

NEST SITE SELECTION BY THE BROAD-WINGED HAWK IN NORTH CENTRAL MINNESOTA AND WISCONSIN

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Abstract

Twenty-nine nests in several parts of Minnesota and Wisconsin were compared. Nests were primarily in the oak-aspen serotene, 35 years old and older. Nesting density was about one pair per 2 square miles (3.2 km²). Nests were in the first suitable crotch in the lower one-third of the canopy, within 408 feet (124 m) of an upland opening and within 468 feet (143 m) of a wet area.

Introduction

The Broad-winged Hawk (*Buteo platypterus*) has not been studied extensively. In publications from 1880 to 1930 most observations of nesting habitat were in general terms, except for nest heights and dimensions. Burns (1911) stated that the ideal area in Pennsylvania for Broad-winged Hawks consisted of upland hillsides, and swamps, well covered with mixed hardwood stands interspersed with small clearings and roadways with water areas available. Banks (1884), Currie (1901), and Riley (1902) indicated that the nest is always placed in a crotch of the main trunk. Eighty records from the continent-wide Cornell Nest Record Card Program give nest heights ranging from 8 to 70 feet (2 to 21 m), the average being 38 feet (12 m).

My study was carried out as part of an investigation into the effects of Ruffed Grouse (*Bonasa umbellus*) management upon wildlife in general, primarily on the Crow Wing Natural History Area (20 miles [32 km] southeast of Brainerd, Minnesota) and adjacent properties. The area is characterized by hills and outwash plains, the result of glacial activity more than 16,000 years ago. About 28 percent is wetland, ranging from marsh to spruce-fir bog. The remainder is covered with second-growth stands of mixed hardwoods.

One part of the study was to find and describe nest sites of raptors. After two years of observation a pattern for the nest site requirements of the Broad-winged Hawk was apparent. In order to test the site description for places other than the study area, Broad-winged nest sites were observed near Cloquet, Bethel, Lake Itasca, and Brainerd in Minnesota, and near Plainfield and Stevens Point in Wisconsin. The study period extended from March 1971 through August 1974.

Methods

I made systematic searches in areas in which hawk sightings were reported by workers involved in projects on the Crow Wing Area, as well as in areas of previous hawk nests. I looked for hawks on all stick nests. When urates or whitewash, feathers, or fresh greenery were found near a nest or when a hawk was observed frequently in the vicinity, the nest tree was climbed.

I measured height of nest above ground, diameter and depth of the nest, and diameter at breast height (dbh) of the nest tree. Nest materials, species of nest tree, configuration of branches supporting the nest, and egg measurements were recorded. Periodic checks through the nesting season provided data on number of young, food brought to the young, and nest sanitation. Young were banded prior to fledging. Distances from the nest tree to the nearest wet area, trail, road, or other upland opening, and to the nearest conifer were measured.

I compared woodland densities around nest sites by using a modification of the wandering quarter method described by Catana (1963). Ten trees with a dbh of four inches (10 cm) or greater in each of the four cardinal compass directions, with the nest tree as the focal point, were selected for evaluation. Four inches (10 cm) dbh was chosen because trees of this size and larger contribute to the forest crown. Density figures were calculated in trees per acre (trees per hectare).

Results

Twenty-nine nest sites were observed during the study period. Eleven were on the primary study area; 13 were active when investigated.

The nests found were composed of loosely organized twigs of aspen, oak, and birch. Oak was the most frequently used nest tree in this study (table 1).

The support of the nest is a crotch or branching of the main trunk of the tree at a height which is within, but close to, the lower limit of the crown (table 2). Seventy-five percent of all forking configurations were three-way or four-way. The single nest

Table 1. Nest support trees used by Broad-winged Hawks in north central Minnesota and Wisconsin, 1971-1974.

Species	Number	% Occurrence	Av. dbh (in.)	Av. ht. (ft.)
Oak	12	41	9.7 (25 cm)	31 (9 m)
Aspen	6	21	9.3 (24 cm)	34.2 (10 m)
Birch	5	17	9.9 (25 cm)	26 (8 m)
Ash	2	7	9.5 (24 cm)	40 (12 m)
Maple	1	3	13.3 (34 cm)	25 (8 m)
Basswood	1	3	7.5 (19 cm)	26 (8 m)
Red pine	1	3	10.5 (27 cm)	35 (11 m)
Jack pine	1	3	15 (38 cm)	45 (14 m)

Table 2. Branch configuration of 28 nest trees used by Broad-winged Hawks in north central Minnesota and Wisconsin, 1971-1974.

Branching	Number	% Occurrence	Av. dbh (in.)	Av. ht. (ft.)
2 way	1	3.6	10 (25 cm)	30 (9m)
3 way	11	39.3	10.7 (27 cm)	33.2 (10 m)
4 way	10	35.7	9.0 (23 cm)	29.0 (9 m)
5 way	6	21.4	9.7 (25 cm)	33.5 (10 m)

with a two-way fork support was in an aspen in which a deep V provided a large support area.

Two things were apparent when looking at Broad-winged Hawk nests and location in the woods: (1) the close proximity of the nest to an upland opening, and (2) the presence of a wet area near the nest. The types of upland openings and the average distance from the nest are given in table 3. The average distance for all nests from an upland opening was 138 feet (42 m). No nests were found more than 408 feet (124 m) from an upland opening.

Wetlands near the nest were of six types (table 4); none was farther than 468 feet

Table 3. Upland forest opening type nearest to 29 Broad-winged Hawk nests in north central Minnesota and Wisconsin, 1971-1974.

Type of opening	Number of occurrences	% of occurrence	Av. distance to nest (ft.)
Woodland trail	20	69	72 (3-162) 22 m (1-49 m)
Paved road	4	14	224 (120-396) 68 m (37-121 m)
Gravel road	3	10	379 (360-408) 115 m (110-124 m)
Woodland field	2	7	258 (252-264) 79 m (77-80 m)

Table 4. Wetland type nearest to 29 Broad-winged Hawk nests in north central Minnesota and Wisconsin, 1971-1974.

Type of opening	Number of occurrences	% of occurrence	Av. distance to nest (ft.)
Wooded swamp ¹	14	48	116 (3-330) 35 m (1-101 m)
Shrub swamp ¹	8	28	250 (66-468) 76 m (20-143 m)
Shallow fresh ¹ marsh	4	14	224 (84-396) 68 m (26-121 m)
Deep fresh ¹ marsh	1	3	210 (64 m)
Pool ²	1	3	258 (79 m)
Lake ³	1	3	360 (110 m)

¹Wetland types, United States Fish and Wildlife Service classification system (Shaw and Fredline 1956).

²Less than 5 acres, without vegetation, 1-2 feet in depth (.3-6 m).

³More than 10 acres, deeper than 4 feet (1.2 m).

(143 m), and the average distance was 220 feet (67 m). All had two things in common: standing water, and the presence of frogs.

In this area, the forest type preferred by the Broad-winged Hawk was an oak-aspen sere. Stand density and species frequency at 10 nests on the Crow Wing Area are given in table 5. Average stand density was 82 trees per acre (204 per hectare), red oak being the predominant species. Increment borings indicate that the trees which the Broad-winged Hawk used for nesting were between 35 and 50 years of age.

Table 5. Stand density at ten Broad-winged Hawk nests, Crow Wing Natural History Area, 1971-1974.

Nest Tree	Stand Density Trees/Acre	Species Density of Site Dominant Species	% of Stand
Ash	229 (566/ha)	Oak	23
		Aspen	15
Aspen	122 (301/ha)	Aspen	55
		Oak	25
Aspen	158 (390/ha)	Aspen	55
		Oak	25
Aspen	213 (526/ha)	Oak	60
		Maple	15
Red Oak	254 (627/ha)	Aspen	50
		Oak	28
Red Oak	111 (274/ha)	Birch	45
		Oak	35
Red Oak	184 (454/ha)	Oak	43
		Maple	28
Red Oak	317 (783/ha)	Oak	45
		Aspen	28
Bur Oak	283 (699/ha)	Ash	28
		Aspen	23
Paper Birch	172 (425/ha)	Aspen	50
		Oak	40

Discussion

The height of the nest was governed by the forest crown structure. Only one of 29 nests was in the top of a tree. The others were in the lower one-third of the crown and in the first support site available above the lower limit of the crown. Bent (1937) stated that the Broad-winged Hawk nests in the most abundant and characteristic large tree in the area. Matray (1974) found that 12 of 14 nests in the Adirondacks were in yellow birch. Nesting trees in my study were not the most numerous or conspicuous in the area. The tree used for nesting appeared to be one that had an adequate support and was within 408 feet (124 m) of an upland opening and 468 feet (143 m) of a wet area.

Upland openings appeared to provide the primary food. Small mammals, birds, amphibians, reptiles, and insects made up the diet, with small mammals being the major portion, as determined by analysis of nest material and pellets collected at nest.

Broad-wings were often seen perched at the edge of wooded roads and trails. Roadways are used by many forms of wildlife. Six 2-acre (.8-hectare) small-mammal live capture and marking studies lasting 10 days each gave information on sizes and movements of prey populations. Each observation area was divided by a roadway or trail with traps on both sides to determine whether the roads were barriers to movement or if small mammals moved back and forth across them. Mammals captured were toe clipped for identification upon recapture. Small mammal activity and movement did occur across the openings. Also noted was that a large number of the captures of small mammals were adjacent to the openings.

Nest setback appears to be related to the amount of noise and disturbance at the opening. Table 3 shows that woodland trails were nearest and that gravel roads had the greatest nest distance or setback. Woodland trails, at the onset of nesting, were usually wet and inaccessible. Paved roads are accessible, but vehicles moving along these roads are fairly quiet. Two nests were near fields under cultivation, but resultant tractor noise occurred late in the nesting season.

Amphibians appear to be a vital part of the prey base for Broad-winged Hawks. This explains the value of wet areas in nest-site selection. Small birds and insects which frequent swamps also are a part of the Broad-winged diet. There was much variability as to distance from the nest to the wet area, but 468 feet (143 m) was the maximum (table 4). Wooded swamps which provided perch sites for hunting were the closest wetland type.

Broad-winged Hawks on the Crow Wing Area have a breeding density of one pair per 2 square miles (3.2 km²). The activity center is a breeding, nesting, feeding territory which is defended until the young are fledged and the nest is abandoned. Adults which appeared in the same activity center in subsequent years nested in a different part each year. The young, as indicated from banding returns, did not return.

Matray (1974) stated that Broad-winged Hawks in his study area in the central Adirondack Mountains utilized fresh sprigs of several tree species in their nests. This contradicts Burns (1911) who stated that only one kind of leaf material is used in each nest. Nests on the Crow Wing Area were lined on the bottom with bark. Those which showed activity shortly after the birds arrived were decorated with conifer sprigs. Later, fresh sprigs of aspen and oak leaves were used, both in the same nests at some locations. Eight nests that were constructed after leaf emergence did not have conifer in them. The species of conifer used seemed to be a peculiarity of the individual hawks in a particular activity center. In activity centers in use two or more years when conifers were used the species was constant. The conifer used was not always the species nearest to the nest. For example, at one activity center on the Crow Wing study area where Broad-winged nests were located three out of four years, white pine sprigs were in the nest. White pine was not present in the general vicinity of the nest sites—red pine was!

Implications for Forest Wildlife Management

Major emphasis of forest game management is for Ruffed Grouse and white-tailed deer (*Odocoileus virginianus*). This involves the setting back and maintenance of aspen woodlands in a 40-year rotation. Game management also involves the erection of

nest boxes and blasting of small potholes for Wood Duck (*Aix sponsa*) and American Goldeneye (*Bucephala clangula*) production.

I believe these operations will maintain the Broad-winged Hawk in the forest ecosystem. The ideal size of manipulation blocks for grouse and deer is 10 acres (4 hectare). The openings and the trail system that evolve from logging will maintain the needed upland openings. The maintenance of wet areas in the forest for ducks will also provide the required wet areas for Broad-winged Hawks.

As long as a harvest rotation is developed which provides interspersions at the closest intervals, the Broad-winged Hawks will be able to nest in the 40-year-old stands and hunt in the younger areas. These young areas have the necessary substantial small mammal populations. Where woodland waterfowl are part of the forest prescription, in order to maintain nest sites for ducks, older trees of the oak series will not be cut.

Some people are concerned that forest game management advocates an aspen monotype. I do not foresee this occurring in this part of the country with the present equipment, markets, and stand variabilities. Under present methods of clear-cutting, part of the stand will come back with oak and birch, as well as aspen, if the stand contains these components prior to cutting.

Forty percent of forest land ownerships are held in small parcels by private individuals with varying interests which help in maintaining forest stand diversity (Gullion pers. comm.). This in turn will insure the maintenance of the Broad-winged Hawk as part of the forest ecosystem.

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