

There is an apparent correlation between daily activity patterns of the four raptor species and distribution of active nests. Thus the two raptors with the least similar daily activity patterns, Golden Eagles and Great Horned Owls show an aggregated distribution pattern when considered together. The two raptor species with the greatest similarity in daily activity patterns, Golden Eagles and Red-tailed Hawks, show a trend towards uniformity of distribution of active nests, suggesting interaction to at least some degree during nest site selection. The spacing of Golden Eagle and Ferruginous Hawk active nests is more random and may reflect the somewhat crepuscular activity of the Ferruginous Hawk.

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OBSERVATIONS OF GOLDEN EAGLES NESTING IN WESTERN WASHINGTON

by

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Nesting of the Golden Eagle (*Aquila chrysaetos*) west of the Cascade Mountains in Washington State generally has been considered rare, and more commonly has been identified with the open habitats of the arid country of eastern Washington (Dawson and Bowles 1909, Jewett *et al.* 1953, Alcorn 1978). However, Laing (1956) recorded nesting Golden Eagles on Vancouver Island, British Columbia, and Thomas (1977) noted

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probable nesting of Golden Eagles in western Oregon. In western Washington, Retfalvi (1963) observed adult and juvenile Golden Eagles on San Juan Island, Eaton (1976), reported 6 possible nest locations, and Servheen (1978) located an active nest on the west slope of the Cascade Mountains. By the summer of 1981, 21 nests in 13 territories had been reported to the Nongame Wildlife Program of the Washington Department of Game.

The nesting territories were widely distributed: 4 (with 5 nests) were on the western slopes of the northernmost Cascade Mountains; 4 (with 10 nests) in southwestern Washington; 3 (with 4 nests) on the Olympic Peninsula; and 2 (with 2 nests) in the San Juan Islands. We began systematic activity and productivity surveys in 1977, and have observed activity at 11 territories at least once in the past 5 years.

We have not been able to discern any particular pattern of use of territories or of alternate nests within territories. Boeker and Ray (1971) noted that patterns of territory and nest use by eagles in the southwestern United States varied widely among pairs, and we observed similar variation in western Washington. For example, one pair apparently nested in alternate years, another nested in alternate nests in successive years, and a third used the same nest for 4 years.

Of the 13 territories, 12 contain 20 nests located in Douglas-fir (*Pseudotsuga menziesii*), with the remaining nest on a cliff. We have numerous observations at 18 of the tree nests, and found that 17 were located at or below canopy height in trees near the edges of forest stands or in small stands of trees adjacent to clearcuts or open fields. This is consistent with findings of Anderson and Bruce (1981), who noted that Golden Eagle tree nests in western Washington often were distinguishable from Bald Eagle (*Haliaeetus leucocephalus*) nests. Golden Eagle nests tended to be smaller in size than those of Bald Eagles, were located on or very near the edge of a forest stand, and were located at or below the average canopy height. Bald Eagle nests were located at or above the canopy level, within the forest stands, and were nearer water than Golden Eagle nests. One Golden Eagle nest, unlike the others, was found in a dense forest stand overlooking Puget Sound, a habitat more typical for Bald Eagle nesting. This nest tree contained an active Bald Eagle nest in 1979, and an unsuccessful Golden Eagle nest in 1980.

All of the Golden Eagle nests we observed were adjacent to or no more than 500 m from large clearcuts or open fields, which support populations of medium-sized mammals such as mountain beaver (*Aplodontia rufa*), snowshoe hare (*Lepus americanus*), and European rabbit (*Oryctolagus cuniculus*). Servheen (1978) previously reported Golden Eagles preying on mountain beaver, and we found them, snowshoe hare, and unidentified bird remains at several nests. Additional prey species in the diet remain to be determined.

Golden Eagles likely have been present in small numbers for centuries in western Washington where fire provided necessary habitat. Thomas (1977) and Servheen (1978) suggested that clearcut logging creates highly favorable Golden Eagle habitat by providing large, open areas, that support prey species. This suggestion parallels the speculations by Leopold and Wolfe (1970) that the conversion of forestlands to pastures has created an improved habitat for Wedge-tailed Eagles (*Aquila audax*) in south-eastern Australia. Because modern forest practices increasingly have employed the clearcut method in western Washington and Oregon, Golden Eagles may be increasing as they make use of this expanded habitat.

Acknowledgments

E. Cummins and D. Russell provided observations of a nesting territory on the Olympic Peninsula and Cascade Mountains, respectively. M. Cooper, M. Fuller, R. Knight, and others reviewed various drafts of the manuscript.

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MATING BEHAVIOR IN THE GOLDEN EAGLE IN NON-FERTILIZATION CONTEXTS

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Gordon (1935) observed a pair of British Golden Eagles (*Aquila chrysaetos*) copulate late in the incubation period, hence long after it was necessary to fertilize eggs. Herein we report several observations of late season copulations at Golden Eagle eyries in North America, 2 observations of copulatory bouts in unusual behavioral contexts, and comments from the literature showing that this phenomenon is widespread if not well known for other birds of prey.

In species other than Golden Eagles copulatory bouts have been observed very early and very late in the breeding season. In the Ferruginous Hawk (*Buteo regalis*) Olendorff (1973) observed copulation while a pair was still on migration (spring) and Angell (1969) saw copulation in birds on territory but prior to nest repair. Mader (1979) reported copulation in the Harris' Hawk (*Parabuteo unicinctus*) with 5 week old young and Hamerstrom (1969) saw Northern Harrier (*Circus cyaneus*) copulation when their young were well fledged.

Copulatory bouts have been observed in unusual behavioral contexts. Retting (1977) reported a male Harpy Eagle (*Harpia harpyja*) attempting to copulate with the female when an observer moved down a tree limb toward the birds. Watson (1957) observed Snowy Owl (*Nyctea scandiaca*) displacement coition over 100 times during a single breeding season. Tulloch (1968) and Taylor (1973) also frequently observed displacement coition in the Snowy Owl following episodes wherein males escorted an intruder off the territories. Powers (unpub. data) observed Ferruginous Hawks perform copulation as a displacement activity in conflict situations: once when a Red-tailed Hawk (*Buteo jamaicensis*) was perched in the same tree with the pair, once when three coyotes (*Canis latrans*) were foraging nearby, once following a territorial interaction with two Swainson's Hawks (*Buteo swainsoni*), and once after the male was flushed by a human.

Observations herein were from 44 dawn-to-dusk watches at a Golden Eagle eyrie in the Sun River Valley, Montana, 1972. The bout reported below for Montana was made through observatin glass windows in a plywood blind less than 15 m away.

Of 21 copulatory bouts (Fig. 1) nearly all occurred before or after egg laying time when copulation was necessary for fertilization. Thirteen were observed or inferred (from vocalizations of hidden birds) after egg laying. Six followed hatching. The latest observed bout occurred 55 days after laying the last egg. When plotted chronologically the data suggest a bimodal distribution of timing of copulation bouts with peaks occurring at laying and hatching times. Interpretation is somewhat complicated, however, by an increase in observation days around hatching, and by the increased likelihood that an observer near the eyrie would miss a

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