

# FACTORS INFLUENCING NEST SITE SELECTION OF BALD EAGLES IN NORTHERN SASKATCHEWAN AND MANITOBA

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In the course of 7 years' research on Bald Eagles in Northern Saskatchewan and Manitoba, we gained some impressions about eagle nest sites.<sup>3 13</sup> In order to test these observations, we reanalyzed our Bald Eagle data collected from 1968 through 1974. Our information is from extensive aerial surveys of Bald Eagles in central Saskatchewan and Manitoba in 1969<sup>13</sup> and a survey of central and northern Saskatchewan in 1974. Also, we have been studying the eagle population since 1968 on Besnard Lake which is located in central Saskatchewan in the Northern Coniferous forest of the Precambrian shield about 40 miles west-northwest of Lac La Ronge.<sup>11 12</sup>

**METHODS.** In 1974 our Bald Eagle

survey involved aerial censuses of shoreline in 20 randomly selected sample units of boreal forest. Between units we flew straight-line transects at 300 feet altitude; all eagle nests seen within 220 yards of the airplane were recorded. All 1974 data in this paper are from these transects. In analyzing the results of the transects, we considered all nests within 220 yards of a lake or river as being in shoreline habitat and all nests beyond that as being in inland habitat.

To understand the characteristics which make a shoreline attractive for a Bald Eagle to nest, we analyzed all nests visited in July, 1969, as to kind of tree it was in, whether it was on an island or near the edge of a lake or river, and whether it was on large or small lakes or rivers.

We arbitrarily considered all lakes with a total shoreline of 7 miles or more as large and all rivers delineated by two lines on 1:250,000 maps as large rivers (200± feet and wider). All other lakes and rivers were considered to be small. We also noted on which shore the nest was situated on islands more than 1 sq mi in area and along mainland shores. This is referred to as the orientation of the

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Fig. 1. An adult bald eagle in a tree perched just above its nest.

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nest; a nest on an east shore was recorded as oriented west.

The location of each nest on Besnard Lake was plotted on forest inventory maps made from 1968 and 1969 aerial photographs. They show tree species and height and crown cover. By comparing forest types on the entire shore with the vegetation where eagles nested, we tried to determine what forest habitat the birds prefer.

Bald Eagles return to the boreal forest in April when the lakes are still frozen. The only feeding areas available to them are rapids and places around the lake where streams enter to create small areas of open water. These are important fish spawning areas and probably important eagle feeding spots. Because the presence of a spring food supply might influence

the location of nests, we analyzed our nest data to see if successful nests were correlated with distance from a stream mouth. We restricted this analysis to streams that were actually open and used by spawning fish in spring.

All our measurements were made on 1:250,000 National Topographic System maps. Shoreline measurements for the 1974 survey were made by measuring the shoreline with dividers set at 1/2-mile spacing. All other map measurements were made with a map measurer with a 1/4-inch wheel.

**RESULTS.** In our straight-line transect flown in 1974, we searched 47.8 sq mi of shoreline habitat and 140.6 sq mi of inland habitat. Eighteen Bald Eagle nests were found along the shoreline and no eagle nests were found in the inland habitat. The difference is highly significant and provides statistical confirmation of our earlier impression that Bald Eagles in northern Saskatchewan strongly prefer shoreline habitat for their nests ( $\chi^2=53$ ,  $DF=1$ ,  $P<0.001$ ).

Four eagle nests were found in 26.0 sq mi of shoreline habitat on small water bodies, whereas 14 eagle nests were found in 21.2 sq mi of shoreline habitat on large water bodies. The difference is statistically significant, and this finding confirms our impression that Bald Eagles prefer to nest on large lakes and rivers ( $\chi^2=53$ ,  $DF=1$ ,  $P<0.01$ ).

In 1969, 110 nests were found along 589 miles of island shoreline and 14 nests were found along 2,480 miles of mainland shore. The difference between island and mainland shoreline is statistically significant and shows the preference for nest sites on island ( $\chi^2=91$ ,  $DF=1$ ,  $P<0.001$ ).

Eagle nests do not all face in the same direction nor are they oriented at random. Table 1 shows the direction faced by 136 nests found on the 196



Besnard Lake and vicinity. The study area included Saskatchewan north of about 54° lat. and into Manitoba. Note the northeast-southwest orientation of the Churchill River lakes and tributaries.

survey; this total omits all nests on islands less than 1 sq mi in area and nests on narrow peninsulas because they could not readily be assigned a single direction. The largest number of nests (48, 35%), faced west. The distribution of nests is significantly different from random and suggests that eagles prefer east and southeast shores of water bodies so that nests face west and northwest ( $\chi^2=81.7$ ,  $DF=7$ ,  $P<0.001$ ).

Two of our 1969 nests were on the tops of cliffs which rose from the water in a steep incline. The remaining 288 nests were in trees. Of these 156 (54%) were in trembling aspen (*Populus tremuloides*), 90 (30%) were in spruce (*Picea*) and 39 (15%) were in jack pine (*Pinus banksiana*). The other three nests were in balsam poplar (*Populus balsamifera*) and white birch (*Betula papyrifera*). Nests in the more northern part of the area surveyed tended to be

in jack pine; in the central part most nests were in poplar and spruce, while nests in the south, in the Cumberland marshes, tended to be in dead aspen.

Finally, we used our long-term studies of eagles nesting at Besnard Lake to find out some characteristics of the forest vegetation that seems to influence eagles in locating their nests. Forest Service maps classed the vegetation into five types: mixedwood with softwood dominant, softwood, mixedwood with hardwood dominant, hardwood, and marsh or sparsely treed muskeg. The maps also classified forest stands into four height classes and into four classes of crown cover. We measured the number of shoreline miles around the lake in each forest type, height and cover class and determined the number of known nests in each category. The results show that eagles prefer softwood or forest with softwood dominant: 67% of 43 nests were in those two habitats (Table 2). Similarly, eagles do not like forests with dense crown cover, as 63% of the nests were in forests of 30-50 percent coverage (Table 3). Forest of more or less cover had significantly fewer nests per mile of shoreline ( $\chi^2=42.3$ ,  $DF=1$ ,  $P<0.001$ ).

Bald eagles showed a striking preference for tall trees (Table 4). Shoreline habitat with trees above 70 feet had 1.04 nests per mile, almost four times the density of any other

TABLE 1. Orientation of nests found on large islands and mainland shoreline in 1969.

<i>Direction Nest Faced</i>	<i>Nests</i>	
	<i>No.</i>	<i>%</i>
N	10	7
NW	18	13
W	48	35
SW	6	4
S	17	13
SE	12	9
E	21	15
NE	4	3

category. This difference was statistically significant ( $\chi^2=34.1$ ,  $DF=1$ ,  $P<0.001$ ).

The last factor analyzed was the importance of open water in the spring on the location of successful eagle nests as determined by the presence or absence of young in July. The 101 nests represent all nest records for 7 seasons work on the lake (Table 5). They show a steady decrease in success of nests away from open spawning streams. This difference in success between nests less than 2 miles from streams and those farther away is significant ( $\chi^2=6.3$ ,  $DF=1$ ,  $P<0.05$ ). Despite this however, there is no evidence that nests tend to be built more closely to such streams than elsewhere (Table 5).

TABLE 2. Distribution of Bald Eagle nests by forest type on Besnard Lake, 1968-1974

<i>Forest Type</i>	<i>Shoreline</i>		<i>No. of nests</i>	<i>Nests per mile of shoreline</i>
	<i>Miles</i>	<i>%</i>		
Mixedwood with softwood dominant	37.9	15.4	13	0.34
Softwood	66.1	26.8	16	0.24
Mixedwood with hardwood dominant	36.9	15.0	6	0.16
Hardwood	71.3	28.9	8	0.11
Marsh or sparsely treed muskeg	34.1	13.8	0	0.00

**DISCUSSION.** Bald Eagles in the boreal forest of Saskatchewan and Manitoba seem to prefer to nest within 220 yards of large lakes and rivers. They prefer to nest on islands rather than on the mainland and prefer to face their nests towards the west and northwest, i.e., they tend to nest on east and southeast shores. For nest trees they prefer aspen and strongly prefer trees more than 70 feet tall in a softwood stand of moderate to low crown cover. Finally, nests within 2 miles of spawning streams that have open water in the spring show significantly greater success than those farther away.

Bald Eagles prefer shoreline habitat for nest sites in other areas also,<sup>1 5 10</sup> but a notable difference is evident in the more populated areas of Wisconsin and Minnesota where eagle nests are frequently located more than 1/2 mile from water — 36 percent of nests in the Bena district of Minnesota<sup>7</sup> (C. Sindelar *personal communication*). It is possible, therefore, that increased human presence on the lakes of northern Saskatchewan and Manitoba with cottages and other developments along the shoreline could lead to eagles choosing sites farther from open water.

Why eagles prefer large rather than small bodies of water for nesting is not as clear. Factors such as the larger fishing area, taller nest trees, and greater productivity while young are in the nest are probably important. The presence of long shoreline up-drafts which facilitate travel to and from fishing areas may also be important. A considerable portion of eagle nests on small lakes were within 2 miles of large lakes.<sup>13</sup> The presence of the large lake may be the factor inducing this as these eagles could actually use the large lake with its presumed advantages just as a resident eagle.

There is a wide variation in the tree species Bald Eagles choose for nest

sites across North America. In Saskatchewan and Manitoba trembling aspen is most frequently used. In the Tongass National Forest of southeast Alaska, Sitka spruce (*Picea sitchensis*) is used most frequently for nests.<sup>2 9</sup> On San Juan Island, Washington, Douglas fir (*Pseudotsuga menziesii*) is preferred;<sup>10</sup> in northern Minnesota the birds prefer red pine (*Pinus resinosa*) and white pine (*Pinus strobus*),<sup>7</sup> and near Lake Erie they formerly preferred sycamore (*Platanus occidentalis*) and shellbark hickory (*Carya ovata*).<sup>6</sup> It is apparent from the variety of trees used that Bald Eagles react to the structure of the tree and the forest community rather than to the species itself.

Our observations at Besnard Lake show that in anything more than a light wind, eagles land on the nest facing into the wind; therefore, a nest needs to be approachable from several directions. This factor may explain their preference for tall, relatively exposed trees in open forest.<sup>8 10</sup>

The preference of eagles for nesting on islands rather than mainland is difficult to explain. The usual explanation for island nesting in waterfowl is that it protects them from predators, particularly mammals. This is probably not a factor in nest site selection by eagles. One possibility, suggested above, is the open, exposed site provided by islands; this allows ready access to the nest from many directions, depending on wind direction. Another possibility is that islands, being protected from the frequent lightning-caused fires of the boreal forest, usually have mature stands which provide the eagles with the tall trees they prefer. Islands are also close to fishing areas in all directions.

The direction that a nest faces is probably significant, as the eagles show definite preferences for some directions over others. However, they do not have equal opportunity to



Fig. 2. A bald eagle landing on its nest with a fish.

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TABLE 3. Distribution of Bald Eagle nests by forest crown cover density on Besnard Lake, 1968-1974.

<i>Percent crown cover</i>	<i>Miles</i>	<i>Shoreline %</i>	<i>No. of nests</i>	<i>Nests per mile of shoreline</i>
Less than 30%	37.4	15.1	0	0.0
30 - 50%	53.1	21.4	27	0.51
50 - 70%	111.4	45.0	14	0.13
More than 70%	45.7	18.5	2	0.04

TABLE 4. Relationship between tree height and nest site of Bald Eagles on Besnard Lake 1968-1974.

<i>Tree height</i>	<i>Miles</i>	<i>Shoreline %</i>	<i>No. of nests</i>	<i>Nests per mile of shoreline</i>
Marsh of sparsely treed muskeg	34.1	13.8	0	0.0
Less than 30 feet	57.4	23.3	1	0.02
30 - 50 feet	52.0	21.1	8	0.15
50 - 70 feet	95.2	38.6	26	0.27
Above 70 feet	7.7	3.1	8	1.04

choose any direction. Glacial scouring of the precambrian shield in northern Saskatchewan is oriented from northeast to southwest and lake basins tend to be similarly oriented. Hence there is very little northeast or southwest shoreline and a disproportionate amount of northwest- and southeast-facing shoreline. This is evident in the map, particularly for the lakes which make up the Churchill River. Yet if we compare the number of nests on east and southeast-facing shoreline with west and northwest-facing shoreline, twice as many nests are on the latter as on the former (66 vs. 33, Table 1). The high proportion of nests along east shores may be because winds create favourable soaring conditions along a west-facing shoreline,<sup>4</sup> or because the east shore is more sheltered from the predominant east wind during incubation. It is also possible that exposure to the warmth of the south and west sun may be important in the spring as well.

**SUMMARY.** Bald Eagles in northern Saskatchewan and Manitoba show a close association with shoreline habitat. Nests are more frequently found along the shores of large lakes and rivers than along small waters. They are not found inland from water bodies. Island shoreline is used for nests more frequently than mainland shoreline. Nests on large islands and the mainland showed a significant ten-

dency to be situated on the east shores of water bodies. An analysis of the utilization of shoreline habitat for nests by Bald Eagles on Besnard Lake, Saskatchewan, revealed a preference for tall, relatively open mixedwood forest with softwood dominant. Nests within 2 miles of small streams entering the lake showed a higher breeding success rate than more distant nests, although the presence of the streams did not appear to influence the location of nests.

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TABLE 5. Nest success and proximity to spawning streams open in spring on Besnard Lake, 1968-1974.

Miles from stream	Active Nests			% with young
	Total	With young	Empty	
Less than 1	16	14	2	87
- 1.9	24	17	7	71
- 2.9	18	8	10	44
- 3.9	32	17	15	53
- 4.9	11	5	6	45

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# FIRST RECORDS OF THE ORCHARD ORIOLE IN SASKATCHEWAN

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On three dates from June 19 to June 28, 1974, I stopped briefly at the P.F.R.A. dam over the river at the northern edge of the town of Fort Qu'Appelle and in an adjacent, heavily wooded area I heard a lively warble similar to the Purple Finch. The bird could not be seen from the perimeter of the woods and it was singing from a residential area. On June 29 I asked the residents, Constable John Lloyd and his wife, for permission to enter

the area for the purpose of observing and recording. They were most obliging and during the next hour taped about 35 songs but the bird was extremely shy and not once could I get a glimpse of it.

On June 30 Jack Lowe of Fort Qu'Appelle and on July 1 Fran Brazier of Regina assisted in the search for identity of the elusive bird which sang regularly but remained hidden in the upper portion of a very high spruce tree. During these two days more songs and calls were recorded.

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