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ECOLOGY OF THE GOLDEN EAGLE

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THE American eagles have declined over much of their former range. Recently a notable decrease in the number of Bald Eagles (*Haliaeetus leucocephalus*) occurred on the eastern coast of the United States (Carson, 1962); this decline emphasized the need of determining population norms for the Golden Eagle (*Aquila chrysaetos*) so that any reduction could be recognized early and the possible causes isolated and evaluated.

The stability of Golden Eagle populations is threatened by several factors. Although a federal law was enacted in 1962 to provide protection for this species, limited seasons have been reopened in many of the western states for killing eagles that are purported to be taking livestock. The widespread use of pesticides has introduced another threat (Cramp, 1963; Dewitt and Buckley, 1963; Lockie and Ratcliffe, 1964; Watson and Morgan, 1964).

The conservation and management of any species is contingent upon an understanding of its population dynamics. The effects of a new environmental influence impressed upon any population of organisms can only be determined accurately if a thorough study has been made earlier. The object of this paper is to provide basic information. The density, productivity, nesting success, and mortality of a Montana population of Golden Eagles were determined; nesting behavior and movements were observed. These data can aid in determining the effects of such changes as the expanded use of pesticides, by comparing them either with data taken where pesticide levels are much higher or with data obtained if pesticides are introduced directly into the study area. In addition, data on the food habits of this population are of value for estimating the economic status of this large raptor.

STUDY AREA

The principal study area (Area A) is near Livingston, Montana, in central and eastern Park County and western Sweetgrass County. The area is 30 by 42 miles, and includes 35 townships. Area B designates the surrounding country of south-central Montana not included in the principal study area.

Area A is bordered by the Bridger, Crazy, and Absaroka mountain ranges. Elevations range from 4,000 to 10,000 feet above sea level. Temperatures are mild and the annual precipitation is near 12 to 13 inches. Persistent local and thermal currents prevail in the area and may be important factors in delimiting suitable nesting territories.

Over half of Area A is cultivated for hay, winter wheat, and barley. Other vegetation on the lower slopes between 4,000 and 6,000 feet consists of wheatgrasses (*Agropyron* spp.), fescues (*Festuca* spp.), needlegrasses (*Stipa* spp.), Junegrass (*Koeleria cristata*), and wild rye (*Elymus* spp.) interspersed with sagebrush (*Artemisia tridentata*) and juniper (*Juniperus scopulorum*). Douglas fir (*Pseudotsuga menziesii*) grows at lower altitudes and lodgepole pine (*Pinus contorta*) occupies the higher slopes.

The intermediate slopes between 5,500 and 7,500 feet are characterized by vegetation of alpine fescues (*Festuca ovina*), bluegrasses (*Poa* spp.), and hairgrasses (*Deschampsia* spp.). Sagebrush and juniper begin to diminish as ninebark (*Physocarpus* sp.), snowberry (*Symphoricarpos* sp.), and arrow-wood (*Viburnum* sp.) become more plentiful. Douglas fir and lodgepole pine are still the most prevalent types of timber at this altitude. Engelmann spruce (*Picea engelmanni*), alder (*Alnus* spp.), and willow (*Salix* spp.) grow in the wet bottoms.

On the high slopes between 7,000 and 10,000 feet alpine fescues and sedges (*Carex* spp.) are prominent. Lodgepole pine is the dominant timber type. Subdominant timber consists of Douglas fir, alpine fir (*Abies lasiocarpa*) and limber pine (*Pinus flexilis*).

NEST LOCATIONS

Locating nests proved a time-consuming and challenging physical task. Most of the nests observed in this study were located from May through August, 1962. Food habit data were gathered from May through July, 1962–1964. Data on nest sites and productivity were taken in 1963 and 1964 from May through July, except for data on egg production obtained in mid-March of 1964 and 1965. Several nests were visited only once during the nesting season; others were approached up to 10 times during one season to gather additional information on the food habits. Complete data were unavailable for some nests, hence not all the nests are represented in every aspect of the study.

Nest sites.—Of the total of 92 occupied and unoccupied nests found, 62 per cent were located on cliffs (Table 1). These nests were usually in positions accessible only by ropes. The next most common nest site (26 nests) was the Douglas fir, a tree characterized by large limbs that provide ideal support for the heavy, bulky nests. Unoccupied nests were classified as Golden Eagle nests if they were large enough to exclude the possibility of being *Buteo* nests or if they contained eagle feathers.

In Wyoming, Colorado, and New Mexico, Wellein and Ray (1964) found that of 79 occupied and unoccupied nests, 87 per cent were on cliffs, 9 nests (11 per cent) were in trees, and 1 nest was on the ground. In Scotland, Watson (1957) found that 70 per cent of 64 nests were placed on rocks, the rest in pine trees.

TABLE 1
NUMBER (AND PERCENTAGE) OF GOLDEN EAGLE NESTS IN VARIOUS SITES
IN AREAS A AND B

Nest sites	1963		1964		All nests ¹
	Unoccupied	Occupied	Unoccupied	Occupied	
Cliff	32 (59)	22 (71)	35 (67)	21 (70)	57 (62)
Douglas fir	15 (28)	8 (26)	15 (29)	7 (23)	26 (29)
Cottonwood	1 (2)	1 (3)	1 (2)	2 (7)	3 (3)
Ponderosa pine	2 (3)	0 (0)	0 (0)	0 (0)	2 (2)
Dead snag	2 (4)	0 (0)	0 (0)	0 (0)	2 (2)
Ground	2 (4)	0 (0)	1 (2)	0 (0)	2 (2)
Totals	54 (100)	31 (100)	52 (100)	30 (100)	92 (100)

¹ All nests for which this information was recorded, regardless of the years of construction, destruction, occupation, or abandonment.

Other investigators have found different ratios for nest site locations. In Alaska, 23 nests were all on cliffs (Murie, 1944). In Scotland, Gordon (1955) claims that most Golden Eagle nests of the central highlands are in Scots fir (*Pinus sylvestris*), while in the Hebrides nests are always on cliffs. In California (Dixon, 1937) eagles nesting in trees use oaks (*Quercus* spp.) and eucalyptus (*Eucalyptus* spp.). The choice of nest sites is, of course, limited by the range of environmental possibilities. The similar findings of this study and Wellein and Ray's probably reflect a similarity of environments; both study areas were in the foothills of the Rocky Mountains.

Of all nests (occupied and unoccupied) in my study, 81 per cent were at altitudes between 4,000 and 6,000 feet (Table 2). Wellein and Ray (1964) found 85.5 per cent of all their nests in the southern Rockies in this altitude range, again probably reflecting similarity of habitat. The highest altitude of nests located in either my Area A or B was 7,000 feet; three occupied nests were observed at this elevation. Packard (1945)

TABLE 2
NUMBER (AND PERCENTAGE) OF GOLDEN EAGLE NESTS AT VARIOUS ALTITUDES
IN AREAS A AND B

Altitude ranges (feet)	1963		1964		All nests ¹
	Unoccupied	Occupied	Unoccupied	Occupied	
3,000-4,000	2 (4)	1 (4)	3 (6)	0 (0)	3 (4)
4,000-5,000	24 (48)	10 (37)	26 (58)	11 (41)	37 (46)
5,000-6,000	18 (36)	10 (37)	12 (27)	11 (41)	28 (35)
6,000-7,000	5 (10)	3 (11)	3 (7)	3 (11)	8 (10)
7,000-8,000	1 (2)	3 (11)	1 (2)	2 (7)	4 (5)
Totals	50 (100)	27 (100)	45 (100)	27 (100)	80 (100)

¹ All nests for which this information was recorded regardless of the years of construction, destruction, occupation, or abandonment.

TABLE 3
EXPOSURES OF OCCUPIED CLIFF NESTS, 1963-1964, AREAS A AND B

Year	Direction of exposure			
	North N (Per cent)	East N (Per cent)	West N (Per cent)	South N (Per cent)
1963	2 (9)	5 (23)	4 (18)	11 (50)
1964	2 (10)	5 (24)	4 (19)	10 (48)

found an empty Golden Eagle nest at 9,500 feet in Colorado, and Wellein and Ray (1964) one at 10,000 feet.

In 1963, 11 of 22 cliff nests were on southern exposures, 5 faced east, 4 faced west, and although as many cliffs with northern exposures were available, only 2 nests were found on them (Table 3). Differences observed in 1964 were negligible. These data suggest that nest-site preference is influenced by the direction of the sun's rays. Exposure should be important during the early spring months, particularly for the eggs and incubating adults in March when the average monthly temperature is often below freezing. Even in the warmer months of June and July, nests facing south and east might be preferable; those with easterly exposures would receive the warm morning sun and be shaded in the hot afternoons. In Scotland Watson (1957) found that most of the nests in his study area faced either north or east, which he also noted was how most of the cliffs faced.

Proximity of nests.—The maximum and minimum distances between nearest neighbors for 17 occupied nests in 1963 were 10.5 miles and 1.2 miles. In 1964 the maximum distance was 10.2 miles, and the minimum distance of 1.0 mile separated two nests on the same long semicircular cliff, one facing southwest and the other southeast. In 1939 Murie (1944) found two pairs of eagles nesting 1.5 miles apart.

Many pairs of eagles build more than one nest. They generally use the same nest through consecutive nesting seasons, even though they repair the supernumerary nests and attend them regularly until the eggs are laid. Supernumerary nests were found for 20 nesting pairs, or 56 per cent of 36 occupied nests visited from 1961 to 1965. Pairs with more than one nest had an average of 1.8 supernumerary nests. One pair attended eight nests, no two of them farther apart than 0.3 mile; 11 pairs had one supernumerary nest each, the remaining 8 pairs had two or three additional nests. Watson (1957) reported a total of 64 eyries that belonged to 12 pairs of eagles in Scotland. A single pair in California had 12 nests (Dixon, 1937). I found the distances separating nests of a single pair highly variable; they ranged from a few feet to 3.8 miles. Lockie and Ratcliffe (1964) found alternate nests in Scotland ranging from a few yards to 3 miles apart.

TABLE 4
COMPARISON OF CLUTCH SIZES FROM DIFFERENT AREAS

Area and investigator	Number of clutches in sample	Frequency of different clutch sizes (per cent)		
		1 egg	2 eggs	3 eggs
California (Dixon, 1937)	unknown	10	80	10
California (Hanna, 1930)	unknown	35	60	5
California (Slevin, 1929)	21	19	67	14
Scotland (Gordon, 1927)	82	18	72	10
Colorado (Jollie, 1943) ¹	5	20	80	0
Montana (present study)	20	5	80	15

¹ "The Golden Eagle: Its life history, behavior, and ecology," M. S. dissertation, University of Colorado, 1943.

In 1963 the average density for 17 known nesting pairs of Golden Eagles in Area A was one pair per 74.2 square miles. In 1964 the same area supported 19 known pairs for an average density of one pair per 66.3 square miles. These figures express the maximum area per pair, for areas inhabited by humans are included, and unknown nesting pairs may also have been present. Dixon (1937) mapped the actual areas 27 nesting pairs of Golden Eagles used in California; ranging from 19 to 59 square miles, these averaged 36 square miles, or the equivalent of one township. Arnold (1954) located 6 pairs of eagles on 6 adjacent townships in Colorado. Lockie (1964) determined each of 13 Golden Eagle pairs in Scotland occupied an average of 27.1 square miles. In another Scottish study Watson (1957) found the average area for each of 5 pairs of eagles was 9 square miles.

TABLE 5
YOUNG HATCHED AND FLEDGED, 1963-1964, AREAS A AND B

	Area A	Area B	Area A and B
Number of nesting efforts 1963	13	8	21
Number of nesting efforts 1964	19	11	30
Number hatched 1963	22	14	36
Number hatched 1964	27	18	45
Average number hatched per nest 1963	1.69	1.75	1.71
Average number hatched per nest 1964	1.42	1.64	1.50
Average number hatched per nest 1963-1964	1.53	1.68	1.59
Number fledged 1963	18	11	29
Number fledged 1964	23	18	41
Average number fledged per nest 1963	1.38	1.38	1.38
Average number fledged per nest 1964	1.21	1.64	1.37
Average number fledged per nest 1963-1964	1.28	1.53	1.37
Per cent of hatched that fledged 1963	81.8	78.6	80.6
Per cent of hatched that fledged 1964	85.2	100	91.1
Per cent of hatched that fledged 1963-1964	83.7	90.6	86.4

TABLE 6
SUMMARY OF PREY COMPOSITION¹

Prey type	1962		1963		1964		Total	
	N	(Per cent)	N	(Per cent)	N	(Per cent)	N	(Per cent)
Mammals	83	(85.0)	355	(88.5)	416	(86.2)	854	(87.0)
Birds	15	(15.0)	45	(11.1)	62	(12.7)	122	(12.4)
Reptiles	0	(0.0)	0	(0.0)	4	(0.8)	4	(0.4)
Game species	9	(9.0)	30	(7.4)	48	(9.9)	87	(8.8)
Non-game species	89	(91.0)	369	(92.0)	434	(89.8)	892	(90.9)
Domestic species	0	(0.0)	1	(0.2)	0	(0.0)	1	(0.1)

¹ Based on 95 samplings taken from 38 nests.

PRODUCTIVITY

Clutch size.—In 1964, 13 nests produced 29 eggs; in 1965, 7 nests contained 13 eggs, an average of 2.1 eggs per nest for the 2 years. Three nests contained 3 eggs; one nest held only 1 egg, and the remaining nests contained 2 eggs each. Table 4 lists clutch sizes recorded in California, Colorado, and Scotland. The percentages of clutches in each of the three size categories do not differ statistically among these areas.

Hatching and fledging success.—In 1963 and 1964 a total of 45 successful nesting efforts hatched 81 young for an average of 1.8 young per nest. Of those hatched 70 (86.4 per cent) fledged, an average of 1.56 fledglings per nest. Combining these data with those from unsuccessful nesting attempts yields an average of 1.59 young per nest hatched and 1.37 per nest fledged (Table 5).

Data obtained by Wellein and Ray (1964) from 23 nests reveal similar productivity in the southern Rockies, where 1.59 young hatched per nesting attempt, an average of 1.32 birds per nest fledged, and 85.7 per cent of all young fledged, not counting four young the investigators took for study purposes.

In Scotland, Watson (1957) recorded lower productivity values; 5 nests produced 0.8 young per annum per pair over a 12-year period. There also Brown and Watson (1964) recorded fewer than 1.3 eaglets reared for each of 97 successful nestings, and Sandeman (1957) recorded 1.4 young fledged for each of 19 successful nests.

FOOD HABITS

Remains of prey were counted, recorded, removed from the nest, and when possible identified. Pellets regurgitated by both adults and young were counted, collected, and stored. To aid in analysis of pellet contents, microscope slides were prepared of hairs of the different resident mammals, for use with mammalian hair keys (Mathiak, 1938; Spence, 1963). In all,

TABLE 7
FOOD OF NESTING GOLDEN EAGLES, AREAS A AND B, 1962-1964¹

Prey species	Scientific name	1962		1963		1964		Total	
		N	Per cent	N	Per cent	N	Per cent	N	Per cent
Whitetail jackrabbit	<i>Lepus townsendii</i>	38	39	156	39.0	171	35.5	365	37.2
Cottontail (desert and mountain)	<i>Sylvilagus audubonii</i> , <i>S. nuttallii</i>	32	33	126	31.5	161	33.4	319	32.6
Yellow-bellied marmot	<i>Marmota flaviventris</i>	11	11	26	6.5	33	6.8	70	7.1
Richardson's ground squirrel	<i>Citellus richardsonii</i>	0	0	25	6.2	19	3.9	44	4.5
Black-billed Magpie	<i>Pica pica</i>	7	7	18	4.5	19	3.9	44	4.5
Gray Partridge	<i>Perdix perdix</i>	2	2	9	2.2	15	3.1	26	2.7
Mule deer (fawn)	<i>Odocoileus hemionus</i>	1	1	8	2.0	15	3.1	24	2.4
Blue Grouse	<i>Dendragapus obscurus</i>	5	5	8	2.0	6	1.2	19	1.9
Longtail weasel	<i>Mustela jrenata</i>	0	0	0	0	10	2.1	10	1.0
Sage Grouse	<i>Centrocercus uro- phasianus</i>	0	0	2	0.5	8	1.7	10	1.0
Vole (longtail, Richardson's, and others)	<i>Microtus</i> spp.	0	0	4	1.0	5	1.0	9	0.8
Great Horned Owl	<i>Bubo virginianus</i>	1	1	2	0.5	3	0.6	6	0.6
Blacktail prairie dog	<i>Cynomys ludovicianus</i>	0	0	5	1.2	0	0	5	0.5
Red Shafted Flicker	<i>Colaptes cafer</i>	0	0	2	0.5	2	0.4	4	0.4
Ring-necked Pheasant	<i>Phasianus colchicus</i>	0	0	0	0	4	0.8	4	0.4
Pronghorn antelope (fawn)	<i>Antilocapra americana</i>	1	1	2	0.5	0	0	3	0.3
Short-eared Owl	<i>Asio flammeus</i>	0	0	2	0.5	0	0	2	0.2
Prairie rattlesnake	<i>Crotalus viridis</i>	0	0	0	0	2	0.4	2	0.2
Unidentified snake		0	0	0	0	2	0.4	2	0.2
Striped skunk	<i>Mephitis mephitis</i>	0	0	0	0	1	0.2	1	0.1
Porcupine	<i>Erethizon dorsatum</i>	0	0	0	0	1	0.2	1	0.1
Bushytail woodrat	<i>Neotoma cinerea</i>	0	0	1	0.2	0	0	1	0.1
Muskrat	<i>Ondatra zibethicus</i>	0	0	1	0.2	0	0	1	0.1
Domestic lamb	<i>Ovis</i> spp.	0	0	1	0.2	0	0	1	0.1
Long-eared Owl	<i>Asio otus</i>	0	0	1	0.2	0	0	1	0.1
Sharp-tailed Grouse	<i>Pedioecetes phasianellus</i>	0	0	1	0.2	0	0	1	0.1
Marsh Hawk	<i>Circus cyaneus</i>	0	0	0	0	1	0.2	1	0.1
Sparrow Hawk	<i>Falco sparverius</i>	0	0	0	0	1	0.2	1	0.1
Rock Dove	<i>Columba livia</i>	0	0	0	0	1	0.2	1	0.1
Hawk (nestling)		0	0	0	0	1	0.2	1	0.1
Long-billed Curlew	<i>Numenius americanus</i>	0	0	0	0	1	0.2	1	0.1

¹ Based on 95 samplings taken from 38 nests.

95 samples were taken from 38 eyries, which included 321 pellets, or 3.4 per sample. From these 980 prey specimens, or 10.3 per sampling, were identified, indicating the minimum number of individuals that the various identified items could represent.

Identified prey.—Of the 980 specimens of prey identified, 87 per cent were mammals (Table 6). Of the mammals, 80 per cent were lagomorphs. Whitetail jackrabbits were the major prey species, composing 42.7 per cent of the mammals and 37.2 per cent of all prey items (Table 7). Desert and mountain cottontails were nearly as plentiful, representing 37.4 per cent

of the mammals and 32.6 per cent of the total. Birds composed 12.4 per cent of the total number of prey specimens, with Black-billed Magpies the most prevalent, representing 36 per cent of the birds. Gray Partridge and Blue Grouse were fairly common, together composing 37 per cent of the birds. The only reptiles tallied were four snakes, representing only 0.4 per cent of the total number of prey individuals.

Game and domestic species.—Game and domestic species represented only 8.8 per cent of the prey recorded. Of all the game species, 30 per cent of the individuals were Gray Partridges. Mule deer fawns represented 28 per cent, Blue Grouse, 22 per cent, and Sage Grouse, 11 per cent. The remaining 8 per cent included Ring-necked Pheasants, pronghorn antelope fawns, and a Sharp-tailed Grouse. It is not known how many of these were taken as carrion.

Predation by eagles on live game of numerous species and on domestic species has been reported by many observers in various places. Golden Eagles have been known to kill or attack bighorn sheep (*Ovis canadensis*) lambs (Kennedy, 1948), pronghorn antelope (Lehti, 1947), whitetail deer (*Odocoileus virginianus*) (Willard, 1916), mule deer (Craighead and Craighead, 1956), domestic geese (Smith, 1915), chickens (Musselman, 1942), calves (Wood, 1946), and lambs (Gordon, 1955; Lockie, 1964; Lockie and Stephen, 1959). Other investigators have observed that eagles either neglect or only very slightly affect various domestic and game animals (Arnold, 1954; Brown and Watson, 1964; Lockie and Stephen, 1959; Stephen, 1950). In the present study, one pair of Golden Eagles nested 200 yards from a small farm with several hundred chickens. In the 5 years the eagles had nested there they were never known to prey on the poultry.

Indeed, predation on domestic species in this study was negligible. On Area A during the investigation 26,000 to 28,000 sheep were reared, with an annual production of approximately 18,000 lambs, yet none was found in 702 prey items. The remains of one lamb, possibly taken as carrion, were found at the foot of a nest in Area B.

Other food habit studies.—Other American studies have also shown a predominance of lagomorphs, ranging from 28 to 90 per cent, in the diets of Golden Eagles (Arnold, 1954; Carnie, 1954; Gloyd, 1925; McAtee, 1935; Woodgerd, 1952). In several European studies avian forms made a large proportion of the prey; birds, usually ptarmigan or grouse (*Lagopus*, *Tetrao*, *Lyrurus*), were taken almost as frequently as rabbits (Hagen, 1952; Lockie and Stephen, 1959; Uttendorfer, 1939). In a few studies rabbits or hares were not predominant. Murie (1944) reports one population in Alaska that lived primarily on ground squirrels (*Citellus undulatus*). Capercaillie (*Tetrao urogallus*) were the most prevalent prey species in a study in Finland (Sulkava, 1959).

TABLE 8
AGE COMPOSITION OF MORTALITIES, 1962-1964, AREAS A AND B¹

Age	1962		1963		1964		Total	
	N	Per cent	N	Per cent	N	Per cent	N	Per cent
Nestling	3	60	7	58	4	80	14	64
Juvenile	0	0	2	17	0	0	2	9
Adult	2	40	0	0	0	0	2	9
Unknown	0	0	3	25	1	20	4	18

¹ This table does not include the four banded eagle mortalities collected outside my study area.

MOVEMENTS

In 1963 and 1964, 55 young were banded with either regular or "Lok-tite" bands and color marked with braided polyethylene rope and polyvinyl chloride tape. Bands from four eagles were recovered southeast of the banding sites. The youngest eagle, seven months of age, was shot near Kerrville, Texas, 1,290 miles from the banding site. Two other eagles, approximately one year old, were taken in Wyoming, 210 miles and 350 miles distant from the point of release. The fourth eagle, found with an injured wing and later banded and released, was found dead 90 miles southeast of the release site. Band recoveries from other Golden Eagle studies have also indicated north-south movements, evidently migratory (Cooke, 1941, 1950; Spofford, 1964).

While Murie (1944) reported migration of the total eagle population of Mt. McKinley National Park in Alaska, where the eagles arrive in March and leave in October, some populations in the southern parts of the range may show only local or intra-range movements during the annual cycle. Carnie (1954) claimed that 7 recoveries of 33 young banded in California indicated no extensive movement of the population.

MORTALITY

In the present study 22 Golden Eagles were found dead from 1962 through 1964. Of these 14 were nestlings. Nestling mortality is more apparent than mortality of the wide-ranging immature and adult birds. The incidence of mortality among immature and adult eagles is probably greater than here indicated. All four bands recovered were taken from immature eagles shot or found dead from 90 to almost 1,300 miles from the study area.

Man caused the death of 10 eagles; 12 more died from unknown causes. Below one nest containing the remains of a porcupine the remains of one fully feathered young bird were found. No quills were found in the bird, which had been dead almost a month and was badly decomposed (for a case of death from porcupine quills see Lano, 1922).

Human interference.—Young were taken from nests in several instances, yet the adults returned the following year to occupy the same nest, and in one case successfully reared another young the following year. In 1962 an adult male was shot at one nest; the single young was also found dead. The nest remained empty for 2 years, but was again occupied in 1965. Sandeman (1957) relates nine instances where one member of a pair of Golden Eagles was killed; in six of these cases a pair was present the following season. In California, the female of a pair was shot in December; but two eagles began nesting there in February (Dixon, 1937). The destructive effects of human interference on nesting eagle populations may be buffered by a surplus of unmated adults.

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SUMMARY

From 1962 to 1965 ecological studies were made of nesting Golden Eagles primarily in a 1,260 square mile area in south-central Montana. Most nests were on cliffs between elevations of 4,000 and 6,000 feet. Almost half of the cliff nests faced south, only about one-tenth faced north.

The average density of nesting pairs (17–19) in 1963 and 1964 ranged from 66.3 to 74.2 square miles per pair; the distance separating neighbors varied from 1.0 to 10.5 miles. More than half of the pairs observed attended more than one nest, such supernumerary nests averaged 1.8 per pair and ranged from several feet to 3.8 miles apart.

From 1964 through 1965, 20 nests produced 42 eggs (2.1 eggs per nest); in 1963 and 1964, 45 successful nests produced 81 young (1.8 young per eyrie), of which 70 (86.4 per cent) fledged (1.56 per nest).

From 38 eyries 980 prey individuals were identified. Mammals (87.0 per cent) especially lagomorphs predominated. The whitetail jackrabbit was the most numerous prey species (37.2 per cent). Birds represented 12.4 per cent. Of the total prey 8.8 per cent were game species, chiefly Gray Partridge and young mule deer. No predation on domestic species was observed in the principal study area.

In all 55 young were banded of which 4 were recovered from 90 to almost 1,300 miles southeastward.

From 1962 to 1964, 22 Golden Eagles, of which 14 were nestlings, were found dead. Man caused the death of 10 of these birds; 12 died from unknown causes.

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