

MONITORING BIRD POPULATIONS ON
NATIONAL FOREST LANDS:
SUPERIOR NATIONAL FOREST, 1991

A summary report submitted to:

NRRI LIBRARY

Dr. Thomas Nicholls
North Central Forest Experiment Station
Forest Service - U.S. Department of Agriculture
1992 Folwell Avenue
St. Paul, MN 55108

By:

JoAnn M. Hanowski, Research Fellow
Gerald J. Niemi, Director
Center for Water and the Environment
Natural Resources Research Institute
University of Minnesota, Duluth
5013 Miller Trunk Highway
Duluth, MN 55811

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INTRODUCTION

Much concern has recently been expressed over possible declines in many birds that breed in eastern North America. Probable causes of such declines are varied, but generally can be attributed to events occurring on both the breeding and/or wintering grounds. Possible influences affecting birds in both regions are changes in habitat structure, including loss of forest habitat, conversion from natural to managed stands, and changes in climate. Changes in bird populations reflect local, regional, and larger scale phenomena; thus, birds may serve as indicators of environmental change that influence the structure and composition of entire ecosystems. In general, the consequences of changes in habitat structure on birds and other wildlife probably have been large but are poorly understood.

The composition of bird communities in forests of Minnesota is determined by the dynamic interaction of many factors, including disturbance (e.g., logging, fire, wind), weather (e.g., drought), and habitat (e.g., successional change). Minnesota once was covered by a diverse mix of forested and non-forested habitats. Over the past century, this naturally diverse State has been greatly altered; no longer do extensive stands of undisturbed (by humans) forest remain. Increasing demands on forest resources have the potential to further transform forest cover in Minnesota. Many bird species that breed in the State depend on forest habitats (see Green 1991) during all or part of their life cycle; loss or alteration of forests can have profound consequences on the populations of many species. To understand the effects of different environmental influences (habitat alteration, climate change) on birds, it will be necessary to develop a comprehensive monitoring program that will allow us to detect changes in bird populations.

Our objectives for this study in the past year (1991) were to: (1) establish bird monitoring programs in the Chippewa and Superior National Forests; (2) monitor abundance of selected indicator bird species that have been specified by each Forest; (3) monitor abundance of common bird species in each respective Forest; (4) compare point count data gathered in interior forests to data collected along roadsides in the Chippewa, Superior and Chequamegon National Forests; (5) work with NCFES and other Forest Service personnel to coordinate data gathering, data entry, and analyses; and (6) begin refining avian/habitat relationships used to assess forest management activities on breeding bird abundance and distribution.

METHODS

Stratification. The basic unit for stratification in the Superior National Forest was five cover types; deciduous upland, pine, spruce-fir, lowland conifer, and regenerating (Table 1). Because the focus of the monitoring was forest birds, non-forested wetland habitats were excluded. The total number of acres was tabulated and the proportion of the total within each habitat type of interest was calculated (Table 1). A total of 562 point counts were established for bird monitoring in the Superior National Forest including the Boundary Waters Canoe Area Wilderness (BWCAW). A total of 462 points were selected by a restricted random stratification design and were placed in upland and deciduous and upland and lowland conifer stands.

The stratification procedure was used to determine how to optimally allocate samples within each habitat type. This procedure accounted for expected differences in sample variation within each strata. For example, if sample variation within a particular habitat type was greater than others, a higher proportion of samples would be allocated to

that type (Kish 1965). Based on data collected previously in northern Wisconsin, Michigan, and Minnesota we found that the variance of several parameters associated with samples in different habitat strata were similar. Therefore, it was best to stratify the points based on the actual proportion of each habitat present in the Forest.

Sample unit. The sample unit for the study was individual stands > 40 acres. The stratification was done based on stands > 40 acres for a number of statistical and sampling reasons. First, we wanted to subsample stands to obtain a mean and variance for bird parameters in a stand so that numbers could be extrapolated to a number per unit area. We felt that at least three point counts within a stand was required to do this extrapolation. A 35 to 40 acre stand is the minimum size required to allow three point counts that do not overlap in area. In addition, time and effort for field sampling would be better optimized if subsamples were placed within the same stand. The number of stands and number of points sampled are listed in Table 1.

Randomization of samples. The base unit for selection of sample stands was Forest compartments. This was a convenient starting point because the Forest is mapped in compartments (Appendix 1). Approximately 40 compartments were selected with a random numbers table. One stand within each compartment > 40 acres was then chosen randomly as a starting point for travel within that compartment. Because of sampling restrictions (e.g., time and travel optimization) four or five stands (> 40 acres) were randomly selected within each compartment with the restriction that all could be sampled by one observer in one morning. Other restrictions for stand selection was road access and physical barriers (e.g., large rivers and bodies of water could not be crossed).

We conducted an additional 100 point counts in the BWCAW. Our objectives for this portion of the project this year were to develop methods to establish a monitoring program in this area. Because this area is not mapped into stands and recent air photos were not available, we could not use the same design for selecting stands for sampling. We experimented with a variety of techniques (in terms of point locations) primarily because it was difficult to traverse large expanses of the area. For example, a point count route would bring us 1.5 miles from the edge of a body of water. The shrub density, number of large downed trees, and thick balsam fir regeneration in this area made traversing difficult. We will explore alternative methods for censusing in the BWCAW next year.

Bird census. All stands were located and census points were marked on compartment maps and aerial photos. Each stand was visited prior to censusing to permanently mark locations and routes of travel between points. We conducted one bird census (10 minutes in duration) at each point during June through early July using the point-count method (Reynolds et al. 1989). This method is good for determining relative abundance of singing passerine species, but is inadequate for raptors, waterfowl, and other wide-ranging species. In addition, because only one census is conducted in June, this method probably underestimates relative densities of early nesting species (e.g., most permanent residents including woodpeckers and chickadees).

Six trained (see observer training section below) observers conducted the censuses which were done from 0.5 hours to 4 hours after sunrise. Censuses were conducted only during good weather (e.g., wind < 15 mph and no precipitation). Types of stands censused (forest cover type) were stratified by time of morning. For example,

we avoided sampling all upland pine stands early or late in the morning. Forest cover types censused were also stratified by observer; each observer sampled relatively the same number of stands in each forest type.

We recorded weather (cloud cover, temperature, and wind speed) and time of day the census was conducted. All birds heard or seen from the center point were recorded in a circle with estimates of their distance from the center point. Number of individuals observed for each species were summed for three and ten minute periods (see Appendix 2).

Observer training. Four of the six observers in this study had previously conducted systematic bird counts, but had not been specifically trained in the identification of northern Minnesota breeding birds or with the methodology used in this study. These four observers were hired in April and were given a list of species that they were required to identify by sight and sound. Tapes of bird songs were provided as a learning tool for all observers. All observers were required to pass an identification test of 75 bird songs made by Cornell Laboratory of Sound. A standard for number of correct responses was established by giving the test to observers trained in identification of birds by sound and that had four to five years of experience. This was done to identify songs on the tape that were not good representations of songs heard in northern Minnesota. Based on results of trained observers, we set the standard for passing at 85% correct responses. Songs on the tape were grouped by habitat (e.g., upland deciduous) to simulate field cues that would aid in song identification.

Observer field training was done in late-May. Observers were first instructed on the methods for recording data on the field sheets. Observers then conducted

simultaneous counts (four mornings; 40 points) and were allowed to ask questions about unknown birds after each count (10 minute count). Count information was compiled for each observer and new observer data was compared to the experienced observer data. Species lists and number of individuals recorded on the count by each observer were compared. Deviations from the average or species missed were noted on the field sheets and returned to each observer.

In addition to training and testing, all observers were required to have a hearing test to ensure that their hearing was within normal ranges for all frequencies (125 to 8000 hertz). Normal ranges were standards established by audiologists.

Habitat data. We collected information on habitat structure and plant species composition at the center of each point. We estimated canopy height (m) and recorded tree and shrub species (up to five each). Tree and shrub density was estimated and coded by abundance (see Appendix 3). Percent coverage of vegetation layers at the high canopy, subcanopy, understory and ground levels were also estimated and coded. Codes were also recorded for topography and special features (e.g., snags) (Appendix 3). These data will ultimately be used to identify habitat features that may be important to bird species within individual forest cover types and ages.

Stand size. We separated each forest cover type into three groups based on age or stand origin and stocking density. We used the Forest Service classification of stand size density for three classes: regenerating, pole size, and saw size. This information was obtained from the VMIS database or the compartment maps. We changed the stand size density classification if after field verification the stand had changed since the database or compartment map had been updated (e.g., especially regenerating stands).

Data management. All data were entered into a Paradox file directly from the field data sheet. Several checks were made of the data file by someone other than the person who entered the data. After the data files were checked, information on birds within a stand were grouped (i.e., three points). Stands where we were not able to place three points were not included in this summary file. In addition, we assigned each species into groups based on migration strategy, feeding method and substrate, and nest location (Appendix 4).

Density calculations. We calculated relative abundance values per unit area for each species. This information was used to determine relative populations of indicator species in each forest. We calculated numbers of territorial males / 40 acres by summing numbers of individuals for each species in three points within each stand. We determined the area of each sample (point count) based on a radius of 100 m for most species. We used a smaller radius for Brown Creeper, Cape May Warbler, Golden-crowned Kinglet, and Bay-breasted Warbler because we were not confident that we could detect these species beyond 75 m. A priority for additional work in subsequent years is to determine detection limits for a variety of species; however, recent work by Howe et al. (ms) in northern Wisconsin indicate that these distances are reasonable and perhaps conservative. This also will affect calculations of densities in subsequent years. A density value for each bird in the forest can be calculated by multiplying the density value of a species within each habitat by the total amount of that habitat in the forest. Because we have presented densities as number of territorial males / 40 acres, these values must then be divided by 40 to establish number of males in the forest. Numbers of males

within each forest type and stand density can be summed to determine total numbers of territorial males in all cover types.

The relative density calculations should be used with caution. They are not meant to be an absolute density value for the Forest. Rather, they should be viewed as base values upon which future monitoring data can be compared to determine whether species populations are increasing, decreasing, or remaining stable. More importantly, as these data are related to forest inventories, they will allow an approximate measure on how bird populations may change with changes in forest harvesting, management, and natural processes.

RESULTS AND DISCUSSION

Bird communities. We present bird community parameters for data gathered in 1991 but caution that these data are best used for comparisons of annual variation within the Superior National Forest. For example, because the sample was allocated to cover types based on amount of that cover type in the Forest we do not have equal sample sizes in each cover type (Table 1, Appendix 4). Difference in number of stands sampled within each forest cover type (and age) has an affect on bird community parameters especially number of species. For example, the number of species observed within a particular cover type is positively correlated with the area of that cover type (number of stands) that was censused. We would expect more species to be recorded in cover types that had the most samples. There are statistical procedures that correct for species/area effects (e.g., rarefaction) and if we intended to compare data collected in the Superior National Forest to other areas it would be best to standardize the data. Again, we stress that the objective for the monitoring is to assess annual variation in bird numbers. Therefore, it is

not necessary that we standardize the species counts because the comparison that we will use to assess annual variation will be based on a comparison of stands among years.

There are some general patterns that are evident in the bird community data. Pole size and regenerating upland pine had the highest density of total individuals, while upland spruce and pole size upland deciduous had the lowest total number of individuals/40 acres (Figure 1, Appendix 4). Pole size stands within each upland forest cover type generally had the highest density of individuals compared to the regenerating or mature stands in the same cover type (Figure 1). However, in upland pine types, pole size stands had higher numbers of individuals than the other two age classes (Figure 1).

In contrast to the pattern that we observed in total numbers of individuals being lowest in pole size upland deciduous stands, species richness was highest in this cover type (Figure 2). More species had their highest densities within pole size lowland conifer stands than number of species within any other type (Figure 2). Species richness was generally highest in pole size stands within each cover type (except upland pine) (Figure 2).

Migration guilds. The relative proportion of permanent residents within a cover type was highest in lowland (black spruce, white cedar, and mixed swamp conifer) and upland conifer stands (white spruce and balsam fir) (Figure 3). Short-distance migrants made up a larger proportion of bird communities in conifer stands than in deciduous stands (Figure 3). Long-distance migrants were most abundant (relative proportion) in deciduous stands (Figure 3).

Indicator species. The number of Brown Creepers in the Forest (three Districts studied) in 1991 was approximated as 9600 males (Figure 4). The largest proportion was found in

pole size aspen stands. Brown Creepers also were recorded in pole size swamp conifer, regenerating, pole size, and mature jack pine, mature white pine, and mature birch stands (Figure 4).

Scarlet Tanagers were most numerous in pole-sized aspen stands, but were also found in eight other habitat types (Figure 5). The density in 1991 was approximated at 1900 males; all were associated with pole size or mature forest types (Figure 5).

Swainson's Thrushes were found in a wide variety of forest cover types (15 total) and total males in 1991 was approximated at 6100 males (Figure 6). Populations are likely highest in pole-sized stands in upland spruce/fir, aspen, and lowland black spruce (Figure 6).

Pine Warblers were identified in only two cover types; mature red pine and pole size white spruce (Figure 7). Total territorial males was approximated at 2900 males (Figure 7).

Power analyses. We assessed the adequacy (e.g., number of samples) of our sampling design in terms of the annual difference that we would be able to detect in a two-tailed t-test. Results from this analysis indicated that we would be able to detect a 25% annual change for those species that occurred with a density > 5 individuals/40 acres (six species) (Figure 8). The power of detecting a 50% annual change however, was greater than the standard (80%) used in most statistical tests for all species (Figure 8). This indicates that we would be able to detect a 50% or less annual change for many species that occur in the Forest. These values are quite good compared to those we have calculated for our studies in Wisconsin and Michigan.

Summary. We established a monitoring program in the Superior National Forest that was designed to assess annual changes in bird numbers and to attribute possible changes in numbers as a response to habitat changes that have occurred in the forest or to natural fluctuations in bird numbers. Data collected in 1991 have provided information on relative densities of bird species within representative cover types in the Superior National Forest. This information can be used by wildlife biologists to determine critical habitat needs for forest indicator species as well as habitat requirements for a variety of forest bird species. This information can be used to aid forest management by providing information to establish harvesting and regenerating guidelines for individual forest cover types. Power of statistical analyses calculations indicated that we should be able to detect less than a 50% annual change in bird numbers for many species (individuals/40 acres). These numbers indicate that a sufficient sample size is in place to detect the magnitude of difference that we feel is adequate for the majority of the species.

LITERATURE CITED

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- Howe, R. W., A. T. Wolf, and G. J. Davis. Estimating avian densities from simple point counts. Manuscript in preparation.
- Hish, L. 1965. Survey sampling. John Wiley and Sons, New York, NY. 643 pp.
- Reynolds, R. T., J. M. Scott, and R. A. Nussbaum. 1980. A variable circular-plot method for estimating bird numbers. *Condor* 82: 309-313.

Table 1. Total acres (stands > 40 acres) in LaCroix, Kawishiwi, and Tofte Districts, number of stands > 40 acres, number of stands sampled, and number of points sampled in the Superior National Forest in 1991. This does not include the 100 points that were sampled in the Boundary Waters.

| Habitat Type | Total acres | Number of stands | Number of points |
|---------------------|-------------|------------------|------------------|
| Deciduous upland | 65,726 | 60 | 180 |
| Pine | 22,812 | 25 | 75 |
| Lowland conifer | 20,329 | 17 | 51 |
| Upland spruce/fir | 13,563 | 12 | 36 |
| Regenerating upland | 52,603 | 40 | 120 |
| Total | 175,033 | 154 | 462 |

Table 2. Number of points (N) and all forest cover types where each species was observed in the Superior National Forest in 1991.

| Species | N | Forest Cover Types |
|---------------------------|----|--------------------|
| Wood Duck | 1 | 11 |
| Broad-winged Hawk | 4 | 7,8,11 |
| Ruffed Grouse | 24 | 6,8,9,10,11 |
| Black-billed Cuckoo | 3 | 6 |
| Yellow-billed Cuckoo | 1 | 9 |
| Great Gray Owl | 1 | 11 |
| Boreal Owl | 1 | 11 |
| Ruby-throated Hummingbird | 2 | 10 |
| Belted Kingfisher | 1 | 10 |
| Yellow-bellied Sapsucker | 36 | 2,3,4,8,10,11 |
| Downy Woodpecker | 5 | 2,7,8,10 |
| Hairy Woodpecker | 16 | 6,7,8,10,11 |
| Northern Flicker | 11 | 6,7,9,10,11 |
| Pileated Woodpecker | 8 | 7,9,10,11 |
| Olive-sided Flycatcher | 16 | 2,3,6,8,9,10,11 |
| Eastern Wood-pewee | 41 | 7,8,10,11 |
| Yellow-bellied Flycatcher | 33 | 2,3,6,7,8,9,10,11 |
| Alder Flycatcher | 27 | 2,6,7,8,9,10 |
| Least Flycatcher | 73 | 2,6,7,8,9,10,11 |
| Eastern Phoebe | 2 | 6,10 |
| Great Crested Flycatcher | 3 | 10,11 |
| Eastern Kingbird | 1 | 11 |
| Gray Jay | 10 | 3,6,7,8,10 |
| Blue Jay | 35 | 2,6,7,8,9,10,11 |
| Common Raven | 3 | 3,11 |
| Black-capped Chickadee | 15 | 6,7,8,9,10,11 |

| | | |
|------------------------------|-----|---------------------|
| Boreal Chickadee | 12 | 2 |
| Red-breasted Nuthatch | 33 | 1,2,6,7,8,9,10,11 |
| Brown Creeper | 18 | 2,6,7,8,10,11 |
| House Wren | 2 | 6,10 |
| Winter Wren | 74 | 2,3,6,7,8,9,10,11 |
| Sedge Wren | 3 | 8,10,11 |
| Golden-crowned Kinglet | 37 | 2,3,6,7,8,9,10,11 |
| Ruby-crowned Kinglet | 9 | 2,5,6,7,10 |
| Eastern Bluebird | 1 | 9 |
| Veery | 187 | 2,3,6,7,8,9,10,11 |
| Swainson's Thrush | 35 | 2,3,7,8,10,11 |
| Hermit Thrush | 60 | 2,3,6,7,8,9,10,11 |
| American Robin | 91 | 2,3,6,7,8,9,10,11 |
| Cedar Waxwing | 10 | 2,3,6,8,9,10,11 |
| Solitary Vireo | 7 | 2,6,7,8,10 |
| Red-eyed Vireo | 327 | 2,3,6,7,8,9,10,11 |
| Golden-winged Warbler | 17 | 6,9,10 |
| Nashville Warbler | 273 | 1,2,3,6,7,8,9,10,11 |
| Northern Parula | 48 | 2,3,6,7,8,9,10,11 |
| Yellow Warbler | 28 | 7,10 |
| Chestnut-sided Warbler | 249 | 1,2,3,6,7,8,9,10,11 |
| Magnolia Warbler | 75 | 1,2,3,6,7,8,9,10,11 |
| Cape May Warbler | 1 | 7 |
| Black-throated Blue Warbler | 4 | 7,8 |
| Yellow-rumped Warbler | 35 | 1,2,3,6,7,8,9,10,11 |
| Black-throated Green Warbler | 82 | 2,3,7,8,9,10,11 |
| Blackburnian Warbler | 110 | 1,2,3,6,7,8,9,10,11 |
| Pine Warbler | 9 | 7,8,11 |
| Black-and-white Warbler | 145 | 1,2,3,6,7,8,9,10,11 |

| | | |
|------------------------|-----|---------------------|
| American Redstart | 13 | 7,8,9,10,11 |
| Ovenbird | 355 | 1,2,3,6,7,8,9,10,11 |
| Connecticut Warbler | 12 | 1,2,3,8,10 |
| Mourning Warbler | 165 | 1,2,3,4,5,6,9,10,11 |
| Common Yellowthroat | 62 | 1,6,7,8,9,10,11 |
| Canada Warbler | 90 | 1,2,3,6,7,8,9,10,11 |
| Scarlet Tanager | 14 | 7,8,10,11 |
| Rose-breasted Grosbeak | 62 | 1,3,6,7,8,9,10,11 |
| Indigo Bunting | 4 | 8,9 |
| Chipping Sparrow | 45 | 2,3,6,7,8,9,10,11 |
| Clay-colored Sparrow | 1 | 9 |
| Vesper Sparrow | 22 | 10 |
| Song Sparrow | 36 | 3,6,8,9,10,11 |
| Lincoln's Sparrow | 6 | 6,7,9 |
| Swamp Sparrow | 9 | 1,6,7,8,10 |
| White-throated Sparrow | 285 | 1,2,3,6,7,8,9,10,11 |
| Dark-eyed Junco | 2 | 7,8 |
| Red-winged Blackbird | 13 | 6,8,9,10,11 |
| Brown-headed Cowbird | 8 | 6,9,10,11 |
| Northern Oriole | 1 | 6 |
| Purple Finch | 14 | 1,3,7,8,9,10,11 |
| American Goldfinch | 2 | 6,9 |
| Evening Grosbeak | 12 | 2,7,9,10,11 |
| Total Species | 78 | |

Forest Cover Types

- 1 = Semi-open lowland conifer
- 2 = Young lowland conifer
- 3 = Mature lowland conifer
- 4 = Young lowland deciduous
- 5 = Mature lowland deciduous
- 6 = Regenerating upland conifer
- 7 = Young upland conifer
- 8 = Mature upland conifer
- 9 = Regenerating upland deciduous
- 10 = Young upland deciduous
- 11 = Mature upland deciduous

Figure 1. Total number of individuals (per 40 acres) observed within five cover types in the Superior National Forest in 1991 (R = regenerating, P = pole-sized, M = mature). The value shown is the mean of all stands sampled within each cover type (and age).

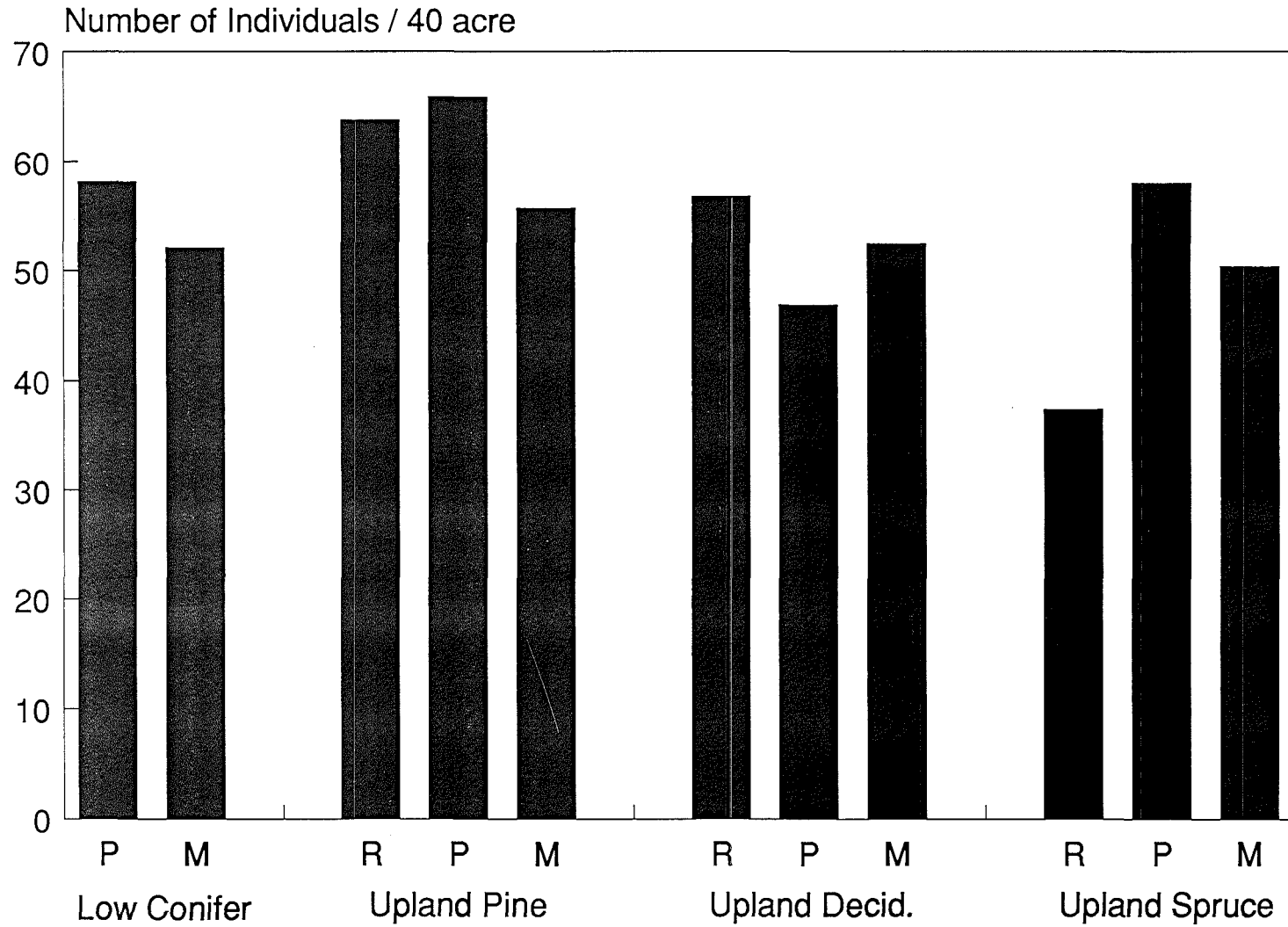


Figure 2. Total number of species observed within four cover types in the Superior National Forest in 1991 (R = regenerating, P = pole-sized, M = mature). The solid portion of each bar indicates number of species that occurred in highest numbers in that cover type.

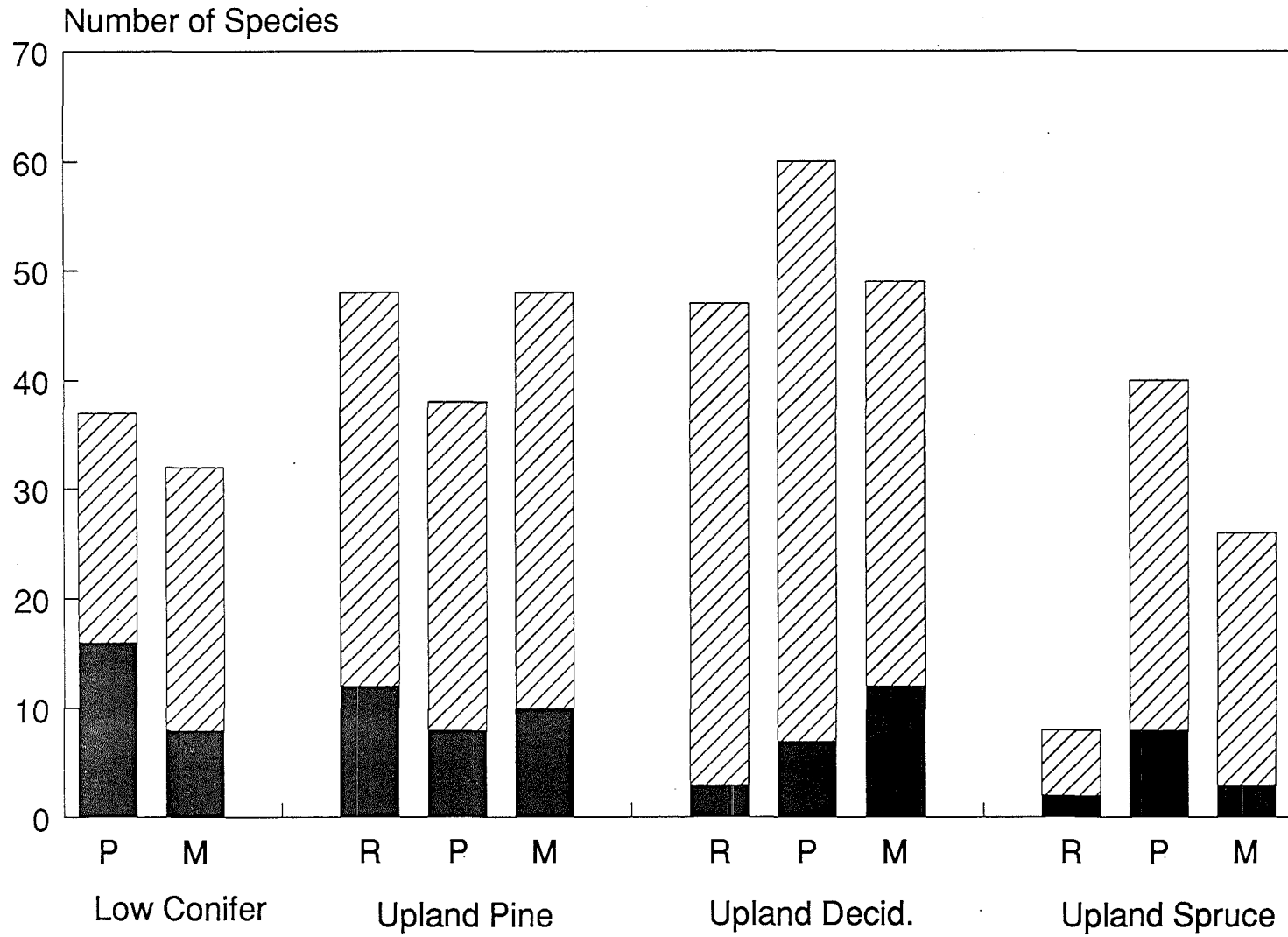


Figure 3. Percent of total individuals (mean of all stands that were permanent residents, short or long-distance migrants within regenerating, pole-size, or saw size (mature) cover types (JP = jack pine; RP = red pine; A = aspen; WS = white spruce; BS = black spruce; C = cedar; SC = swamp conifer; M = maple; B = birch; BF = balsam fir; WP = white pine)).

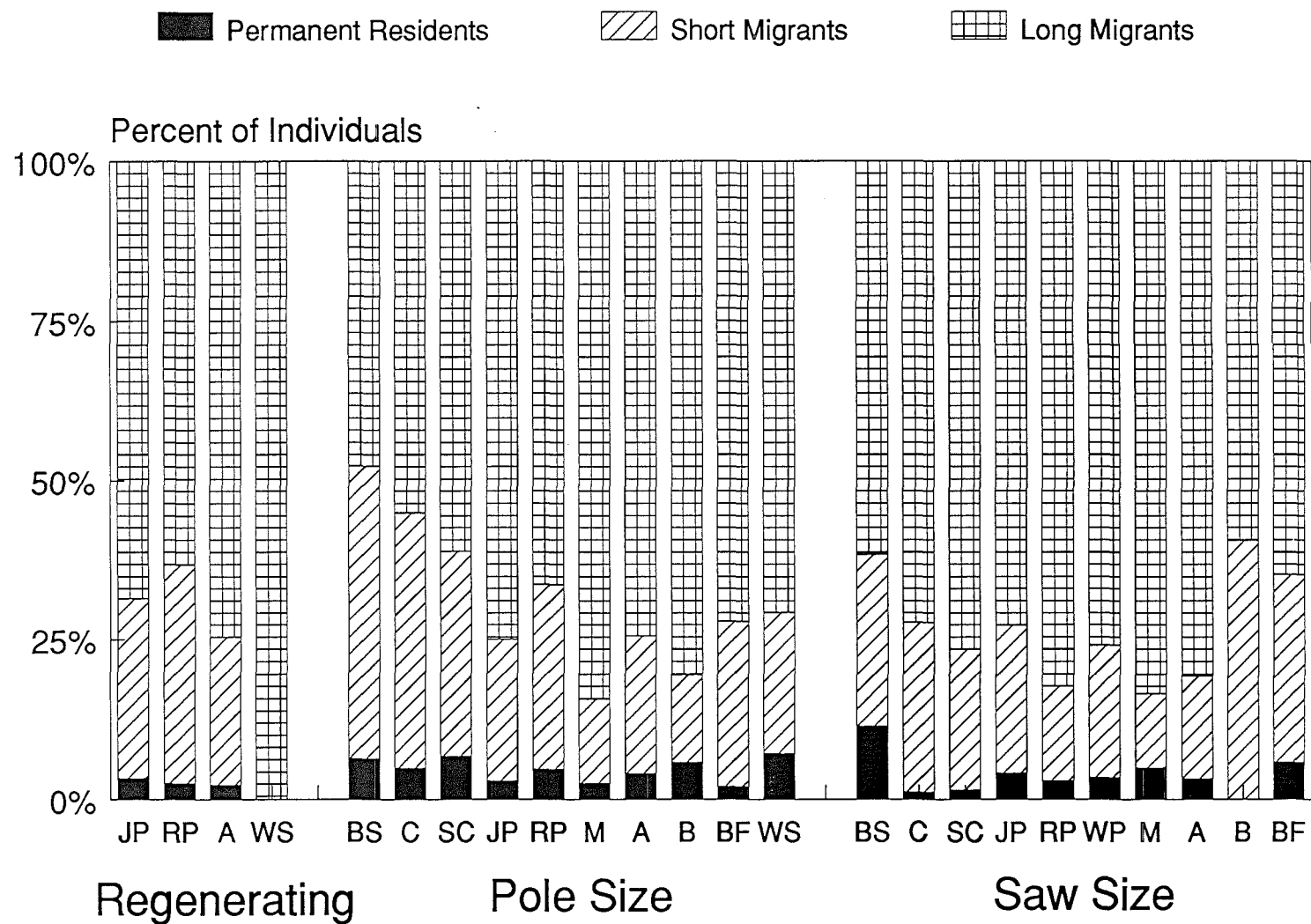


Figure 4. Number of male Brown Creepers by cover type (R = regenerating; P = pole size; M = mature) in the Superior National Forest in 1991. Numbers were calculated by multiplying mean number of males observed within each cover type by the amount of that cover type in the Forest.

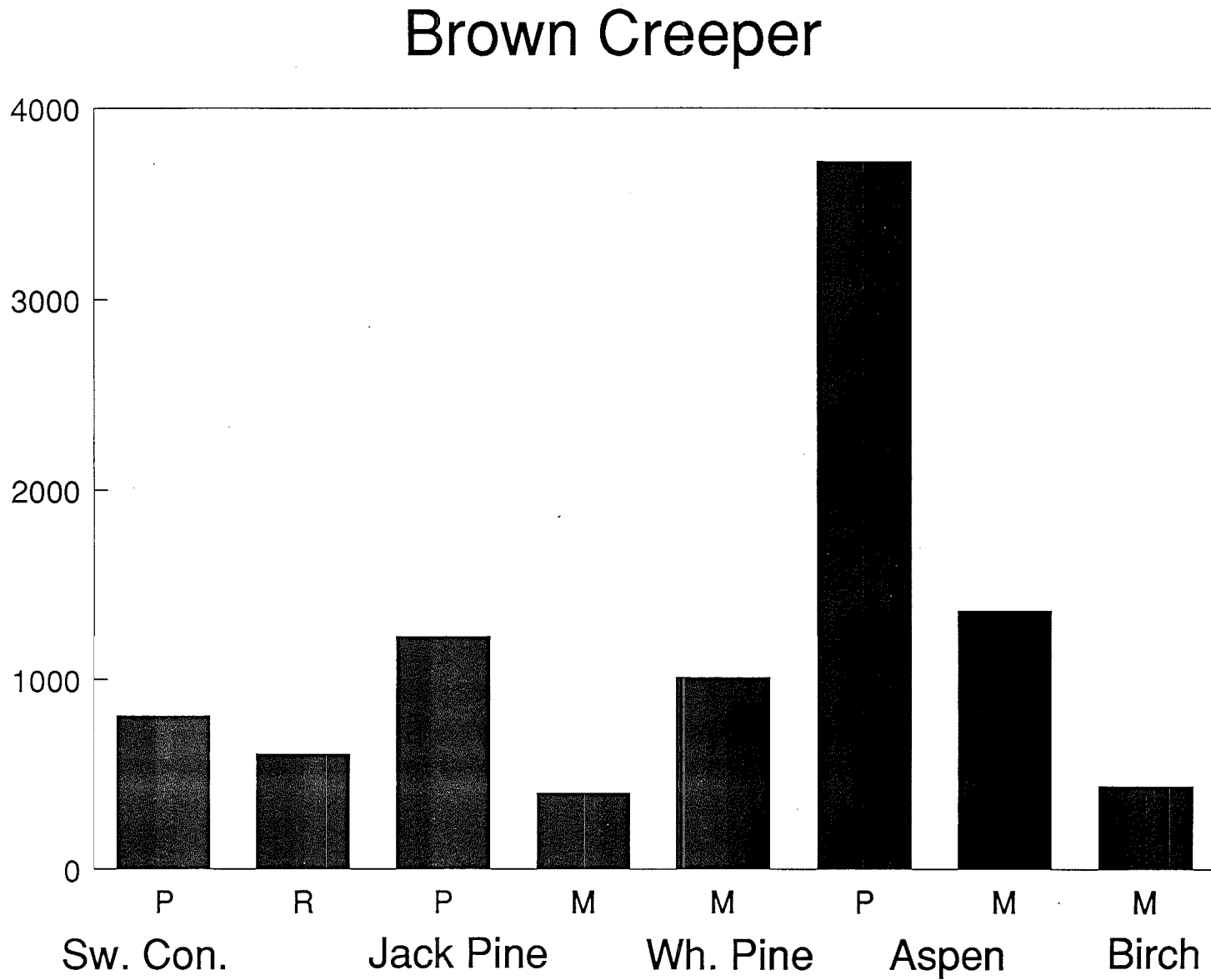


Figure 5. Number of male Scarlet Tanagers by cover type (R = regenerating; P = pole size; M = mature) in the Superior National Forest in 1991. Numbers were calculated by multiplying mean number of males observed within each cover type by the amount of that cover type in the Forest.

Scarlet Tanager

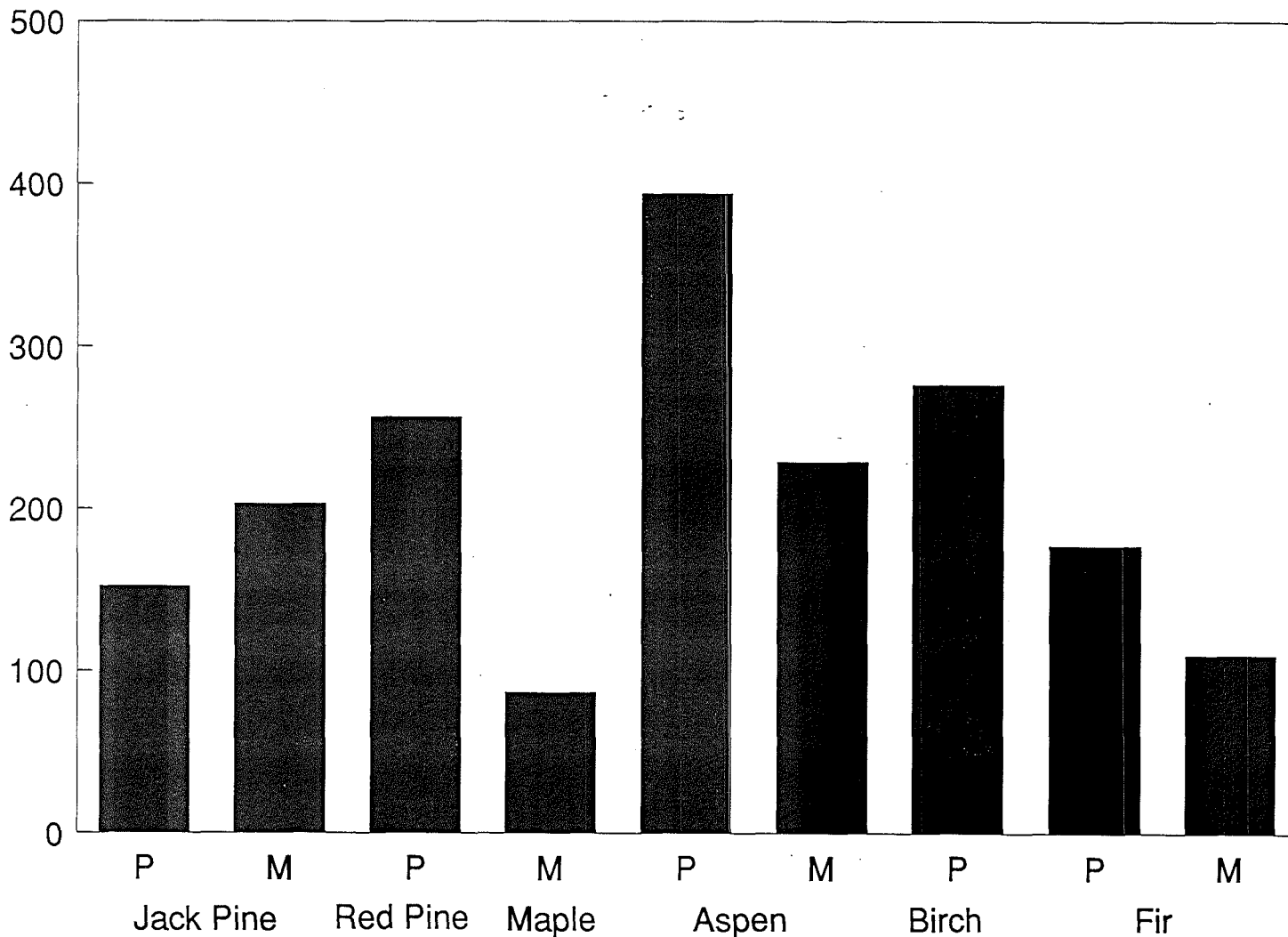


Figure 6. Number of male Swainson's Thrush by cover type (R = regenerating; P = pole size; M = mature) in the Superior National Forest in 1991. Numbers were calculated by multiplying mean number of males observed within each cover type by the amount of that cover type in the Forest.

Swainsons's Thrush

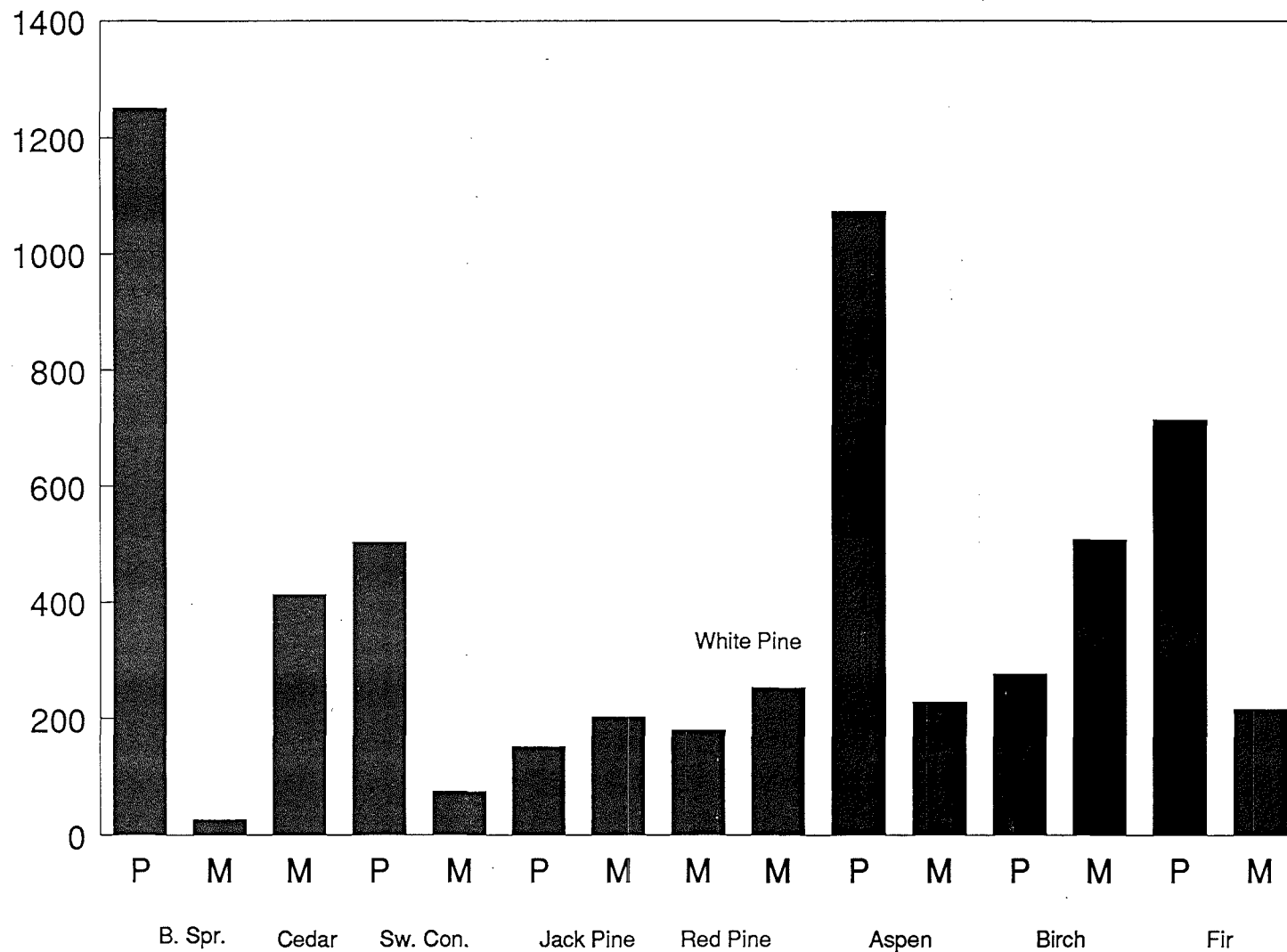


Figure 7. Number of Pine Warbler males in two cover types in the Superior National Forest in 1991.

Pine Warbler

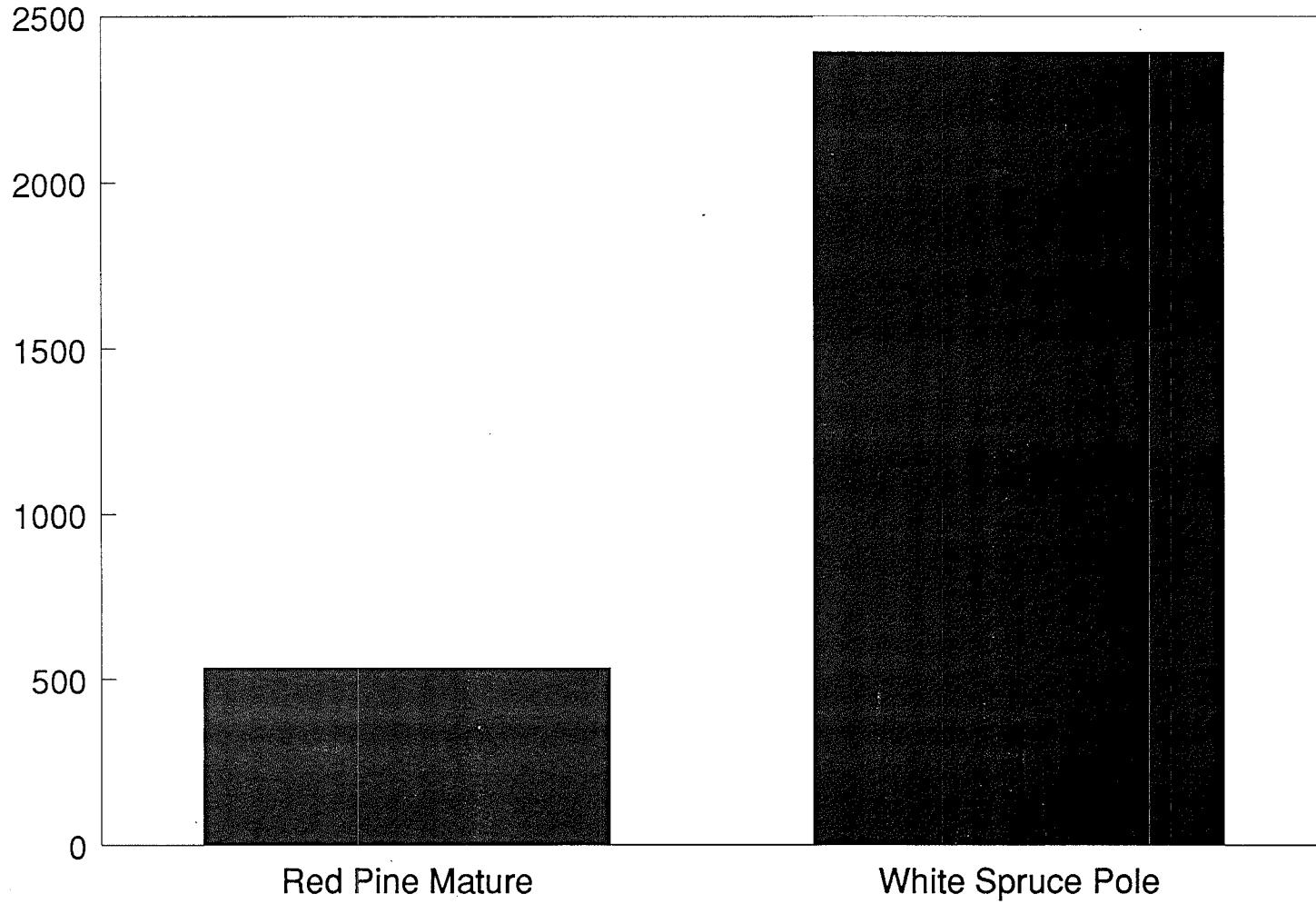
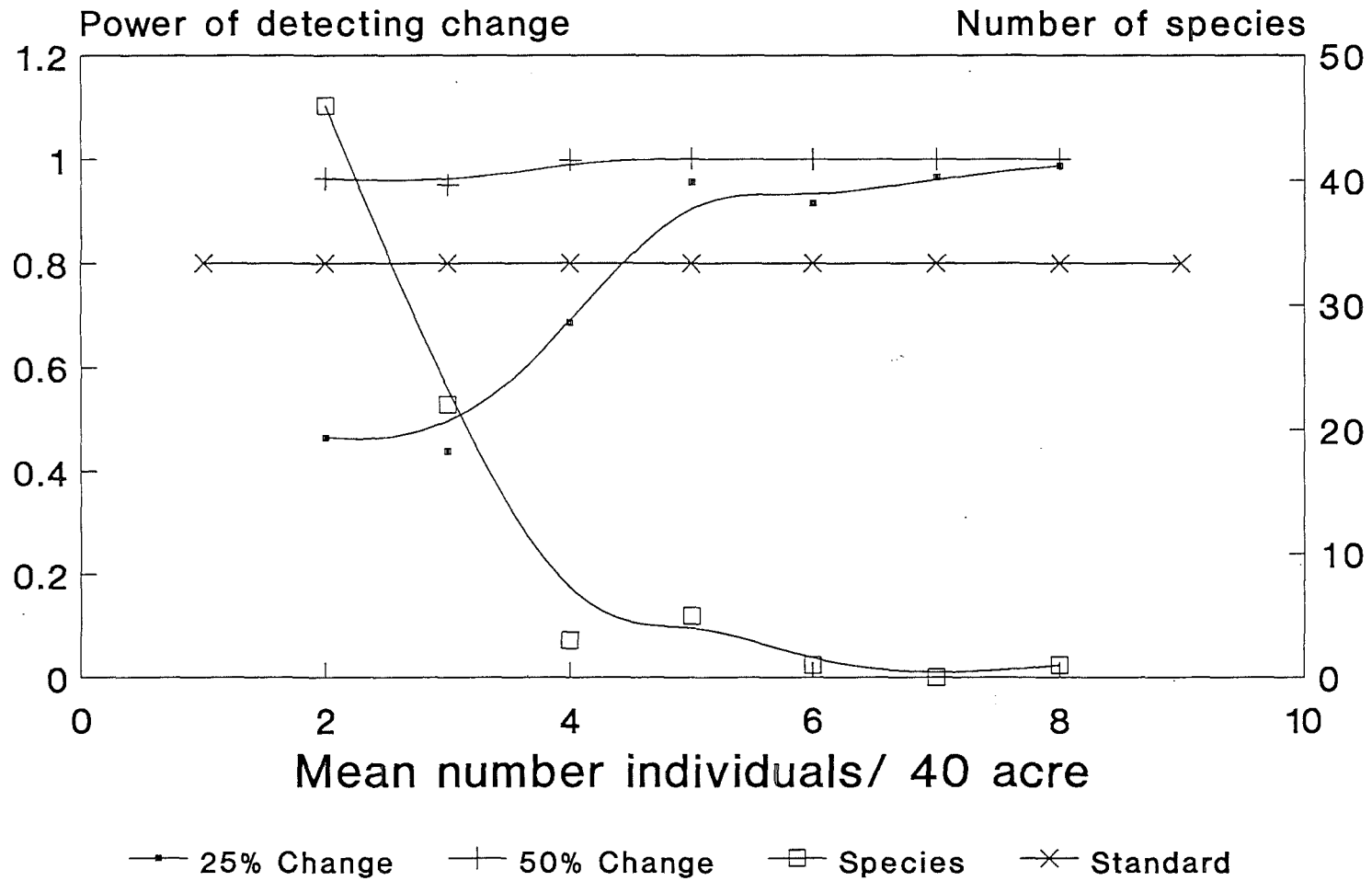
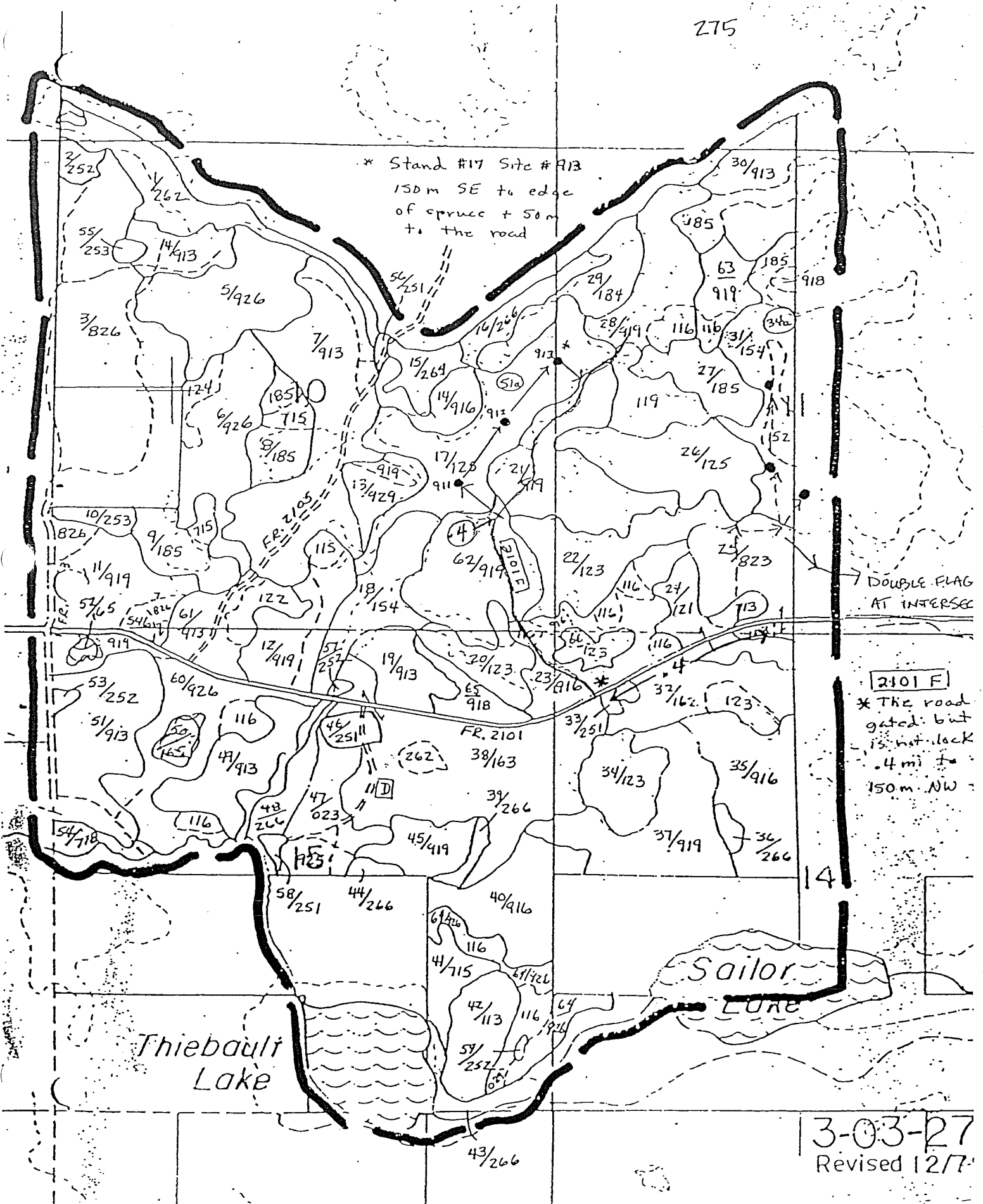
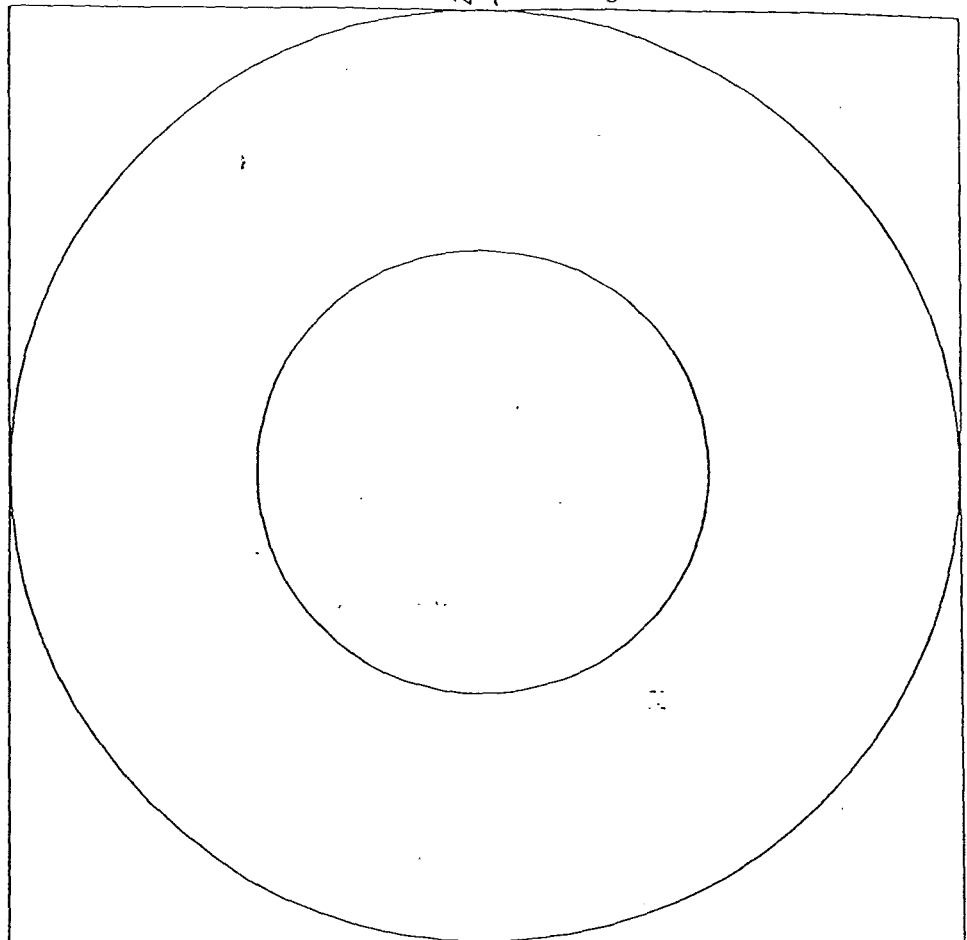


Figure 8. Power of statistical analyses (two-tailed t-test) of detecting a 25% or 50% change in bird numbers (mean/40 acres). Number of species that occurred at densities from 2 to 9 individuals/40 acre are indicated on the Y2 axis. The standard power for statistical tests (0.80) is also shown.





| | |
|----------------------|--|
| National Forest | |
| District | |
| Compartment | |
| Stand Number | |
| Site Number | |
| Observer(s) | |
| Date | |
| Time (start) | |
| Dist. to road (m) | |
| Temperature | |
| Wind (codes) | |
| Humidity (see codes) | |



Standard recording codes
minutes¹

Logging: NAWA Flyover: -NAWA→
 Logging: (NAWA) Observed: NAWA

| Species | AOU # | Ind/10 min | Ind/3 min | FS Type (see compartment map) | |
|---------|-------|------------|-----------|---|--|
| | | | | Stand Size (acres, VMIS data base) | |
| | | | | Canopy Height (m) | |
| | | | | Tree Density (1 = few to 5 = dense) | |
| | | | | Shrub Density (1 = few to 5 = dense) | |
| | | | | Percent Deciduous (see codes: 0 = all conifers) | |
| | | | | High canopy cover (% codes) | |
| | | | | Subcanopy cover (lower layer of trees:%codes) | |
| | | | | Understory cover (3 ft to 12 ft: % codes) | |
| | | | | Ground cover (3 ft to ground; % codes) | |
| | | | | Tree species (up to 5; codes) | |
| | | | | Shrub species (up to 5; codes) | |
| | | | | Topography (codes) | |
| | | | | Special Features (codes) | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

APPENDIX 3. Code sheet for standard Forest Service codes used to collect habitat and weather data.

NATIONAL FOREST

9020 Chequamegon
9030 Chippewa
9090 Superior

DISTRICT

9031 Blackduck
9032 Cass Lake
9033 Deer River
9034 Marcell
9035 Walker
9095 Kawishiwi
9096 LaCroix
9097 Tofte

WINDSPEED CODES

0 No wind
1 Leaves barely move
2 Leaves, small twigs move
3 Leaves twigs in constant motion
4 Small branches move
5 Large branches, small trees sway
6 Large branches in continuous motion
7 Whole trees in motion

SKY COVER

0 clear (<10%)
1 Scattered (10-50%)
2 Broken (60-90%)
3 Overcast (>90%)
4 Fog
5 Light mist

TREE (<2.5CM DBH), SHRUB DENSITY

1 None or few
2 < 5 in 10m radius
3 6-20 in 10m radius
4 21-40 in 10m radius
5 > 40 in 10m radius

ALL PERCENT ESTIMATES

0 Open canopy
1 0-40%
2 40-70%
3 >70%

TOPOGRAPHY

1 Ridgetop
2 Wet sidehill
3 Dry sidehill
4 Wet flat
5 Dry flat
6 Rolling
7 Broken (edges)
8 Bottom or draw

SPECIAL FEATURES

1 Beaver Flooding
2 Large downed logs
3 Small openings
4 Snags
5 Wetland pocket in site
6 Woodland pond in site
7 Natural opening in site
8 Rock outcrop

TREE SPECIES

012 Balsam Fir
071 Tamarack
094 White Spruce
095 Black Spruce
105 Jack Pine
125 Red Pine
129 White Pine
130 Scotch Pine
241 Northern White Cedar
261 Hemlock
316 Red Maple
318 Sugar Maple
371 Yellow Birch
375 Paper Birch
543 Black Ash
544 Green Ash
601 Butternut
741 Balsam Poplar
743 Bigtooth Aspen
746 Quaking Aspen
833 Red Oak
920 Willow
951 Basswood
970 Elm

SHRUB SPECIES

006 Juneberry
015 Leatherleaf
022 Hazel
025 Honeysuckle
032 Labrador Tea
034 Honeysuckle
049 Staghorn Sumac
051 Gooseberry
054 Blackberry
055 Raspberry
075 Arrowwood
083 Highbush Cranberry
319 Mountain Maple
352 Alder
497 Red Osier Dogwood
500 Hawthorn
662 Crabapple
763 Chokecherry
935 Mountain Ash

Mean number per 40 acres of birds observed in Superior National Forest

| | | Habitat=Lowland conifer | | | | | |
|---------------------------|-------------------|-------------------------|------|-----|-------|-----|-------|
| | | Stand Size | | | | | |
| | | 1-3 | | 4-6 | | 7-9 | |
| Bird Species | Forest Cover type | N | Mean | N | Mean | N | Mean |
| Total individuals | Black Spruce | | | 4 | 47.60 | 1 | 47.60 |
| Total individuals | White Cedar | | | 1 | 69.70 | 3 | 50.43 |
| Total individuals | Mix swamp conifer | | | 4 | 57.37 | 4 | 58.23 |
| Yellow-bellied Sapsucker | Mix swamp conifer | | | | | 4 | 0.42 |
| Downy Woodpecker | Mix swamp conifer | | | 4 | 0.85 | | |
| Olive-sided Flycatcher | Black Spruce | | | 4 | 0.42 | 1 | 3.40 |
| Olive-sided Flycatcher | White Cedar | | | 1 | 5.10 | | |
| Yellow-bellied Flycatcher | Black Spruce | | | 4 | 1.70 | 1 | 3.40 |
| Yellow-bellied Flycatcher | White Cedar | | | 1 | 3.40 | 3 | 1.13 |
| Yellow-bellied Flycatcher | Mix swamp conifer | | | 4 | 1.27 | 4 | 2.55 |
| Alder Flycatcher | Black Spruce | | | 4 | 0.42 | | |
| Least Flycatcher | Black Spruce | | | 4 | 0.85 | | |
| Least Flycatcher | Mix swamp conifer | | | | | 4 | 0.85 |
| Gray Jay | Black Spruce | | | 4 | 0.42 | 1 | 3.40 |
| Blue Jay | Black Spruce | | | 4 | 0.85 | | |
| Common Raven | Black Spruce | | | | | 1 | 1.70 |
| Boreal Chickadee | Black Spruce | | | 4 | 0.42 | | |
| Red-breasted Nuthatch | White Cedar | | | 1 | 3.40 | | |
| Red-breasted Nuthatch | Mix swamp conifer | | | 4 | 0.42 | | |
| Brown Creeper | Mix swamp conifer | | | 4 | 3.40 | | |
| Winter Wren | Black Spruce | | | 4 | 0.42 | | |
| Winter Wren | White Cedar | | | | | 3 | 2.83 |
| Winter Wren | Mix swamp conifer | | | 4 | 2.55 | 4 | 2.12 |
| Golden-crowned Kinglet | Black Spruce | | | 4 | 5.10 | 1 | 6.80 |
| Golden-crowned Kinglet | White Cedar | | | 1 | 13.60 | 3 | 4.53 |
| Golden-crowned Kinglet | Mix swamp conifer | | | 4 | 3.40 | 4 | 1.70 |
| Ruby-crowned Kinglet | Black Spruce | | | 4 | 0.42 | | |
| Veery | Black Spruce | | | 4 | 0.42 | | |
| Veery | White Cedar | | | 1 | 1.70 | 3 | 1.13 |
| Veery | Mix swamp conifer | | | 4 | 0.85 | 4 | 1.70 |
| Swainson's Thrush | Black Spruce | | | 4 | 1.27 | 1 | 1.70 |
| Swainson's Thrush | White Cedar | | | | | 3 | 2.27 |
| Swainson's Thrush | Mix swamp conifer | | | 4 | 2.12 | 4 | 0.42 |
| Hermit Thrush | Black Spruce | | | 4 | 3.40 | | |
| Hermit Thrush | White Cedar | | | 1 | 1.70 | | |
| Hermit Thrush | Mix swamp conifer | | | 4 | 1.70 | 4 | 2.97 |
| American Robin | Black Spruce | | | 4 | 1.27 | | |
| American Robin | White Cedar | | | 1 | 1.70 | | |
| American Robin | Mix swamp conifer | | | 4 | 1.27 | 4 | 1.70 |
| Cedar Waxwing | Black Spruce | | | 4 | 0.85 | | |
| Cedar Waxwing | White Cedar | | | | | 3 | 0.57 |
| Cedar Waxwing | Mix swamp conifer | | | | | 4 | 0.85 |
| Solitary Vireo | Black Spruce | | | 4 | 0.42 | | |
| Red-eyed Vireo | Black Spruce | | | 4 | 0.85 | | |
| Red-eyed Vireo | White Cedar | | | 1 | 5.10 | 3 | 3.97 |
| Red-eyed Vireo | Mix swamp conifer | | | 4 | 2.97 | 4 | 2.97 |
| Nashville Warbler | Black Spruce | | | 4 | 8.50 | 1 | 3.40 |
| Nashville Warbler | White Cedar | | | 1 | 5.10 | 3 | 3.97 |
| Nashville Warbler | Mix swamp conifer | | | 4 | 3.82 | 4 | 3.40 |
| Northern Parula | White Cedar | | | | | 3 | 0.57 |

Mean number per 40 acres of birds observed in Superior National Forest

| | | Habitat=Lowland conifer (continued) | | | | | |
|------------------------------|-------------------|--|------|-----|-------|-----|-------|
| Bird Species | Forest Cover type | Stand Size | | | | | |
| | | 1-3 | | 4-6 | | 7-9 | |
| | | N | Mean | N | Mean | N | Mean |
| Northern Parula | Mix swamp conifer | | | 4 | 2.12 | 4 | 1.70 |
| Chestnut-sided Warbler | Black Spruce | | | 4 | 2.12 | 1 | 5.10 |
| Chestnut-sided Warbler | White Cedar | | | 1 | 1.70 | 3 | 1.13 |
| Chestnut-sided Warbler | Mix swamp conifer | | | 4 | 1.70 | 4 | 0.85 |
| Magnolia Warbler | White Cedar | | | 1 | 1.70 | | |
| Magnolia Warbler | Mix swamp conifer | | | 4 | 1.70 | 4 | 0.42 |
| Yellow-rumped Warbler | Black Spruce | | | 4 | 2.55 | 1 | 1.70 |
| Yellow-rumped Warbler | White Cedar | | | 1 | 1.70 | 3 | 0.57 |
| Yellow-rumped Warbler | Mix swamp conifer | | | 4 | 1.27 | 4 | 0.42 |
| Black-throated Green Warbler | White Cedar | | | 1 | 1.70 | 3 | 1.70 |
| Black-throated Green Warbler | Mix swamp conifer | | | 4 | 3.82 | 4 | 5.10 |
| Blackburnian Warbler | Black Spruce | | | 4 | 0.85 | 1 | 5.10 |
| Blackburnian Warbler | White Cedar | | | | | 3 | 1.70 |
| Blackburnian Warbler | Mix swamp conifer | | | 4 | 1.70 | 4 | 0.85 |
| Black-and-white Warbler | White Cedar | | | 1 | 6.80 | 3 | 6.80 |
| Black-and-white Warbler | Mix swamp conifer | | | 4 | 6.80 | 4 | 13.60 |
| Ovenbird | Black Spruce | | | 4 | 1.27 | 1 | 3.40 |
| Ovenbird | White Cedar | | | 1 | 3.40 | 3 | 3.97 |
| Ovenbird | Mix swamp conifer | | | 4 | 2.12 | 4 | 4.67 |
| Connecticut Warbler | Black Spruce | | | 4 | 2.55 | 1 | 1.70 |
| Mourning Warbler | White Cedar | | | | | 3 | 2.83 |
| Mourning Warbler | Mix swamp conifer | | | 4 | 0.85 | 4 | 0.42 |
| Canada Warbler | White Cedar | | | 1 | 1.70 | 3 | 1.70 |
| Canada Warbler | Mix swamp conifer | | | 4 | 1.70 | 4 | 1.70 |
| Scarlet Tanager | Mix swamp conifer | | | | | 4 | 0.42 |
| Rose-breasted Grosbeak | White Cedar | | | | | 3 | 1.13 |
| Rose-breasted Grosbeak | Mix swamp conifer | | | 4 | 0.42 | | |
| Chipping Sparrow | Black Spruce | | | 4 | 1.70 | 1 | 1.70 |
| Chipping Sparrow | White Cedar | | | | | 3 | 0.57 |
| Song Sparrow | White Cedar | | | | | 3 | 0.57 |
| White-throated Sparrow | Black Spruce | | | 4 | 5.95 | 1 | 1.70 |
| White-throated Sparrow | White Cedar | | | 1 | 8.50 | 3 | 3.40 |
| White-throated Sparrow | Mix swamp conifer | | | 4 | 3.82 | 4 | 2.12 |
| Dark-eyed Junco | Mix swamp conifer | | | 4 | 0.42 | | |
| Purple Finch | Mix swamp conifer | | | | | 4 | 0.42 |
| Evening Grosbeak | Black Spruce | | | 4 | 0.42 | | |
| Evening Grosbeak | Mix swamp conifer | | | 4 | 2.55 | | |
| Unidentified passerine | Black Spruce | | | 4 | 2.12 | 1 | 3.40 |
| Unidentified passerine | White Cedar | | | 1 | 1.70 | 3 | 2.27 |
| Unidentified passerine | Mix swamp conifer | | | 4 | 1.27 | 4 | 1.70 |
| Unidentified woodpecker | White Cedar | | | | | 3 | 1.13 |
| Unidentified woodpecker | Mix swamp conifer | | | 4 | 0.42 | 4 | 2.12 |
| Total no. species | Black Spruce | | | 4 | 27.00 | 1 | 15.00 |
| Total no. species | White Cedar | | | 1 | 18.00 | 3 | 23.00 |
| Total no. species | Mix swamp conifer | | | 4 | 28.00 | 4 | 27.00 |

Mean number per 40 acres of birds observed in Superior National Forest

| | | Habitat=Pines | | | | | |
|---------------------------|-------------------|---------------|-------|-----|-------|-----|-------|
| Bird Species | Forest Cover type | Stand Size | | | | | |
| | | 1-3 | | 4-6 | | 7-9 | |
| | | N | Mean | N | Mean | N | Mean |
| Total individuals | Jack Pine | 9 | 59.12 | 8 | 58.86 | 7 | 55.13 |
| Total individuals | Red Pine | 6 | 68.57 | 2 | 73.10 | 6 | 60.07 |
| Total individuals | White Pine | | | | | 2 | 51.85 |
| Broad-winged Hawk | Jack Pine | | | | | 7 | 0.24 |
| Ruffed Grouse | Jack Pine | 9 | 0.57 | | | 7 | 0.24 |
| Ruffed Grouse | Red Pine | 6 | 0.28 | | | | |
| Ruffed Grouse | White Pine | | | | | 2 | 0.85 |
| Black-billed Cuckoo | Jack Pine | 9 | 0.19 | | | | |
| Black-billed Cuckoo | Red Pine | 6 | 0.57 | | | | |
| Yellow-bellied Sapsucker | Jack Pine | | | 8 | 0.64 | 7 | 0.24 |
| Yellow-bellied Sapsucker | Red Pine | 6 | 0.28 | 2 | 0.85 | | |
| Yellow-bellied Sapsucker | White Pine | | | | | 2 | 0.85 |
| Hairy Woodpecker | Jack Pine | 9 | 0.19 | | | 7 | 0.24 |
| Hairy Woodpecker | Red Pine | | | | | 6 | 0.85 |
| Northern Flicker | Red Pine | 6 | 0.28 | | | | |
| Pileated Woodpecker | Jack Pine | | | 8 | 0.21 | | |
| Olive-sided Flycatcher | Red Pine | 6 | 0.28 | | | 6 | 0.28 |
| Eastern Wood-Pewee | Jack Pine | | | 8 | 0.85 | | |
| Eastern Wood-Pewee | Red Pine | | | | | 6 | 2.27 |
| Yellow-bellied Flycatcher | Jack Pine | 9 | 0.19 | 8 | 0.21 | | |
| Yellow-bellied Flycatcher | Red Pine | 6 | 0.28 | | | 6 | 0.28 |
| Alder Flycatcher | Jack Pine | 9 | 0.19 | 8 | 0.21 | 7 | 0.24 |
| Alder Flycatcher | Red Pine | 6 | 2.55 | | | | |
| Least Flycatcher | Jack Pine | 9 | 0.94 | 8 | 0.42 | 7 | 1.21 |
| Least Flycatcher | Red Pine | | | | | 6 | 5.95 |
| Eastern Phoebe | Jack Pine | 9 | 0.19 | | | | |
| Gray Jay | Jack Pine | | | | | 7 | 0.24 |
| Gray Jay | Red Pine | 6 | 0.28 | 2 | 0.85 | 6 | 0.28 |
| Blue Jay | Jack Pine | 9 | 0.76 | 8 | 0.64 | 7 | 0.97 |
| Blue Jay | Red Pine | 6 | 0.28 | 2 | 1.70 | | |
| Black-capped Chickadee | Red Pine | 6 | 0.85 | | | | |
| Black-capped Chickadee | White Pine | | | | | 2 | 0.85 |
| Red-breasted Nuthatch | Jack Pine | 9 | 0.19 | 8 | 0.64 | 7 | 0.24 |
| Red-breasted Nuthatch | Red Pine | | | 2 | 0.85 | 6 | 0.57 |
| Brown Creeper | Jack Pine | 9 | 0.76 | 8 | 1.70 | 7 | 0.97 |
| Brown Creeper | White Pine | | | | | 2 | 3.40 |
| House Wren | Red Pine | 6 | 0.28 | | | | |
| Winter Wren | Jack Pine | 9 | 0.19 | 8 | 0.21 | 7 | 0.73 |
| Winter Wren | Red Pine | 6 | 0.28 | | | | |
| Winter Wren | White Pine | | | | | 2 | 0.85 |
| Sedge Wren | Jack Pine | | | | | 7 | 0.24 |
| Golden-crowned Kinglet | Jack Pine | | | 8 | 4.25 | | |
| Golden-crowned Kinglet | Red Pine | 6 | 1.13 | 2 | 3.40 | 6 | 1.13 |
| Ruby-crowned Kinglet | Jack Pine | 9 | 0.19 | 8 | 0.21 | 7 | 0.24 |
| Ruby-crowned Kinglet | Red Pine | | | 2 | 1.70 | 6 | 0.57 |
| Veery | Jack Pine | 9 | 2.64 | 8 | 1.91 | 7 | 2.67 |
| Veery | Red Pine | 6 | 3.97 | 2 | 1.70 | 6 | 2.83 |
| Veery | White Pine | | | | | 2 | 0.85 |
| Swainson's Thrush | Jack Pine | | | 8 | 0.21 | 7 | 0.49 |
| Swainson's Thrush | Red Pine | | | | | 6 | 0.57 |

Mean number per 40 acres of birds observed in Superior National Forest

| | | Habitat=Pines | | | | | |
|------------------------------|-------------------|---------------|------|-----|-------|-----|-------|
| | | (continued) | | | | | |
| Bird Species | Forest Cover type | Stand Size | | | | | |
| | | 1-3 | | 4-6 | | 7-9 | |
| | | N | Mean | N | Mean | N | Mean |
| Swainson's Thrush | White Pine | | | | | 2 | 0.85 |
| Hermit Thrush | Jack Pine | 9 | 0.76 | 8 | 0.64 | 7 | 0.49 |
| Hermit Thrush | Red Pine | 6 | 0.57 | | | 6 | 1.42 |
| American Robin | Jack Pine | 9 | 1.51 | 8 | 0.21 | 7 | 0.97 |
| American Robin | Red Pine | 6 | 1.98 | 2 | 0.85 | | |
| American Robin | White Pine | | | | | 2 | 0.85 |
| Cedar Waxwing | Jack Pine | 9 | 0.19 | | | 7 | 0.24 |
| Solitary Vireo | Jack Pine | 9 | 0.19 | 8 | 0.21 | | |
| Solitary Vireo | Red Pine | | | | | 6 | 0.28 |
| Solitary Vireo | White Pine | | | | | 2 | 0.85 |
| Red-eyed Vireo | Jack Pine | 9 | 4.53 | 8 | 4.67 | 7 | 3.40 |
| Red-eyed Vireo | Red Pine | 6 | 2.55 | 2 | 5.10 | 6 | 6.52 |
| Red-eyed Vireo | White Pine | | | | | 2 | 6.80 |
| Golden-winged Warbler | Red Pine | 6 | 1.42 | | | | |
| Nashville Warbler | Jack Pine | 9 | 8.50 | 8 | 7.22 | 7 | 6.07 |
| Nashville Warbler | Red Pine | 6 | 7.08 | 2 | 8.50 | 6 | 3.40 |
| Nashville Warbler | White Pine | | | | | 2 | 0.85 |
| Northern Parula | Jack Pine | 9 | 0.19 | 8 | 0.42 | 7 | 0.24 |
| Northern Parula | Red Pine | 6 | 0.57 | | | 6 | 0.28 |
| Northern Parula | White Pine | | | | | 2 | 0.85 |
| Chestnut-sided Warbler | Jack Pine | 9 | 5.29 | 8 | 2.55 | 7 | 4.61 |
| Chestnut-sided Warbler | Red Pine | 6 | 6.52 | 2 | 9.35 | 6 | 3.68 |
| Chestnut-sided Warbler | White Pine | | | | | 2 | 3.40 |
| Magnolia Warbler | Jack Pine | 9 | 0.94 | 8 | 0.64 | 7 | 0.49 |
| Magnolia Warbler | Red Pine | 6 | 1.13 | 2 | 1.70 | 6 | 0.85 |
| Yellow-rumped Warbler | Jack Pine | 9 | 0.19 | 8 | 0.42 | 7 | 0.49 |
| Yellow-rumped Warbler | Red Pine | 6 | 0.57 | 2 | 0.85 | | |
| Black-throated Green Warbler | Jack Pine | | | 8 | 0.64 | 7 | 0.49 |
| Black-throated Green Warbler | Red Pine | 6 | 0.28 | | | | |
| Blackburnian Warbler | Jack Pine | 9 | 0.19 | 8 | 2.55 | 7 | 2.43 |
| Blackburnian Warbler | Red Pine | 6 | 0.28 | 2 | 0.85 | 6 | 0.85 |
| Blackburnian Warbler | White Pine | | | | | 2 | 4.25 |
| Pine Warbler | Red Pine | | | | | 6 | 1.70 |
| Black-and-white Warbler | Jack Pine | 9 | 6.04 | 8 | 3.40 | 7 | 4.86 |
| Black-and-white Warbler | Red Pine | 6 | 5.67 | 2 | 10.20 | 6 | 10.20 |
| Black-and-white Warbler | White Pine | | | | | 2 | 3.40 |
| Ovenbird | Jack Pine | 9 | 5.48 | 8 | 12.11 | 7 | 6.56 |
| Ovenbird | Red Pine | 6 | 3.97 | 2 | 8.50 | 6 | 6.23 |
| Ovenbird | White Pine | | | | | 2 | 10.20 |
| Connecticut Warbler | Jack Pine | | | | | 7 | 0.24 |
| Connecticut Warbler | Red Pine | | | | | 6 | 0.57 |
| Mourning Warbler | Jack Pine | 9 | 1.89 | 8 | 3.19 | 7 | 2.19 |
| Mourning Warbler | Red Pine | 6 | 1.98 | | | 6 | 1.13 |
| Mourning Warbler | White Pine | | | | | 2 | 1.70 |
| Common Yellowthroat | Jack Pine | 9 | 1.51 | 8 | 0.64 | 7 | 1.21 |
| Common Yellowthroat | Red Pine | 6 | 2.55 | | | 6 | 0.28 |
| Common Yellowthroat | White Pine | | | | | 2 | 0.85 |
| Canada Warbler | Jack Pine | 9 | 0.19 | 8 | 0.64 | 7 | 0.73 |
| Canada Warbler | Red Pine | 6 | 0.85 | | | 6 | 0.28 |

| | | Habitat=Pines (continued) | | | | | |
|-------------------------|-------------------|------------------------------|-------|-----|-------|-----|-------|
| Bird Species | Forest Cover type | Stand Size | | | | | |
| | | 1-3 | | 4-6 | | 7-9 | |
| | | N | Mean | N | Mean | N | Mean |
| Scarlet Tanager | Jack Pine | | | 8 | 0.21 | 7 | 0.49 |
| Scarlet Tanager | Red Pine | | | 2 | 0.85 | | |
| Rose-breasted Grosbeak | Jack Pine | 9 | 0.38 | 8 | 0.85 | 7 | 0.49 |
| Rose-breasted Grosbeak | Red Pine | 6 | 0.85 | | | 6 | 0.57 |
| Rose-breasted Grosbeak | White Pine | | | | | 2 | 0.85 |
| Indigo Bunting | White Pine | | | | | 2 | 2.55 |
| Chipping Sparrow | Jack Pine | 9 | 1.51 | 8 | 0.64 | 7 | 1.46 |
| Chipping Sparrow | Red Pine | 6 | 0.85 | 2 | 5.10 | 6 | 0.85 |
| Chipping Sparrow | White Pine | | | | | 2 | 1.70 |
| Song Sparrow | Jack Pine | 9 | 1.51 | | | 7 | 0.24 |
| Song Sparrow | Red Pine | 6 | 3.40 | | | | |
| Lincoln's Sparrow | Jack Pine | 9 | 0.19 | 8 | 0.21 | | |
| Lincoln's Sparrow | Red Pine | 6 | 0.28 | | | | |
| Swamp Sparrow | Jack Pine | | | | | 7 | 0.24 |
| Swamp Sparrow | Red Pine | 6 | 0.28 | | | | |
| White-throated Sparrow | Jack Pine | 9 | 6.80 | 8 | 2.12 | 7 | 4.13 |
| White-throated Sparrow | Red Pine | 6 | 8.22 | 2 | 6.80 | 6 | 2.27 |
| White-throated Sparrow | White Pine | | | | | 2 | 1.70 |
| Dark-eyed Junco | Red Pine | | | | | 6 | 0.28 |
| Red-winged blackbird | Jack Pine | 9 | 0.38 | | | 7 | 0.24 |
| Red-winged blackbird | Red Pine | 6 | 0.28 | | | | |
| Brown-headed Cowbird | Red Pine | 6 | 0.28 | | | | |
| Northern Oriole | Jack Pine | 9 | 0.19 | | | | |
| Purple Finch | Jack Pine | | | 8 | 0.85 | 7 | 0.24 |
| Purple Finch | Red Pine | | | 2 | 0.85 | | |
| American Goldfinch | Red Pine | 6 | 0.57 | | | | |
| Evening Grosbeak | Jack Pine | | | 8 | 0.21 | | |
| Unidentified passerine | Jack Pine | 9 | 1.32 | 8 | 0.85 | 7 | 0.49 |
| Unidentified passerine | Red Pine | 6 | 3.40 | 2 | 1.70 | 6 | 1.42 |
| Unidentified passerine | White Pine | | | | | 2 | 0.85 |
| Unidentified woodpecker | Jack Pine | 9 | 2.08 | 8 | 0.42 | 7 | 2.19 |
| Unidentified woodpecker | Red Pine | 6 | 0.57 | 2 | 0.85 | 6 | 1.42 |
| Unidentified woodpecker | White Pine | | | | | 2 | 1.70 |
| Total no. species | Jack Pine | 9 | 38.00 | 8 | 39.00 | 7 | 42.00 |
| Total no. species | Red Pine | 6 | 41.00 | 2 | 22.00 | 6 | 32.00 |
| Total no. species | White Pine | | | | | 2 | 24.00 |

Mean number per 40 acres of birds observed in Superior National Forest

| ----- Habitat=Upland deciduous ----- | | | | | | | |
|--------------------------------------|-------------------|------------|-------|-----|-------|-----|-------|
| Bird Species | Forest Cover type | Stand Size | | | | | |
| | | 1-3 | | 4-6 | | 7-9 | |
| | | N | Mean | N | Mean | N | Mean |
| Total individuals | Maple | | | 2 | 35.70 | 3 | 37.40 |
| Total individuals | Aspen | 24 | 56.81 | 28 | 65.57 | 19 | 65.58 |
| Total individuals | Paper Birch | | | 7 | 39.59 | 1 | 54.40 |
| Wood Duck | Aspen | | | 28 | 0.06 | | |
| Broad-winged Hawk | Aspen | | | 28 | 0.12 | | |
| Ruffed Grouse | Aspen | 24 | 0.35 | 28 | 0.30 | 19 | 0.36 |
| Ruffed Grouse | Paper Birch | | | 7 | 0.97 | | |
| Yellow-billed Cuckoo | Aspen | 24 | 0.07 | | | | |
| Great Gray Owl | Aspen | | | | | 19 | 0.09 |
| Boreal Owl | Aspen | | | | | 19 | 0.09 |
| Ruby-throated Hummingbird | Aspen | | | 28 | 1.94 | | |
| Belted Kingfisher | Aspen | | | 28 | 0.06 | | |
| Yellow-bellied Sapsucker | Aspen | | | 28 | 0.85 | 19 | 0.89 |
| Yellow-bellied Sapsucker | Paper Birch | | | 7 | 0.49 | | |
| Downy Woodpecker | Aspen | | | 28 | 0.06 | | |
| Hairy Woodpecker | Maple | | | 2 | 0.85 | 3 | 0.57 |
| Hairy Woodpecker | Aspen | | | 28 | 0.24 | 19 | 0.27 |
| Northern Flicker | Aspen | 24 | 0.14 | 28 | 0.18 | 19 | 0.27 |
| Pileated Woodpecker | Aspen | 24 | 0.14 | 28 | 0.12 | 19 | 0.18 |
| Olive-sided Flycatcher | Aspen | 24 | 0.35 | 28 | 0.06 | 19 | 0.27 |
| Eastern Wood-Pewee | Maple | | | | | 3 | 1.13 |
| Eastern Wood-Pewee | Aspen | | | 28 | 0.97 | 19 | 1.16 |
| Yellow-bellied Flycatcher | Aspen | 24 | 0.14 | 28 | 0.18 | | |
| Yellow-bellied Flycatcher | Paper Birch | | | | | 1 | 1.70 |
| Alder Flycatcher | Aspen | 24 | 0.50 | 28 | 0.30 | | |
| Least Flycatcher | Maple | | | 2 | 3.40 | 3 | 4.53 |
| Least Flycatcher | Aspen | 24 | 0.21 | 28 | 1.21 | 19 | 2.24 |
| Least Flycatcher | Paper Birch | | | 7 | 1.21 | | |
| Eastern Phoebe | Aspen | | | 28 | 0.06 | | |
| Great Crested Flycatcher | Aspen | | | 28 | 0.06 | 19 | 0.09 |
| Eastern Kingbird | Aspen | | | | | 19 | 0.09 |
| Gray Jay | Aspen | | | 28 | 0.18 | | |
| Blue Jay | Aspen | 24 | 0.21 | 28 | 0.49 | 19 | 0.36 |
| Blue Jay | Paper Birch | | | 7 | 0.49 | | |
| Common Raven | Aspen | | | | | 19 | 0.18 |
| Black-capped Chickadee | Aspen | 24 | 0.21 | 28 | 0.30 | 19 | 0.18 |
| Red-breasted Nuthatch | Maple | | | | | 3 | 1.13 |
| Red-breasted Nuthatch | Aspen | 24 | 0.14 | 28 | 0.67 | 19 | 0.27 |
| Red-breasted Nuthatch | Paper Birch | | | 7 | 0.49 | | |
| Brown Creeper | Aspen | | | 28 | 1.70 | 19 | 1.07 |
| House Wren | Aspen | | | 28 | 0.06 | | |
| Winter Wren | Aspen | 24 | 0.64 | 28 | 0.85 | 19 | 0.89 |
| Winter Wren | Paper Birch | | | 7 | 0.73 | 1 | 3.40 |
| Sedge Wren | Aspen | | | 28 | 0.06 | 19 | 0.18 |
| Golden-crowned Kinglet | Aspen | 24 | 1.13 | 28 | 1.70 | 19 | 0.36 |
| Golden-crowned Kinglet | Paper Birch | | | 7 | 0.97 | 1 | 6.80 |
| Ruby-crowned Kinglet | Paper Birch | | | 7 | 0.24 | | |
| Eastern Bluebird | Aspen | 24 | 0.07 | | | | |
| Veery | Maple | | | 2 | 5.10 | 3 | 2.27 |
| Veery | Aspen | 24 | 4.25 | 28 | 2.73 | 19 | 4.21 |

Mean number per 40 acres of birds observed in Superior National Forest

| ----- Habitat=Upland deciduous ----- | | | | | | | |
|--------------------------------------|-------------------|------------|------|-----|-------|-----|-------|
| (continued) | | | | | | | |
| Bird Species | Forest Cover type | Stand Size | | | | | |
| | | 1-3 | | 4-6 | | 7-9 | |
| | | N | Mean | N | Mean | N | Mean |
| Veery | Paper Birch | | | 7 | 2.19 | 1 | 3.40 |
| Swainson's Thrush | Aspen | | | 28 | 0.49 | 19 | 0.18 |
| Swainson's Thrush | Paper Birch | | | 7 | 0.24 | 1 | 1.70 |
| Hermit Thrush | Maple | | | 2 | 0.85 | 3 | 1.13 |
| Hermit Thrush | Aspen | 24 | 0.42 | 28 | 0.24 | 19 | 0.27 |
| Hermit Thrush | Paper Birch | | | 7 | 0.24 | 1 | 3.40 |
| American Robin | Maple | | | | | 3 | 0.57 |
| American Robin | Aspen | 24 | 1.63 | 28 | 1.27 | 19 | 1.25 |
| American Robin | Paper Birch | | | 7 | 0.49 | 1 | 1.70 |
| Cedar Waxwing | Aspen | 24 | 0.07 | 28 | 0.06 | 19 | 0.09 |
| Solitary Vireo | Paper Birch | | | 7 | 0.49 | | |
| Red-eyed Vireo | Maple | | | 2 | 5.10 | 3 | 6.23 |
| Red-eyed Vireo | Aspen | 24 | 3.68 | 28 | 4.55 | 19 | 5.82 |
| Red-eyed Vireo | Paper Birch | | | 7 | 4.86 | 1 | 1.70 |
| Golden-winged Warbler | Aspen | 24 | 0.71 | 28 | 0.18 | | |
| Nashville Warbler | Maple | | | 2 | 3.40 | 3 | 0.57 |
| Nashville Warbler | Aspen | 24 | 3.05 | 28 | 3.95 | 19 | 4.38 |
| Nashville Warbler | Paper Birch | | | 7 | 2.19 | 1 | 8.50 |
| Northern Parula | Aspen | 24 | 0.14 | 28 | 0.85 | 19 | 0.63 |
| Northern Parula | Paper Birch | | | 7 | 0.97 | | |
| Yellow Warbler | Aspen | | | 28 | 0.06 | | |
| Chestnut-sided Warbler | Maple | | | 2 | 1.70 | 3 | 1.13 |
| Chestnut-sided Warbler | Aspen | 24 | 7.30 | 28 | 2.67 | 19 | 4.47 |
| Chestnut-sided Warbler | Paper Birch | | | 7 | 1.21 | | |
| Magnolia Warbler | Maple | | | 2 | 0.85 | | |
| Magnolia Warbler | Aspen | 24 | 1.13 | 28 | 0.85 | 19 | 1.43 |
| Magnolia Warbler | Paper Birch | | | 7 | 0.49 | 1 | 1.70 |
| Black-throated Blue Warbler | Aspen | | | | | 19 | 0.18 |
| Yellow-rumped Warbler | Aspen | 24 | 0.57 | 28 | 0.24 | 19 | 0.18 |
| Yellow-rumped Warbler | Paper Birch | | | 7 | 0.24 | | |
| Black-throated Green Warbler | Maple | | | 2 | 0.85 | 3 | 4.53 |
| Black-throated Green Warbler | Aspen | 24 | 0.50 | 28 | 1.03 | 19 | 0.89 |
| Black-throated Green Warbler | Paper Birch | | | 7 | 1.21 | | |
| Blackburnian Warbler | Aspen | 24 | 0.57 | 28 | 1.94 | 19 | 1.70 |
| Blackburnian Warbler | Paper Birch | | | 7 | 1.46 | | |
| Pine Warbler | Aspen | | | | | 19 | 0.18 |
| Black-and-white Warbler | Maple | | | 2 | 3.40 | | |
| Black-and-white Warbler | Aspen | 24 | 7.08 | 28 | 8.50 | 19 | 7.52 |
| Black-and-white Warbler | Paper Birch | | | 7 | 0.97 | | |
| American Redstart | Maple | | | | | 3 | 1.13 |
| American Redstart | Aspen | 24 | 0.42 | 28 | 0.06 | 19 | 0.18 |
| Ovenbird | Maple | | | 2 | 3.40 | 3 | 5.67 |
| Ovenbird | Aspen | 24 | 4.67 | 28 | 9.65 | 19 | 8.77 |
| Ovenbird | Paper Birch | | | 7 | 10.69 | 1 | 10.20 |
| Connecticut Warbler | Paper Birch | | | 7 | 0.24 | | |
| Mourning Warbler | Maple | | | | | 3 | 0.57 |
| Mourning Warbler | Aspen | 24 | 3.12 | 28 | 2.43 | 19 | 2.95 |
| Mourning Warbler | Paper Birch | | | 7 | 0.49 | | |
| Common Yellowthroat | Maple | | | | | 3 | 0.57 |

----- Habitat=Upland deciduous -----
 (continued)

| Bird Species | Forest Cover type | Stand Size | | | | | |
|-------------------------|-------------------|------------|-------|-----|-------|-----|-------|
| | | 1-3 | | 4-6 | | 7-9 | |
| | | N | Mean | N | Mean | N | Mean |
| Common Yellowthroat | Aspen | 24 | 0.99 | 28 | 0.79 | 19 | 0.45 |
| Common Yellowthroat | Paper Birch | | | | | 1 | 3.40 |
| Canada Warbler | Aspen | 24 | 1.35 | 28 | 1.52 | 19 | 1.88 |
| Canada Warbler | Paper Birch | | | 7 | 0.73 | 1 | 1.70 |
| Scarlet Tanager | Maple | | | | | 3 | 0.57 |
| Scarlet Tanager | Aspen | | | 28 | 0.18 | 19 | 0.18 |
| Scarlet Tanager | Paper Birch | | | 7 | 0.24 | | |
| Rose-breasted Grosbeak | Aspen | 24 | 1.20 | 28 | 0.55 | 19 | 1.61 |
| Rose-breasted Grosbeak | Paper Birch | | | | | 1 | 1.70 |
| Indigo Bunting | Aspen | 24 | 0.21 | | | | |
| Chipping Sparrow | Aspen | 24 | 0.28 | 28 | 0.36 | | |
| Chipping Sparrow | Paper Birch | | | 7 | 0.49 | | |
| Clay-colored Sparrow | Aspen | 24 | 0.07 | | | | |
| Vesper Sparrow | Aspen | | | 28 | 0.12 | | |
| Song Sparrow | Aspen | 24 | 0.71 | 28 | 0.42 | 19 | 0.36 |
| Lincoln's Sparrow | Aspen | 24 | 0.21 | | | | |
| Swamp Sparrow | Aspen | | | 28 | 0.18 | | |
| Swamp Sparrow | Paper Birch | | | 7 | 0.24 | | |
| White-throated Sparrow | Maple | | | 2 | 1.70 | 3 | 1.70 |
| White-throated Sparrow | Aspen | 24 | 5.24 | 28 | 3.52 | 19 | 3.67 |
| White-throated Sparrow | Paper Birch | | | 7 | 0.97 | 1 | 1.70 |
| Red-winged blackbird | Aspen | 24 | 0.07 | 28 | 0.49 | 19 | 0.09 |
| Brown-headed Cowbird | Maple | | | 2 | 0.85 | | |
| Brown-headed Cowbird | Aspen | 24 | 0.28 | 28 | 0.12 | 19 | 0.09 |
| Purple Finch | Maple | | | 2 | 0.85 | | |
| Purple Finch | Aspen | 24 | 0.07 | 28 | 0.18 | | |
| Purple Finch | Paper Birch | | | | | 1 | 1.70 |
| American Goldfinch | Aspen | 24 | 0.07 | | | | |
| Evening Grosbeak | Aspen | 24 | 0.14 | 28 | 0.18 | | |
| Evening Grosbeak | Paper Birch | | | 7 | 0.24 | | |
| Unidentified passerine | Maple | | | 2 | 3.40 | 3 | 2.83 |
| Unidentified passerine | Aspen | 24 | 1.56 | 28 | 1.21 | 19 | 1.07 |
| Unidentified passerine | Paper Birch | | | 7 | 1.70 | | |
| Unidentified woodpecker | Maple | | | | | 3 | 0.57 |
| Unidentified woodpecker | Aspen | 24 | 0.71 | 28 | 1.15 | 19 | 1.43 |
| Unidentified woodpecker | Paper Birch | | | 7 | 0.73 | | |
| Total no. species | Maple | | | 2 | 15.00 | 3 | 19.00 |
| Total no. species | Aspen | 24 | 47.00 | 28 | 60.00 | 19 | 49.00 |
| Total no. species | Paper Birch | | | 7 | 33.00 | 1 | 16.00 |

Appendix 4

Mean number per 40 acres of birds observed in Superior National Forest

36

| | | Habitat=Upland spruce | | | | | |
|------------------------------|-------------------|-----------------------|-------|-----|-------|-----|-------|
| Bird Species | Forest Cover type | Stand Size | | | | | |
| | | 1-3 | | 4-6 | | 7-9 | |
| | | N | Mean | N | Mean | N | Mean |
| Total individuals | Bals-Fir-Aspen-Pb | | | 8 | 44.62 | 3 | 50.43 |
| Total individuals | Wh Spruce-Fir | 1 | 37.40 | 1 | 71.40 | | |
| Broad-winged Hawk | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | | |
| Yellow-bellied Sapsucker | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | 3 | 0.57 |
| Yellow-bellied Sapsucker | Wh Spruce-Fir | | | 1 | 1.70 | | |
| Downy Woodpecker | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | | |
| Hairy Woodpecker | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | | |
| Hairy Woodpecker | Wh Spruce-Fir | | | 1 | 1.70 | | |
| Northern Flicker | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | | |
| Northern Flicker | Wh Spruce-Fir | | | 1 | 1.70 | | |
| Yellow-bellied Flycatcher | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | | |
| Alder Flycatcher | Wh Spruce-Fir | | | 1 | 1.70 | | |
| Least Flycatcher | Wh Spruce-Fir | | | 1 | 3.40 | | |
| Gray Jay | Bals-Fir-Aspen-Pb | | | | | 3 | 1.13 |
| Blue Jay | Bals-Fir-Aspen-Pb | | | | | 3 | 1.70 |
| Black-capped Chickadee | Bals-Fir-Aspen-Pb | | | 8 | 0.42 | | |
| Red-breasted Nuthatch | Wh Spruce-Fir | | | 1 | 1.70 | | |
| Brown Creeper | Bals-Fir-Aspen-Pb | | | | | 3 | 2.27 |
| Winter Wren | Bals-Fir-Aspen-Pb | | | 8 | 1.91 | 3 | 1.70 |
| Winter Wren | Wh Spruce-Fir | | | 1 | 1.70 | | |
| Golden-crowned Kinglet | Bals-Fir-Aspen-Pb | | | 8 | 2.55 | 3 | 4.53 |
| Veery | Bals-Fir-Aspen-Pb | | | 8 | 1.91 | 3 | 1.13 |
| Veery | Wh Spruce-Fir | 1 | 6.80 | | | | |
| Swainson's Thrush | Bals-Fir-Aspen-Pb | | | 8 | 0.85 | 3 | 1.13 |
| Hermit Thrush | Bals-Fir-Aspen-Pb | | | 8 | 1.49 | 3 | 1.70 |
| American Robin | Wh Spruce-Fir | | | 1 | 3.40 | | |
| Red-eyed Vireo | Bals-Fir-Aspen-Pb | | | 8 | 4.04 | 3 | 5.67 |
| Red-eyed Vireo | Wh Spruce-Fir | 1 | 6.80 | 1 | 5.10 | | |
| Nashville Warbler | Bals-Fir-Aspen-Pb | | | 8 | 3.19 | | |
| Nashville Warbler | Wh Spruce-Fir | 1 | 1.70 | 1 | 6.80 | | |
| Northern Parula | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | 3 | 1.70 |
| Yellow Warbler | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | | |
| Chestnut-sided Warbler | Bals-Fir-Aspen-Pb | | | 8 | 1.06 | 3 | 0.57 |
| Chestnut-sided Warbler | Wh Spruce-Fir | 1 | 8.50 | 1 | 6.80 | | |
| Magnolia Warbler | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | 3 | 3.40 |
| Magnolia Warbler | Wh Spruce-Fir | | | 1 | 1.70 | | |
| Cape May Warbler | Wh Spruce-Fir | | | 1 | 6.80 | | |
| Black-throated Blue Warbler | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | 3 | 0.57 |
| Yellow-rumped Warbler | Bals-Fir-Aspen-Pb | | | 8 | 0.64 | 3 | 1.13 |
| Black-throated Green Warbler | Bals-Fir-Aspen-Pb | | | 8 | 2.12 | 3 | 2.27 |
| Blackburnian Warbler | Bals-Fir-Aspen-Pb | | | 8 | 0.85 | 3 | 3.97 |
| Blackburnian Warbler | Wh Spruce-Fir | | | 1 | 1.70 | | |
| Pine Warbler | Wh Spruce-Fir | | | 1 | 1.70 | | |
| Black-and-white Warbler | Bals-Fir-Aspen-Pb | | | 8 | 4.25 | 3 | 4.53 |
| Black-and-white Warbler | Wh Spruce-Fir | 1 | 6.80 | 1 | 6.80 | | |
| American Redstart | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | 3 | 0.57 |
| Ovenbird | Bals-Fir-Aspen-Pb | | | 8 | 6.16 | 3 | 3.97 |
| Ovenbird | Wh Spruce-Fir | 1 | 3.40 | 1 | 5.10 | | |
| Mourning Warbler | Bals-Fir-Aspen-Pb | | | 8 | 2.55 | | |
| Mourning Warbler | Wh Spruce-Fir | 1 | 1.70 | 1 | 3.40 | | |

Mean number per 40 acres of birds observed in Superior National Forest

| | | Habitat=Upland spruce (continued) | | | | | |
|------------------------|-------------------|--------------------------------------|------|-----|-------|-----|-------|
| | | Stand Size | | | | | |
| | | 1-3 | | 4-6 | | 7-9 | |
| Bird Species | Forest Cover type | N | Mean | N | Mean | N | Mean |
| Common Yellowthroat | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | | |
| Canada Warbler | Bals-Fir-Aspen-Pb | | | 8 | 1.27 | 3 | 0.57 |
| Canada Warbler | Wh Spruce-Fir | 1 | 1.70 | | | | |
| Scarlet Tanager | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | 3 | 0.57 |
| Rose-breasted Grosbeak | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | 3 | 0.57 |
| Chipping Sparrow | Bals-Fir-Aspen-Pb | | | | | 3 | 0.57 |
| Swamp Sparrow | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | | |
| White-throated Sparrow | Bals-Fir-Aspen-Pb | | | 8 | 3.19 | 3 | 1.70 |
| White-throated Sparrow | Wh Spruce-Fir | | | 1 | 5.10 | | |
| Purple Finch | Bals-Fir-Aspen-Pb | | | 8 | 0.21 | | |
| Evening Grosbeak | Wh Spruce-Fir | | | 1 | 1.70 | | |
| Unidentified passerine | Bals-Fir-Aspen-Pb | | | 8 | 2.76 | 3 | 2.27 |
| Unidentified passerine | Wh Spruce-Fir | | | 1 | 1.70 | | |
| Total no. species | Bals-Fir-Aspen-Pb | | | 8 | 34.00 | 3 | 26.00 |
| Total no. species | Wh Spruce-Fir | 1 | 8.00 | 1 | 21.00 | | |