# Spatially Explicit Goshawk Surveys on the Kabetogama and Washington/Sturgeon River State Forest

**WCR Goshawk Project (2003)**


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***Please note that all goshawk nest location information has been removed from this document to protect Minnesota's goshawk populations.***

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## Introduction

The northern goshawk was surveyed in the Kabetogama State Forest located in Northern St. Louis County and in the George Washington State Forest located in northern Itasca County. The surveys were an effort to expand information on the distribution of goshawk in MN. No goshawk territories were known from the Kabetogama State Forest or the George Washington State Forest. Prior to this survey the location of 50 goshawk nest sites (Appendix A) were known as a result of surveys and reporting of accidental discoveries associated largely with past studies. As no overall stratification design had guided the location of surveys, the pattern of goshawk distribution (Figure 1) from past surveys cannot reflect the actual distribution of goshawk in Northern Minnesota. These surveys were undertaken mostly to serve the immediate needs of specific studies or local management and had not intended to describe as a whole the distribution of goshawk in MN. Twenty-three territories, for example, are known from the Chippewa Plains subsection as compared to the one known for the Border Lakes subsection. A clustering of territories within and around the Chippewa National Forest is likely a reflection of the location of past study activities. Surveys were also undertaken in parts of the Superior National Forest on the Laurentian Ranger District (four nests in the Toimi Uplands subsection and one in the Laurentian Uplands subsection) and along the North Shore in Lake and Cook Counties (two in the Superior Highlands subsection and one on the borderline between Superior subsection and Border Lakes). Although some effort at surveying goshawk had been undertaken in Voyageur National Park, no goshawk nesting activity was reported. Only one territory was known from extreme North-Central Minnesota (International Falls in the Border Lakes subsection). Surveys in mostly boreal forest landscapes in extreme Northern Minnesota are needed because these landscapes differ the most, along many aspects (management, ecosystems, disturbance regimes, geology), from landscapes where goshawk had been more intensively sampled.

Insight on how forest disturbance regimes, land ownership and logging intensity affect the distribution of goshawk would allow better integration of goshawk conservation into forest management. Surveys are an important tool to management because density differences of goshawk among different management units are a first step to identifying and quantifying factors limiting the species. Because of the large space a single breeding pair of goshawk requires (in the range of 7,000 to 12,000 acres), the spatial scale of different land units that must be compared to assess a difference in goshawk encounter rate would be in the range of tens of thousands of acres. No standardized sampling technique has yet been developed that allows the comparison of goshawk encounter rate among landscapes. Surveys at a spatial scale appropriate to sample goshawk present a challenge because of the large amount of habitat heterogeneity (uplands, lowlands, large number of forest cover types and forest maturity levels) comprised within large land units. In the absence of a standard specifying spatial and temporal survey intensities adequate to determine goshawk occurrence, this survey served as a pilot effort to test the feasibility of quantifying available habitat and rate of survey coverage within a defined survey area. Information on habitat selection by goshawk in Minnesota from recently completed studies (Boal et al. 2001) was used to identify suitable habitat within the boundaries of survey areas. Details of the sampling methodology used and current limitations to its applicability are discussed.

## Survey Areas

Goshawk was surveyed in four areas within the Kabetogama State Forest. The land mass covered by the Kabetogama State Forest ranges approximately between latitudes 47° 50' and 48° 30' and longitudes 92°20' and 93°00'. This is an area of boreal forest that falls largely within the Border Lake Subsection. The four areas are South Kabetogama West of Vermilion Lake Survey Area (T63N R19W; Figures 3A and 3B); Vermilion Lake Survey Area (T64N R17W and T64N R18W; Figures 4A and 4B); North Pelican Lake Survey Area (T65N R19W and T65N R20W, T65N R21W, Figures 5A, and 5B) and Elbow Lake Survey Area (T64N R18W, T64N R19W, Figures 6A and 6B). Three of the four survey areas on the Kabetogama are entirely within the Border Lake Subsection; about 1/3 of the South Kabetogama West of Vermilion Lake Survey Area is in the Little Fork-Vermilion Uplands Subsection.

The one survey area located on the Washington/ Sturgeon River State forests is the Link Lake-Snake Lake-Sturgeon Lake Survey Area (Figures 2, 7A and 7B). The Washington State forest spans approximately latitudes 47° 30' to 47° 50', and longitudes 93°00' to 93° 40'. The greatest part of this forest lies in the St. Louis Moraine, with smaller areas occurring in the Little Fork-Vermilion Uplands subsection and Nashwauk Uplands subsection. The Sturgeon River State Forest spans latitudes 47° 35' to 47° 55' and longitudes 92° 15' and 93° 00'. Half of the Sturgeon River State Forest is in the Little Fork-Vermilion Uplands Subsection and the other half is in the Nashwauk Uplands.

The size of survey areas ranged between one township to one and half townships (36 –72 square miles). The predominant land ownership is county or state. There were some industrial lands intermingled with county and state lands, but very little USFS lands occurred in survey areas. The predominant land use is timber production. The Link Lake-Snake Lake-Sturgeon Lake Survey Area comprised McCarthy Beach State Park. Accessibility to goshawk habitat by motorized vehicle varied considerably among survey areas. Figures 3A-7B show the extent of each survey area and the distribution of survey points. A more detailed description of each survey area is given in Appendix B.

## Methodology

The immediate objective of the survey was to determine whether goshawk is present during the breeding period within delineated survey areas. To determine the presence of goshawk within the survey area to a degree of certainty requires that all goshawk suitable habitat within that area be surveyed during the period of the year when detectability of breeding goshawk is highest (Roberson). Land cover types were characterized as suitable goshawk habitat or non-suitable habitat for the purpose of this survey effort based on habitat preferences by foraging goshawk and habitat characteristics at nest locations described by Boal et al. (2001). The survey design that was followed attempted to identify all suitable goshawk habitats within a delimited area and to locate survey points such that all habitats suitable for nesting goshawk would be effectively covered by a call-back methodology.

Past studies and surveys in Minnesota have determined that the goshawk preferentially nests and forages in upland older forest. Boal et al. (2001) classified forest types into late and early successional forest, upland and lowland forest, coniferous and deciduous, and young, mature and old to describe habitat selectivity by goshawk. In Boal et al (2001) Tables 1 and 2 describe their categorization of land cover types, Tables 11 and 12 quantify habitat selection by foraging goshawk. All four tables are presented in Appendix C.

"Common CSA" data for MNDNR, US Forest Service and County lands were used to determine suitable goshawk habitat on public lands, and classified 1997 satellite imagery was used to delineate most probable suitable habitat on public and industrial lands. "Common CSA" data and classified satellite imagery are provided as GIS coverages in the utility "Quick Themes" (MNDNR-GIS). Common CSA data were produced by an effort commissioned by the MN Forest Resources Council to provide land cover information for all public lands by combining or reducing all forest cover types recognized by different land management public agencies to common denominations. The categorization of forest types recognized in Common CSA is also provided in Appendix C.

Fewer categories than those used by Boal et al. 2001 are actually needed when the sole purpose is to identify which areas need to be surveyed. For public lands land cover types and forest maturity were combined into categories of "Older Upland Deciduous" consisting of all deciduous forest types >30 years of age, "Older Upland Coniferous" (>25 years of age for Jack pine, >30 years for red pine and white pine), "Lowland Deciduous" (ash and willow), "Lowland Coniferous" and an "Other" category consisting of all non forested lands.

Categorization into forest maturity stages is not possible for satellite imagery. As land cover data are not field verified for private lands or industrial lands, categorization of satellite imagery-derived land cover information into upland and lowland cover types has low accuracy without the use of auxiliary topographical information (such as delineation of wetlands on USGS maps). A category of "Regenerating Forest" was among the categories provided with this classified imagery. This was defined as forest <30 years. Because satellite imagery was acquired as long ago as (1997), it was impossible to know which stands have become suitable habitat and which were still too young to consider. Because of these limitations, the categories used to describe private and industrial lands (Deciduous, Coniferous, and Mixed) did not indicate whether the stands were suitable habitat, but as forest cover they indicated potential suitable habitat. The category "Other" included all non-forested lands that are not suitable habitat.

Contractors were provided with two sets of ArcView maps, one set based on the categories of land cover information for public lands and another based on the categories of land cover information from satellite imagery. They were also provided with printouts of USGS topographical maps and of the most recent aerial photos. As contractors were required to survey goshawk in all suitable habitat, they needed to survey all "still standing" stands of "Older Upland Deciduous", "Older Upland Coniferous" delineated on maps on public lands. They also needed to determine the suitability of the categories of "Deciduous", "Mixed" and "Coniferous" forest areas as delineated for private and industrial lands. They were instructed to locate survey points no further than a 0.25 mile from suitable habitat and to set survey points no more than 0.4 miles apart in suitable habitat to achieve this objective.

*Conducting Goshawk Call Back Survey*

Call back surveys involve broadcasting of goshawk alarm calls and monitoring a response (Watson et al. 1999; Kennedy and Stahlecker 1993). This methodology was specifically refined for application in Minnesota by the University of Minnesota (Roberson et al. 2001). The refinement assessed the time of day and dates during the nesting period when goshawk can be best detected in Northern Minnesota. A megaphone (Fanon Model MV-10s), a CD player and a CD recording of goshawk alarm call were used to broadcast goshawk alarm calls. All broadcasting equipment was checked to produce 100-110 dB output at three feet from the source. All goshawk surveys were undertaken between March 10$^{th}$ and April 30$^{th}$ 2003. Surveyors were instructed to undertake two surveys at each point location once during March and once during April. Surveys were conducted between ½ hour before sunrise and ½ hour before sunset. No goshawk surveys were conducted when the wind speed exceeded 15 miles/hour. Goshawk surveyors were instructed to visually search for goshawk for 30 seconds before broadcasting goshawk alarm call. During the four-minute call back broadcast, goshawk alarm calls were broadcast six times for 10 seconds each time, followed by 30 seconds of silence. Surveyors were instructed to watch for goshawk during the silent period and to broadcast successive surveys from an initial random direction followed by a direction of 120°, 240°, 60°, 180° and 300°. Surveyors were instructed to spend one minute at the end of the broadcast searching in all directions for goshawk. In the event a response was detected, the surveyor was to search for a nest until found or until the end of the day. He or she would record the GPS location of the nest and suspend all broadcasting within one mile of an active nest.

*Logistics*

Six different contracting groups were hired. A total of nine different individuals participated in the surveys. All contractors had an educational background either in wildlife or in forestry. Contractors were provided with written instructions of the procedures for locating survey points, call back methodology, and a description of survey areas. They were provided a goshawk alarm call CD, CD player, megaphone, GPS unit, maps and survey sheets. They were requested to attend a one-day training session which consisted of reviewing field survey requirements and methodologies, hawk identification, and logging and downloading of GPS data.

After an initial field check, surveyors needed to select a contiguous area approximating a township in which they would survey all suitable habitat. They were required to provide the DNR with a map of the location of their selected survey points, which they prepared from the maps that were initially provided to them, by consultation with local foresters, and initial field check. All stands that were indicated as goshawk suitable habitat on the maps but that had been harvested were eliminated from consideration. At that time, the DNR biologist reviewed the proposed location of survey points, checking the remaining suitable habitat, as indicated from maps, was effectively covered by the call back surveys.

In general, habitat suitable for goshawk was not easily surveyed from roads because readily accessible areas had been logged or developed for human habitation. Habitat was accessed from trails by either snowmobile, ATV, or by foot. Cross-country travel on foot in rugged terrain was necessary. Goshawk surveys were repeated two times between March 10 and April 30$^{th}$. DNR-nongame biologist visited each of the survey areas to check on reported stick nests and to broadly assess field conditions (access, forest conditions and terrain) goshawk surveyors were experiencing.

## Results

Two active goshawk nests were discovered as a result of the surveys in the Kabetogama State Forest and Washington/Sturgeon River state forests. One active nest was located in the Link Lake/ Sturgeon Lake survey area. Cameron Trembath reported this nest April 2, 2003. The nest was in an expansive older jack pine-red pine-aspen forest area within XXXXX1. It was within 0.10 of a mile from a hiking trail. The second active nest was in the South Kabetogama, west of Vermilion Lake survey area in the XXXXX2 area (Figure 3A, 3B). It was in a continuous tract of forest that comprised a mixture of mature forest and regenerating mostly aspen forest. This nest was reported by Dustin Nelson on April 7, 2003. This latter nest was visible from the road but was >2 miles from a gate that closed the road to motorized vehicle after snowmelt. Both nests were monitored past fledging. The nest within XXXXX1 produced two young and the XXXXX2 nest produced one.

A goshawk response was documented in the Elbow Lake Survey Area, but no active goshawk nest was found. An old stick nest in mature contiguous habitat was reported in the Elbow Lake Survey Area. Contractors in the Vermilion Lake survey area found three old stick nests in an extensive forested area. Ravens were occupying the nest reported in the Elbow Lake survey area and two of the three nests reported for the Vermilion Lake Survey Area when they were checked by the Nongame specialist.

Details of goshawk surveys are giving in Tables 1-5. The spatial configuration of survey points relative to suitable habitat (as identified from available land cover data) in each area are depicted in figures 3A-7B. All areas had received some natural and human induced disturbance since the land cover information was assessed. Maps presented here from available GIS coverage are, therefore, outdated. The area of Vermilion Lake had experienced large scale blow-down in 1999; many stands have been logged since that disturbance. This area thus differed greatly and the most from land cover conditions depicted from maps. Surveys concentrated on the two areas of relatively contiguous forest Figures 4A and 4B. All other survey areas varied somewhat from maps but their differences did not present as major modifications in the surveying, as was true for the Vermilion Lake Survey Area.

## Discussion

One objective of this project's undertakings was to progress towards understanding how land cover conditions at relevant scales affect goshawk occurrence and productivity. Surveys were undertaken in state forest and county forest, forests that are more intensively managed for timber than federal lands where a majority of the known nesting sites are located. The Kabetogama State Forest comprises mostly boreal forest. Disturbance regimes in boreal forest are larger scale and more intense than disturbance regimes characteristic of red pine/white pine and mesic forest communities. Survey results expanded our knowledge about goshawk distribution in MN into areas that had received little surveying. Continued surveys in these lands would eventually lead to a more complete picture of goshawk distribution in the state of MN. Occupancy by goshawk was determined in two survey areas in which active nests were encountered. Signs of goshawk were reported in two other landscapes (a response and stick nest). As goshawk do not nest every year,

landscapes where no nesting activity was reported would need to be resurveyed during at least two more consecutive years before a determination of no occupancy would be stated.

This survey effort was guided by the need for a standardized methodology to sample different land units such that they could be compared with respect to goshawk encounter rate. A great effort was undertaken to define suitable habitat and to map it such, that the majority of it would be effectively covered by the call-back survey methodology. It is feasible to calculate the amount of suitable habitat that lies within any particular survey area and the amount or percentage of it that has been effectively surveyed. This calculation can be done in ArcView by summing up the areas of all suitable habitat (polygons) that fall within the survey area and all the polygons of suitable habitat that lie within a 0.25 mile buffer around each of the survey points within the survey area.

Several limitations were, however, encountered that prevented these quantifications. One major limitation was the lack of information on forest maturity for private and industrial lands (all non public lands). Forest maturity is an important aspect of goshawk habitat. Land cover information for private and industrial lands is only available from satellite imagery which can be classified to forest types but not to age classes. Another limitation was that the 1999 Common CSA data were outdated; in some instances there were severe discrepancies between those data and field conditions. The 1999 wind blow-down in Northern Minnesota hit some areas on the Kabetogama State Forest. Salvage and logging operations have been intensive and are not documented in the land cover information that was used.

Limitations relating to land cover information have been discussed with 'DNR Forest Resource Assessment' and measures will be taken to resolve them in future surveys. These include preparing a land cover GIS coverage from updated stand data from various public land agencies instead of using the 1999 Common CSA data. This in essence would be repeating a similar effort that had gone into the development of the Common CSA data but in this case would only be undertaken for the specific survey areas. All agencies update their stand data within a few months of when the stands have been logged or received any management. Natural disturbance that occurred since a stand has been last examined would, however, still not be documented. Another measure that would be used in future surveys is the mapping of disturbed areas from satellite imagery. Unclassified satellite imagery is available for each of the years dating back to 1986**.** Although this imagery is not classified, recently disturbed areas are easily identifiable. Using a series of 17 yearly images, it would be possible to age stands that have been disturbed within the last 17 years. Although stands that are >25 years of age would be surveyed, in the absence of a mechanism to age stands for private and industrial lands all upland forested lands >17 years of age would have to be covered in future years to insure that all suitable habitat within a survey area is covered.

During this initial year of surveys, contractors were requested to field check survey areas and locate survey points. Since it was not feasible for Nongame staff to field check every stand and since there was no accurate map of suitable habitat, it was not possible for the DNR biologist to determine if all suitable habitat was effectively surveyed. In future surveys land cover information would be updated prior to surveys and all survey point locations would be determined prior to the initiation of surveys and would only be dropped after being field checked by DNR staff.

***Tables 1 – 5 removed as they contain sensitive nest location information.***

***Figures 1 - 4 removed as they contain sensitive nest location information.***

Figure 5A. Location of survey points relative to goshawk habitat in surveys conducted March-April 03 in the Pelican Lake Survey Area on the Kabetogama State Forest. Habitat depicted was based on common CSA data (1999)

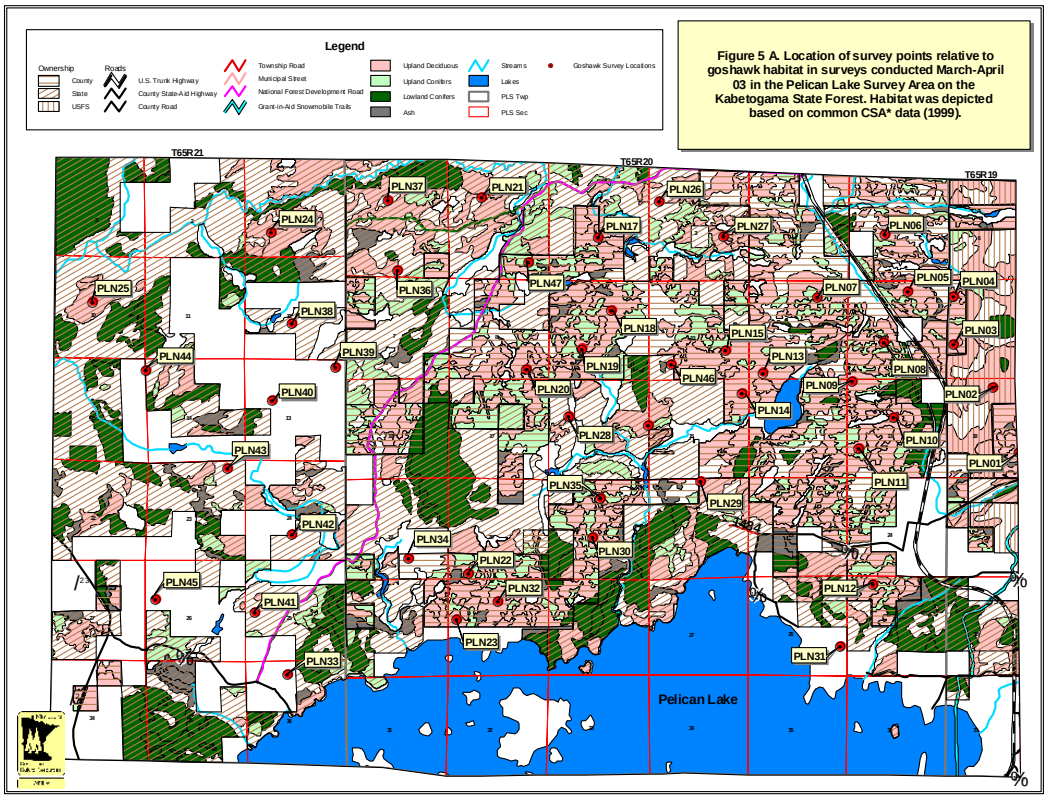
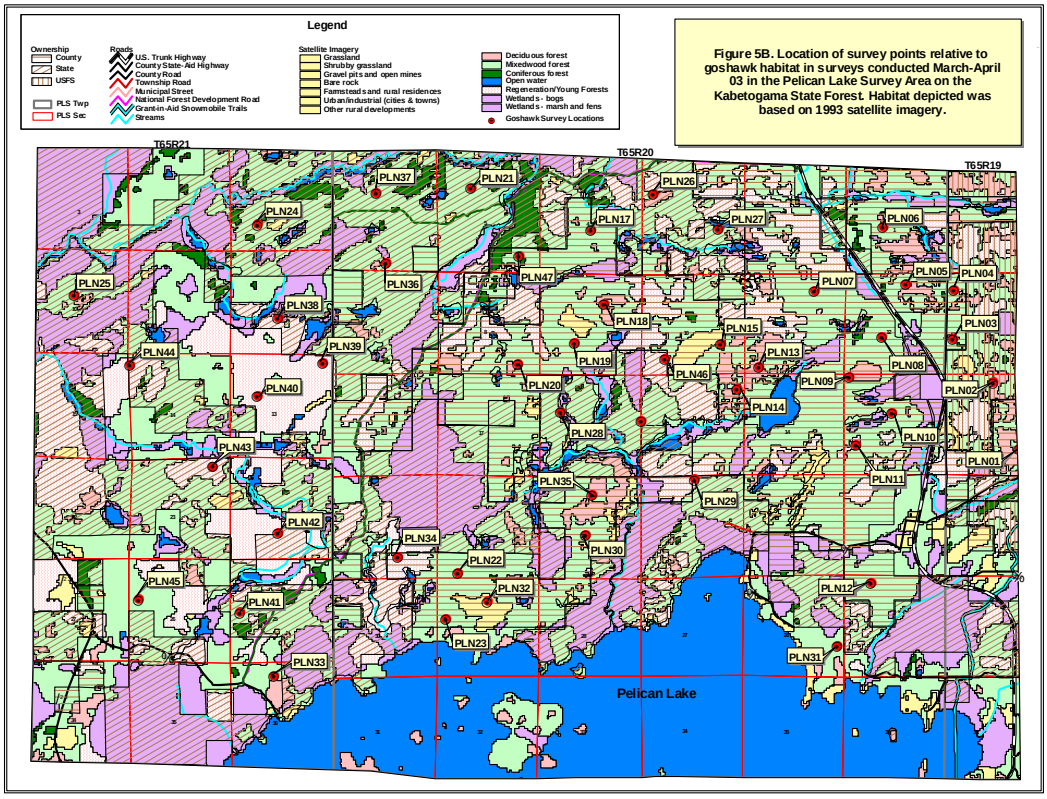


Figure 5B. Location of survey points relative to goshawk habitat in surveys conducted March-April 03 in the Pelican Lake Survey Area on the Kabetogama State Forest. Habitat depicted was based on 1993 satellite imagery.



***Figures 6 - 7 removed as they contain sensitive nest location information.***

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Watson, J.W. , D.W. Hays, and D. J. Pierce. 1999. Efficacy of northern goshawk broadcast surveys in Washington State. J. Wildl. Manage. 63 (1). 98-106.nd D. J. Pierce. 1999. Efficacy of northern goshawk broadcast surveys in Washington State. J. Wildl. Manage. 63 (1). 98-106.

***Appendices A - B removed as they contain sensitive nest location information.***

Appendix C. Determination of Habitat suitability for goshawk

Table A. Presentation of Table 1 from Boal et al 2001. "Hierarchical levels of stand type categories within goshawk home ranges, Minnesota, 1998-2000. Terms "young", "mature", and "old" are used only for convenience in separating out chronological age groupings."

| Level 1 | Level 2 | Level 3 |
|---|---|---|
| Early Successional | Upland Conifer | Young (0-25) |
| | Upland Conifer | Mature (>25) |
| | Lowland Conifer | Young (0-25) |
| | Lowland Conifer | Mature (> 25) |
| | Upland Hardwood | Young (0-25) |
| | Upland Hardwood | Mature (26-50) |
| | Upland Hardwood | Old (> 50) |
| | Lowland Hardwood | Young (0-25) |
| | Lowland Hardwood | Mature (> 26) |
| Late Successional | Upland Conifer | Young (0-50) |
| | Upland Conifer | Mature (> 51) |
| | Lowland Conifer | Young (0-50) |
| | Lowland Conifer | Mature (> 51) |
| | Upland Hardwood | Young (0-50) |
| | Upland Hardwood | Mature (> 51) |
| | Lowland Hardwood | Young (0-50) |
| | Lowland Hardwood | Mature (> 51) |
| Other | Brush, open areas | |

Appendix C continued. Determination of Habitat suitability for goshawk

Table B. Presentation of Table 2 from Boal et al.2001. Tree species in early successional (ES) and late successional (LS) stand type categories used for goshawk habitat analysis in Minnesota, 1998-2000.

| Stand Type | Species | |
|---|---|---|
| ES Upland Conifer | jack pine | *Pinus banksiana* |
| | upland black spruce | *Picea mariana* |
| | white spruce | *Picea glauca* |
| | balsam fir | *Abies balsamea* |
| ES Upland Hardwood | quaking aspen | *Populus tremuloides* |
| | bigtooth aspen | *Populus gradidentata* |
| | balsam poplar | *Populus balsamifera* |
| | paper birch | *Betula papyrifera* |
| LS Upland Conifer | white pine | *Pinus strobus* |
| | red pine | *Pinus resinosa* |
| LS Upland Hardwood | red maple | *Acer rubrum* |
| | sugar maple | *Acer saccharum* |
| | basswood | *Tilia americana* |
| | red oak | *Quercus rubra* |
| | bur oak | *Quercus macrocarpa* |
| LS Lowland Conifer | tamarack | *Larix laricina* |
| | lowland black spruce | *Picea mariana* |
| | white cedar | *Thuja occidentalis* |
| LS Lowland Hardwood | black ash | *Fraxinus nigra* |
| | green ash | *Fraxinus pennsylvanica* |
| | willow | *Salix* spp. |

Appendix C continued. Determination of Habitat suitability for goshawk

Table C. Presentation of Table 11 from Boal et al. 2001. " Ranking of stand types used by male goshawks, Minnesota, 1998-2000. Assessment based on compositional analysis (Aebischer et al. 1993), using stand types at relocation points and within 50 m radius (0.79 ha) buffers around relocation points, compared to proportional availability of stand types within home ranges. Ranks: 0 = least preferred, 10 = most preferred."

| Stand Type | Buffered Points | Mean[1] points | Mean proportion rank | availability |
|---|---|---|---|---|
| ES Upland conifer-mature | 7 | 9 | 8.0 | 3.9 |
| ES Upland hardwood-young | 3 | 6 | 4.5 | 18.0 |
| ES Upland hardwood-mature | 8 | 4 | 6.0 | 5.6 |
| ES Upland hardwood-old | 10 | 10 | 10.0 | 11.6 |
| LS Upland conifer-young | 0 | 0 | 0.0 | 5.0 |
| LS Upland conifer-mature | 9 | 8 | 8.5 | 2.5 |
| LS Lowland conifer-young | 1 | 1 | 1.0 | 6.6 |
| LS Lowland conifer-mature | 6 | 5 | 5.5 | 19.4 |
| LS Upland hardwood-mature | 5 | 3 | 4.0 | 4.9 |
| LS Lowland hardwood-mature | 4 | 7 | 5.5 | 1.9 |
| Other | 2 | 2 | 2.0 | 20.6 |

[1] Mean of point and buffered point ranks.

Table D. Presentation of Table 12 from Boal et al. 2001. "Forest stand types used by male goshawks, Minnesota, 1998-2000. Assessment based on the $\chi^2$ method (Neu et al. 1974), using stand types at relocation points and within 50 m radius (0.79 ha) buffers around relocation points, compared to proportional availability of stand types within home ranges (* = $P < 0.05$; ** = $P < 0.001$; *** = $P < 0.0001$)."

| Stand Type | Points | Buffered Points | Mean proportion availability |
|---|---|---|---|
| ES Upland conifer-mature | Preferred*** | Preferred*** | 3.9 |
| ES Upland hardwood-young | Avoided*** | Avoided** | 18.0 |
| ES Upland hardwood-mature | Preferred* | -- | 5.6 |
| ES Upland hardwood-old | Preferred*** | Preferred*** | 11.6 |
| LS Upland conifer-young | -- | Preferred | 5.0 |
| LS Upland conifer-mature | Preferred*** | Preferred*** | 2.5 |
| LS Lowland conifer-young | Avoided | Avoided* | 6.6 |
| LS Lowland conifer-mature | Avoided* | Avoided* | 19.4 |
| LS Upland hardwood-mature | Preferred* | Preferred*** | 4.9 |
| LS Lowland hardwood-mature | -- | -- | 1.9 |
| Other | Avoided*** | Avoided*** | 20.6 |

Appendix C continued. Determination of Habitat suitability for goshawk

Table E. Land Cover types recognized by the Common CSA endeavor and how they were treated for the determination of goshawk suitable habitat

| | |
|---|---|
| Ash, Willow or Lowland Hardwood | Lowland Deciduous |
| White pine | Upland Coniferous >40 sampled |
| Norway Pine | Upland Coniferous >40 sampled |
| Jack Pine | Upland Coniferous >30 sampled |
| Scotch Pine | Upland Coniferous >30 sampled |
| White Spruce | Upland Coniferous >30 sampled |
| Balsam fir | Upland Coniferous >30 sampled |
| Lowland black spruce | Lowland Coniferous |
| Upland black spruce | Upland Coniferous >30 sampled |
| Tamarack | Lowland Coniferous |
| Balm-of-Gilead | Upland Deciduous >30 sampled |
| Cedar | Lowland Coniferous |
| Mixed Swamp Conifers | Lowland Coniferous |
| Cut over | Other |
| Upland grass | Other |
| Lowland grass | Other |
| Marsh | Other |
| Bog-muskeg | Other |
| Upland brush | Other |
| Lowland brush | Other |
| Aspen, big-tooth, cottonwood, off-site aspen or aspen-spruce-fir | Upland Deciduous >30 Sampled |
| Water | Water |
| Gravel pit | Other |
| Agriculture | Other |
| Industrial | Other |
| Recreation | Other |
| Transportation | Other |
| Other | Other |
| Hybrid | Upland Deciduous >30 |
| Birch | Upland Deciduous >30 |
| Northern Hardwoods, mixed sugar maple | Upland Deciduous >40 |
| Oak, bur oak, northern red oak | Upland Deciduous >40 |