WESTERN GREAT LAKES REGION

OWL MONITORING PROGRAM

2005 Final Report

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

2005 WESTERN GREAT LAKES REGION OWL MONITORING

EXECUTIVE SUMMARY

As top predators of the food chain, owls are considered good indicators of environmental health, making them important to monitor. However, there is a paucity of abundance and population status data available for most species of owls in the western Great Lakes region. Currently, few species of owls are adequately monitored using traditional avian survey methods, such as the Breeding Bird Survey (BBS) and Christmas Bird Counts (CBC). For these reasons, the Western Great Lakes Region Owl Monitoring survey was initiated in 2005. The objectives of this survey are to: 1) understand the distribution and abundance of owl species in the region, 2) determine trends in the relative abundance of owls in the region, 3) determine if trends are comparable in surrounding areas and analyze whether these trends could be scaled up or down on the landscape, and 4) determine if there are habitat associations of owl species in the region.

In 2005, a group of interested personnel from the Hawk Ridge Bird Observatory (HRBO), Natural Resources Research Institute (NRRI), MN-Dept. of Nat. Res. (MN-DNR), and WI-Dept. of Nat. Res. (WI-DNR) were involved with the development of the first large-scale, long-term volunteer-based owl survey in the western Great Lakes region. Existing randomly selected survey routes were used to conduct roadside surveys in the Laurentian Forest Province of Minnesota and in Wisconsin. Volunteers surveyed each route one time in Period 2 (March 21 to April 10); however, some volunteers conducted an additional survey in Period 1 (March 12 to March 20) and Period 3 (April 11 to April 24). Each survey route consisted of 10 survey points spaced ~1.6 km (1 mile) apart. A 2 minute "passive" listening period was done at each designated survey point along the route.

The number of routes assigned in 2005 was 131, with 51 in northern Minnesota and 80 in Wisconsin. Of the 131 assigned routes, 43 routes and 55 routes were surveyed in northern Minnesota and in Wisconsin, respectively. At least two surveys were conducted on 42 of the 98 routes completed. The number of participants that signed up to conduct an owl survey exceeded 100, with 81 volunteers conducting surveys this spring. Given the amount of time available to organize volunteers, volunteer participation (77%) was relatively good, and it should increase in future years with volunteer coordination and recruitment beginning earlier in spring 2006.

In total, 205 owls of seven species (including 5 owls of an unknown species) were recorded on 67 routes, with 31 routes recording no owls (see Table 1). The top three owl species combined from northern Minnesota and Wisconsin were Barred Owl, Northern Saw-whet Owl, and Great Horned Owl, respectively. In Minnesota, a total of 119 individual owls comprising 7 species were recorded during all survey periods. The mean number of owls/route was 0.60 for Period 1, 1.85 for Period 2, and 1.83 for Period 3. In

Wisconsin, a total of 86 individual owls comprising 5 species were recorded during both survey periods. The mean number of owls/route was 1.13 for Period 2 and 1.25 for Period 3.

Recommendations and future perspectives for the Western Great Lakes Region owl survey include: 1) increasing volunteer participation, 2) providing training to volunteers, 3) possibly integrating on-line data entry, 4) testing nightly variation in calling activity, 5) increasing the number of survey routes in both states, 6) conducting future analysis on abundance trends, habitat associations, and distribution, and 7) considering the importance of using and collecting small mammal data.

INTRODUCTION

There is increasing concern about the distribution, population status, and habitat loss for both diurnal and nocturnal raptors (Newton 1979, Gutierrez *et al*. 1984, Wellicome 1997, Takats *et al*. 2001). Birds of prey occupy the top of the food chain and may be susceptible to environmental toxins and contaminants, making them important to monitor as indicators of environmental health (Johnson 1987, James *et al*. 1995, Duncan and Kearns 1997, Francis and Bradstreet 1997). Further understanding of the distribution, relative abundance, and density of wildlife populations would be valuable to make sound management decisions (Mosher and Fuller 1996).

Currently, there is a paucity of abundance and population status information available for most owl species in the western Great Lakes region. Due to their nocturnal behavior and time of breeding, owls often go undetected using traditional avian population monitoring methods (e.g. Breeding Bird Survey routes, Breeding Bird Atlases, Christmas Bird Counts, and migration monitoring). Breeding Bird Surveys and Breeding Bird Atlases are conducted in the morning, when few owls are vocal, and occur after the breeding season for most owl species in North America. Christmas Bird Counts are also done outside of the breeding season and may not detect resident owl species. Migration monitoring is presumably the best alternative method to monitor owl populations, but it may not be suitable to detect all owl species, as well as determining reliable trends. Therefore, the need to conduct a large scale, long-term owl survey in the Western Great Lakes region would be beneficial to monitor owl populations.

In 2005, the HRBO, in collaboration with the NRRI, MN-DNR, and WI-DNR, initiated a volunteer-based roadside owl survey to monitor owl populations in the western Great Lakes region. Standardized methods developed by existing owl surveys done in the United States and Canada were implemented to increase the North American owl monitoring effort in the future (Takats *et al.* 2001, Hodgman and Gallo 2004, Monfils and Pearman 2004, Paulios 2005). The objectives of this survey are to: 1) understand the distribution and abundance of owl species in the region, 2) determine trends in the relative abundance of owls in the region, 3) determine if trends are comparable in

surrounding areas and analyze whether these trends could be scaled up or down on the landscape, and 4) determine if there are habitat associations of owl species in the region.

This report summarizes the results of the 2005 Western Great Lakes Region spring owl survey conducted in northern Minnesota and in Wisconsin, and briefly discusses a few recommendations and future perspectives.

METHODS

Standardized methods used in currently existing owl surveys were implemented in 2005 to conduct a volunteer-based survey in the Laurentian Forest Province of Minnesota and in Wisconsin. The use of standardized methods to monitor owl populations will provide comparable data throughout North America (Morrell et al. 1991, Takats *et al.* 2001).

CURRENT PROTOCOL

In both Minnesota and Wisconsin, each survey route consisted of 10 survey stations spaced ~1.6 km (1 mile) apart. A 2 minute "passive" listening period, documenting all owl species heard, was done at each designated survey station along the route. Playbacks were not used given the logistical and standardization concerns with broadcast equipment.

At the start and finish of an owl survey route, the temperature, cloud cover, precipitation level and type, and snow cover and depth was recorded. At each survey station, the time, wind speed, and noise level was recorded. Volunteers were asked to record each owl detected on the data sheet, including direction (Azimuth bearing) and estimated distance [Categories = 1) $\leq$ 100 m, 2) > 100 m to 500 m, 3) >500 m to 1000 m, 4) >1000 to 1500 m, and 5) >1500 m]. Additionally, volunteers were asked to record the time interval when each owl detected was heard (e.g. in first minute, in second minute, after 2 minutes). Volunteers were asked to conduct surveys on days with minimal wind ($\leq$ 25 km/hr) and little or no precipitation.

SURVEY TIMING

LaurentianForest Province of Minnesota. To test the seasonal variation in calling activity, volunteers were asked to survey their route once during three different survey periods (Period 1 = 12 March to 20 March, Period 2 = 21 March to 10 April, Period 3 = 11 April to 24 April). If a volunteer was unable to conduct a survey in each of the three periods, the volunteer was requested to conduct a survey in Period 2.

Wisconsin. To test the seasonal variation in calling activity, volunteers were asked to survey their route during two different survey periods (Period 2 = 21 March to 10 April,

Period 3 = 11 April to 24 April). If a volunteer was unable to conduct a survey in each of the three periods, the volunteer was requested to conduct a survey in Period 2.

Surveys started at least one half-hour after sunset and finished when the volunteer completed the route(s). For volunteers conducting a survey in more than one time period, it was recommended that the start time remain similar for each period, adjusting for the change in sunset and daylight savings time.

ROUTE SELECTION

Laurentian Forest Province of Minnesota. Owl surveys were conducted along currently existing randomized routes. The MN-DNR Frog/Toad survey routes were used as the base to conduct owl surveys. There are 52 Frog/Toad survey routes randomly located in a variety of habitat types in the Laurentian Forest Province of northern Minnesota. The start point for the owl survey route corresponded with the start point of the Frog/Toad route.

Wisconsin. Owl surveys were conducted along currently existing randomized routes. Breeding Bird Survey (BBS) routes were used as the base to conduct owl surveys. There are approximately 92 active BBS routes located in a variety of habitat types throughout the state. The start point for the owl survey route corresponded with the start points of the BBS route.

In both states, survey routes were generally located along secondary roads. However, it was difficult to ascertain whether or not an owl survey route would be drivable in late winter/early spring, given that both Frog/Toad and BBS surveys occur during the late spring or summer. If a participant encountered an unplowed route, the survey was either postponed until a later date, altered in its direction, or eliminated.

DATA COLLECTION AND DATABASE STRUCTURE

Data collection. Volunteers were asked to record all owls detected, seen or heard, at each designated station along the route, keeping track of the direction and estimated distance for each owl. Additionally, participants were asked to document the time interval for each owl detected during the 2 minute listening period (e.g. first minute, second minute). The number of owls for each route was determined by eliminating any birds a participant detected from a previous station. Volunteers were requested to record other nocturnal species, such as American Woodcock, Common Snipe, and Ruffed Grouse, detected on survey routes.

Database structure. Data collected by volunteers were computerized into a Microsoft Excel database system. The database includes a table for each of the following: 1) weather table, 2) owls/route table, 3) owl/station/weather table, and 4) additional species table.

RESULTS

VOLUNTEER PARTICIPATION

In 2005, 105 volunteers signed up to conduct owl surveys in northern Minnesota and in Wisconsin, with 81 participants (77%) surveying at least one route. In total, 131 survey routes were assigned to volunteers, with 51 in northern Minnesota and 80 in Wisconsin. In northern Minnesota, 37 volunteer teams returned data sheets for 43 routes. Thirty-two volunteer teams surveyed 1 route, 4 volunteer teams surveyed 2 routes, and 1 volunteer team surveyed 3 routes. In Wisconsin, 44 volunteer teams returned data sheets for 55 routes in Wisconsin. Thirty-two volunteer teams surveyed 1 route, 10 volunteer teams surveyed 2 routes, and 1 volunteer team surveyed 3 routes.

In northern Minnesota, 20 routes were surveyed in one time period, 10 routes were surveyed once during each of 2 time periods, and 12 routes were surveyed once during each of the 3 time periods. One volunteer team surveyed 2 routes once in each of the 3 time periods. In Wisconsin, 36 routes were surveyed in one time period, and 19 routes were surveyed once during each of the 2 time periods. Six volunteer teams surveyed 2 routes once in each of the 2 time periods.

OWL DISTRIBUTION AND ABUNDANCE

In total, 205 owls of seven species (including 5 owls of an unknown species) were recorded on 67 routes, with 31 routes recording no owls (see Table 1). The overall mean number of individual owls detected per route was 0.60 in Period 1, 1.44 in Period 2, and 1.53 in Period 3 (Note: Period 1 was only surveyed in Minnesota). The top three owl species combined from northern Minnesota and in Wisconsin were Barred Owl, Northern Saw-whet Owl, and Great Horned Owl, respectively. The overall mean number of Barred Owls detected in Period 2 and 3 went up 39% from 0.46 to 0.76 owls/route. Also, the mean number of Northern Saw-whet Owls detected in Period 2 and 3 went up 32% from 0.36 to 0.53 owls/route. However, the overall mean number of Great Horned Owls detected in Period 2 and 3 went down 65% from 0.37 to 0.13 owls/route.

Laurentian Forest Province of Minnesota. A total of 119 individual owls comprising 7 species were recorded during all survey periods (See Table 2). The number of individual owls detected ranged from 1 to 11 for routes that recorded owls, with 1 to 3 species. The mean number of owls/route went up 68% from Period 1 (0.60) to Period 2 (1.85), but the mean remained stable from Period 2 (1.85) to Period 3 (1.83), only going down by 1%.

Barred Owls and N. Saw-whet Owls were detected throughout the Laurentian Forest Province of Minnesota. Great Horned Owls were detected throughout much of the Laurentian Forest Province; however, they were not represented in Lake or Cook Counties. Of interest was the relatively large number of Great Gray Owls recorded

Table 1. Total number of individual owls recorded during Periods 1, 2, and 3 in Minnesota and Wisconsin compared to the number of routes for which each owl species was detected.

Owl Species	Northern Minnesota		Wisconsin	
	Individuals	**Routes**	**Individuals**	**Routes**
Barred Owl	46	15	30	15
Northern Saw-whet Owl	26	17	29	10
Great Horned Owl	19	11	20	11
Great Gray Owl	14	6	0	0
Long-eared Owl	4	4	4	4
Eastern Screech Owl	2	2	1	1
Boreal Owl	2	2	0	0
Unknown Owl	3	3	2	2
Total	**119**		**86**	

Table 2. Mean and total number of owls/route for each survey period in northern Minnesota and Wisconsin.

			Barred Owl		N. Saw-whet Owl		Great Horned Owl		Great Gray Owl		Long-eared Owl	
Region	**Survey Period**	**# Routes[a]**	**# Obs.[b]**	**Mean[c]**	**# Obs.**	**Mean**	**# Obs.**	**Mean**	**# Obs.**	**Mean**	**# Obs.**	**Mean**
Minnesota	1	20	4	0.20	2	0.10	1	0.05	4	0.20	1	0.05
	2	40	23	0.58	16	0.40	18	0.45	8	0.20	3	0.08
	3	18	19	1.06	9	0.50	2	0.11	2	0.11	---	---
	Subtotal	78	46	0.58	27	0.34	21	0.27	14	0.18	4	0.05
Wisconsin	2	54	20	0.37	18	0.33	17	0.31	---	---	3	0.06
	3	20	10	0.50	11	0.55	3	0.15	---	---	1	0.05
	Subtotal	74	30	0.41	29	0.39	20	0.27	---	---	4	0.05
Overall	1	20	4	0.19	2	0.10	1	0.05	4	0.19	1	0.05
	2	94	43	0.46	34	0.36	35	0.37	8	0.09	6	0.06
	3	38	29	0.76	20	0.53	5	0.13	2	0.05	1	0.03
	Total	152	76	0.50	56	0.37	41	0.27	14	0.09	8	0.05

[a] Number of routes surveyed.
[b] Number of owls detected.
[c] Average number of owls detected per route surveyed.

Table 2 (continued). Mean and total number of owls/route for each survey period in northern Minnesota and Wisconsin.

			E. Screech Owl		Boreal Owl		Unknown Owl		Total	
Region	**Survey Period**	**# Routes**	**# Obs.**	**Mean**	**# Obs.**	**Mean**	**# Obs.**	**Mean**	**# Obs.**	**Mean**
Minnesota	1	20	---	---	---	---	---	---	12	0.60
	2	40	2	0.05	2	0.05	2	0.05	74	1.85
	3	18	---	---	---	---	1	0.06	33	1.83
	Subtotal	79	2	0.03	2	0.03	3	0.04	119	1.51
Wisconsin	2	54	1	0.02	---	---	2	0.04	61	1.13
	3	20	---	---	---	---	---	---	25	1.25
	Subtotal	74	1	0.01	---	---	2	0.03	86	1.16
Overall	1	20	---	---	---	---	---	---	12	0.60
	2	94	3	0.03	2	0.02	4	0.04	135	1.44
	3	38	---	---	---	---	1	0.03	58	1.53
	Total	152	3	0.02	2	0.01	5	0.03	205	1.35

(n=14) on routes in Cass, Beltrami, St. Louis, and Aitkin Counties. Eight of the 14 Great Gray Owls detected were observed at or near a station. Four Great Gray Owls were observed in Period 1, 3 were observed and 5 heard in Period 2, and 1 was observed and 1 heard in Period 3. Additional owls of interest recorded this spring were 4 Long-eared Owls, 2 Eastern Screech Owls, and 2 Boreal Owls. The Long-eared Owls were scattered throughout northern Minnesota. One Eastern Screech Owl was detected in the southcentral portion (Todd County) and one in the southeastern portion (Carlton County) of the Laurentian Forest Province. One Boreal Owl was detected in the central portion (Aitkin County) and one in the northeastern portion (Cook County) of the Laurentian Forest Province.

Wisconsin. A total of 86 individual owls comprising 5 species were recorded during both survey periods (see Table 2). The number of individual owls detected ranged from 1 to 10 for routes that recorded owls, with 1 to 3 species. The mean number of owls/route increased by 10% from Period 2 (1.13) to Period 3 (1.25).

While Barred Owls were observed throughout the state, the majority of owls (70%) were detected in northern Wisconsin. All of the N. Saw-whet Owls (n=29) were detected in northern Wisconsin. Great Horned Owls were evenly represented throughout the state. Additional owls of interest include 4 Long-eared Owls, with 2 detected in northern and southern Wisconsin, and one E. Screech Owl detected in southwestern Wisconsin (Crawford County).

OWL DISTANCE AND DIRECTION

A summary of owls detected for northern Minnesota and in Wisconsin at estimated distance categories is included in Table 3. The majority of owls detected in Minnesota and Wisconsin was less than 1000 meters from a station. The most frequently estimated distance for owls was >100 – 500 meters (Category 2) in both states.

The direction for each owl detected in northern Minnesota and in Wisconsin is summarized in Figures 1 and 2. We asked participants to record the Azimuth compass bearing for each owl detected, however, we did not include a compass in the instruction packet. Therefore, a number of participants recorded the compass heading (e.g. S, SW, WSW, etc.). The direction data summarized in Table 3 uses this system.

ADDITIONAL SPECIES

Volunteers were asked to record any additional species detected while conducting an owl survey (see Table 4). In northern Minnesota, 12 additional species were documented. The top four species detected were American Woodcock, Wilson's Snipe, Canada Goose, and Ruffed Grouse. In Wisconsin, 11 additional species were documented. The top four species detected were American Woodcock, Canada Goose, Ruffed Grouse, and Wilson's Snipe.

Table 3. Summary of owls detected for each distance category in Minnesota and Wisconsin.

Distance Category	No. of Owls by Region	
	Minnesota	Wisconsin
(1) ≤ 100 meters	10 (10%)	6 (8%)
(2) > 100 – 500 meters	48 (48%)	43 (55%)
(3) > 500 – 1000 meters	21 (21%)	23 (29%)
(4) > 1000 – 1500 meters	14 (14%)	2 (3%)
(5) > 1500 meters	6 (6%)	4 (5%)

Table 4. Additional species recorded during owl surveys in Minnesota and Wisconsin.

Species	Region		Total
	Minnesota	Wisconsin	
Common Loon	---	2	2
American Bittern	2	---	2
Great Blue Heron	---	1	1
Tundra Swan	---	1+	1+
Canada Goose	17+	14+	31+
Mallard	1	---	1
Ruffed Grouse	16	11	27
Sandhill Crane	7	1	8
Killdeer	2	3	5
American Woodcock	20	67+	87+
Wilson's Snipe	17+	11	28+
Winter Wren	2	---	2
American Robin	3	3+	6+
Hermit Thrush	1	1+	2+
White-throated Sparrow	2	---	2
Total	**90+**	**115+**	**205+**

Figure 1. Summary of owls detected for each direction estimate in Minnesota. Numbers are the percentage of owls detected in each compass heading.

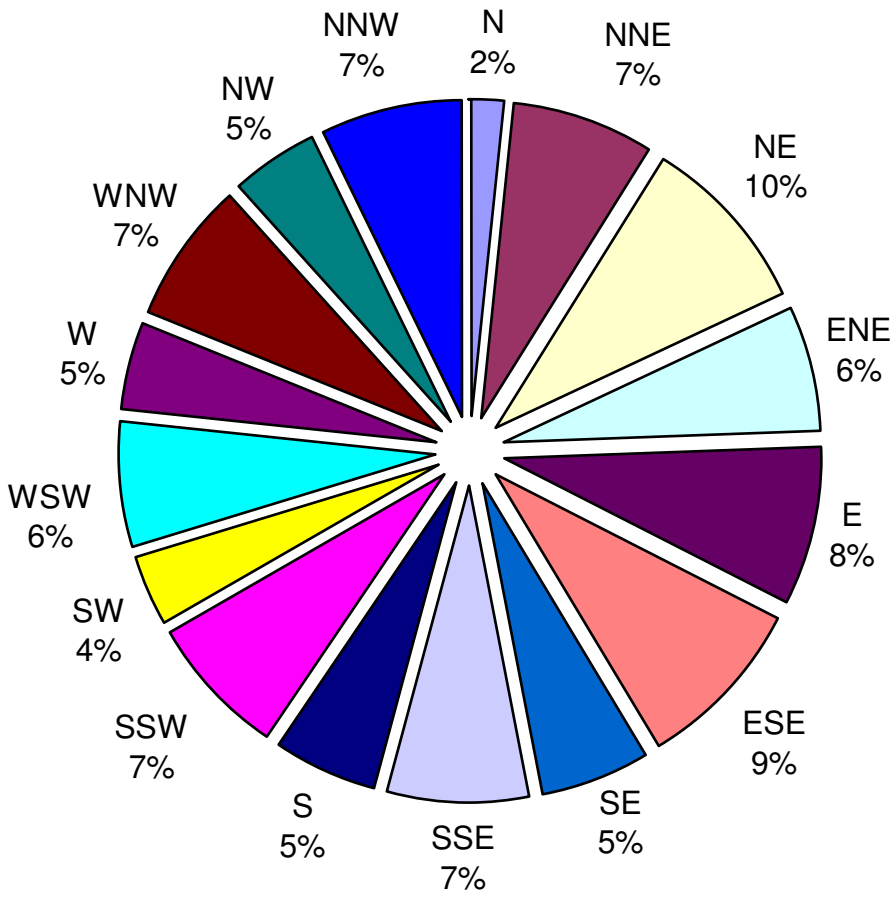
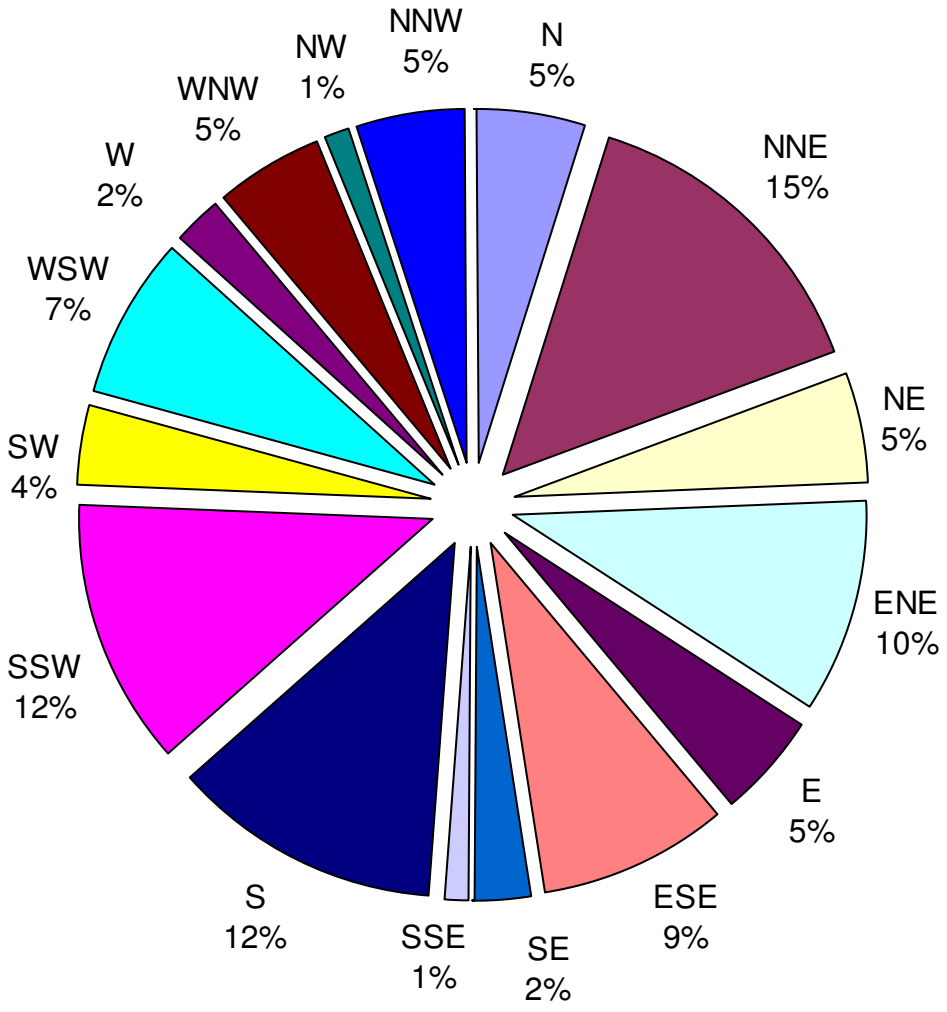


Figure 2. Summary of owls detected for each direction estimate in Wisconsin. Numbers are the percentage of owls detected in each compass heading.



DISCUSSION

Volunteer Participation

The large number of volunteer participants was a highlight for the first year of the owl survey. Of the 105 volunteers that signed up, 81 (77%) returned data sheets for 98 survey routes. It appears that volunteer interest in owl monitoring remains high, as people continue to inquire about conducting a survey next spring. In 2006, we will attempt to maintain or increase volunteer participation by contacting past participants earlier, recruiting new volunteers, and providing pre-survey training.

Although most participants did not report any problems completing a survey, there were 4 cases when a survey route was closed due to an unplowed road. In 3 of the 4 cases, a volunteer was able to return at a later date to complete the survey. Additionally, there were 6 instances when a route was altered due to road conditions or high traffic noise. In 2006, we will attempt to alter routes hampered by poor road conditions or high traffic noise.

Owl Surveys

An encouraging outcome of the survey was the relatively large number of owls (n=205) and species (n=7) recorded on routes. An expected result was the respectable number of Barred Owls, Northern Saw-whet Owls, and Great Horned Owls detected in both states. The preliminary results suggest enough data can be collected for these species to monitor abundance trends. However, because this was the first year of the survey no trend analysis could be done. A power analysis will be done to determine the number of routes needed to detect a 20, 30, and 50% decline in the number of owls at the 2, 5, and 10 year interval. These results will provide the necessary information to increase the number of routes required in both states.

Also of interest were the detections of Great Gray Owls, Long-eared Owls, Eastern Screech Owls, and Boreal Owls. Although few individuals were recorded, this information will be useful in mapping distribution. Of particular interest was the number of Great Gray Owls (n=14) detected in Cass, Beltrami, St. Louis, and Aitkin Counties of Minnesota. The substantial "irruption" of Great Gray Owls in the winter of 2004/2005 presumably contributed to the large number of owls recorded on routes. In fact, it is possible that several owls may have been migrating north during the first two time periods. I am currently unaware of any Great Gray Owl nests found in Minnesota this year. In the future, it may be beneficial to conduct additional surveys to specifically target species of interest or Special Concern.

One of the goals of the survey was to collect seasonal data on calling activity for various species. Calling activity data will be used to determine if one survey period is adequate to detect all owl species of interest. In 2005, the overall mean number of Barred Owls

and Northern Saw-whet Owls detected increased during each of the three time periods. These results may suggest that both species of owls may not be fully represented on their breeding territories until Period 3. Great Horned Owls increased from Period 1 to Period 2 and then declined from Period 2 to Period 3. These results may suggest Great Horned Owls have established their breeding territory by Period 2. However, there is currently not enough data for each species to conduct a reliable analysis.

In 2006, we will again be asking participants to conduct surveys in each of the three time periods. Provided enough data is collected, an analysis will be done to determine if one time period suffices to monitor abundance trends of the owl species of interest. It may be necessary to conduct additional surveys, using a modified protocol, to specifically target rare species or species of Special Concern (e.g. Great Gray Owl, Long-eared Owl, Boreal Owl). This would be done to increase our understanding of their distribution and abundance. The modified protocol may include using playbacks to solicit responses or targeting specific habitat types.

In 2005, we asked volunteers to collect direction and distance estimates for each owl detected. Overall, there did not appear to be a bias in the direction of owls recorded in either state. The distance estimates showed that most owls were detected within 1000 meters of a station. The preliminary results of the distance estimates suggest the 1.6 km spacing between stations is adequate to avoid duplicate detections.

One concern is the reliability of direction and distance estimates. Although direction estimates can be reasonably determined, the distance estimate is a much more complicated and subjective measurement. These data will be crucial for conducting an analysis on habitat associations for different owl species in the future. By providing training to new volunteers and with additional experience of past participants, it may be possible to reduce the amount of variability in the distance estimate. In 2006, we will ask volunteers to include a confidence value for each distance estimate recorded. This information will help us understand how comfortable participants feel when recording a distance estimate.

Recommendations and Future Perspectives

1) We would like to increase the number of participants conducting surveys. To achieve this we will contact and recruit volunteers well in advance of the looming survey period.

2) If possible, we would like to provide volunteer training prior to surveys, which may help eliminate confusion about the protocol.

3) We are currently talking with staff from Bird Studies Canada about the possibility of integrating an on-line data entry system for volunteers. This will reduce the number of mailings, and it will make data access easier for volunteers.

4) To test nightly variation in calling activity of owls, volunteers may be asked to survey routes during one of three different nightly time intervals (Early = 0.5 hrs. after sunset to 22:00, Mid = 22:00 to 02:00, Late = 02:00 to 0.5 hrs. before sunrise). A matrix of time intervals and survey periods would be designed to determine when each volunteer should conduct a survey.

5) To improve the statistical power of trend analysis and habitat associations, there is a need to increase the number of survey routes available in both states. Therefore, in 2006, we will attempt to identify new routes. Additional survey routes will be randomly selected using the same methods to identify currently existing routes. In the future, we plan to include survey routes throughout Minnesota.

6) As future data continues to be collected, we will increase the amount of data analysis done on owl abundance trends, habitat associations, and distribution.

7) Lastly, it would be extremely valuable to include data about the prey base owls require to survive and produce young. Currently, limited small mammal data is available, but it may prove valuable to include such information when interpreting trend abundance and distribution data. In the future, it may be possible to work collaboratively with other resource organizations collecting such data.

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Most importantly, I would like to thank the volunteers that made this project a huge success! Participants deserve special thanks for generously donating their time and money driving many miles to conduct owl surveys. The amount of energy and enthusiasm volunteers expressed about owls in the region was amazing, and it will surely help with the continuation of this project! Thanks for your dedication in providing valuable information about owls in the western Great Lakes region.

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