Habitat Relationships of Bald Eagles in Alaska

Lowell H. Suring
U.S. Forest Service, Anchorage, AK

Studies of Bald Eagles in Alaska show that they consistently select areas with specific landscape features for nesting, perching, roosting and foraging. They also choose different landscape features, or habitat, for different activities. This paper describes the kinds of habitat Bald Eagles use in Southeast Alaska, Kodiak Island, the Kenai Peninsula, the Alaska Peninsula, the Aleutian Islands and Interior Alaska.

Bald Eagle nests, which may measure up to 1.8 m (6 ft) in diameter and 1.2 m (4 ft) tall, are placed in large dominant or co-dominant trees or on prominent land forms. Nest sites are usually close to water where Bald Eagles can forage for fish and other prey. When Bald Eagles are not at their nest site or moving about, they usually find a place to perch. Perches are usually located along the coast or along rivers and streams where food is available.

Roosts are areas where Bald Eagles spend the night. Roosts are usually located in protected areas that minimize the effects of adverse weather. Foraging sites are selected by Bald Eagles to maximize availability and accessibility of food items.

These habitat relationships have been extensively studied throughout the range of Bald Eagles (e.g., Gerrard et al. 1975, Servheen 1975, McEwan and Hirth 1979, Steenhof et al. 1980, Andrew and Mosher 1982, Anthony et al. 1982, Mathisen 1983, Grubb 1988, Anthony and Isaacs 1989, Johnsgard 1990). In this paper I review the information available on the use of habitats by Bald Eagles throughout Alaska.

Nesting Habitat

Southeast Alaska

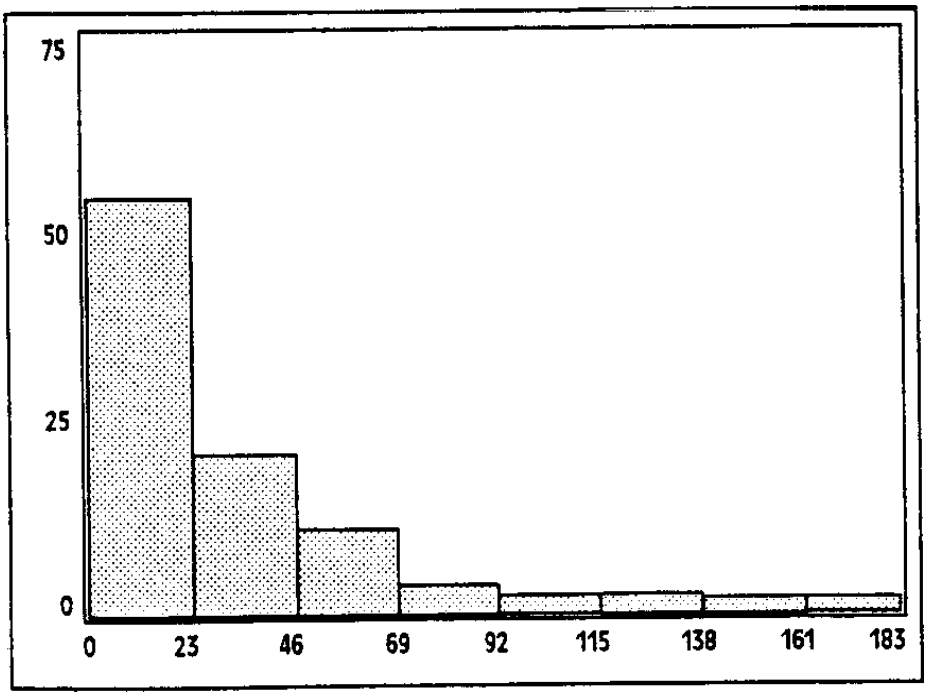
A clear description of nest sites selected by Bald Eagles in Southeast Alaska has emerged from the extensive surveys conducted by the U.S. Fish and Wildlife Service. The typical nest site in this area is associated with old-growth forests near salt water (Hodges and Robards 1982). Nearly all (98%) of the nest trees were within 183 m (600 ft) of the shoreline (Figure 1). The mean distance of the nest tree to salt water was 37 m (121 ft) (Table 1).

Most (94%) of 3,850 nests examined by Hodges and Robards (1982) were found in live trees. Sitka spruce provided sites for 78% of 3,850 nests (Table 2). Although 20% of the nests were located in western hemlock, this species is usually not preferred because its branches are shorter than those of Sitka spruce. Hemlock do not live as long as spruce and their terminal branches are much finer (Grubb 1976). Western red cedar is found

throughout southern Southeast Alaska, but it is rarely used for nesting by Bald Eagles because of its fine branching structure. Corr (1974) reported a very similar distribution in the species of nest trees near Petersburg, Alaska (Table 2).

Bald Eagle nests have usually been found near the top of large, old trees (Table 1). Nest trees averaged 30-36 m (98-118 ft) tall and had an average diameter of 1.1 m (3.6 ft). Trees of this size are usually at least 400-500 years old (Corr 1974, Hodges and Robards 1982). Height of nest trees was shown to have a significant, positive relationship to the percentage of active nests (Hodges and Robards 1982, Hansen 1987). Perhaps Bald Eagles with nests in trees that extend above the surrounding canopy are better able to locate prey.

Figure 1. Frequency distribution of distances of nests to water for Bald Eagle nests In Southeast Alaska (from Hodges and Robards 1982).



The major mainland river systems in Southeast Alaska also support approximately 200 Bald Eagle nests (Hodges 1979). The flood plains of these rivers support stands of large, mature black cottonwood trees that serve as nest sites (Hodges 1979, Hughes 1980, Hansen et al. 1986). Black cottonwood also provided the majority of nest trees along rivers in the Yakutat area (Patten 1981) (Table 2).

Kodiak Island/Kenai Peninsula

Although the preference Bald Eagles have for placing their nests on prominent locations does not change throughout Southcentral Alaska, the actual sites of nests vary. Trees are preferred nest sites and are used whenever available. Black cottonwood is the preferred

species on Kodiak Island and the Kenai Peninsula (Table 1) (Chrest 1964, Troyer and Hensel 1965, Bangs et al. 1982a). However, on Kodiak Island, where trees grow only in riparian areas, 20-30% of nests were found on rocky cliffs or at the bases of alder trees on rock cliffs along the coast. All nests were near water and areas without trees or cliffs did not have nests (Table 1).

Alaska Peninsula/Aleutian Islands

Although the Alaska Peninsula and the Aleutian Islands are nearly treeless, approximately 17% of the breeding Bald Eagles in Alaska occur there (Sidle et al. 1986). Bald Eagles breed on every major island in the Aleutian chain except the Near Island group (Early 1982). Hehnke (1973) reported locating 43 Bald Eagle nests from Unimak Island north to Bear Lake on the Alaska Peninsula. All of the nests were on rocky pinnacles or cliffs.

Table 1. Characteristics of locations of Bald Eagle nests in Alaska

Location	Mean Distance	Height of Nest Tree	Height of Nest	Source
Southeast Alaska	37 m	30 m	25 m	Hodges & Robards (1982)
Southeast Alaska	33 m	36 m	30 m	Corr (1974)
Chilkat Valley	75 m	30 m	23 m	Hansen et al. (1986)
Prince William		24 m		Anthony et al. (1982)
Kodiak Island	73 m	22 m	16 m	Chrest (1964)
Kenai Peninsula	0.2 km	13 m	8-10 m	Bangs et al. (1982)
Alaska Peninsula	20 m			Hehnke (1973)
Amchitka Island			12 m	Sherrod et al. (1976)
Tanana River			18 m	Ritchie (1982)

On Amchitka Island, Bald Eagles selected one of five types of sites on which to build nests: 1) sea stacks or pinnacles sticking out of the ocean, which had been formed by the erosion of small peninsulas; 2) ridges, which are small peninsulas still connected to the mainland; 3) connected sea stacks, which are partially eroded ridges; 4) islets, which are similar to sea stacks but are broader and flatter; and 5) the sides of hills adjacent to saltwater (Sherrod et al. 1976, Byrd and Williams 2008).

Pinnacles or similar sites were preferred Bald Eagle nesting sites (Murie 1959, Sherrod et al. 1976). Pinnacles and sea stacks are most similar to trees in that they are the dominant structure on the landscape and they provide protection from potential nest predators. Hillsides and cliffs close to good foraging areas may have functioned as nest sites as well as pinnacles did prior to the introduction of mammalian predators on these islands. The introduction of arctic fox for fur farming in the early 1900s and the introduction of dogs, cats and Norway rats during World War II may have influenced selection of nest sites by Bald Eagles (Kenyon 1961, Sherrod et al. 1976). The elimination of foxes, dogs and cats from Amchitka Island may have allowed Bald Eagles to reestablish nests on hillsides adjacent to intertidal beaches where they forage for fish, shorebirds and waterfowl.

Interior Alaska
Although the Bald Eagle is generally considered to be uncommon to rare throughout interior Alaska, it is known to breed throughout the area (Gabrielson and Lincoln 1959, Armstrong 1980). Several major river systems, such as the Tanana River and the Yukon River, support well-established populations of Bald Eagles (Metcalf 1976, Ritchie 1982). Less dense populations of Bald Eagles nest in association with the numerous lakes, ponds and wetlands throughout the area (Spindler et al. 1981).

Bald Eagles prefer to nest in trees that are close to water (e.g., within 600 m on the Tanana River) and that are the dominant member of the stand (Ritchie 1982). Stands of balsam poplar and spruce are common adjacent to rivers in interior Alaska and balsam poplar is favored as a nest site (Table 2). Spruce, primarily white spruce, is also used often and occasionally nests are located in quaking aspen trees.

Perching Habitat

Perches are integral features of habitat for Bald Eagles because the birds spend significant portions of time perching. Non-breeding adults and wintering Bald Eagles may spend up to 90% of daylight hours perching (Gerrard and Whitfield 1980, Stalmaster 1981). Often Bald Eagles hunt from perches, waiting there for prey to pass by (Stalmaster 1987). Once food is secured, the birds often return to the perch to consume their prey. Perching requires less energy than flight and exposure to the sun warms the birds. Both factors reduce metabolic demands (Hayes and Gessaman 1980, Stalmaster 1981).

Perches also serve important functions for breeding adults. Perches may be used as sites to attract mates and to advertise territory occupation (Fraser 1981, Mahaffy 1981). They may also provide locations from which nests may be protected from other predatory birds (Sidle et al. 1986).

Bald Eagles usually select tall trees with large lateral branches near the top for perching (Stalmaster et al. 1985). In winter they choose such trees that are close to water and associated food sources. More than 80% of wintering Bald Eagles on the Skagit River in Washington were observed to perch within 25 m of water (Figure 2) (Hunt et al. 1980 as cited in Stalmaster et al. 1985). Nesting Bald Eagles choose perch sites close to their nests. Bald Eagles prefer dominant or co-dominant trees in small groups, or single trees near water, over large uniform stands of trees (Stalmaster and Newman 1979). Snags also provide preferred perching sites for Bald Eagles (Stalmaster and Newman 1979, Hansen and Bartelme 1980).

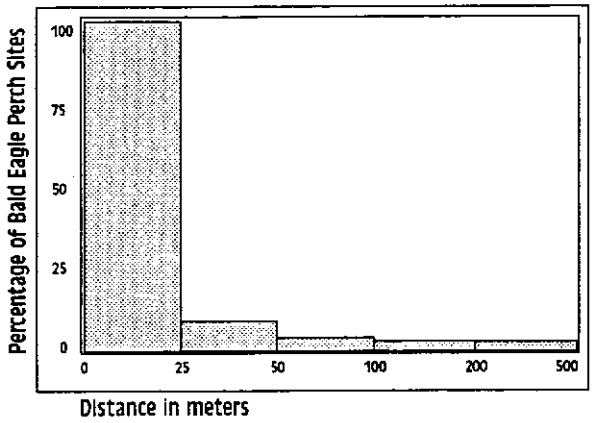
Table 2. Nest Sites of Bald Eagles in Alaska

Location	Number of Nests Observed	Nest Site	Percent	Source
Southeast Alaska	3829	Sitka spruce	(78)	Hodges and Robards (1982)
		Western hemlock	(20)	
		Cedar Cottonwood	(2) (t)	
Southeast Alaska	128	Sitka spruce	(77)	Corr (1974)
		Western hemlock	(14)	
		Cedar	(2)	
		Dead Tree	(7)	
Chilkat Valley	59	Sitka spruce	(12)	Hansen et al. (1986)
		Cottonwood	(88)	
Yakutat	32	Sitka spruce	(6)	Patten (1981)
		Cottonwood	(84)	
		Other tree	(6)	
		Rocky knob	(3)	
Kodiak Island		Cottonwood	(66)	Chrest (1964)
		Cliff	(34)	
Kodiak Island	326	Cottonwood Cliff	(81)	Troyer and Hensel (1965)
		Rocky	(13)	
		Alder	(6)	
Kodiak Island	12	Cottonwood	(100)	Trudgeon (1980)
Kenai Peninsula	36	Cottonwood	(77)	Bangs et al. (1982)
		Aspen	(19)	
		White spruce	(3)	
Amchitka Island	251	Sea stack	(38)	Sherrod et al. (1976)
		Ridge	(24)	
		Connected stack	(20)	
		Islets	(8)	
		Hillsides	(10)	
Tanana River	48	Balsam poplar	(69)	Ritchie (1982)
		White spruce	(29)	
		Aspen	(2)	
Interior Alaska	23	Balsam poplar	(78)	Roseneau and Bente (1979)
		Spruce	(22)	

Roosting Habitat

Roosting sites are generally those areas where wintering Bald Eagles spend the night; however, roosts may also be used throughout the day during severe weather (Stalmaster et al. 1985). Roosting sites are selected for characteristics that reduce exposure of the birds to wind, precipitation and low temperatures. The presence of protective land forms and stands of conifer trees appears to be more important than distance to foraging areas. Roosts in Oregon have been reported up to 20 km from food sources (Keister and Anthony 1983). Large, old-growth trees located on slopes or in protected valleys are preferred roosting sites (Steenhof 1978, Hansen et al. 1980, Keister 1981, Anthony et al. 1982). Bald Eagles often choose coniferous forests over deciduous forests for roosting even though the birds may have to travel greater distances from the conifers to obtain food (Stalmaster and Gessman 1984). The energy saved by roosting in the greater protection of the conifer trees more than compensates for the extra energy expended in travel (Stalmaster and Gessman 1984).

Figure 2. Frequency distribution of distances of perches to water for Bald Eagles in Washington State (from Stalmaster et al. 1985)



Very little published information is available describing the roosting habits of Bald Eagles during winter in Alaska. Black cottonwood and conifer trees were used for night roosting in the Chilkat Valley in northern Southeast Alaska (Hansen et al. 1986). Bald Eagles in this area roosted mainly in black cottonwoods until late fall. From late fall through winter the birds roosted in stands of western hemlock and Sitka spruce that were protected from prevailing winds by topographic features such as ridges and mountains.

Even less is known of roosting behavior of Bald Eagles during spring and summer. Bald Eagles concentrating in response to food sources in spring and early summer have been reported for the Copper River Delta (Bucaria 1979, Michelson et al. 1980), Yakutat Forelands (Peterson et al. 1981) and the mouth of the Stikine River (Hughes 1980). However, roosting areas used in association with these seasonal concentrations have not been identified. At the mouth of the Stikine River the Bald Eagles apparently do not use specific roosting areas but are dispersed throughout the forested hillsides close to the feeding area (Hughes 1980).

Foraging Habitat

Populations of various raptors may be limited by the availability of food (Newton 1979). Several studies have suggested that this phenomenon applies to Bald Eagles (Sherrod et al. 1976, Stalmaster 1981, Hansen 1987). Availability of food appears to be extremely important in the relationship of Bald Eagles to their habitat. Although Bald Eagles are opportunistic feeders, they are strongly associated with aquatic environments for foraging. Studies in Canada have shown that as the distance to aquatic foraging habitat increased the percentage of nests with young decreased (Gerrard et al. 1975).

The large foraging areas provided by inland seas and broad channels are preferred by Bald Eagles in Southeast Alaska. Approximately 55% of nests examined occurred adjacent to such areas (Hodges and Robards 1982). Nearly 30% of observed nests were associated with salt water bays and 11% were found on narrow salt water channels. Heads of bays and brackish lagoons were avoided (Robards and King 2008). Most nest sites in Southeast Alaska were associated with intertidal margins of less than 45 m (Robards and Hodges 1976). Fewer nest sites than expected were located adjacent to broad expanses of mud flats (Corr 1974). The increased distance over extensive mud flats to foraging sites may be a disadvantage to nesting Bald Eagles.

Bald Eagle sitting in its nest atop a western hemlock tree overlooking the ocean. Photo by Scott Gende.

The location of Bald Eagle nests found in the Yakutat area and on the Kenai Peninsula suggested that the birds preferred sites near clear, slow moving, relatively shallow streams that support spring and fall spawning fish (Patten 1981, Bangs et al. 1982). Streams and rivers that are free from ice throughout the winter or early in the spring are

preferred foraging sites (Ritchie 1982, Gerrard and Bortolotti 1988). Reduced visibility of fish in silty or turbid rivers reduces the success of hunting efforts by Bald Eagles (Grubb 1977). Hunting conditions for Bald Eagles tend to be more variable in glacier-fed rivers than in salt water because of turbidity and fluctuation of river level associated with glacier melt (Hansen 1987).

Summary

A pattern for a general description of Bald Eagle habitat in Alaska may be extracted from this review. Nest sites are located on a dominant structure near good foraging sites. If the nest is placed in a tree, the tree is generally live, is dominant or co-dominant in the stand and has large branches. Large snags that serve as perches are close to the nest tree. If the nest is not in a tree it is located on a cliff or rock structure such as a sea pinnacle that provides protection from predators and disturbance.

Perch sites for immature and non-nesting adult Bald Eagles are usually large, tall trees with large lateral branches and close to foraging sites. Single trees or trees in small groups are preferred. Snags are preferred but live trees are readily used.

Roosting sites for wintering Bald Eagles are located in areas protected from prevailing winds by topographic features. Although Bald Eagles use deciduous trees for roosting, they prefer conifers during severe weather. Large trees with open horizontal branches are preferred within the roosting site.

Bald Eagle nests are built close to foraging areas where prey are available. These foraging areas include large salt water channels and clear, shallow streams that are ice free.

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