

## GENERAL NOTES

**Nesting and productivity of Bald Eagles on the Kodiak National Wildlife Refuge, Alaska.**—The decline in Bald Eagle (*Haliaeetus leucocephalus*) numbers has been the subject of mounting public concern in recent years. Reports of decreasing numbers have been coupled with the inimical use of pesticides, rural development, and destruction of nesting trees by hurricanes (F. K. Truslow, *Natl. Geogr. Mag.*, 48: 122, 1961; A. Sprunt III, Natl. Aud. Soc., Rept. 57th Ann. Convention, pp. 1-7, 1961). However, populations remain copious in the relatively unchanged environment of Alaska. This paper reports on the nesting abundance and productivity of Bald Eagles on the Kodiak National Wildlife Refuge in 1963.

*The habitat.*—The Kodiak National Wildlife Refuge occupies the southwestern portion of Kodiak Island and is located within the Gulf of Alaska (Figure 1). It encompasses 2,780 square miles and is characterized by mountainous terrain with deeply indented bays having rocky shorelines. Large areas of the refuge are covered with brushy vegetation consisting of alder (*Alnus crispa*), willow (*Salix* spp.), and elderberry (*Sambucus racemosa pubens*) interspersed with open grassy meadows and fireweed (*Epilobium angustifolium*). Cottonwood stands (*Populus trichocarpa*) are interspersed along riparian systems, and Sitka spruce (*Picea sitchensis*) occurs in

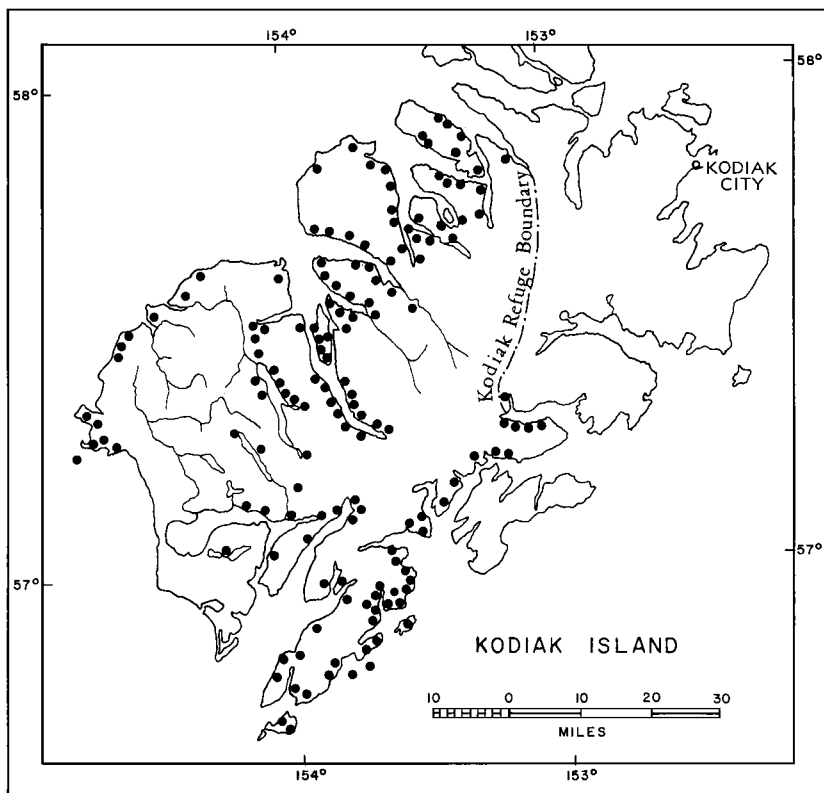


Figure 1. Locations of Bald Eagle nests (black dots) on Kodiak Island, Alaska, 1963.

TABLE 1  
BALD EAGLE NESTS ON KODIAK NATIONAL WILDLIFE REFUGE, MAY, 1963

<i>Nest site</i>	<i>Active</i>	<i>Inactive</i>
Cottonwood trees	106	158
Rocky cliffs	35	8
Alder cliffs	17	2
Totals	158	168

scattered communities in the northeastern portion of the refuge. Temperatures are mild and the island receives an average annual precipitation of 60 inches. Periodic rain storms in the winter months often keep lower elevations and seacoasts devoid of snow. Numerous lakes, rivers, and streams provide spawning and rearing areas for several kinds of salmon (*Onchorhynchus* spp.) that influence the distribution of Bald Eagles.

*Techniques.*—A Piper "150" Supercub Model PA-18 aircraft piloted by the author (accompanied by an observer) was used to survey eagle populations. This maneuverable aircraft is slow and affords excellent visibility for both occupants. Flights made in the two surveys were flown at 60 mph, did not exceed 200 feet above the terrain under study, and covered all potential habitat. The first survey was made to locate all active and inactive nests. These were plotted on U.S. Geological Survey maps (scale 1:63,360). This detailed reconnaissance was accomplished from 19 to 27 May, when eagles were known from previous work by us to be incubating and the foliage had not yet emerged, thus permitting optimum visibility. The second survey was flown between 5 and 8 August, when nestlings had developed to a stage where they could be clearly distinguished and counted by observers aloft. The objective of this survey was to measure productivity by sampling 50 per cent of the nests occupied in May. Population compositions were obtained in the initial nesting survey and again in the summer when both juveniles and adults were feeding along salmon streams.

*Nests.*—Generally, eagle nests were found on three kinds of substrates. The substrate apparently most preferred was cottonwood trees, which are restricted to drained soil conditions bordering water systems. Since trees are not present in quantity, other substrates utilized were rocky cliffs or the bases of alder trees protruding from rock cliffs along the seashore. These were usually found on prominent points, pinnacles, and islets, from 40 to 200 feet above sea level, but sometimes an occasional nest was found at higher elevations. Islets used as nesting sites were usually a short distance from the shoreline but in one instance a nest was located on an islet almost one mile from Kodiak Island. Areas devoid of trees or cliffs contained no nests.

Tree nests were more readily observed than those on cliffs, which were sometimes obstructed by alder growths. The white heads of incubating birds assisted us in ascertaining nest location by contrasting with the drab colors of their surroundings.

A total of 158 active and 168 inactive nests was tallied in the initial survey (Table 1). Nests were considered active when occupied by incubating birds or when they contained eggs and an adult was nearby. The latter occurred in five instances. The low proportion of cliff nests tallied as inactive may have resulted from the small quantity of material used for cliff nests, which made them less visible than the elaborate tree nests. Moreover, the small cliff nests deteriorate soon after abandonment. We calculated that 20 per cent of nests were not enumerated in the initial

TABLE 2  
BALD EAGLE PRODUCTIVITY IN THREE NEST TYPES ON KODIAK  
NATIONAL WILDLIFE REFUGE, 1963

Substrate	Nests checked	Basic data				Total young
		Eaglets per nest				
		0	1	2	3	
Cottonwood trees	58	21	12	22	3	65
Rocky cliffs	16	2	8	6	0	20
Alder cliffs	6	4	1	1	0	3
Totals	80	27	21	29	3	88

	Successful nests (per cent)	Productivity	
		Number of young per nest	Number of young per successful nest
Cottonwood trees	64	1.1	1.7
Rocky cliffs	87	1.2	1.4
Alder cliffs	33	.5	1.5
Totals	66	1.1	1.7

aerial survey. This percentage was derived by comparing a complete count obtained by observers on foot to those made from the air within a limited area of high nesting density (20 per cent were missed in the aerial survey). Therefore, a total of about 190 nests was probably active during the 1963 season.

*Productivity.*—A sample of 80 of the occupied nests (about 50 per cent) was rechecked in August to determine productivity and nesting success. Nests situated in dense groves of cottonwood trees were not included in this sample as they could not, in some cases, be relocated. Table 2 shows that from these 80 nests 88 eaglets (average, 1.1 per nest) were produced. Of the 80 nests sampled 27 (34 per cent) were unproductive while 53 (66 per cent) successful nests produced an average of 1.6 birds each. Considering the total of 190 nests having a success of 66 per cent, the production for 1963 would be approximately 200 eaglets. These findings reveal a higher average productivity than that recorded in other states (Sprunt, *op. cit.*). Some nests, however, may have been abandoned prior to the first survey made in May, which would account for less than a 66 per cent total nesting success. Of the 53 nests containing young, 40 per cent produced one, 55 per cent two, and 5 per cent three eaglets.

*Population composition.*—In the first survey in May, 225 adults and 21 juvenile eagles were counted. Surveys flown along salmon streams in July and August yielded a total of 372 eagles of which 238 (63 per cent) were adult. Sprunt (*op. cit.*) found, from inventories made in other states in January, that in the eagle populations there studied, 76 per cent of the birds were adults. The reason for the preponderance of adults in May is not fully understood but could be caused by variations in migratory pattern between age groups. Further, juveniles inhabiting Kodiak Island may have been more dispersed and not found near nesting areas during the time of the surveys. In any case, certainly, white-headed adults are more easily observed than the inconspicuous juveniles.—WILLARD A. TROYER and RICHARD J. HENSEL, *U. S. Fish and Wildlife Service, Kodiak, Alaska.*