# NESTING HABITAT CHARACTERISTICS

# OF THE

# NORTHERN GOSHAWK
# (*Accipiter gentilis*)

# IN MINNESOTA

**Final Report**

*Please note that all location information has been removed from this document*
*to protect the goshawk populations*

Submitted to:

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By

**Mark Martell**
**Ted Dick**

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

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# ACKNOWLEDGMENTS

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Three radio stations generously contributed air time to the goshawk search. News director Marty Karger of KBHP radio of Bemidji made several announcements on the hourly news. John Latimer of KAXE in Grand Rapids allowed time for a 20 minute interview and made other announcements of the project. Dan Hertsgaard of WCCO radio in Minneapolis, conducted a 40 minute interview with Ted Dick and Mary Beth Garrigan discussing goshawks and our project.

# INTRODUCTION

Concerns over changes in northern goshawk (*Accipiter gentilis*) populations, and particularly whether these changes are due to modern forest management practices, have brought to light the need for data on even the most basic elements of goshawk biology in parts of North America (Reynolds et al. 1992). Against this background, recent proposals to change forestry management practices in Minnesota have raised concerns over the future of goshawk populations in the state. In response, biologists with private organizations as well as federal and state agencies have realized the need for more information in order to develop a comprehensive management plan for goshawks in Minnesota. The first steps in designing such a plan are to locate nest sites, quantify nesting habitat characteristics, and outline goshawk nesting distribution within the state.

Numerous recent studies particularly in the southwestern and western regions of the country, have investigated various aspects of goshawk population dynamics. In the Midwest, some information on goshawk nesting has been gathered (T. Erdman, S. Postulpulsky, pers. com.) although little has been published. In Minnesota, almost no quantitative information has been gathered on nesting or habitat characterization and few attempts have been made to investigate goshawk nesting in the state. Studies done by Eng and Gullion (1962), and Davis (1979), investigated goshawk predation on ruffed grouse *(Bonasa umbeilus*), and post-fledgling movements, behavior and prey use on XXXXXX.

The northern goshawk is considered to be a year-round resident in Minnesota. Nesting occurs primarily north of Pine and Crow Wing counties, although nests have been reported as far south as Hennepin County (Roberts 1932, Janssen 1987). Nesting populations have always been considered small; Roberts (1932) wrote that the species was "...rarely a summer resident" and had reports of only four nests. Janssen (1987) reported confirmed nesting in 10 counties since 1970, while Johnson (1982) reported a total of 61 nestings. Fall migration data has been collected at Hawk Ridge in Duluth since 1972 and show 10 year cycles of peak numbers (Hawk Ridge Annual Report 1995). The goshawk is considered a regular winter resident in Minnesota (Janssen 1987).

At the time this study was started, concern over the status of goshawk populations had resulted in the bird's classification as a Category 2 species (meaning that more information is needed) by the U.S. Fish and Wildlife Service (USFWS) (Smith 1992). The U.S. Forest Service (USFS) listed it as a sensitive species in the Southwest region (USDA Forest Service 1991). In the Midwest, the state of Wisconsin considered listing the species, although that proposal was not adopted. The goshawk is not currently listed by the state of Minnesota.

This report summarizes a study begun in 1994 and continuing through 1996. The objectives of this study were to 1) locate goshawk nests in Minnesota, 2) monitor nest productivity at these sites, and 3) quantify the habitat at these sites.

# METHODS

## STUDY AREA

The primary nest search area was the XXXXXX. Efforts were also made to solicit public assistance throughout the northern forested region of the state. Federal, state, county and some private lands were also surveyed XXXXX. State lands included portions of: XXXXXX.

## NEST LOCATION

Nest location efforts consisted of a three pronged approach: 1) conspecific call playback surveys, 2) searches of historical records, and 3) solicitation of information from the public 1 and professionals .

## CALL PLAYBACK SURVEYS

We broadcast two types of conspecific calls which they have been shown to be effective in eliciting goshawk responses (Kennedy and Stahlecker 1993, Kimmel and Yahner 1990); the alarm or "kakking" call of the adult, and the food begging call of the juvenile. 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 ten second span. The food-begging call consisted of 11 calls over a 10 second span. These calls were re-recorded on

20-second continuous-loop cassettes for playback broadcast. Alarm calls were used for surveys during the late incubation and nestling periods, while food-begging calls were used during the late nestling and fledgling periods.

Portability, reliability, and sound quality were evaluated for several different broadcast systems. A Sony Sport Walkman cassette player combined with a Radio Shack Musical Megahorn was the system used for the majority of the surveys. In 1994, a Johnny Stewart Wildlife Caller cassette player was used on some surveys. To insure sound consistency, a Realistic Sound Level Meter set on the C weighting was used to verify sound output of 100 to 105 decibels at a distance of one meter from the speaker, as recommended by Kimmel and Yahner (1990)

Our survey procedures were modeled after those distributed by the USFS Southwest Region, Rosenfield et al. (1988), and Kennedy and Stahlecker (1993). Transects were established along roads or trails with stations spaced every 300m. Surveys were conducted from a truck, bicycle, canoe, or on foot. At each station along a transect, the speaker was directed 60 degrees from the line of the transect for a 10 second bout of calls. This was repeated at 180 degrees and 300 degrees. After 30 seconds of silence, the calls were again played in the same three directions with a 30-second pause after each play.

In 1994, we began our survey season on 16 May and continued through 15 July, with the bulk of the surveys completed before 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. In 1995, we began new nest surveys on 20 April. Total survey distances were 600 km by truck, 350 km by bicycle, 125 km on foot, and 80 km by canoe.

The 1994 survey transects were designed to include portions of each of the XXXXXX designated Land Type Associations (LTA's). A number of these routes were repeated in 1995 and some surveys were added, including surveys of several timber sale areas. Surveys in other parts of the state were designed to cover a variety of cover types and geographic regions. Many survey areas were chosen in response to suggestions from local agency personnel. Some

surveys were conducted in areas selected through GIS analysis as having mature aspen stands (Nongame DNR pers. com.).

## CALL PLAYBACK TECHNIQUE TESTS

We conducted a limited number of call playback trials along transects at known nest sites. 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, *The Loon,* and the personal records of Gordon Gullion at the University of Minnesota.

## SOLICITATIONS

Public - We placed a strong emphasis on attempts to solicit information from the public. Press releases, presentations to organizations, and flier distributions were conducted. In 1995, radio interviews were given, and notices sent to over 30 local newspapers.

Professional - Professional foresters and wildlife biologists from a variety of land management agencies played an important role in disseminating information and providing leads to potential nest sites. The offices XXXXXX were notified as were all offices XXXXXX. Presentations were made at XXXXXX district meetings in order to make all field personnel familiar with goshawk field identification.

## NEST PRODUCTIVITY AND MONITORING

Nest sites were listed as active if behaviors such as aggressive nest defense, incubation, or the presence of chicks was verified. Locations where adults were seen or heard during the breeding

season, but where nesting was not confirmed, were classified as territories. Once nests were located, periodic visits provided information on productivity, mortality, approximate hatching and fledging dates, and changes in nest defense behavior. Occasional discoveries of prey remains were also noted.

In 1995 and 1996 we revisited, and searched, the nest sites and surrounding territories of goshawks located in previous years. At previously active nests, an initial examination of the nest and immediate vicinity was conducted looking for fresh nest greenery, feathers, prey remains or droppings. If goshawks, or these signs were not present, the site was observed for a minimum of two hours. If goshawks were still not seen, a systematic visual search and call playback survey of the area was begun. The searcher walked expanding circles out from the nest concentrating on appropriate territory (forested areas as opposed to openings). We attempted to conduct these searches in April before leaf-out. The sites were searched again in May and June. Call playback surveys were conducted again in June and July. If goshawks were still not observed, the nest site was declared inactive.

At previously confirmed active territories (sites where adult goshawks had responded to taped calls, but no nest had been located) a one day visual search of the area was conducted to locate any stick nests before leaf-out. Within the following four weeks, another day was spent searching an expanded area around the call-in site. If no nesting pairs had been found, a call playback survey was conducted during the nestling period.

Previously located stick nests were also visited and observed for at least 2, two-hour periods with periodic checks for raptor activity in the following weeks.

## HABITAT ANALYSIS

Measurements were taken at active goshawk nest sites to analyze habitat characteristics at the nest tree, nest site, and landscape level.

At the nest tree: tree height, nest height, and crown height were measured using a Suunto PM-5/360 PC clinometer. Diameter breast height (DBH) was measured using steel DBH tapes. Canopy closure was measured by ocular estimation using a 5cm diameter PVC tube sectioned with monofilament line.

At the nest site: stem density (recorded as live or dead stems/ha.), and mean DBH (of trees over 1 inch diameter), were measured within a circular plot of 16m diameter (.08ha) centered at the nest tree. Within the same 16m plot, 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: cutover (defined as the nearest area logged within the past 15 years), water (defined as the nearest body of water present during the entire nesting season), and maintained roads, were measured at each active nest. Distances to cutover and water were measured on the ground, while distance to roads were estimated from maps and aerial photographs.

# RESULTS

## CALL PLAYBACK TECHNIQUE TESTS

In 1994, limited tests of call playback survey effectiveness were conducted at known nests. When nests were occupied, the alarm call produced a 70% response rate, at an average distance of 127m (416ft), n=10. The response rate using the food-begging call was 100% at an average distance of 150m (492ft) n=5.

## HISTORIC NEST SITES

Nineteen historic nest sites from 14 counties were identified from historic records available to us (Table 1).

## NEST PRODUCTIVITY AND MONITORING

Between 1994 -1996, 18 nesting attempts at 13 territories were recorded (4 -1994,6 -1995, 8 -1996). At least 13 of these 19 attempts were successful, and produced a minimum of 26 fledged young. Sixteen nests were found over the three years. The only territory known to be used all three years was XXXXXX. No nests were known to be active all three years (Table 2).

**Table 1: Historical Goshawk Nesting Records in Minnesota.**

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

DNRNHD - Minnesota Department of Natural Resources Natural History Database.

1994 - Four active nests with 9 nestlings were found in 1994. Three of these, fledged 2 young each, while the fourth nest failed (Table 2). One nestling from the XXXXXX nest was taken for falconry. This resulted in an average of 1.5 young per active nest or 2 young per successful nest (this includes the bird taken for falconry as a fledged young). Two of the active nests were located XXXXXX, one was on state land, and one was on private land. The two chicks from the XXXXXX nest were banded with USFWS leg bands.

1995 - XXXXXX was the only 1994 site reused in 1995, successfully fledging young in both 1994 and 1995. The nesting pairs from the other three 1994 sites were not relocated in 1995, and the sites were declared inactive after a thorough search. Five new active nests were discovered, for a total of six active nests in 1995. Of the six active nests, five fledged 12 young for an average of 2.0 young per active nest or 2.4 young per successful nest. Three of these nests fledged three young each. No birds were banded in 1995.

Some of the active nests discovered in 1995 were in proximity to sites where adult goshawks responded to call surveys in 1994. The XXXXXX site was within 2 miles of what was called the "XXXXXX" activity site in 1994. For listing purposes they have been merged under the XXXXXX heading in Table 2. Although there is no way of knowing whether the 1995 pair was the same called in 1994, it would be unusual to find two so close to each other. The XXXXXX (XXXXXX) nest discovered in 1995 is on the edge of an area searched extensively in 1994 after an adult was called in and the area had been near a site of previously documented activity reported by a falconer.

Of the two other areas listed as activity sites in 1994, a 1995 search of XXXXXX revealed an appropriately sized inactive stick nest in an area where a goshawk had responded to calls the previous year. A brief search of the area of the XXXXXX where a falconer had reported historical nesting and where in 1994, a goshawk had responded to calls, produced no nests or responses to tapes. One other nest structure on private land near XXXXXX that was surveyed in 1994 was reported by Jeff Hines (MNDNR) to be near a hawk nest in the same stand in 1995. Repeat checks of historical sites near XXXXXX and XXXXXX that were surveyed in 1994 produced no responses in 1995.

1996 - Monitoring of nests was done sporadically in 1996. A total of 9 active nests were recorded and produced at least 8 young. One nest (XXXXXX), had been active in 1995, and we believe that 2 territories (XXXXXX, XXXXXX) active in 1995 were re-used in 1996 with the birds at new nests. The XXXXXX territory was active in 1994, 1995, and 1996. The XXXXXX territory which was active in 1994, inactive in 1995, was used again in 1996 (Table 2). No birds were banded in 1996.

## PREY ITEMS

Prey items found in or near nests included remains from blue jays *Cyanocitta cristata*, northern flicker *Colaptes auratus*, and ruffed grouse.

## Table 2. Verified Goshawk Activity Sites in Minnesota 1994 - 1996.

| Site Name | County | 1994 Activity | 1995 Activity | 1996 Activity |
|---|---|---|---|---|
| **NEST SITES** | | | | |
| | Beltrami | 2 Fledglings[1] | inactive | unchecked |
| | Beltrami | unknown | 2 Nestlings[2] | inactive[6] |
| | Beltrami | unknown | 3 Fledglings | NA |
| | | NA | NA | 2+ Fledglings |
| | Beltrami | unknown | unknown | 2 Fledglings |
| | Beltrami | unknown | unknown | active |
| | Beltrami | unknown | unknown | 1 Fledgling |
| | Cass | 1 Adult seen | 3 Fledglings[4] | inactive |
| | Cass | 2 Fledglings | 2 Fledglings | NA |
| | | NA | NA | active[5] |
| | Cass | 2 Fledglings | inactive | NA |
| | | NA | NA | 1+ Fledgling |
| | Clearwater | unknown | 3 Fledglings | unchecked |
| | Itasca | 1 Adult seen | 1+ Fledglings[3] | active[6] |
| | Itasca | unknown | unknown | 2+ Fledglings |
| | Morrison | 2 Nestlings[2] | inactive | unchecked |
| | | | | |
| **TERRITORIES** | | | | |
| | Itasca | 1 Adult heard | NA, stick nest discovered | unchecked |
| | Pine | 1 Adult seen | no activity observed | unchecked |

[1] One fledgling taken for falconry.
[2] Both died.
[3] 1995 nest discovered within 2.5 miles of 1994 activity
[4] 1995 nest discovered within 1.5 miles of 1994 activity.
[5] Incubation seen in May, no birds present at end of June.
[6] Site checked by MNDNR (K. Haws pers. com.)

## HABITAT ANALYSIS

Nest Tree - Of the fourteen nests for which we have data, 10 were in aspen (*Populus tremuloides*), two were in white pine *(Pinus strobus),* one was in a basswood (*Tilia americana*) and one was in burr oak (*Quercus macrocarpa*) (Table 3). The mean height of the nests was 14.4m (47.2ft), n = 9. The mean DBH of the nest tress was 35.9cm (14.1 in), n = 9. The mean height of the nest trees was 22m (72.2ft), n = 9. The mean height of the base of the crown was 11.8m (38.7ft), n = 8 (Table 3). Separating the aspen from the other trees, n = 7, the mean DBH was 35.5cm (14in), mean tree height was 23m (75.46ft) mean nest height was 15.7m (51.5ft), and the mean height of the base of the crown was 14.6m (47.9ft) (Table 3).

Nest Site - Mean canopy closure ranged from 60% to 90.63% at eight sites (Table 4). Mean stem density at eight sites was 1153 stems/ha. and the mean DBH of these stems was 16.8cm (6.6 in) (Table 5).

Landscape Features

The mean distance to cutovers was 187m (613ft) and ranged from 38m (124ft) to 482m (1,581ft), n = 8. Mean distance to water was 63.7m (209ft), n = 9 and ranged from 18m (59ft) to 187m (613ft). The mean distance to the nearest road ranged from 2 to 4,000m (Table 6).

**Table 3. Goshawk Nest Tree Features.**

| Site | (Nest Tree Species) | Tree Ht (m) | Crown Ht (m) | Nest Ht (m) | DBH (cm) |
|---|---|---|---|---|---|
| | (*Pinus strobus*) | 20 | - | 11 | 41.9 |
| | (*Tilia americana*) | - | - | - | - |
| | (*Populus tremuloides*) | 20 | 12 | 12 | 40.1 |
| | (*Populus tremuloides*) | - | - | - | - |
| | (*Populus tremuloides*) | 17 | 10 | 13 | 26.4 |
| | (*Populus tremuloides*) | 21 | 13 | 14 | 26.9 |
| | (*Populus tremuloides*) | 25 | 16 | 16 | 42.2 |
| | (*Populus tremuloides*) | 27 | 19 | 20 | 35.1 |
| | (*Populus tremuloides*) | 24 | 16 | 17 | 39.2 |
| | (*Quercus macrocarpa*) | 17 | 4 | 9 | 32.5 |
| | (*Populus tremuloides*) | 27 | 16 | 18 | 38.4 |
| | (*Pinus strobus*) | - | - | - | - |
| | (*Populus tremuloides*) | - | - | - | - |
| | (*Populus tremuloides*) | - | - | - | - |
| | unk | - | - | - | - |
| | unk | - | - | - | - |

## Table 4. Percent Canopy Closure.

Site: (1995)

| | 4m | 8m | 12m | 16m | Mean |
|---|---|---|---|---|---|
| South | 60 | 40 | 30 | 40 | 42.5 |
| East | 80 | 50 | 70 | 50 | 62.5 |
| North | 80 | 60 | 60 | 80 | 70 |
| West | 80 | 90 | 80 | 60 | 77.5 |
| Mean | 75 | 60 | 60 | 57.5 | 63.125 |

Site: (1995)

| | 4m | 8m | 12m | 16m | Mean |
|---|---|---|---|---|---|
| South | 90 | 90 | 90 | 80 | 87.5 |
| East | 80 | 70 | 80 | 80 | 77.5 |
| North | 90 | 90 | 90 | 90 | 90 |
| West | 80 | 80 | 80 | 80 | 80 |
| Mean | 85 | 82.5 | 85 | 82.5 | 83.75 |

Site: (1995)

| | 4m | 8m | 12m | 16m | Mean |
|---|---|---|---|---|---|
| South | 100 | 100 | 100 | 80 | 95 |
| East | 90 | 90 | 60 | 100 | 85 |
| North | 90 | 100 | 90 | 90 | 92.5 |
| West | 100 | 100 | 100 | 60 | 90 |
| Mean | 95 | 97.5 | 87.5 | 82.5 | 90.625 |

**Table 4. Percent Canopy Closure (cont.).**

Site: (1995)

| | 4m | 8m | 12m | 16m | Mean |
|---|---|---|---|---|---|
| South | 80 | 80 | 70 | 40 | 67.5 |
| East | 90 | 90 | 80 | 90 | 87.5 |
| North | 50 | 40 | 90 | 80 | 65 |
| West | 100 | 100 | 90 | 70 | 90 |
| Mean | 80 | 77.5 | 82.5 | 70 | 77.5 |

Site: (1994)

| | 4m | 8m | 12m | 16m | Mean |
|---|---|---|---|---|---|
| South | 80 | 80 | 50 | 90 | 75 |
| East | 10 | 0 | 100 | 70 | 45 |
| North | 90 | 20 | 0 | 10 | 30 |
| West | 90 | 90 | 90 | 90 | 90 |
| Mean | 67.5 | 47.5 | 60 | 65 | 60 |

Site: (1994)

| | 4m | 8m | 12m | 16m | Mean |
|---|---|---|---|---|---|
| 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 |
| Mean | 87.5 | 77.5 | 47.5 | 80 | 72.5 |

**Table 4. Percent Canopy Closure (cont.).**

Site: (1994)

| | 4m | 8m | 12m | 16m | Mean |
|---|---|---|---|---|---|
| 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 |
| Mean | 67.5 | 62.5 | 70 | 77.5 | 69.68 |

Site: (1994)

| | 4m | 8m | 12m | 16m | Mean |
|---|---|---|---|---|---|
| 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 |
| Mean | 75 | 72.5 | 57.5 | 57.5 | 65.62 |

## Table 5. Goshawk Nest Site Features.

| SITE | STEM DENSITY | MEAN DBH |
|---|---|---|
| | 1237.5 | 4.44 in |
| | 762.5 | 7.45 in |
| | 1250 | 6.9 |
| | 1187.5 | 6.9 |
| | 1262.5 | 5.65 |
| | 1025 | 7.32 |
| | ----- | -------- |
| | 1312.5 | 6.30 |
| | 1187.5 | 8.08 |

† Storm damage prevented data collection at this site.

## Table 6. Distance to Landscape Features.

(meters)

| Site | Water | Maintained Road | Cutover Area |
|---|---|---|---|
| | 25 | ~4000 | 50 W |
| | 33 | 62 | 117 E |
| | 30 | ~3000 | 38 SW |
| | 130 | ~3000 | 73 SW |
| | 26 | 2 | 482 W |
| | 30 | ~2300 | 211 E |
| | 95 | ~3000 | -- |
| | 18 | ~1000 | 400 E |
| | 187 | 281 | 127 W |

# DISCUSSION

The increasing numbers of active territories found over the course of the study recorded (4 -1994, 6 -1995, 8 -1996) are likely the result of greater experience by observers and an increase in the number of people looking for nests. An addition of 14 new territories to the DNR Natural History database increases the total for the last 100 years by 100%.

Our tests and experience in the field indicate that goshawks in Minnesota respond to conspecific call-playback which is in agreement with findings from other parts of the country (Kimmel and Yahner 1990, Kennedy and Stahlecker 1993). The use of calls during nest searches improves detection speed and ability, and we believe that it is an effective means of locating goshawks in Minnesota forests, as well as being an extremely effective means of finding nests within territories.

Although transect surveys resulted in locating nest sites, they are extremely time consuming when not limited to particular timber sales or study areas. Surveyors on this study generally covered less than a mile every 20 minutes. Broadcasts are considered effective for a distance of 200m on each side of the transect (Kimmel and Yahner 1990, Kennedy and Stahlecker 1993) resulting in coverage over a small area. Transect surveys may be most effective in carefully searching well defined study or sale areas rather than being randomly used throughout an area as large as northern Minnesota.

For large areas, or a statewide search, an even more effective means of locating nests seems to be a large scale solicitation of information from the general public and forest and wildlife professionals. Twelve of the fourteen activity sites were found after information was reported to us by the public or professionals.

A need still exists for more information on the northern goshawk in Minnesota. The paucity of nesting records, habitat analysis and productivity estimations for the species in the state leaves wildlife officials and land managers with more questions than answers when trying to incorporate goshawk populations into management decisions. Furthermore, the population levels and status of this species remains to be determined.

Some of the more pressing questions facing goshawk management in Minnesota include, what is the population level and is the population in long term decline? Will new timber harvests alter the population trend? Is the population in Minnesota cyclical? What is the size of the goshawk home range in Minnesota?

It has yet to be determined how the goshawk population is faring in Minnesota. Given the suspected cyclical nature of the population, the-fact that Minnesota is on the southern edge of the North American range, and the expense involved with conducting, yearly representative surveys of the state, an accurate trend estimation will probably be expensive and difficult to obtain.

For the near future, the need to obtain additional information on the goshawk is critical. The U. S. Department of Interior has received petitions for listing all three of the currently recognized North American subspecies of the northern goshawk. Timber

sales and land management evaluations in XXXXXX have brought public responses concerned with the loss of goshawk habitat. The potential for an increase in these types of responses is strong given the current proposed increases in timber harvest and decrease in rotation lengths. Biologists on the XXXXXX have very little data at their disposal when called upon to make these evaluations in regard to the goshawk,

This situation is not unique to Minnesota. Postulpulsky (1991) stated, ... "currently, the most significant threat to continued nesting of the goshawk in Michigan is habitat alteration through timber harvest-directly through effects on nest sites and indirectly by influencing the distribution of competitors and abundance, distribution, and vulnerability of prey. Several breeding areas in the state were abandoned in recent years following', clear cutting. Fragmentation of Mature stands and creation of openings favor the influx of the goshawk competitors red-tailed hawk, and great horned owl. The latter also prey on goshawk nestlings and adults. In the long, run, intensive forest management will eliminate most mature forest stands which the goshawk requires for nesting and hunting."

Until more information is available, it is important to protect the known nest sites for future study. Recommendations for managing goshawks have been published for the Southwestern United States (Reynolds et al. 1992) The biologists XXXXXX have put together management guidelines based on those established in Wisconsin and other lake states. No nest site protection measures are currently enforced on state or county land.

In some parts of the country the taking of birds for falconry has also become a management issue (T. Kimmel pers comm. T. Erdman. pers. comm.). Of the 31 nestlings observed during this study, only one was taken by a falconer (and our knowledge of that nest was due to the cooperation of that falconer). There was a report that the XXXXXX nest tree showed signs of being climbed in 1996. The taking of raptors is limited to resident falconers in Minnesota, and several of the Minnesota falconers using goshawks trap migrating passage birds instead of taking nestlings (B. Ohlander pers. comm.). We do not know of any data to show that falconry in any way threatens goshawk populations in Minnesota.

Future research needs - Coordination between the USFS, USFWS, Universities, and NGO's is critical. Continued monitoring of known nest sites, location of new nests through surveys and solicitations, habitat and prey use studies, telemetry studies to determine breeding and wintering home ranges, and banding and color-marking to determine nest fidelity are all currently needed in Minnesota. Although the current focus in forest management is shifting toward a landscape or ecosystem approach, a continued analysis of goshawk habitat use can and should be incorporated into future system approaches to forest habitat management.

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# Appendix I:
# Verified Active Goshawk Nest Sites In Minnesota

This list is a compilation of all nest sites that were verified as active by this study in at least one of the breeding seasons of 1994, 1995, or 1996. Activity is defined here as observed nesting behavior; nest building, copulation, incubation, brood rearing or territorial behavior. Each of the following sites were observed to have produced nestlings in at least one of the three years.

**XXXXXX - Cass County**

This active nest was discovered by Ted Dick on May 11, 1995. Stands within 3 miles of this site had been reported as active nest sites in previous years by falconer Andy Weaver. As a result of this lead, the area had been searched and surveyed extensively in 1994. On May 17, 1994, an adult goshawk responded to alarm call playbacks on XXXXXX. Several days of searching failed to reveal the nest sits in 1994.

In April 1995, Ted Dick began a new search of the area. A stick nest was discovered approximately one mile east of the site of the 1994 goshawk response. Searches of this stand and surrounding stands and call playback surveys failed to uncover any other evidence of goshawk activity. On May 10, Ted returned to the area to search again. An adult goshawk responded to the third bout of alarm calls played at 6 PM. The calls were played sparingly and the hawk responded vocally, for 30 min. although it was never seen. Darkness halted the search for the day.

On May 11, the search was resumed. After searching for 30 min. without playing tapes a goshawk responded to the calls again. During this search, a total of five stick nests, were discovered in the stand (one was occupied by common ravens (*Corvus corax*)). The goshawk approached and defended one of the stick nests much more vigorously than any of the others. Hatching at this nest occurred on about June 10. This pair fledged three young and at least one of them was still in the area on July 30.

The aspen tree in which this nest was built is on the edge of a disturbed area measuring 20 by 120 feet. It appears that shooting lanes were cleared by a deer hunter. This stand was damaged by the storms of July (at least one area measuring approximately 100 by 150 was opened up by wind damage) and 1 tree with a stick nest was toppled.

**XXXXXX - Cass County**

Discovered by Ted Dick doing alarm call playback surveys on 24 May 1994. A male goshawk responded to the calls by vocalizing and flying to within 50 meters of the observer who was standing in the middle of a one year old logged area. A stick nest was found in a dead white pine and as the observer passed beneath it, a calling femme goshawk flew off the nest. During subsequent visits, the female sat tight on the nest until after 3 June, when she became much more aggressive toward human approach (possibly indicating a hatching date near 30 May). In 1994, three nestlings were observed on 11 June, but only two survived until 25 June. The two surviving young were at the branching stage as late as 15 July. Both had successfully fledged by 30 July.

In 1995, the adults were observed at the same nest on the first search day 8 April. It was larger then the previous year and had abundant balsam sprigs added to it. Incubation was first observed on 18 April and hatching was believed to have occurred on 18 May. Periodic return visits were made until 19 June. One brancher and one nestling were observed on 21 June. Two fledglings were seen on 15 July.

In 1996 a check of the site in late April revealed a pair of goshawks defending a new nest in a basswood. The nest was approximately 600m north of the old nest and about 75m north of XXXXXX. Ted had seen goshawks in this area in late October, 1995. The old structure in the white pine was still intact. It is believed this nest is now on state land.

Another check on Memorial Day found the female incubating and fairly aggressive. She came out to the road as Ted and another observer approached (110 m). During an additional check at the end of June, the nest was empty. No debris, prey remains or whitewash was found under the nest (recent rains may have washed the area clean). it is possible that this pair fledged young before this time, although no nestlings or fledglings were seen or heard at any time. As noted in the Discussion, a falconer reported signs of climbing at this nest.

**XXXXXX - Beltrami County**

This nest was first reported by Rob Samuelson and XXXXXX employee who observed territorial goshawk behavior while marking a timber sale in early June. Three nestlings were observed in mid June and three fledglings were seen in the area on 30 July. There was a raven nest 2km SE of the goshawk nest but no other stick nests were found in the area. No storm damage occurred at this site.

Jim Gallagher and Ted Dick had checked the area at different times in early 1996. Jim reported a new nest six chains north of the old nest and north of the road. At times in early July, the nest appeared abandoned, but two fledglings were seen in the immediate vicinity of the nest on July 12. The nest was in a white pine. Remains of one nestling were recovered by Ted on the 12th. Blue jay and flicker feathers were also found.

**XXXXXX - Beltrami County**

Jim Gallagher first reported goshawk activity in this area. The canopy of this aspen nest tree actually hangs over a road. Due to limited nest visits, only one nestling wash confirmed but two fledglings may have been heard in July. Due to the proximity to the search area of the territory called XXXXXX in 1994 (2.5 miles), the two sites are combined on our tables.

Jim reported activity at this site in 1996 and Ted observed an aggressive female on Memorial Day weekend. It is believed the site failed sometime in June.

**XXXXXX - Beltrami County**

Jim Gallagher was attacked by aggressive goshawks in early June, 1995 and 2 nestlings were observed on 25 June. These birds were behind in development, trailing some of the other nestlings in this study by as much as 3 weeks. Juvenile feathers were found under the tree and the cause of death was believed to be predation but this area also suffered very heavy storm damage. The nest was in a burr oak on the western edge of a cedar swamp.

This site was checked by DNR personnel in the spring of 1996 and declared inactive.

**XXXXXX - Clearwater County**

First reported by project intern Deb Moore who discovered the nest while doing call playback surveys on May 11, 1995. The nest was on the edge of a mature red pine stand within XXXXXX. The aspen in which the nest was located remained standing despite the fact that the immediate area was heavily damaged during July storms. No site measurements were taken at this site because of the severe damage. Three fledglings were seen at the site on 30 June. The site was not checked in 1996.

**XXXXXX - Cass County**

This nest site was reported by John Casson in 1991. This site was active in 1994, producing two fledglings, but no activity was observed in 1995. In 1994, incubation was observed by Casson on April 15, hatching was believed to have occurred by Mad 18 and the young were banded on 24 June. On May 20, a plucking perch had remains of a ruffed grouse and Casson reported he had previously found flying squirrel skulls at the site.

During searches of the surrounding area, a stick nest in a jack pine was found 1.8 miles from the original stick nest. An accipiter was observed flying from this stand. Although the nest had fresh balsam sprigs on it and whitewash under it, no birds were seen at the nest.

In 1996, an active goshawk nest was discovered by Casson in an aspen, across the road from the other known nest. This is believed to be a new nest since the area was searched heavily in 1995. One fledgling was heard and seen on July 12.

**XXXXXX - Beltrami County**

The location of this site was first reported by falconer Dana Harrington in 1994. One of 4 of the nestlings was removed for falconry on 22 June, 1994. Immature blue jay primary feathers were found below the nest. One other nestling remained in the nest and a fledgling was seen in the area on 5 July 1994.

In 1995, Cooper's hawks responded to goshawk calls and remained in the area as the observer searched. No goshawk activity was observed in subsequent searches and no birds were observed using the nest. The nest was not checked by anyone from this study in 1996.

**XXXXXX - Morrison County**

This site was discovered in 1994 by Mary Ann McLeod, a Univ. of Minnesota graduate student conducting research. After finding a stick nest in the area, McLeod investigated and discovered an active nest in the stand and reported two nestlings. It was abandoned by 21 June. Cause of abandonment was unknown. Part of a young goshawk wing was found within 5m of the base of the nest tree on 21 June.

This nest was on private land. A search of the area in June found that the structure was still in place, but no activity was observed in the area in 1995. The site was not checked in 1996.

**XXXXXX - Itasca County**

This site was discovered by Itasca County forester Doug Veidt while marking a timber sale in the spring of 1996. Ted Dick, Tom Soule and Veidt returned to the site, south of the town of Blackberry, on July 12. The nest was in an aspen and two fledglings were heard. Veidt moved the access road to reduce disturbance to the nest.

**XXXXXX - Beltrami County**
Two fledglings positively identified by Casson and Gallagher in the spring of 1996, although the nest has not yet been located.

**XXXXXX - Beltrami County**
Nesting confirmed in 1996.

**XXXXXX - Beltrami County**
This nest was originally reported in 1994 on private land, by MNDNR forester Dan Hertle. Evidence of raptor activity was found that year but no confirmation of goshawk nesting. Goshawk nesting was confirmed in 1996.