NESTING HISTORY OF GOLDEN EAGLES IN MALHEUR-HARNEY LAKES BASIN, SOUTHEASTERN OREGON

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Abstract

Historically, the Golden Eagle (*Aquila chrysaetos*) was a common breeding species and permanent resident of Malheur-Harney Lakes Basin since at least 1875. Incidental records on breeding territories were available from 1875 to 1980. Data were available from preselected breeding territories from 1966 to 1980. Eaglets fledging per occupied breeding territory fluctuated annually from 0.20 to 1.67. A total of 179 breeding territories were examined on or adjacent to Malheur National Wildlife Refuge. Our data agree with studies elsewhere which suggest a relationship between Golden Eagle reproductive success and abundance of their major prey species, the black-tailed jackrabbit (*Lepus californicus*). Nesting and fledging success are summarized for 1940, and 1966 through 1980.

Introduction

Several unpublished Golden Eagle studies have been conducted in the Malheur-Harney Lakes Basin in southeast Oregon. Here we attempted to summarize past studies and present the nesting status for the species in the basin. Nesting surveys were conducted in 1940, and from 1966–1980. Incidental records on specific nests were available from 1875–1980. In 1966, The U.S. Fish and Wildlife Service initiated a study of Golden Eagles in southwest Idaho and southeast Oregon. This preliminary field work (Hickman 1968) began long term data collection on and adjacent to Malheur National Wildlife Refuge (NWR), Harney County, Oregon.

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Study Area

Malheur-Harney Lakes Basin is in the northwest extremity of the Great Basin. It is composed of the High Lava Plains and Basin and Range Physiographic Provinces (Franklin and Dyrness 1973). The High Lava Plains Province is characterized by extensive basalt-rhyolite rimrock formations, while the Basin and Range Province consists of fault block mountains enclosing internal drainage basins. Elevation varies from 1227–1586 m (4025–5200 ft.).

The relatively flat lowlands are a mosaic of shrub uplands, freshwater marshes, seasonally wet meadows and alkali playas. Within the shrub upland native and introduced grasses are common. Dominant shrubs include big sagebrush (*Artemisia tridentata*), low sagebrush (*A. arbuscula*), black greasewood (*Sarcobatus vermiculatus*) and rabbitbrush (*Chrysothamus spp.*). Freshwater emergents grow adjacent to the shrub upland in marshes. Wet meadows are composed of meadow grasses including timothy (*Phleum pratensis*), wildryes (*Elymus spp.*), meadow barley (*Hordeum hystrix*), and red top (*Agrostis alba*). A unique feature of the basin is the extensive ecotone between the seasonal flooded wetlands and shrub uplands. Low rimrock cliffs 5–70 m high provide a sharp ecotone between sagebrush and wetland plant communities. Generally, the region resembles the Great Basin of northern Nevada and western Utah. Vegetation in some areas has been converted to alfalfa, cereal grains and crested wheatgrass. Many of the crested wheatgrass monotypic seedings range from 800 to 3200 ha.

The climate is semi-arid, typical of the cooler portions of the Intermountain West. Most precipitation occurs from November through January principally in the form of snow. Water on all lakes and ponds, except those with warm springs, is usually frozen from late November through early February.

Methods

Data were collected annually on an average of 11 (range 5 to 18) breeding territories from 1966–1979. In 1980, 33 territories were surveyed, 15 of which were associated with predominantly sagebrush and greasewood plant communities. Another 15 were associated with varying degrees of wetland habitat. Three were not used in the analysis comparing wetlands and rangelands because they could not be clearly classified into either community. Breeding territories were recorded as active or inactive. Breeding territories were considered unoccupied when no sign of territorial defense, courtship, or other related reproductive activities were noted after several visits. Both traditional and alternative nest sites were plotted on topographic maps and all known nests within a territory were examined annually. Most surveys were conducted on foot and by vehicle, but fixed-wing aircraft and helicopters were used at least 1 time a year. Field work began in February and continued through August. Additional observations were also noted for the remainder of the year, but not on a regular basis. Terminology used to describe reproductive success follows the definitions as defined by Postupalsky (1974).

Data collected in 1940, and 1966–1976 were analyzed by us. Additional data were collected by us during 1977–1980. Oologist records of egg sets and nest site descriptions were provided by the Western Foundation of Vertebrate Zoology (Lloyd Kiff pers. comm.). Field notes of William E. Griffee were also incorporated into this report.

Results and Discussion

Historically, Golden Eagles have been a common breeding species in the basin since at least 1875 (Bendire 1877). The first nesting record was by Captain Charles Bendire (1877). He stated, "Golden Eagles are moderately abundant throughout the mountainous portions during the greater part of the year. Each pair appears to confine itself to a certain district and no others breed there. I have heard of several other nests in this vicinity at intervals of about twenty miles from the other. They are generally seen hunting in pairs in the early spring, chasing ducks, geese, and sagehens, and most successfully." Captain Bendire took eggs from a nest located in a ponderosa pine (*Pinus ponderosa*) on 9 April 1877 and 4 April 1878.

Willett (1919) also reported Golden Eagles as rather common in the mountainous sections surrounding the lake in 1918. In 1936, Jewett (Lloyd Kiff pers. comm.) located 2 large, downy young on 15 May 1934 near the present site of Krumbo Reservoir. Jewett also recorded the species as common on Steens Mountain (Jewett 1936).

William E. Griffee collected Golden Eagle egg sets annually within the basin from 1937–1942. In 1940, only 2 of the 7 nests that Griffee visited contained eggs. Two sites had single birds near their nests, but no eggs were present, and no nesting activity was noted at 3 other traditional sites. In 1941, of 6 nests traditionally visited, 4 contained eggs; 1 was decorated and ready for eggs with both birds in attendance; and 1 appeared deserted. Of the 4 occupied nests, 3 held sets of 3 eggs, while 1 had 2 eggs. He also recorded an unusually large number of 3 egg clutches in 1942. Black-tailed jackrabbits were extremely common in the spring of 1941 (Griffee).

The first documented study on Golden Eagles in the basin was conducted by Frank W. Groves (Refuge files). In 1940, Groves found all 7 sites he examined to be active. Four of the 7 sites fledged 6 young (0.86 fledged/occupied breeding territory; 1.5 fledged/successful nest).

Although few data were collected from 1950 to 1966, Golden Eagle populations were apparently low. John Scharff (Refuge files) stated, "There has been a 75 percent reduction in the Golden Eagle population in the Malheur NWR area since 1950." He postulated that the local population reduction was probably due to low jackrabbit populations, with a few eagles being shot. A large "jackrabbit crash" was recorded in 1950 (Refuge files).

Since 1966, traditional sites have been examined every year except 1975. Food habit data collected in 1940, 1966 and 1967 indicated Golden Eagles depend heavily on black-tailed jackrabbits as their primary prey during the nesting season (Table 1). Gabrielson and Jewett (1940) reported, "The Golden Eagle feeds largely on jackrabbits, but also takes waterfowl and other birds, all kinds of rodents, and possibly occasional lambs and fawns."

Table 1. Percent frequency of prey remains at Golden Eagle nesting sites in southeast Oregon (Malheur-Harney Lakes Basin).

Prey Species	%Frequency 1940 (Groves)	%Frequency 1966-67 (Hickman)
Mammals	**78**	**69**
black-tailed jack rabbit (*Lepus californicus*)	69	49
Nuttall's cottontail (*Sylvilagus nuttallii*)	4	12
yellow-bellied marmot (*Marmota flaviventris*)	5	2
Other Mammals	0	6
Birds	**22**	**29**
dabbling ducks (*Anas* spp.)	20	9
Other Birds	2	20
Other Species	**0**	**2**
TOTAL	**100**	**100**

McAdoo and Young (1980) stated that jackrabbit populations are cyclic. Wagner and Stoddart (1972) reported that black-tailed jackrabbits normally experience cyclical population fluctuations with 4 or 5 years of population decline (1962 to 1967), followed by 3 successive years of population increase. In west-central Utah, Murphy (1975) reported that rabbit densities were moderately low in 1967, rose to a peak in 1969, then began a precipitous decline falling to very low levels in 1973. Kochert (1980) assumed that in southwest Idaho jackrabbit numbers peaked in 1970 or early 1971. Jackrabbit populations in southwest Idaho declined in 1972 and reached a low level in 1973, 1974, and 1975. By 1976–1978, their numbers had increased but were still below 1971 levels. The timing of our subjective jackrabbit "highs" and "lows" approximate those of Murphy and Kochert. A "jackrabbit crash" occurred in the Malheur-Harney Lakes Basin during the winter of 1972–1973 (Littlefield 1976). Several investigators (Palmer 1897; Nelson 1909; Clark 1972; Wagner and Stoddart 1972; Newton 1979; McAdoo and Young 1980) suggest a 7–10 year jackrabbit population cycle. Low and high populations are evident by their scarcity and abundance. Our subjective rabbit estimates suggest that 7–10 year cycles also occur in the Malheur-Harney Lakes Basin.

Murphy (1975) and Kochert (1980) found that fledging rates in Utah and Idaho closely followed fluctuations in jackrabbit populations. Kochert (1980) found nestling survival declined markedly from good to poor jackrabbit years. Kochert reported decreases in the percent of successful pairs, number of young fledged per successful attempt, and number of young fledged per pair. In southeast Oregon, we believe the most reliable indicators of Golden Eagle production were fledglings per pair and the percent of traditional eyries which were successful in fledging at least 1 young (Table 2, Fig. 1). Eagle reproductive success closely paralleled our subjective estimates of jackrabbit frequency.

Table 2. Golden Eagle breeding data 1940, 1966–80 in southeast Oregon; sample size (n) in parentheses.

Year Occupied	# Fledged Per Breeding Territory	# Fledged Per Successful Nest	# Successful Nests / # Breeding Territories Checked
1940	0.86 (7)	1.50 (4)	57% (7)
1966	1.00 (6)	1.50 (4)	57% (7)
1967	1.40 (10)	1.75 (8)	73% (11)
1968	1.60 (5)	2.00 (4)	57% (7)
1969	1.67 (6)	1.67 (6)	66% (9)
1970	1.00 (8)	1.60 (5)	45% (11)
1971	0.89 (9)	2.00 (4)	40% (10)
1972	0.50 (10)	1.67 (3)	27% (11)
1973	0.20 (10)	2.00 (1)	8% (13)
1974	0.55 (11)	2.00 (3)	25% (12)
1975			
1976	1.00 (8)	1.60 (5)	55% (9)
1977	1.50 (8)	2.00 (6)	60% (10)
1978	1.62 (13)	1.75 (12)	75% (16)
1979	1.06 (16)	1.42 (12)	71% (17)
1980	1.39 (18)	1.67 (15)	83% (18)
Pooled Mean	1.08 (145)	1.70 (92)	51% (179)

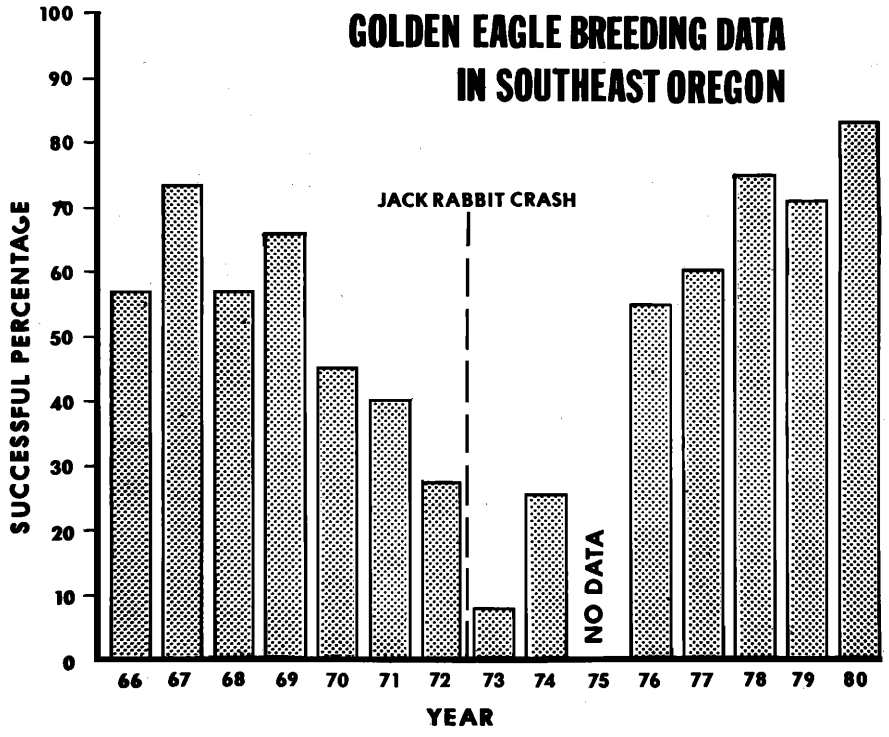

Figure 1. Golden Eagle reproduction data, Harney Co., Oregon. Percentage of Golden Eagle pairs fledging at least one successful young from 1966–1980.

The percentage of breeding territories which were successful in fledging at least one young were higher in years when jackrabbit populations appeared high. In contrast, eagles were less successful when jackrabbits appeared scarce (Fig. 1). Murphy (1975) found in low prey years, even though fewer pairs breed, there is a high potential for success on the part of those which do nest. Our data support Murphy's conclusions.

Within the basin, approximately 50,587 ha of native range have been converted to crested wheatgrass (G. Wing pers. comm.). For the past 7 years, approximately 1215 ha per year, of sagebrush and greasewood, have been cleared and converted to cereal crops or alfalfa (Paul Friedricksen pers. comm.). Brush species provide escape cover to jackrabbits from aerial predators such as Golden Eagles. The ability of brush species to store water during winter and early spring months may be as important to jackrabbit survival as escape cover. Water is known to be important, with most workers agreeing that jackrabbits select succulent vegetation (Hansen and Flinders 1969). In northern Utah, Westoby (1980) found shrubs, such as sagebrush and greasewood, were commonly selected in the jackrabbit's diet because of their relatively high water content. Sagebrush was a large proportion of their diet from the beginning of shrub dormancy (November) until new growth began in April. This may explain why breeding territories associated with large blocks of monotypic vegetation, such as crested wheatgrass and agricultural areas, were not as successful as sites with a mosaic of native vegetation. Because Golden Eagles are permanent residents within the basin, it is important that substantial areas re-

main in native vegetation. Small monotypic stands of agriculture and crested wheatgrass within a breeding territory may increase diversity, thereby increasing the prey base.

Several workers (Perrins 1969; Krapu 1979; Newton 1979) have discussed the need for proper nutrition of adult birds before egg laying and incubation. It seems logical that pairs associated with wetland habitat should have an available food supply to exploit during the critical winter months prior to egg laying and incubation that is not available in the shrub uplands. In 1980, additional breeding territories were examined, bringing the total checked to 33. Fifteen were associated with predominantly sagebrush and greasewood plant communities and another 15 were adjacent to wetland plant communities. In 1980, the mean number of fledglings per occupied breeding territory was 1.07 in sagebrush and greasewood communities as compared to 1.67 fledged per occupied territory associated with varying degrees of wetland habitat. These data were significant ($t = 2.40$; $p<.05$) indicating eagles were more productive adjacent to wetlands. The low elevation wetland areas attract migratory waterfowl, upland game birds, mule deer (*Odocoileus hemionus*), jackrabbits, and usually large populations of wintering livestock (Refuge files).

The amount and quality of wetlands within breeding territories varied. During winter, prey appeared to concentrate near wetland lowlands. Thus, pairs associated with wetland habitat may have an abundant food supply prior to egg laying. When jackrabbit numbers were low or declining Golden Eagles pairs in territories associated with sagebrush and greasewood plant communities and no wetlands would be forced to exert more energy to obtain food. The apparent difference in potential prey frequency is one possible explanation for the differences noted in reproductive success between occupied breeding territories adjacent to wetlands and those inhabiting homogeneous rangelands in 1980.

Of data collected on 179 breeding territories over a 15 year period, the fate was determined on 145 (Table 2). Ninety-two (63%) of the 145 of known fate were successful in raising at least 1 young. In our study area, 156 eaglets fledged from 107 occupied breeding territories (1.46 eaglets fledged/occupied territory). Eaglets fledged per successful nest was slightly higher, with 1.70 fledged per successful nest (156 eaglets fledged/92 successful nests). These data are very comparable to other long term studies in Scotland and Idaho (Watson 1957, USDI 1979).

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