 2002). Habitats with these characteristics typically support substantial prey populations of ground squirrels and black-tailed jackrabbits (Johnsgard 1990).

Species Distribution and Population Trends

Distribution

In North America, the golden eagle breeds mainly in western portion (west of the 100th meridian) of the continent from Alaska south to central Mexico, with small numbers in eastern Canada and a few isolated pairs in eastern United States (Kochert 2002). In California, the species is an uncommon permanent resident and migrant throughout the state, except for the center of the Central Valley (Polite and Pratt 1999). It is considered more common in southern California than in the northern part of the state (USFS 2008); however, the central interior Coast Ranges support a significant nesting and wintering population (Hunt *et al.* 1999).

Population Trends

The golden eagle appears to be thriving in North America; however, relatively few reliable population estimates exist (USFS 2008). Approximately 25,000 pairs have been estimated for the New World, and a world population of 50,000-75,000 pairs was conservatively estimated in 2001 (Johnsgard 1990). However, long-term survey data indicate overall population declines in most of the western United States (Kochert and Steenhof 2002). Golden eagle populations have declined, in particular, near human population centers (Thelander 1974, Scott 1985). Additionally, declines have been noted, especially along the southern California coast, as a result of habitat loss (Ferguson-Lees and Christie 2001).

Distribution and Population Trends in the Plan Area

The nesting distribution of golden eagles in Yolo County is restricted to the high elevation mountainous areas on the western side of the county. Like most of the interior Coast Ranges, this area is dominated by a mixture of oak woodland and chaparral communities, steep topography, and rocky ridges. There are potential cliff nesting sites along Blue Ridge and other high elevation ridge lines, some isolated rock outcrop sites that are capable of supporting golden eagle nests, and numerous potential tree-nesting sites. There are few official records of golden eagle nests in the area (CNDDDB reports no nesting golden eagles for Yolo County [CNDDDB 2008]); however, several have been incidentally reported over the years and are likely extant. An eagle nest has been reported and has been regularly observed from the northernmost extent of Blue Ridge at

Highway 16 (Estep pers. obs.). Other possible nesting areas include the remaining portions of Blue Ridge, portions of Rocky Ridge, and throughout much of the mountainous region east of Blue Ridge, north of Blue Ridge in the extreme northwest corner of the county, and the Capay Hills east of Capay Valley. Golden eagles are regularly observed year round throughout this area.

Golden eagles are also occasionally observed foraging in the grassland foothills along the western edge of the valley during the breeding season, and are occasionally observed, mainly during the winter months, on the valley floor. The species may occasionally forage in pasturelands.

Sustainability of the golden eagle population in Yolo County will require protection of high elevation nesting sites and surrounding woodland, chaparral, and grassland foraging habitat in the western portion of the county.

Threats to the Species and Other Conservation Issues

Throughout its range, the golden eagle is threatened by habitat loss and degradation, human disturbances, and direct fatalities from wind turbine strikes, electrocution, and poisoning. The conversion of native habitats to urban and agricultural lands has eliminated many large and unfragmented nesting and foraging habitat areas (Thelander 1974). The construction of residential developments and associated disturbances near traditional nest sites has also caused nest abandonment in some portions of California, particularly southern California and portions of the Coast Ranges (Carnie 1954, Boeker and Ray 1971, Thelander 1974, Scott 1985).

Humans and human-related phenomena (power lines, vehicles, toxic compounds [i.e. automobile antifreeze/coolant]) account for more than 70% of the documented deaths of golden eagles (Franson *et al.* 1995, Kochert *et al.* 2002). Franson *et al.* (1995) reported that accidental trauma (e.g., collisions with power lines, vehicles), electrocution, shooting, and poisoning cause 27%, 25%, 15%, and 6% of recorded deaths, respectively.

In Yolo County, threats to golden eagles are largely restricted to activities occurring in the mountainous areas on the western side of the county. Thus, habitat loss and conversion pose minimal risk to this population currently. However, other human disturbances including recreational activities and illegal shooting, as well as the potential for electrocution on unprotected utility poles, pose a more realistic threat to breeding and wintering eagles in Yolo County.

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