

Survey of Rare Avian Species and General Avian Diversity at UNDERC

BIO 569- Practicum in Aquatic Biology

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Abstract

This study identified the presence of rare birds and general species diversity on the property of UNDERC using diurnal spot count surveys and call playback nocturnal surveys. Birds were surveyed in a wide range of habitats, including mature upland forest, lowland coniferous forest, lakes, streams, and bogs. In these habitats eight regionally rare birds were sought using spot counts for diurnal birds and call playbacks for nocturnal owls.

In 72 diurnal surveys at 18 locations, 595 birds were identified. A total of 53 different species were found. Average species richness per site was 8.3. One rare species, the black-backed woodpecker, was located at one site. Additionally, owl surveys were conducted 36 times, at 18 sites, and sites revealed 3 species on property: the eastern screech owl, northern saw-whet owl, and the barred owl. Two rare species were identified. The eastern screech owl was identified at one site, and the northern saw-whet was also identified at one site.

Statistical comparisons between species parameters and general habitat measures conducted. There was positive correlation between average number of individuals, species richness and total vegetation density. Statistical comparisons between species parameters and habitats with and without open water were conducted and positive correlations were found in all species parameters, habitat measurements, and presence of water.

Introduction

Several rare avian species depend on the diverse habitats of northern Wisconsin and the upper peninsula of Michigan. They depend on this geographic area for summer breeding, feeding, and other basic parameters of survival. However, due to negative human interference, certain avian populations have been on the decline.

In the midst of this negative impact humans have on ecosystems around the world, protected areas of land and water become more important in sustaining healthy and diverse populations of organisms. The integrity of an ecosystem can be classified as valuable and healthy by surveying for balanced and diverse populations of organisms, and in particular avian populations. Birds are commonly used as bio-indicators of ecosystem integrity (Defilippo 2003). The presence of less common or rare avian populations suggests an even more unique habitat, and warrants greater concern when considering conservation and land management.

The University of Notre Dame Environmental Research Center (UNDERC) is a protected research facility with 7500 acres of ecologically varied land and water habitat. The property is relatively undisturbed by human interaction and offers prime habitat for an assortment of avian species. These species include eight regionally rare species, which are at the core of this survey.

Eight bird species are regionally rare as a result of geographic location, natural range of a species, interspecies competition, and human disturbance. The cerulean warbler, *Dendroica cerulean*, is perhaps the species of greatest concern in this survey due to the rapidly-declining numbers of this once common bird. Its habitat includes large tracts of mature deciduous forest. These mature forests have a clearly defined and dense canopy with an open understory (Kricher and Morrison 1988). Recent surveys on the adjacent Ottawa National Forest have indicated that these conditions are not often met for forest stands less than 100 years of age (Francl, personal communication). Based on extensive BBS data, cerulean warblers have declined sharply over the past thirty years. If this trend continues, for thirty years, then populations will be only eight percent of 1966 levels (U.S. Fish and Wildlife Service 2000).

The black-backed woodpecker, *Picoides arcticus*, resides in northern Canada, but frequents southern Canada and the northern United States. In boreal forests (Michigan Department of Natural Resources 2003), black spruce (*Picea mariana*), eastern hemlock (*Tsuga canadensis*), and jack pine (*Pinus banksiana*) are among the dominant species in these forests of preference. In addition, this species prefers swampland in which tamarack (*Larix laricina*) and northern white cedar (*Thuja occidentalis*) are dominant (Barnes and Wagner 1981). Modern forest management practices in jack pine stands provide abundant snags for woodpeckers to forage. Keeping these regionally rare woodpeckers in Michigan will require natural processes and forest

management activities like prescribed burns and leaving snags (Michigan Department of Natural Resources 2003).

The spruce grouse, *Falciennis canadensis*, habitat includes large tracts of lowland coniferous forests with swampy regions, with tree species including: white spruce (*Picea glauca*), northern white cedar, balsam fir (*Abies balsamea*), white birch (*Betula papyrifera*), black ash (*Fraxinus nigra*), tamarack, American elm (*Ulmus americana*), and red maple (*Acer rubrum*) (Barnes and Wagner 1981). This species of bird was placed on the Wisconsin threatened list in 1997. Management includes the preservation of large tracts of coniferous forest. Threats include human recreational incursions into these remote areas, which disturb the grouse in its habitat (Wisconsin Department of Natural Resources 2003).

The sharp-shinned hawk, *Accipiter striatus*, prefers mixed coniferous forests, and is usually found on the forest edge. Edge habitat can include an open field, open bog, or very young forest 3 to 12 years old (Kricher and Morrison 1988). This hawk is not threatened or endangered, but is relatively uncommon throughout its range.

The northern saw-whet owl, *Aegolius acadicus*, habitat includes woodlands of varied vegetation and elevation. These owls tend to avoid large stands of unbroken pines and prefer a pine/deciduous tree mix. This owl is very approachable in the daytime and perches as low as five feet from the ground. This bird is not threatened, but being nocturnal, it is less visible to

humans; recorded owl callings are among the only methods of finding it and other owls (Sibley 2000).

The eastern screech owl, *Otus asio*, is found in open woods at forest edges of varied composition. Although the geographic range of this common species does not include northern Wisconsin and the Upper Peninsula on Michigan, it has been heard anecdotally on UNDERC property during summer months (Francl, personal communication; Sibley 2000).

The great grey owl, *Strix nebulosa*, is the largest owl in North America. Preferred habitat includes dense coniferous forests with close proximity to meadows, or open fields. The range of this owl extends to central Canada, but harsh winters and low food supplies can cause these birds to move to the northern United States. Deforestation, automobile collisions, development, pocket gopher (*Geomys* spp.) poisoning, and cattle grazing are all threats to this owl. Although the great grey owl is not threatened, its population density is generally low (Sibley 2000).

boreal owl, *Aegolius funereus*, habitat includes northern coniferous and mixed deciduous boreal and sub-alpine forests, but prefers mature *green ash* and *balsam fir* forests. This owl resides in the northern part of Canada and down the spine of the Rocky Mountains into central Colorado. Periodically, large numbers of boreal owls move into Southern Canada and the north and north-eastern United States (Sibley 2000). According to Ottawa National Forest representatives, boreal owls will occasionally migrate south in the

winter months, but have never been recorded in the area during the breeding season (Francel, personal communication).

In 2003, the first study to accurately characterize the avian population at UNDERC was completed (Defilipo 2003). In conjunction, my survey will measure the diversity of general avian populations at additional sites at UNDERC, and compare species parameters to general habitat measures. I will also compare sites with bodies of water to sites without bodies of water. My study is the first to qualitatively sample owl populations on property, and the first to characterize the rare avian populations on the UNDERC property.

Materials and Methods

My survey was taken from May 24 2004 to July 16 2004 in which I selected sites among 7 available habitat types each research week. Each habitat was selected in accordance with habitat preference of each of the rare birds. These habitats consisted of: mature upland deciduous forest, mature upland coniferous forest, semi-open lowland coniferous forest, closed canopy lowland coniferous forest, lakeshore, stream edge, and open water bog (Table 1). In these habitats, 36 sites were chosen (Table 3,4; Figure 1).

I used two methods to survey birds, based on daily activity cycles. For the diurnal birds, six new areas were chosen each research week and surveyed for four days. Three habitats were surveyed at dawn and up to four hours after dawn. Three different habitats were surveyed at dusk including four hours before dusk. Morning and evening counts were alternated between sites each

day (DeFilippo 2003). All six sites were surveyed four times each research week. Once at the site, after waiting five minutes, the point count survey method was used to determine species richness and diversity (Ralph et al. 1993). In these surveys, the author stood at a fixed point at the site and recording every bird detected within a twenty minute count period within a 50-meter radius. A tape recorder was used to record calls, which were taken back for analysis using Peterson's Multimedia Guides to North American Birds (1995).

To identify nocturnal species, six new sites were chosen each of the three research weeks from May 28 2004 to July 16 2004. Each research week, each of the 6 sites was surveyed twice over a 4-day period. The method used for surveying the nocturnal birds (owls) was a combination between the automobile transects method, and the broadcast recorded calls method or the playback survey method. The automobile transects method was modified from a moving survey into a stationary survey, and the owl calls were conducted from the bed of a pick- up truck. All sites were on the edge of a road, at a fixed point, on UNDERC property. The playback survey method is based on individuals responding to taped (or imitated) vocalizations (Ralph et al. 1993). Each rare owl call was recorded on a CD and owl calls were projected into the habitat. In addition, the barred owl, *Strix varia*, was recorded and played along with the rare owl species as a control. There is an abundance of barred owls at UNDERC, and barred owls responding to my calls ensured my method was working (Francl, personal communication). The owl calls were played in order

from smallest owl to largest owl. Using a 40-watt amp and 2 speakers, each call was played for a minute and then a minute pause. This method was repeated three times for each species at each site. Owls heard/responding at an unlimited distance were recorded.

The bird species diversity at each site was calculated using the Shannon-Weiner index of diversity (MacArthur and MacArthur 1961):

$$H = -\sum p_i (\ln p_i)^2$$

This index provides a quantitative measure of the diversity of species in the total population at each site. At all of the sites for the diurnal bird surveys, vertical stratification of vegetation within the 50-m radius was recorded. The structure of the vegetation was analyzed through the use of range pole surveys at 20 random points within each site (Franci and Schnell 2000). The pole was divided into 11 half-meter increments, extending from 0.0 to 5.5 meters as well as an interval for vegetation above 5.5-m. Intervals where vegetation crossed the range pole were recorded (DeFilippo 2003). The Levins diversity index (L ; Levins 1968) was calculated for each site:

$$L = \sum 1/(d_i)$$

This formula is used to compare vertical vegetation complexity among sites.

In addition, the total vegetation volume was calculated (Mills et al. 1991) through the following formula:

$$TVV = h / 10v$$

The data derived from this formula provides an accurate method of estimating vegetation structure and is useful in quantitative descriptions and comparisons between plant communities at each site (Francl and Schnell 2000).

An assessment between the relation between vegetative complexity and species diversity was accomplished using Microsoft Excel (Microsoft Corporation, 2002) and correlation analysis was performed using Systat 10.0 (SPSS, INC. 2000). Statistical analyses between sites with open water and sites without significant water were conducted. Surveys were conducted unless extreme temperatures, rain, fog, or extreme wind limited bird activity or inhibited accurate surveying.

Results

Of the eight regionally rare birds in this survey, three were identified. The identified species included: the black-backed woodpecker, the eastern screech owl, and the northern saw-whet owl (Table 5). A total of 595 birds, composed of 56 species were observed during 108 surveys at 36 different sites at UNDERC (Appendix 1). The most common diurnal species was the ovenbird, followed by the cedar waxwing (Table 7). The species of greatest distribution of all sites was the hermit thrush, followed by the white-throated sparrow (Table 7).

The average number of diurnal individuals per site ranged from 3.3-13.5 (Table 3), with an overall average of 8.3/site. Species richness for all sites

ranged from 6 - 19. Species diversity per site ranged from 1.62 - 2.65 with an average of 2.16 for all sites.

A total of 27 owls were identified during the nocturnal survey, and owl density ranged from 0 - 3 owls at a given site (Table 4).

Total vegetation volume varied from 0.68- 1.94, and the average vegetation volume across sites was 1.21. There were significant correlations between vegetation and species parameters (Table 6). Furthermore, there was a significant correlation between all species parameters and sites with open water. (i.e. open water bog, lake, stream, etc.).

Discussion

The results of this survey indicate that three of the eight rare species reside on the property. These species include: the black-backed woodpecker, northern saw-whet owl, and eastern screech owl. However, only one of each individual was observed.

One black-backed woodpecker was found in flight over Brown Lake. The presence of this individual indicates that UNDERC has potential habitat for populations of this bird. Conversely, this bird prefers high densities of tree snags, forest stands that have been burned, and forests with jack pine (Michigan Department of Natural Resources 2003). UNDERC has few areas with high densities of dead tree snags, has no areas of forest that have been burned in recent years, or any large areas of jack pine (Dr. Belovsky personal communication). Prescribed burns of coniferous forest at UNDERC could

create habitat for this bird. Furthermore, there were five other species of woodpecker identified on property. This bird would have to compete with these species for food, nesting, and cover (Fish and Wildlife Service 2002).

The northern saw-whet was predicted to be here at UNDERC. Its geographic range includes the property, and they are relatively abundant in their range, but hard to find (Sibley 2000).

The eastern screech owl was not predicted to be here, and UNDERC location is north of its expected geographic range (Sibley 2000). This owl is present in the Great Lakes region and present at one site on property. This species has naturally moved north of its range in the summer because it can tolerate summer temperatures, and can find adequate food supplies in this area. The eastern screech owl is a non-migratory bird (Cornell Laboratory of Ornithology 2000). It is my prediction that the abundant supply of food allows this owl to survive above its range throughout the year.

The boreal owl was not found in survey, but one was identified in the Ottawa National Forest, adjacent to the property, which indicates that this area supports habitat that is suitable for this owl (Francl, personal communication). I believe further surveys will identify this species on property. This species usually resides north of this area (Sibley 2000), but there is an abundance of suitable habitat in this area and this species could be expanding its natural range.

The cerulean warbler, was not found on the property. I predicted that this bird would be identified on Tenderfoot or Brown creek because of the

presence of deciduous vegetation in close proximity to the creeks. The limiting factor for these birds is the age of the forest. The forests by these creeks were very dense and young. The cerulean warblers prefer older forests, with open understory (Kricher and Morrison 1988), and UNDERC's forests are not old enough to provide proper breeding and feeding habitat for this bird.

The habitat of the great grey owl is present at UNDERC. I believe this owl was not found because of the low population densities and because UNDERC is south of its normal geographic distribution. In addition, low population densities of the sharp-shinned hawk are a possible reason for the absence of this bird.

The spruce grouse was not found on property, but there is abundant habitat for this bird. These birds are easily disturbed by humans, and future surveys that penetrate further into grouse habitat could possibly reveal spruce grouse populations that are not disturbed by vehicles or other human activity.

Statistical analysis indicated a direct correlation between vegetation complexity and general species parameters. This was not observed in the 2003 survey (DeFilippo 2003). The relationship between species diversity and vertical vegetation has been positively demonstrated in past studies (MacArthur and MacArthur 1961, Wilson 1974). A direct correlation between species parameters and habitats with and without water was found. This was found in the 2003 survey (Defilippo 2003). Generally more species are attracted to an area where two habitats join (U.S. Geological Survey 2004). Habitats with water offer this edge habitat, which increases diversity. In this

survey, habitats with water show a statistical correlation with greater vertical diversity and total vegetation volume (Table 6).

This survey was successful in identifying rare birds, and finding correlation between species parameters and vegetative complexity. There are a few changes to my methods that could reveal more rare birds, and greater species richness. The first change would be finding survey sites that are a greater distance from the road, and deep into the habitat. All surveys were conducted in close proximity to the road and this could have affected the survey results. Moreover, some species of bird tend avoid humans and man made structures (i.e. roads, buildings boat landings, etc.), (Cornell Laboratory of Ornithology 2000). Walking transects in a habitat, for diurnal surveying, would reveal a wider picture of a habitat and allow the surveyor to cover more area (Ralph et. al. 1993).

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Table 1.

(a description of each habitat surveyed at UNDERC. Refer to Table 2 for site references.)

Habitat**Description**

1. Bog	A mat of wet, nutrient poor, acidic peat topped with sphagnum moss and ericaceous plants and shrubs. A bog is a closed system, with no streams feeding in or out. Often a dark pool of stagnant water will be in the center.
2. Closed- canopy Lowland Coniferous Forest	A dense forest of closely spaced trees up to 60 feet high, growing atop an unstable carpet of mosses. The shrub layer is usually sparse due to the heavy shade. Characteristic species include the black spruce, tamarack, northern white cedar, and balsam fir
3. Lake and	A body of permanent water more than 10 acres in size, and usually more than six feet deep. Includes beaches and mud flats, surrounding vegetation
4. Mature Upland Coniferous Forest	A closed- canopy forest with trees older than 30 years, an overstory taller than 30 feet, and a sparse shrub and herbaceous layer. Old stands with uneven or broken canopies may have well developed underlayers. Characteristic species include balsam fir, usually in combination with white spruce, and red pine, white pine, and jack pine.
5. Mature Upland Deciduous Forest layer.	A closed- canopy forest with trees more than 30 years old, an overstory 30 or more feet tall, and a variable shrub and herbaceous layer. Characteristic species include aspens, birches, and northern hardwoods (especially sugar maples). Old stands with broken or uneven canopies may have well-developed underlayers, downed logs, and standing snags.
6. River and Stream the banks,	A body of permanent flowing water; includes open water, the bed, and the vegetated areas along the banks.
7. Semi-open Lowland Coniferous Forest	A bog that has begun to fill in with scattered clumps of tamaracks and black spruces, usually less than 20 feet tall. The surface is carpeted with a dense, low lying layer of ericaceous shrubs, sphagnum moss, and wildflowers. It is often wet because the surface is so close to the water table.

Table 2. (each diurnal site with a reference to rare species and habitat descriptions on Table 1) (Sibley 200)

Habitat	Site #	Potential Rare Birds in Habitat	Habitat
1. Bog	5a, 9, 18a	Sharp-shinned Hawk, Eastern Screech Owl, Black-backed Woodpecker	
2. Closed- Canopy Lowland Coniferous Forest	5a, 6, 7, 9, 10a, 12a, 13a, 14, 16a, 18a	Black-backed Woodpecker, Spruce Grouse, Sharp- shinned Hawk, Boreal Owl, Northern Saw whet Owl, Eastern Screech- Owl, Great Grey Owl	
3. Lake	2, 7, 10, 18	Cerulean Warbler, Sharp-shinned Hawk,	
4. Mature Upland Coniferous Forest	1, 1a, 2, 4, 4a, 8, 8a, 10a, 11a, 12, 12a, 13 14, 15, 15a, 17, 17a	Great Grey Owl, Northern Saw-whet Owl, Black-backed Woodpecker, Sharp-shinned hawk, Boreal Owl, Spruce Grouse	
5. Mature Upland Deciduous Forest	1, 1a, 2, 4, 6a, 8, 9a, 10, 11, 11a, 13, 15, 16, 16a	Cerulean Warbler, Sharp-shinned Hawk, Eastern Screech Owl, Northern Saw-whet Owl, Boreal Owl	
6. River and Stream	1, 5, 7a, 10	Cerulean Warbler, Sharp-shinned hawk, Great Grey Owl	
7. Semi-open Lowland Coniferous Forest	3, 2a, 3a, 4a, 17a 18a	Spruce Grouse, Black-backed Woodpecker, Boreal Owl, Great Grey Owl, Northern Saw-whet Owl	

Table 3. (Diurnal sites in survey, See Table 1 for habitat descriptions)

Diurnal Bird Sites (descriptions on Table 1)	Average Number of Individuals	Species Richness	Bird Species Diversity	Levins diversity Index	Total Vegetation Volume	GPS Location
1. Tenderfoot Creek Road Crossing	10.5	19	2.648	1095.33	1.5	0303637N 51233551E
2. Roach Lake Boat Landing	7	13	2.465	2923.78	1.2	0305320N 5122431E
3. Habitat #7 on Main Road (Tamarack dominated)	8.25	13	2.383	3736.89	1.02	030415N 5123867E
4. Mixed Upland Coniferous & Upland Deciduous on road to Cranberry Bog	7.25	8	1.975	1857.11	1.32	0305320N 5122431E
5. Tenderfoot Creek/ Gravel Pit	7.75	14	2.491	4270.89	0.86	03048771N 5125104 E 30532320N 5126063E
6. North Gate	9	6	1.621	1836.33	1.4	0305594N 512563E
7. Morris Lake Boat Landing	13.5	10	2.029	3409.89	1.1	0305864N 5121021E
8. Morris Lake, N.E. Side of Lake	16.5	15	2.535	648.22	1.64	3064884N 5124950E
9. Bog Pot	3.5	7	1.772	1015.79	1.94	0305277N 5122419E
10. Mouth of Tenderfoot Creek	11.75	10	2.123	864	1.38	0305658N 5122028E
11. Habitat #5 (Birch dominated) by powerline easement and Craig house	6.5	9	1.951	1975.78	1.1	0307813N 5121247E
12. Site on N.E. Plum Lake (Fir dominated)	3.25	6	1.626	5676.44	0.68	

13. Habitat # 5 (Maple Dominated) Driveway to Bay Lake	4.5	10	2.001	1713.33	1.28	0306768N 5124646E
14. Site on N.W. side of property	7	6	1.706	2961.11	0.92	0305658N 5122028E
15. Mixed Upland Coniferous & Upland Deciduous by Kickapoo Creek	11.25	15	2.435	3990.33	0.86	0307893N 5121235E
16. Habitat # 5 Crampton Gate	6.25	9	2.037	3426.44	0.9	0307968N 5120260E
17. Forest by Brown Lake	5.25	12	2.465	1782.11	1.36	0308143N 5123314E
18. Brown Creek at Brown Lake	9.75	16	2.655	1164	1.36	0309012N 5123401E

Table 3. (Continued)

Table 4. (Nocturnal sites in survey, for habitat descriptions see Table 1)

Nocturnal Bird Sites (Descriptions on Table 1.)	Number of Barred Owls	Rare Owls Present	Total Number of Individuals	GPS Location
1a. Mixed Upland Coniferous & Upland Deciduous by Maintenance Building	3	0	3	0305320N 5122431E
2a. Habitat # 7 (Tamarack Dominated)	0	0	0	0304229N 5123870E
3a. Habitat #7 Spruce/Tamarack Dominated)	2	0	2	0304151N 5123867E
4a. Site on road to Cranberry Bog	2	0	2	0305678N 5124236E
5a. Habitat #1 & # 2 Main Road	1	0	1	0304126N 5124848E
6a. Main Road/Entrance to Gravel Pit	1	0	1	0304360N 5125432E
7a. Gravel Pit/ Tenderfoot Creek	3	0	3	0304877N 5125103 E
8a. Tenderfoot Creek & Habitat # 4	0	0	0	0304909N 5125988E
9a. Habitat # 5	2	0	2	0305720N 5125050E
10a. Site by Beaver Bog	1	0	1	0307925N 5123149E
11a. On driveway to Bay Lake	1	0	1	0306768N 5124646E
12a. Site by Long Lake	1	0	1	0307925N 5123155E
13a. Site by Ziesnis Bog	1	1, Northern Saw-whet Owl	2	0305976N 5123066E
14a. Habitat #5	1	0	1	0307925N 51233149
15a. Site by Forest Service Bog	2	1, Eastern Screech Owl	3	0307925N 5123564E
16a. Site by Ed's Bog	1	0	1	0305978N 5123065E
17a. Site on S.W. Plum Lake	1	0	1	0308558N 5120058E
18a. Site on main road by Brown Creek	2	0	2	0307968N 5120260E

Table 5. (Rare species identified during surveys)

Rare Species Observed	Site No.	Diurnal or Nocturnal
Black-backed Woodpecker	18	Diurnal
Eastern Screech Owl	15a	Nocturnal
Northern Saw-whet Owl	13a	Nocturnal

Table 6. (Correlation (“r”) values for sites and vegetation measurements)

Veg. Measure	Average No. of individuals	Species Richness	Bird Species Diversity
Levins	2.82(.257)	.194 (.440)	.884 (p<.0001)
Total Veg. Vol.	0.457 (.057)	.960 (p<.0001)	.123 (.628)

Table 7. Top ten most common species observed

Species	Total No. of Individuals Observed	Total No. of Sites Where Present
Ovenbird	68	16
Cedar Waxwing	63	12
Black-capped Chickadee	42	15
Hermit Thrush	42	18
American Robyn	41	16
Common Grackle	40	10
White-throated Sparrow	36	17
Red-eyed Vireo	33	15
Yellow-Rumped Warbler	28	14
Yellow-bellied Sapsucker	21	16

Table 8. Species Distribution

Species	Total No. of Sites Where Present	Total No. of Individuals Observed
Hermit Thrush	18	42
White-throated Sparrow	17	36
American Robyn	16	41
Ovenbird	16	68
Yellow-bellied Sapsucker	16	21
Black-capped Chickadee	15	42
Red-eyed Vireo	15	33
Yellow-Rumped Warbler	14	28
Cedar Waxwing	12	63
Common Grackle	10	40

Appendix 1. Avian Species Observed

Family	Species	Scientific Name
Accipitridae	Bald Eagle	<i>Haliaeetus leucocephalus</i>
Accipitridae	Broad-winged Hawk	<i>Buteo platypterus</i>
Accipitridae	Cooper's Hawk	<i>Accipiter cooperii</i>
Accipitridae	Red-tailed Hawk	<i>Buteo jamaicensis</i>
Alcedinidae	Belted Kingfisher	<i>Ceryle alcyon</i>
Anatidae	Common Merganser	<i>Mergus merganser</i>
Anatidae	Canada Goose	<i>Branta canadensis</i>
Anatidae	Hooded Merganser	<i>Lophodytes cucullatus</i>
Anatidae	Mallard	<i>Anas platyrhynchos</i>
Anatidae	Mute Swan	<i>Cygnus olor</i>
Anatidae	Red-Breasted Merganser	<i>Mergus serrator</i>
Anatidae	Wood Duck	<i>Aix sponsa</i>
Apodidae	Chimney Swift	<i>Chaetura pelagica</i>
Ardeidae	Great Blue Heron	<i>Ardea herodias</i>
Bombycillidae	Cedar Waxwing	<i>Bombycilla cedrorum</i>
Cardinalidae	Indigo Bunting	<i>Passerina cyanea</i>
Cardinalidae	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
Certhiidae	Brown Creeper	<i>Certhia americana</i>
Corvidae	American Crow	<i>Corvus brachyrhynchos</i>
Corvidae	Blue Jay	<i>Cyanocitta cristata</i>
Corvidae	Raven	<i>Corvus corax</i>
Emberizidae	American Tree Sparrow	<i>Spizella arborea</i>
Emberizidae	Eastern Towhee	<i>Pipilo erythrophthalmus</i>
Emberizidae	Field Sparrow	<i>Spizella pusilla</i>
Emberizidae	Song Sparrow	<i>Melospiza melodia</i>
Emberizidae	Swamp Sparrow	<i>Melospiza georgiana</i>
Emberizidae	White-throated Sparrow	<i>Zonotrichia albicollis</i>
Falconidae	Merlin	<i>Falco columbarius</i>
Fringillidae	American Goldfinch	<i>Carduelis tristis</i>
Gaviidae	Common Loon	<i>Gavia immer</i>
Hirundinidae	Bank Swallow	<i>Riparia riparia</i>
Hirundinidae	Tree Swallow	<i>Tachycineta bicolor</i>
Icteridae	Common Grackle	<i>Quiscalus quiscula</i>
Icteridae	Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Mimidae	Catbird	<i>Dumetella carolinensis</i>
Pandionidae	Osprey	<i>Pandion haliaetus</i>
Paridae	Black-capped Chickadee	<i>Poecile atricapilla</i>
Parulidae	American Redstart	<i>Setophaga ruticilla</i>
Parulidae	Black & White Warbler	<i>Mniotilta varia</i>
Parulidae	Blackburnian Warbler	<i>Dendroica fusca</i>
Parulidae	Black-throated Green Warbler	<i>Dendroica virens</i>

Family	Species	Scientific Name
Parulidae	Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>
Parulidae	Common Yellowthroat	<i>Geothlypis trichas</i>
Parulidae	Magnolia Warbler	<i>Dendroica magnolia</i>
Parulidae	Nashville Warbler	<i>Vermivora ruficapilla</i>
Parulidae	Northern Parula	<i>Parula americana</i>
Parulidae	Ovenbird	<i>Seiurus aurocapillus</i>
Parulidae	Tennessee Warbler	<i>Vermivora peregrina</i>
Parulidae	Yellow Warbler	<i>Dendroica petechia</i>
Parulidae	Yellow-rumped Warbler	<i>Dendroica coronata</i>
Phasianidae	Ruffed Grouse	<i>Bonasa umbellus</i>
Picidae	Black-backed Woodpecker	<i>Picoides arcticus</i>
Picidae	Downy Woodpecker	<i>Picoides pubescens</i>
Picidae	Hairy Woodpecker	<i>Picoides villosus</i>
Picidae	Northern Flicker	<i>Colaptes auratus</i>
Picidae	Piliated Woodpecker	<i>Dryocopus pileatus</i>
Picidae	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
Regulidae	Golden-crowned Kinglet	<i>Regulus satrapa</i>
Sittidae	White-Breasted Nuthatch	<i>Sitta carolinensis</i>
Strigidae	Barred Owl	<i>Strix varia</i>
Strigidae	Eastern Screech-Owl	<i>Otus asio</i>
Strigidae	Northern Saw-whet Owl	<i>Aegolius acadicus</i>
Trochilidae	Ruby-throated hummingbird	<i>Archilochus colubris</i>
Turdidae	American Robin	<i>Turdus migratorius</i>
Turdidae	Hermit Thrush	<i>Catharus guttatus</i>
Turdidae	Veery	<i>Catharus fuscescens</i>
Tyrannidae	Eastern Kingbird	<i>Tyrannus tyrannus</i>
Tyrannidae	Eastern Pewee	<i>Contopus virens</i>
Tyrannidae	Eastern Phoebe	<i>Sayornis phoebe</i>
Vireonidae	Red-eyed Vireo	<i>Vireo olivaceus</i>