Nesting Habitat Characteristics of Goshawks in Minnesota

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Mark Martell
Ted Dick
Patrick T. Redig, D.V.M., Ph.D.

The Raptor Center at the University of Minnesota
1920 Fitch Ave, St. Paul, MN 55108

Please note that all location information has been removed from this report to help protect Minnesota's goshawk populations.

Contents

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Introduction

The northern goshawk, *Accipiter gentilis*, is a secretive hawk of northern forests. They are considered to be a year-round resident of Minnesota, nesting primarily north of Pine and Crow Wing counties, although nests have been reported as far south as the Twin Cities (Roberts 1932, Janssen 1987) . Goshawks migrate through Minnesota and are a regular winter resident. The nesting population has always been considered small; Roberts (1932) wrote that the species was "... rarely a summer resident" and had reports of only 4 nests. Janssen (1987) reported confirmed nesting from 10 counties since 1970. Little quantitative information has been gathered on nesting density, chronology, or habitat characteristics of goshawks in Minnesota.

Recent concern over the status of goshawk populations has resulted in its classification as a "Category 2" species by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 1992), and as a candidate for "endangered" status in Wisconsin (Wisconsin Natural Heritage Database 1994). The goshawk is not currently under consideration for listing by the state of Minnesota (R. Baker, Minnesota Department of Natural Resources, personal communication).

In response to this recent concern, federal and state agencies have realized the need for more information that may lead to a comprehensive management plan for goshawks in Minnesota. The first steps in designing a plan for Minnesota goshawk management are to locate nest sites, quantify nesting habitat characteristics, and outline goshawk nesting distribution within the state.

The objectives of our study were to: 1) test, and modify as necessary, nesting goshawk survey and detection methods in Minnesota, 2) quantitatively describe goshawk nesting habitat in Minnesota, and 3) create a list of goshawk nesting sites in Minnesota.

Methods

Study Area

The study was conducted in northern Minnesota, ……XXXXXXX

….……Goshawk nest sites were analyzed wherever they were located within the state.

Nest Location

Call Playback - The broadcast of two types of conspecific calls--the alarm, or "kakking" call of the adult, and the food-begging call of the juvenile--have been shown to be effective in eliciting goshawk responses (Kennedy 1993). Taped calls were obtained from the USFS Southwest Region (517 Gold Ave. SW, Albuquerque, New Mexico). The alarm call consisted of 35 kaks over a 10-second span. The food-begging call consisted of 11 calls over a 10-second span. These calls were rerecorded on 20-second continuous loop cassettes for playback broadcast.

Portability, reliability, and sound quality were evaluated for several different playback systems. A Sony Sport Walkman cassette player combined with a Radio Shack Musical Megahorn, or a Johnny Stewart Wildlife Call cassette player were used to broadcast calls. To insure consistency, a Realistic Sound Level Meter set on the C weighting was used to check for an output of 100 to 105 decibels at a distance of one meter from the speaker.

The broadcast procedure followed Rosenfield (1988) and Kennedy (1993). At each station along a transect the caller was directed 60 degrees from the line of the transect for a 10-second bout of calls. This was followed by the same calls repeated at 180 degrees and 300 degrees. After 30 seconds of silence the calls were again played in the three directions with a 30-second pause after each play.

To test the effectiveness of call playback in eliciting a response, tapes were played along transects that passed near active nests. We determined whether the nest was occupied during the test, and only results from tests at occupied nest were included in the results. The alarm call was tested in five trials at each of two nests for a total of ten trials. The food-begging call was tested in two trials at two nests and one trial at one nest for a total of five trials.

Literature and Record Search - Historic nest records were obtained from the Minnesota Natural History Database and *The Loon.*

Public Solicitation - The general public was solicited for goshawk sightings through appeals for assistance that were sent to a variety of newspapers and organizations. Newspapers to which notices were sent include: *Star Tribune, Ada Norman County Index,*

Aitkin Independent Age, Baudette Region, Bemidji Newsline, Blackduck American, The Blackduck Shopper, Brainerd Daily Dispatch, Cass Lake Times, Deer River Western Itasca Review, Duluth Herald News Tribune, Grand Rapids Herald Review, Heartland Journal, Hibbing Tribune, International Falls Daily Journal Northome Record, Bemidji 0jibwe News, Outdoor News,lnc., Park Rapids Enterprise, and *The Walker Pilot Independent.* The Minnesota Ornithologist's Union also printed a notice in its newsletter, the *MOUthpiece,* and a request for assistance was made to the Minnesota Falconer's Association. These notices were sent out prior to the field survey season. After the survey season had begun, fliers were carried in the survey vehicles and distributed to interested parties as well as local merchants.

Professional Solicitations - Government agency personnel were solicited through personal contact and through agency channels. John Mathisen, Forest Biologist, and Jack Mooty of the Minnesota Department of Natural Resources sent notices prior to the survey season. Fliers were distributed in person, or phone contact was made with USFS, MNDNR, and county forestry employees in Backus, Park Rapids, Longville, Bemidji, Cass Lake, Deer River, Northome, Walker, Grand Rapids, Blackduck, Brainerd, Cloquet, International Falls, and Baudette. Visits were paid to XXXXXX to enlist the assistance of personnel. Call playback tapes and instructions were delivered to XXXXX where students conducted a playback survey.

Surveys - Conspecific call-playback surveys were begun on 16 May and continued through 15 July, with the bulk of the surveys completed by 15 June. A total of 581 km of surveys were completed, 496 km using the alarm call and 85 km using the food-begging call. Alarm calls were used during the late incubation and nestling periods, while food-begging calls were used more extensively during the late nestling and fledgling periods.

Surveys in XXXXXX were designed to include each of the forest's designated Land Type Associations (LTAs). Transects included grouse-drumming survey routes. Additional transects were added as time permitted within XXXXXX as well as other parts of Northern Minnesota.

Survey procedures followed those developed by Rosenfield et a1. (1988) and Kennedy (1993) and conformed to the protocol distributed by the USFS Southwest Region. Transects were established along roads or trails with stations spaced 300m apart. Travel along the transect was done by motor vehicle or bicycle.

Goshawk Activity

Sites were classified as active nest sites if nesting activity such as copulation, egg laying, or the presence of chicks was verified. Locations where adults were seen or heard during the breeding season but nesting was not confirmed were classified as territories. Once nests were located, periodic visits to the sites provided data on productivity, mortality, approximate hatching and fledging dates, prey choice, and changes in nest defense behavior. We also attempted to band all nestlings using standard USFWS bands.

Habitat Analysis

Quantitative vegetation measurements were taken at active nest sites to analyze habitat characteristics at the nest tree, nest site, and landscape level.

At the nest tree; tree height, nest height, crown height, and canopy height were measured using a Suunto PM-5/360 PC clinometer. Dbh was measured using steel dbh tapes. Canopy closure was measured by ocular estimation looking through a 5cm diameter PVC tube sectioned with monofilament line.

At the nest site, stem density and mean diameter breast height (DBH) of trees over 1 inch dbh were measured within a circular plot of 16m diameter (.08ha) centered at the nest tree. Within the same 16m plot, canopy closure was measured. Canopy closure was measured at points 4m, 8m, 12m, and 16m from the trunk, running along lines in the

four cardinal directions from the nest tree.

At the landscape level; distances to water and human disturbance, such as roads and logged areas, were measured at each active nest.

Results

Using the alarm call at occupied nests produced a 70% response rate, at an average distance of 127m (n=10). The response rate using the food-begging call was 100% at an average distance of 150m (n=5).

We verified four active goshawk nests in Minnesota in 1994, three of which successfully fledged young (Table 1). Of the nine nestlings we were able to document, three died before fledging and one was taken for falconry. This resulted in an average of 1.5 young/active nest, or 2 young/successful nest (this includes the bird taken for falconry as a fledged young). Two of the active nests were located XXXXXX. These nests produced five nestlings, four of which fledged.

Three territories, two in located XXXXXX, were also documented (Table 1). A summary of each active nest site is presented in Appendix I and a summary of each territory is presented in Appendix II.

Table 1 Removed – CONTAINS LOCATION INFORMATION

Literature and record search - A check of state records and a review of periodicals for goshawk nesting accounts revealed some historical documentations but nothing from the past 14 years. The DNR Natural Heritage Information System database contains 14 goshawk nesting records (Table 2), none of them more recent than 1980. *A* search of *The Loon* found no nest records listed in volumes dating back to 1982.

Table 2

HISTORICAL GOSHAWK NESTING RECORDS IN MINNESOTA

County Name	Location	Year	Source
Aitkin	xxxxxx	circa 1989	A. Weaver
Becker	xxxxxx	circa 1990	A. Weaver
Beltrami	xxxxxx	1979	DNRNHD
Carlton		1965	DNRNHD
Clearwater	xxxxxx	1980 xxxxxx	DNRNHD
Cook		1937 xxxxxx	DNRNHD
Hennepin		1892	DNRNHD
Hubbard	xxxxxx	1973	DNRNHD
Itasca	xxxxxx	circa 1990	A.Weaver
Lake		1978	DNRNHD
Lake		circa 1991	A.Weaver
Lake of the Woods		1962	DNRNHD
Pine	xxxxxx	1980 xxxxxx	DNRNHD
Roseau		1926	DNRNHD
Roseau	xxxxxx	1927	DNRNHD
Roseau	xxxxxx	1926	DNRNHD
St. Louis		1935	DNRNHD
St. Louis	xxxxxx	1945	DNRNHD
St. Louis	xxxxxx	circa 1990	A. Weaver

Habitat Analysis

Of the four nests we found this year, three were in live aspen (*Populus tremuloides*), while the other was in a dead white pine *(Pinus strobus).* The average height of the nests was 12.4m (40.3 ft). The mean DBH of the nest trees was 13.15 in. The mean height of the nest trees was 19.5m (Table 3). Canopy closure measurements averaged between 60 to 72% at the four sites (Table 4). A computer summary of the acreage in each forest type as listed by XXXXXX for approximately 10,000 acres surrounding each of the two XXXXXX nests is found in Table 5.

Table 3

1994 GOSHAWK NEST TREE, NEST SITE, AND LANDSCAPE FEATURE SUMMARY

	Nest Site			
Nest Tree				
Species	*White Pine*	*Aspen*	*Aspen*	*Aspen*
Tree Height	20m	19.8m	17m	21m
Crown Height[1]	--	11.9m	10.3m	13m
DBH	16.5 in. 41.91 cm	15.8 in. 40.13 cm	10.4 in. 26.42 cm	10.6 in. 26.9 cm
Nest Height	11m	11.9m	13m	13.7m
Nest Site[2]				
Mean DBH[3]	4.44 in. 11.27 cm	7.45 in. 18.9 cm	6.9 in. 17.5 cm	6.9 in. 17.5 cm
Stem Density	1237.5 st/ha	762.5 st/ha	1250 st/ha	1187.5 st/ha
Landscape Features				
Distance to Water	25m	33m	30m	130m
Distance to Path	200m	5.5m	21.3m	17m
Distance to Cutover	50m	117m	38.1m	73m cornfield
Direction to Cutover	west	east	southwest	southwest
Dist. to 2-Lane Rd.	1.5K	62m	1K+	400m
Slope/Elevation	slope to NE	gradual slope to NE and SW	--	--

[1] No crown measure at site because tree was dead.

[2] Site includes area within 16m of nest tree.

[3] Includes all stems over 1 inch DBH.

Table 4

CANOPY CLOSURE GRIDS

Distance From Nest Tree (Meters)

Site: XXXXXX

	4	8	12	16	Average
South	100	50	50	100	75
East	80	80	50	90	75
North	70	100	60	50	70
West	80	80	30	80	67.5
Average	**87.5**	**77.5**	**47.5**	**80**	**72.5**

Site: XXXXXX

	4	8	12	16	Average
South	80	80	50	90	75
East	10	0	100	70	45
North	90	20	0	10	30
West	90	90	90	90	90
Average	**67.5**	**47.5**	**60**	**65**	**60**

Site: XXXXXX

	4	8	12	16	Average
South	80	60	20	80	60
East	80	80	90	80	82.5
North	60	70	40	20	47.5
West	80	80	80	50	72.5
Average	75	72.5	57.5	57.5	65.62

Site: XXXXXX

	4	8	12	16	Average
South	90	30	80	80	70
East	60	90	80	60	72.5
North	80	90	70	80	80
West	50	40	50	90	57.5
Average	67.5	62.5	70	77.5	69.68

Table 5

FOREST TYPES AND ACREAGE SURROUNDING KNOWN GOSHAWK NESTS

XXXXXX

Forest Type	CNF Code	Acres	%	Rank	Min	Max	Average
XXXXXX							
Aspen	91	3209	30.76	1	1903	1994	1957
Red Pine	2	2008	19.25	2	1884	1994	1964
Jack Pine	1	1135	10.88	3	1910	1994	1941
Open	99	896	8.60	4	1976	1993	1984
Lowland Brush	97	650	6.23	5	1988	1988	1988
Balsam-Aspen-P. Birch	11	487	4.67	6	1900	1990	1947
Sugar Maple Basswood	82	464	4.45	7	1890	1989	1926
Black Spruce	12	400	3.83	8	1875	1959	1920
Paper Birch	92	344	3.30	9	1914	1949	1927
Mixed Swamp-Conifer	18	262	2.51	10	1898	1976	1929
White Spruce-Balsam	16	166	1.59	11	1961	1982	1972
Tamarack	15	117	1.12	12	1883	1978	1916
Burr Oak	54	103	.98	13	1900	1916	1905
Northern Red Oak	55	94	.90	14	1912	1990	1929
Northern White Cedar	14	69	.66	15	1886	1889	1888
Black Ash-Elm-Red Maple	71	18	.17	16	1920	1937	1929
Upland Brush	98	11	.11	17	1979	1979	1979
		10433	100.01				
XXXXXX							
Aspen	91	2876	29.11	1	1914	1994	1965
Sugar Maple-Basswood	82	1260	12.75	2	1890	1991	1928
Open	99	1200	12.15	3	1989	1989	1989
Black Ash-Elm-Red Maple	71	682	6.90	4	1830	1984	1924
Black Spruce	12	656	6.64	5	1849	1936	1898
Tamarack	15	577	5.84	6	1844	1931	1900
Lowland Brush	97	512	5.18	7	----	----	----
Red Pine	2	486	4.92	8	1907	1984	1959
Mixed Swamp Conifer	18	393	3.98	9	1826	1938	1900
Balsam-Aspen-P.Birch	11	377	3.82	10	1905	1993	1933
Northern Red Oak	55	298	3.02	11	1914	1938	1925
White Spruce-Balsam	16	182	1.84	12	1959	1985	1975
Northern White Cedar	14	150	1.5	13	1885	1937	1915
Jack Pine	1	91	.92	14	1906	1934	1925
Basswood-Ash	89	44	.45	15	1926	1926	1926
Upland Brush	98	34	.34	16	----	----	----
Balsam Poplar	94	30	.30	17	1934	1934	1934
Paper Birch	92	21	.21	18	1920	1920	1920
White Pine	3	10	.10	19	1983	1983	1983
		9879	99.99				

Discussion

We were able to document 4 active goshawk nest sites in Minnesota in 1994. This number, while low, is consistent with available data on historic goshawk numbers in the state (Roberts 1932, Janssen 1987). The apparently sparse population is not surprising since Minnesota is at the southern edge of the goshawk's range in central North America (Palmer 1988).

In addition to the four verified active nests, we were able to identify two unverified active nests, four active territories, several recently active historical sites, and 14 historical nest sites for the species in the state. These sites will provide a starting point for nest searches next year.

In Wisconsin, researchers documented 4 active nests in 1994, which included areas which have been surveyed and studied for many years (T. Doolittle personal communication). Wisconsin researchers feel that goshawks have been recently declining in that state, with a number of causes suggested including the effects of logging and predation by raccoons *(Procyon lotor)* and fishers (Mattes *pennanti)* (Erdman 1993, T. Doolittle personal communication). The relevance of these findings to Minnesota is uncertain at this time. However, the results from Wisconsin should certainly be taken into consideration as part of any future research planning.

Locating the nests of secretive woodland raptors such as goshawks can be difficult and time-consuming. Recorded vocalization playbacks have been used in surveys to expedite the process (Kimmel and Yahner 1990, Kennedy and Stahlecker 1993). While the hooting call of the great horned owl can be used for multi-species raptor surveys, goshawk location has been shown to be more effective using conspecific vocalizations (Kimmel and Yahner 1990).

Our playback surveys successfully located one goshawk nest and also produced a lead on another previously unknown territory (XXXXXX), and confirmed the presence of adult goshawks at historical nest sites near XXXXXX, XXXXXX, and XXXXXX. Efforts made at soliciting information from other individuals were very effective. Information provided by falconers, foresters, and wildlife biologists led to most of the nest sites we documented this year. It is clear that continued solicitations of this kind will be important to any future nest site location effort.

We have locations, nesting observations, and habitat measurements on the four pairs of goshawks that produced young in 1994. While this number is insufficient for statistical comparisons between the sites, it does provide valuable information which can be used in conjunction with additional data collected in future years to provide a picture of goshawk needs in the state.

We believe that this study has been successful in establishing the usefulness of call-playback techniques in Minnesota, and has started the development of a "goshawk network" of interested falconers, biologists, and foresters which will lead to the discovery of additional goshawk nest sites in the future. Using the information gathered in 1994, we would recommend that nest searches begin earlier in the spring, probably being underway by mid-April.

Research needed in the next two years includes continuation of efforts to locate nesting goshawks, analyzing habitat, and monitoring production. Furthermore, research into the winter movements and foraging activities of Minnesota nesting goshawks may provide valuable insights into factors controlling goshawk numbers in the state. It has also been recommended that evaluation of minimum nest site protection zones, nest production in both protected and disturbed habitats, and the effects of land management practices on goshawk foraging be researched (Annon 1993).

Clearly, much remains to be learned about the goshawk in Minnesota. Concerns over its status in other parts of the country, particularly in neighboring Wisconsin, will continue to put pressure on land and wildlife managers to take action. Because the goshawk is so dependent on forest habitat, actions taken to manage goshawks could have serious ramifications both economically and socially. It is extremely important then, that good, verifiable data be collected on this species and that it be shared with as wide an audience as possible.

Acknowledgements

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