

## NESTING STUDIES OF THE BALD EAGLE IN ALASKA

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Bald Eagles (*Haliaeetus leucocephalus*) have been seriously reduced in numbers in the eastern United States in the last few decades (Truslow, 1961). Despite this reduction, numbers of this species in Alaska are essentially unchanged and studies have been underway to evaluate population productivity. Life history information on this bird is necessary for an understanding of population characteristics. This paper reports on nesting success and related habits of Bald Eagles at Karluk Lake, located within the Kodiak National Wildlife Refuge, Alaska. Data were collected in the summers of 1959, 1961, and 1962.

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### DESCRIPTION OF THE STUDY AREA

The study area is comprised of the land adjacent to the Karluk Lake system (fig. 1). Mountains 1500 to 3500 feet in elevation border the lakes situated about 370 feet above sea level. The Karluk River drains the watershed and meanders 20 miles before entering Shelikof Strait. Red salmon (*Onchorhynchus nerka*) and char (*Salvelinus malma*), important food items of the eagle, spawn in the lakes and tributaries in the summer and fall. An average annual precipitation of 60 inches and a mild climate promote vigorous plant growth. Vegetation consists primarily of dense thickets of alder (*Alnus crispa*) and willow (*Salix* sp.). These thickets are interspersed with meadows containing grasses (Gramineae), sedges (*Carex* sp.) and fireweed (*Epilobium angustifolium*). Intermittent groves of cottonwood trees (*Populus trichocarpa*), commonly growing 70 feet in height, are found along riparian systems.

### TERRITORIES

Territory, as referred to here, is defined as an area defended against competing members of the same species from the time of mating until young are independent. Acts associated with food gathering and soaring do not pertain to this type of territory. Territories were established from mid-March through April and were well delineated through August. Adults maintained these areas after young had departed from nests in late August, although they were not as vigorously protected nor as clearly defined as during the nesting period.

Most territories had relatively uniform physical characteristics and their extremities were marked by perching trees or loafing places usually located along lake shores. The adults, when not occupying the nesting site, habitually used these perching trees. Studies conducted in southeastern Alaska by Imler (MS) revealed that mature birds preferred nesting trees very near beaches and were rarely found beyond shorelines unless there was a prominent ridge or point nearby. He also found two occupied nests less than 400 yards apart in the Affleck Canal area on Kuiu Island. During the nesting season of 1961, 42 per cent of the Karluk Lake shoreline was included within Bald Eagle territories (see fig. 1).

The linear distance between nesting sites and perching trees demarcated the radius of each territory. We found that by measuring these radii the size of 14 territories ranged from 28 to 112 acres and averaged 57 acres. The larger territories occurred

between unclaimed areas while the smaller were usually contiguous. The number and size of territories apparently influences the density of mature pairs.

NESTS

Nests were constructed of elderberry, cottonwood, and alder sticks and the depressions were lined with grasses. When used nests were repaired, depressions often were formed near the perimeter rather than in the center of nests. The nest diameter varied from 52 to 77 inches and averaged 63 inches (table 1). The mean depth was 38 inches with a range of from 22 to 46 inches. Measurements of nest depressions averaged 4 inches in depth and 14 inches in diameter.

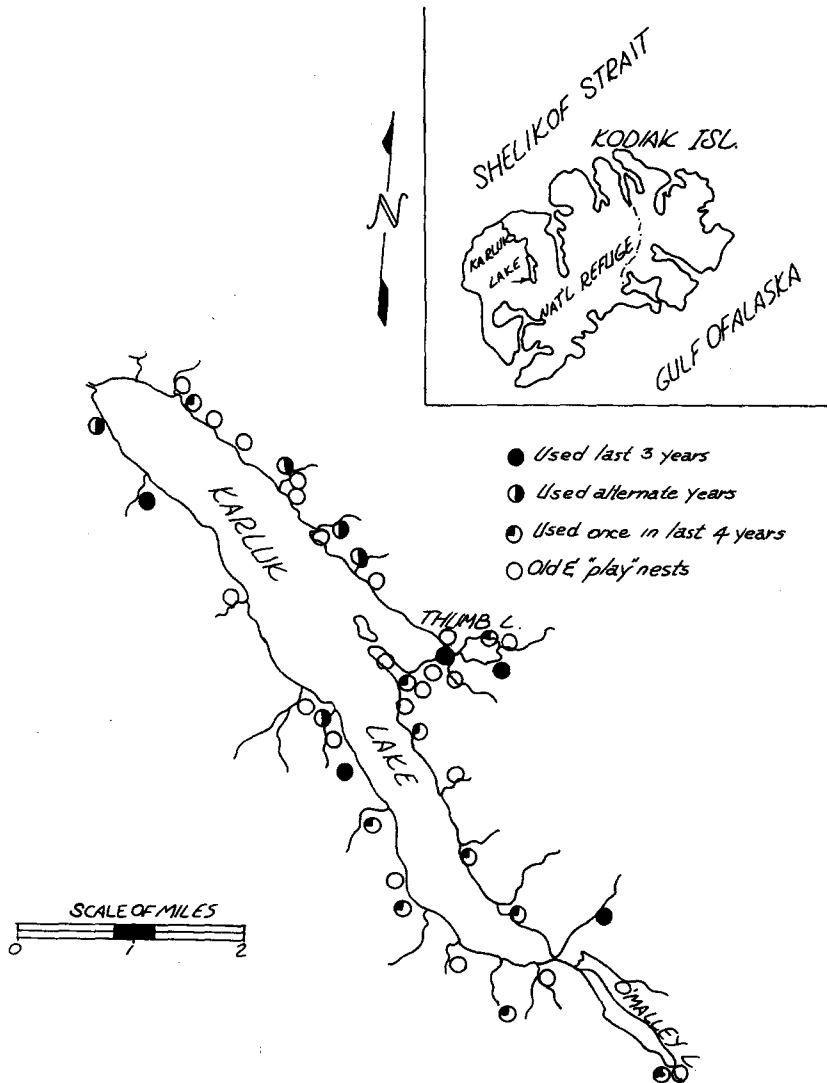


Fig. 1. Map showing the location of 42 nests of the Bald Eagle in the Karluk Lake study area, Kodiak, Alaska.

TABLE 1.  
DIMENSIONS OF SEVEN NESTS OF THE BALD EAGLE AT KARLUK LAKE DURING 1961\*

Nest no.	Location	Diameter of nest	Depth of nest	Depression	
				Diameter	Depth
1	Morrain Creek	77	22	14	5
2	Island Point	52	36	20	4
3	Thumb Beach	66	46	16	3
4	Upper Thumb	56	46	9	4
5	Eagle Creek	—	—	12	5
6	Eagle Creek	60	37	9	3
7	Grassy Point	64	42	15	5
	Average	63	38	14	4

\* All measurements are in inches.

All nests were located in live cottonwood trees. Mean height from the ground to the nests was 53 feet and varied from 42 to 65 feet. Tree height above nests averaged 23 feet. Limbs extending over nests provided landing places and the foliage offered protection from the sun. The mean diameter (dbh) of nesting trees was 24 inches and ranged from 17 to 33 inches.

Figure 1 shows the location of the 42 nests in the study area. However, many of these were abandoned and may never again be occupied. Territories often contained several inactive nests in addition to the one currently used. During 1961, three territories had three nests each and four had two nests each while 14 territories contained a single nest each. Seven to 18 nests have been used each season for the past four years. Some pairs may have alternated use between two nests during subsequent years, but this remains to be verified.

#### REPRODUCTION

*Egg laying to hatching.*—The egg-laying period extends from mid-April to the end of May and reaches a peak in the second week of May. This approximates the egg-laying period of the Golden Eagle (*Aquila chrysaetos*) observed by Sheldon (1909), who stated that the birds arrived at the Mount McKinley area, Alaska, in April and immediately began nesting activities.

The mean clutch size for the three year period was 1.7 eggs. Ten nests contained two eggs and four contained one egg in 1962 and in the previous year, seven nests had two eggs and only one contained a single egg. Gabrielson and Lincoln (1959) stated that the clutch size is almost invariably two eggs, which has been demonstrated in this study. We recorded one clutch of three eggs in 1959.

The average weight of eggs soon after deposition was 130 gm. and the dimensions averaged 73 x 53 mm. These measurements compare closely with those of the Golden Eagle in Scotland which averaged 77 x 59 mm. according to Witherby (*vide* Gordon, 1955).

Incubation begins soon after the first egg has been deposited, and the incubation period is approximately 34 days. Based on several observations, the duration of the pipped stage was one day. For example, one egg pipped on June 23 was hatched about the same time the following day; the chick was dry and capable of gaping. It is of interest to note that before the egg hatched, food (dolly varden char) was placed in the nest. The cause of this behavior is open to conjecture, for the food may have been discarded by an adult or the noises made by the hatching chick may have stimulated a parental feeding response.

*Nesting success and productivity.*—Nesting success refers to the number of young that left the nest compared to the number of eggs laid. Table 2 shows the nesting success for three seasons.

Success during 1959 and 1962 was relatively favorable compared to 1961. Fourteen pairs nested in 1962; however, 42 per cent of the birds that nested failed to produce young. Considering the success of those producing young, 64 per cent reared one bird per egg laid, while the remaining 36 per cent raised one bird per two eggs laid. The same number that nested in 1962 established territories in the previous year, but because of an unknown factor, only eight pairs completed nesting. The poor success in 1961 resulted in only five young leaving nests after eight eggs hatched of a total of 15 eggs deposited. Ten pairs completed nesting in 1959 and yielded a 77 per cent success, the highest attained during three years of study. Eagles failing to complete incubation showed no inclination to renest.

TABLE 2  
NESTING SUCCESS OF BALD EAGLES AT THE KARLUK LAKE STUDY AREAS  
DURING THREE NESTING SEASONS

Year	No. pairs laying eggs	No. eggs laid	No. eggs hatched	No. young fledged	Birds raised per nest	Nesting success (per cent)
1962	14	24	14	13	0.9	54
1961	8	15	8	5	0.6	33
1959	10	18	15	14	1.4	77

Observations made prior to this study (Anonymous, 1952–1958) have revealed that no more than 18 pairs have nested at Karluk Lake areas in any one year during the last decade. Numbers of mature pairs have remained essentially the same. Although data are fragmentary, about 31 nests, or one nest per mile of shoreline, were recorded in 1952. In the same year about 18 pairs were said to have territories around the lakes. Meager observations made in 1955 showed that six nests produced eight eaglets. The following year eight nests contained young, and in 1957, five nests were known to be used. In 1959 ten nests were occupied and several non-nesting pairs were known to be present. During the 1960 nesting season, six pairs produced 12 young; the total number of nesting pairs was not ascertained.

Broley's (1947) production records for the west coast of Florida showed that 56 nests in 1946 produced an average of 1.8 birds per nest and the production average decreased to only 1.1 young for seven successful nests in 1957. Robbins (1960) stated that good reproductive success occurred in 1959, at the Everglades National Park, when 18 young were raised in 11 nests (1.6 per nest). Records obtained in the Karluk study indicate that nesting success varies from year to year and suggests further that a year of low productivity follows one of high productivity. Reproductive success in some years compares with what was considered to be good success in Florida.

#### DISCUSSION

Nesting success was influenced by abandonment, the causes of which remain to be understood. Nests were visited frequently in 1961 and may have caused eggs to be destroyed when excited adults shuffled about the nest prior to being flushed. When our visits were prolonged, newly born young may have been subjected to over exposure in inclement weather. Another cause of poor nesting success may stem from depredation.

Magpies (*Pica pica*) are common nesters within the study area and are suspected predators. Gulls (*Larus* sp.) frequent the study area but no evidence of gull depredation has been gathered.

Despite the frequency of nesting failure, there has been no apparent decline in numbers of breeding pairs nor any significant reduction in productivity in the last decade.

#### SUMMARY

A nesting study of the Bald Eagle was conducted in the Kodiak National Wildlife Refuge of Alaska in 1959, 1961, and 1962. Territories were established from mid-March through April and were maintained through August. Territorial size varied from 28 to 112 acres. Nests per territory varied from one to three with one nest being the most common. All nests were in live cottonwood trees and averaged 53 feet in height above the ground. Nests averaged 63 inches in width and 38 inches in depth. Egg laying began in late April and reached a peak the second week in May. The mean clutch size was 1.7 eggs; incubation lasted about 34 days. Nesting success, based on number of young leaving nests in relation to number of eggs laid, varied from 33 to 77 per cent in the three seasons. A cause of nesting failure was abandonment. Data suggest that there has been no alarming decline in nesting numbers or productivity in the last decade.

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