WESTERN GREAT LAKES REGION

OWL MONITORING SURVEY

2006 Final Report

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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.

This was the second year of a collaborative effort between personnel from the Hawk Ridge Bird Observatory (HRBO), Natural Resources Research Institute (NRRI), MN-Dept. of Nat. Res. (MN-DNR), WI-Dept. of Nat. Res. (WI-DNR), and the Minnesota Ornithologists' Union (MOU) to monitor owl populations in the western Great Lakes region. Existing and new randomly selected survey routes were used to conduct roadside surveys in the Laurentian Forest Province of Minnesota and in Wisconsin. Volunteers were requested to conduct a survey in each period (Period 1-March 11 to March 19; Period 2-March 20 to April 9; Period 3-April 10 to April 23). All survey routes 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 2006 was 138, with 79 in northern Minnesota and 59 in Wisconsin. Of the 138 assigned routes, 69 routes and 52 routes were surveyed in northern Minnesota and in Wisconsin, respectively. At least two surveys were conducted for 88 of the 121 routes completed, with 58 routes being surveyed three times. The number of participants that signed up to conduct an owl survey was 116, with 99 volunteers returning completed survey sheets.

In total, 393 owls of nine species (including 7 owls of an unknown species) were recorded on 83 routes, with no owls recorded on 38 routes (see Table 1). The top three owl species combined for northern Minnesota and Wisconsin were Northern Saw-whet Owl, Barred Owl, and Great Horned Owl, respectively. In Minnesota, a total of 253 individual owls comprising eight species were recorded during all survey periods. The mean number of owls/route was 0.70 for Period 1, 1.82 for Period 2, and 2.08 for Period 3. In Wisconsin, a total of 140 individual owls comprising 5 species were recorded during all survey periods. The mean number of owls/route was 0.96 for Period 1, 1.82 for Period 2, and 1.09 for Period 3.

Recommendations and future perspectives for the Western Great Lakes Region owl survey include: 1) expanding the survey to all of Minnesota, 2) providing on-line training to volunteers, 3) possible integration of an on-line data entry system, 4) conducting analysis of seasonal variation of calling activity, 5) conducting future analysis on abundance trends, habitat

associations, and distribution, and 6) 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 2006, the HRBO, in collaboration with the NRRI, MN-DNR, WI-DNR, and MOU, coordinated the second year of 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 2006 Western Great Lakes Region spring owl survey conducted in northern Minnesota and in Wisconsin, and briefly discusses a few recommendations and future perspectives.

METHODS

A standardized protocol, developed in 2005 from currently existing owl survey protocols, was used in 2006 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

Laurentian Forest Province of Minnesota and in Wisconsin. To test the seasonal variation in calling activity, volunteers were asked to survey their route once during three different survey periods (Period 1 = 11 March to 19 March, Period 2 = 20 March to 9 April, Period 3 = 10 April to 23 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.

Additionally, 32 new routes were identified in the Laurentian Forest Province of Minnesota. These routes were randomly selected implementing the same protocol used to identify the initial Frog/Toad survey routes. A power analysis was done to estimate the number of new routes needed for reliable trend analysis. Based on this analysis, it was determined that approximately 90 routes would be needed to detect a 20% decline in the number of owls recorded over 10 years. Currently 84 routes exist in northern Minnesota, with another 6 routes expected to be added in 2007.

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 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. The database file included the following: 1) general weather, 2) weather at each station, 3) results from each station surveyed, and 4) additional species.

RESULTS

VOLUNTEER PARTICIPATION

In 2006, 116 volunteers signed up to conduct owl surveys in northern Minnesota and Wisconsin, with 99 participants (85%) surveying at least one route. In total, 138 survey routes were assigned to volunteers, with 79 in northern Minnesota and 59 in Wisconsin. In northern Minnesota, 57 volunteer teams returned data sheets for 69 routes. Forty-six volunteer teams surveyed 1 route, 10 volunteer teams surveyed 2 routes, and one volunteer team surveyed 3 routes. In Wisconsin, 47 volunteer teams returned data sheets for 52 routes in Wisconsin. Forty-two volunteer teams surveyed 1 route and five volunteer teams surveyed 2 routes.

In northern Minnesota, 13 routes were surveyed in one time period, 16 routes were surveyed once during each of 2 time periods, and 40 routes were surveyed once during each of the 3 time periods. One volunteer team surveyed 3 routes once in each of the 3 time periods. In Wisconsin, 20 routes were surveyed in one time period, 14 routes were surveyed once during each of the 2 time periods, and 18 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.

OWL ABUNDANCE AND DISTRIBUTION

In total, 393 owls of nine species (including 7 owls of an unknown species) were recorded on 83 routes, with no owls being detected on 38 routes (see Table 1). The overall mean number of individual owls detected per route was 0.78 in Period 1, 1.82 in Period 2, and 1.69 in Period 3. The top three owl species combined from northern Minnesota and in Wisconsin were Northern Saw-whet Owl, Barred Owl, and Great Horned Owl, respectively. The overall mean number of Northern Saw-whet Owls detected between Period 1 and Period 2 went up 68% from 0.22 to 0.68 owls/route, with a slight increase from Period 2 to Period 3 of 9% (0.68 to 0.75 owls/route). The overall mean number of Barred Owls detected between Period 1 and Period 2 went up 51% from 0.21 to 0.43 owls/route, with a slight increase of 10% between Period 2 and Period 3 (0.43 to 0.48 owls/route). The overall mean number of Great Horned Owls detected between Period 1 and Period 2 went up 43% from 0.28 to 0.49 owls/route. However, there was a relatively large decrease of detections by 59% between Period 2 (0.49) and Period 3 (0.20).

Laurentian Forest Province of Minnesota. A total of 253 individual owls comprising 8 species were recorded during all survey periods (See Table 2). The top three species detected in northern Minnesota were N. Saw-whet Owl, Barred Owl, and Great Horned Owl, respectively. The number of individual owls detected ranged from 1 to 13 for routes with owls recorded, comprising between 1 and 3 species. The mean number of owls/route went up 62% between Period 1 (0.70) and Period 2 (1.82), with a slight increase of 13% between Period 2 (1.82) and Period 3 (2.08).

Northern Saw-whet Owls were detected in 11 counties within the Laurentian Forest Province of northern Minnesota including: Cook, Lake, St. Louis, Koochiching, Lake of the Woods, Roseau, Beltrami, Itasca, Hubbard, Cass, Aitkin, and Pine (see Figure 1). Barred Owls were detected in 11 counties within the Laurentian Forest Province of northern Minnesota including: Cook, Lake, St. Louis, Lake of the Woods, Roseau, Itasca, Hubbard, Cass, Crow Wing, Aitkin, and Pine (see Figure 2). Great Horned Owls were detected in nine counties within the Laurentian Forest Province of northern Minnesota including: Lake, St. Louis, Beltrami, Itasca, Hubbard, Cass, Crow Wing, Carlton, and Pine (see Figure 3).

Long-eared Owls were detected in six counties of the Laurentian Forest Province in northern Minnesota including: Lake of the Woods, Roseau, Itasca, Hubbard, Carlton, and Pine. Of the 21 Long-eared Owls recorded, over 70% were detected in Lake of the Woods and Roseau counties. Great Gray Owls were detected in seven counties of the Laurentian Forest Province in northern Minnesota including: Lake, St. Louis, Koochiching, Lake of the Woods, Beltrami, Itasca, and Cass. Seven of the eight Great Gray Owls detected were detected in Periods 1 and 2.

Additional owls of interest recorded this spring were 2 Boreal Owls, a Northern Hawk Owl, and a Short-eared Owl. One of the Boreal Owls was detected in northern St. Louis County, and the other was detected in southeastern Itasca County. Both owls were detected during Period 3. The Northern Hawk Owl was detected during Period 2 in northeastern Cook County. The Short-eared Owl was detected during Period 3 in west central Carlton County. A noteworthy Snowy Owl was observed between 2 stations during Period 1 in Lake of the Woods County.

Wisconsin. A total of 140 individual owls comprising 5 species were recorded during all survey periods (see Table 2). The top three species detected in Wisconsin were Great Horned Owl,

Barred Owl, and N. Saw-whet Owl, respectively. The number of individual owls detected ranged from 1 to 23 for routes with owls recorded, comprising between 1 and 4 species. The mean number of owls/route went up 47% from Period 1 (0.96) to Period 2 (1.82). However, unlike northern Minnesota, the mean number of owls/route decreased by 40% between Period 2 (1.82) and Period 3 (1.09).

Great Horned Owls were detected in 14 counties throughout Wisconsin including: Bayfield, Burnett, Rusk, Door, St. Crouix, Dunn, Wood, Waupaca, Waushara, Sauk, Columbia, Dodge, LaFayette, and Rock (see Figure 3). Although Great Horned Owls were detected throughout much of Wisconsin, no individuals were detected in northeastern Wisconsin. Barred Owls were detected in 14 counties throughout Wisconsin including: Douglas, Vilas, Forest, Marinette, Door, Burnett, Chippewa, Taylor, Jackson, Portage, Waupaca, Juneau, Sauk, and LaFayette (see Figure 2). Northern Saw-whet Owls were detected in 11 counties in northern and central Wisconsin including: Douglas, Bayfield, Iron, Vilas, Forest, Marinette, Door, Burnett, Chippewa, Taylor, and Waupaca (see Figure 1).

Additional owls of interest include 6 Eastern Screech Owls and 5 Long-eared Owls. Eastern Screech Owls were detected in 5 counties throughout western Wisconsin including: Bayfield, Dunn, Chippewa, Sauk, and LaFayette. Five of the 6 E. Screech Owls were detected in Period 2, with no owls detected in Period 1. Long-eared Owls were detected in 5 counties in central and southern Wisconsin including: Dunn, Wood, Portage, Waupaca, and Dane. Long-eared Owls were detected in Periods 1 and 2, with no owls detected in Period 3.

SEASONAL VARIATION IN CALLING ACTIVITY

Laurentian Forest Province of Minnesota and in Wisconsin. Figures 4, 5, and 6 illustrate a comparison of owl detections for each survey period between northern Minnesota and in Wisconsin. Northern Saw-whet Owls were detected during each survey period in both states. There was a substantial increase in detections between Period 1 and 2, but detections remained relatively stable between Periods 2 and 3 in both states (see Figure 4). Barred Owls were detected during each survey period in both states. A relatively large increase in detections occurred in both states between Period 1 and 2. However, in northern Minnesota detections remained stable between Period 2 and 3, while in Wisconsin detections increased between Period 2 and 3 (see Figure 5). Great Horned Owls were detected during each survey period in both states. In northern Minnesota, owl detections remained stable throughout each survey period, but there were significant differences between survey periods in Wisconsin (see Figure 6). In Wisconsin, a large increase occurred between Period 1 and 2, but there was a substantial decrease in detections between Period 2 and 3.

Laurentian Forest Province of Minnesota. Figures 7, 8, and 9 illustrate a comparison of owl detections during each survey period between 2005 and 2006 in northern Minnesota. In both years, the number of N. Saw-whet Owl detections increased between Period 1 and 2, but there was little change between Period 2 and 3 (see Figure 7). Barred Owl detections increased in both years between Period 1 and 2. In 2005, Barred Owl detections increased between Period 2 and 3, but in 2006, the number of detections remained stable (see Figure 8). Great Horned Owl detections during each survey period appear very different between 2005 and 2006 (see Figure 9). In 2005, a large increase in detections occurred between Period 1 and 2, with a substantial decrease between Period 2 and 3. In contrast, owl detections in 2006 remained stable during each survey period.

Figures 10, 11, and 12 illustrate routes surveyed in each period compared to pooled surveys in northern Minnesota for 2006. Northern Saw-whet Owl detections for routes surveyed in each period versus pooled surveys showed similar trends (see Figure 10). Owl detections increased between Period 1 and 2, and detections remained relatively stable between Period 2 and 3. Also, Barred Owl detections for routes surveyed in each period versus pooled surveys showed similar trends (see Figure 11). Owl detections increased between Period 1 and 2, with detections remaining relatively stable between Period 2 and 3. However, Great Horned Owl detections for routes surveyed in each period versus pooled surveys did not show similar trends (see Figure 12). For routes surveyed in each period, owl detections increased between Period 1 and 2, and detections remained stable between Period 2 and 3. For pooled surveys, owl detections remained relatively stable during each survey period.

Table 1. ***Total number of individual owls detected and number of routes each species detected in northern Minnesota and in Wisconsin.***

Owl Species	Northern Minnesota		Wisconsin	
	Individuals	**Routes**	**Individuals**	**Routes**
Northern Saw-whet Owl	129	37	22	17
Barred Owl	51	22	50	17
Great Horned Owl	35	17	55	15
Long-eared Owl	21	8	5	5
Great Gray Owl	8	8	0	0
Eastern Screech Owl	0	0	6	5
Boreal Owl	2	2	0	0
Northern Hawk Owl	1	1	0	0
Short-eared Owl	1	1	0	0
Unknown Owl	5	4	2	2
Total	**253**		**140**	

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

			N. Saw-whet Owl		Barred Owl		Great Horned Owl		Long-eared Owl		Great Gray Owl	
Region	**Survey Period**	**# Routes[a]**	**# Obs.[b]**	**Mean[c]**	**# Obs.**	**Mean**	**# Obs.**	**Mean**	**# Obs.**	**Mean**	**# Obs.**	**Mean**
Minnesota	1	54	15	0.28	8	0.15	11	0.20	1	0.02	2	0.04
	2	62	61	0.98	24	0.39	14	0.23	7	0.11	5	0.08
	3	49	53	1.08	19	0.39	10	0.20	13	0.27	1	0.02
	Subtotal	165	129	0.78	51	0.31	35	0.21	21	0.13	8	0.05
Wisconsin	1	24	2	0.08	8	0.33	11	0.46	2	0.08	---	---
	2	45	12	0.27	22	0.49	38	0.84	3	0.07	---	---
	3	32	8	0.25	20	0.63	6	0.19	---	---	---	---
	Subtotal	101	22	0.22	50	0.50	55	0.54	5	0.05	---	---
Overall	1	78	17	0.22	16	0.21	22	0.28	3	0.04	2	0.03
	2	107	73	0.68	46	0.43	52	0.49	10	0.09	5	0.05
	3	81	61	0.75	39	0.48	16	0.20	13	0.16	1	0.01
	Total	266	151	0.57	101	0.38	90	0.34	26	0.10	8	0.03

[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 in Wisconsin.***

			E. Screech Owl		Boreal Owl		Northern Hawk Owl		Short-eared Owl		Total	
Region	**Survey Period**	**# Routes**	**# Obs.**	**Mean**	**# Obs.**	**Mean**	**# Obs.**	**Mean**	**# Obs.**	**Mean**	**# Obs.[d]**	**Mean**
Minnesota	1	54	---	---	---	---	---	---	---	---	37	0.69
	2	62	---	---	---	---	1	0.02	---	---	112	1.81
	3	49	---	---	2	0.04	---	---	1	0.02	99	2.02
	Subtotal	165	---	---	2	0.01	1	0.01	1	0.01	248	1.50
Wisconsin	1	24	---	---	---	---	---	---	---	---	23	0.96
	2	45	5	0.11	---	---	---	---	---	---	80	1.78
	3	32	1	0.03	---	---	---	---	---	---	35	1.09
	Subtotal	101	6	0.06	---	---	---	---	---	---	138	1.37
Overall	1	78	---	---	---	---	---	---	---	---	60	0.77
	2	107	5	0.05	---	---	1	0.01	---	---	192	1.79
	3	81	1	0.01	2	0.02	---	---	1	0.01	134	1.65
	Total	266	6	0.02	2	0.01	1	0.004	1	0.004	386	1.45

[d] Total # observed does not include owls of unknown species (n=7).

OWL DISTANCE AND DIRECTION

A summary of owls detected for northern Minnesota and in Wisconsin at estimated distance categories is included in Table 3. Approximately 90% of owls detected in Minnesota and Wisconsin were 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 13 and 14. 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. N, NE, NW, etc.). The direction data summarized in Figures 13 and 14 incorporate this system.

ADDITIONAL SPECIES

Volunteers were asked to record any additional species detected while conducting an owl survey (see Table 4). In northern Minnesota, 13 additional species were documented. The top four species detected were American Woodcock, Wilson's Snipe, Ruffed Grouse, and Canada Goose. In Wisconsin, 18 additional species were documented. The top four species detected were American Woodcock, Canada Goose, Sandhill Crane, and Ring-necked Pheasant.

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	50 (27%)	12 (9%)
(2) > 100 – 500 meters	72 (39%)	60 (45%)
(3) > 500 – 1000 meters	43 (23%)	47 (36%)
(4) > 1000 – 1500 meters	13 (7%)	8 (6%)
(5) > 1500 meters	8 (4%)	5 (4%)

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

Species	Region		Total
	Minnesota	Wisconsin	
Common Loon	6+	1+	7+
Great Blue Heron	0	1	1
Tundra Swan	4+	4+	8+
Canada Goose	13+	35+	48+
Ruffed Grouse	28	4	32
Ring-necked Pheasant	0	7+	7+
Wild Turkey	2	1	3
Sandhill Crane	9+	12+	21+
Killdeer	1	3	4
American Woodcock	69	39	108
Wilson's Snipe	41	3	44
Herring Gull	1	0	1
Mourning Dove	2	1	3
American Crow	0	1+	1+
American Robin	4	6	10
Hermit Thrush	0	1	1
Northern Cardinal	0	5	5
White-throated Sparrow	1	0	1
Song Sparrow	0	2	2
Total	**181+**	**126+**	**307+**

DISCUSSION

VOLUNTEER PARTICIPATION

The number of volunteers that signed up to conduct a survey increased from 105 in 2005 to 116 in 2006. Although this does not appear to be a significant increase, the number of routes surveyed went up by over 20. Of the 116 volunteers that signed up, 99 volunteers (85%) returned data sheets for 121 survey routes, which is an 8% increase compared to 2005. The number of volunteers increased in Minnesota but decreased in Wisconsin. In Wisconsin, the number of routes assigned went down from 80 in 2005 to 59 in 2006, but the number of volunteers returning data sheets increased by over 15%. The number of routes assigned in Minnesota increased from 51 in 2005 to 79 in 2006, due to the addition of 32 new routes. The number of volunteers returning data sheets in Minnesota remained relatively stable between 2005 and 2006, with 84% and 87%, respectively.

It appears volunteer interest in owl monitoring remains high, but it is somewhat disconcerting to see the decrease of volunteers in Wisconsin. It may be possible that volunteer recruitment was not as wide spread in Wisconsin, given that the entire state is being surveyed compared to the smaller region of northern Minnesota. In 2007, an attempt will be made to develop local contacts throughout Wisconsin to increase participation. Also, we are hoping to increase participation in Minnesota and conduct surveys throughout the entire state.

Considering we are still in the early stages of developing the western Great Lakes region owl survey, there are still some problems with route placement, caused by unplowed roads, highway traffic, and noise pollution. It is our goal to have most of these problems solved within the next year, depending on the addition of new routes.

OWL SURVEYS

The number of owls detected in 2006 (n=393) nearly doubled the total from 2005 (n=205). However, this increase may be attributed to the increase in routes surveyed, or to the increase in routes being surveyed more than one time compared to 2005. It is expected that by 2008 no additional routes will be added, which should reduce complications with data analysis.

Laurentian Forest Province of Minnesota. As expected, N. Saw-whet Owl, Barred Owl, and Great Horned Owl were the most common species detected in northern Minnesota. A large increase in N. Saw-whet Owls was detected, with an increase of over 100 birds compared to 2005. The overall owls/route detections increased from 0.34 in 2005 to 0.78 in 2006. This may be partially caused by the increase in routes being surveyed, but presumably, this increase cannot be explained by the addition of new routes alone. There was a relatively large decrease in the number of Barred Owls compared to 2005. Overall owls/route detections went down from 0.58 in 2005 to 0.31 in 2006. Great Horned Owl numbers went down slightly compared to 2005. Overall owls/route detections decreased from 0.27 in 2005 to 0.21 in 2006.

The large increase in Long-eared Owl detections compared to 2005 was an interesting result. However, the majority of Long-eared Owls detected (>70%) were from Lake of the Woods and Roseau counties. This may suggest that a localized prey increase influenced where birds were located. Great Gray Owl numbers went down slightly compared to 2005, but unlike 2005, several Great Gray Owl nests were located throughout northern Minnesota in 2006. It may be possible some birds from the 2004/2005 winter irruption remained to breed in 2006.

Wisconsin. As expected, Great Horned Owl, Barred Owl, and N. Saw-whet Owl were the most common species detected in Wisconsin. In contrast to northern Minnesota, the number of N. Saw-whet Owls went down in 2006. Overall owls/route detections decreased from 0.39 in 2005 to 0.22 in 2006. Barred Owl numbers increased slightly compared to 2005. Overall owls/route detections increased from 0.41 in 2005 to 0.50 in 2006. The number of Great Horned Owls nearly doubled compared to 2005. Overall owls/route detections increased from 0.27 in 2005 to 0.54 in 2006. Although the number of routes surveyed in 2006 went down, the number of routes surveyed in more than one period substantially increased. Therefore, data comparisons between years may have limited meaning.

Eastern Screech Owl numbers went up slightly in 2006, but this increase has little meaning considering the low number of birds detected. To better understand E. Screech Owls, it might be useful to develop a specific protocol to determine abundance and distribution. Similarly, to

understand abundance and distribution of Long-eared Owls may require implementing a specific survey protocol.

SEASONAL CHANGE IN CALLING ACTIVITY

One of the goals of the survey was to determine if variation occurred in calling activity between each survey period. Calling activity data will be used to determine if one survey period is adequate to detect all owl species of interest.

Laurentian Forest Province of Minnesota and Wisconsin. Figures 4, 5, and 6 illustrate owl detections between northern Minnesota and Wisconsin. There appears to be a similar trend in detections for N. Saw-whet Owls and Barred Owls between states, but Great Horned Owl detections were considerably different. Although these data represent only one year, they do provide some insight into the differences that might exist between states. Ultimately, it will be useful to determine if enough differences occur between states to modify survey period dates.

Laurentian Forest Province of Minnesota. Two types of analysis were done for seasonal calling activity data. Figures 7, 8, and 9 illustrate owl detections for each survey period in 2005 and 2006. Both N. Saw-whet Owls and Barred Owls showed similar trends. This might suggest that identifying one survey period for these species may be an effective way to monitor trends. In contrast, Great Horned Owl detections were considerably different between years. It is difficult to ascertain what this result means, but by continuing to collect these data, we may be able to determine if one survey period will work for these species.

Figures 10, 11 and 12 illustrate owl detections for routes surveyed in each period to pooling all surveys done in each period. This was done to determine whether pooled data accurately detects seasonal changes in calling activity. Northern Saw-whet Owls and Barred Owls showed similar trends when comparing these data, but there was a difference in trends for Great Horned Owls. Further analysis of these data should provide additional insight regarding the usefulness of comparing routes surveyed in each period to pooled data. It might be expected that routes surveyed in each period should only be included in the analysis.

In 2007, we will again be asking participants to conduct surveys in each of the three time periods. Provided enough data is collected, analyses will be done to determine if one time period suffices to monitor abundance trends for certain owl species.

Note: 2006 was the first year surveys were conducted during 3 periods in Wisconsin; therefore, analysis of seasonal calling activity data between 2005 and 2006 was not done.

DIRECTION AND DISTANCE

Direction and distance estimates continue to be collected, which will be valuable in determining habitat associations for specific owl species. Direction estimates did not appear to be biased in either state during 2005 and 2006. Distance estimates continue to show that most owls were detected within 1000 meters of a station. This might suggest that the 1.6 km spacing between stations is adequate to reduce duplicate detections; although, it is evident that duplicate detections do occur. To better understand the reliability of distance estimates, volunteers will be asked to provide a confidence value for each distance estimate.

RECOMMENDATIONS AND FUTURE GOALS

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) We plan to provide on-line training for volunteers, requiring each volunteer to complete a test. This should help reduce confusion with the survey protocol and increase awareness of owl calls.

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 better understand owl populations throughout the western Great Lakes region, we plan to identify routes in southern and western Minnesota. Additionally, a power analysis may be done to determine the number of routes needed to identify changes in owl abundance trends in Wisconsin.

5) As future data continues to be collected, a trend analysis will be done to determine changes in owl populations.

6) We are currently digitizing survey routes, which should help when analyzing habitat associations.

7) Lastly, it would be extremely valuable to collect data on small mammal populations. 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 possible! 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 incredible, and it will surely help with the continuation of this survey! Thanks again for your dedication in providing valuable information about owls in the western Great Lakes region.

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Figure 1: N. Saw-whet Owl locations.

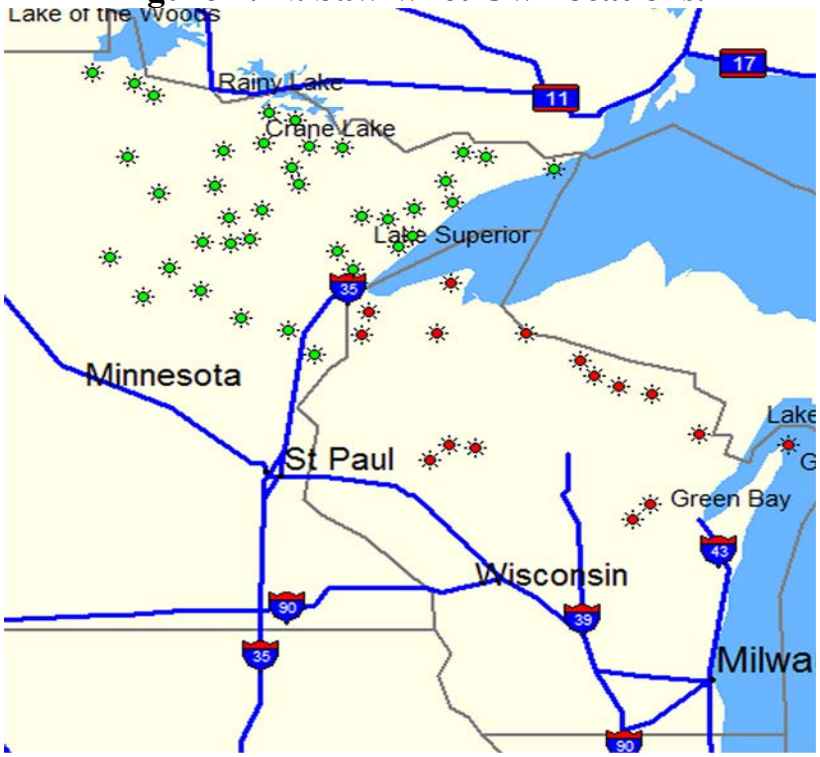

Figure 2: Barred Owl locations.

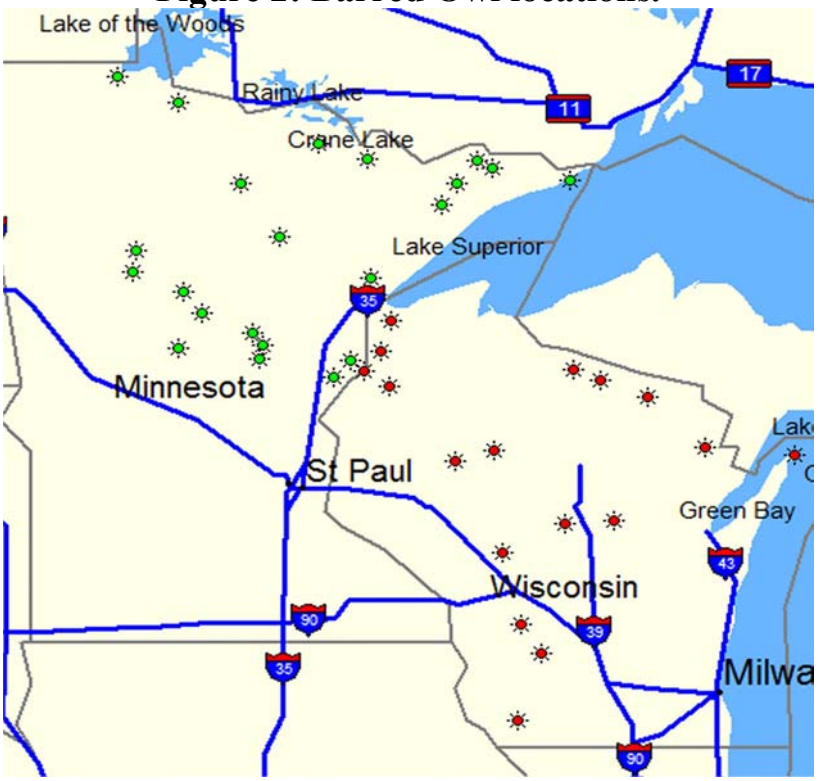

Figure 3: Great Horned Owl locations.

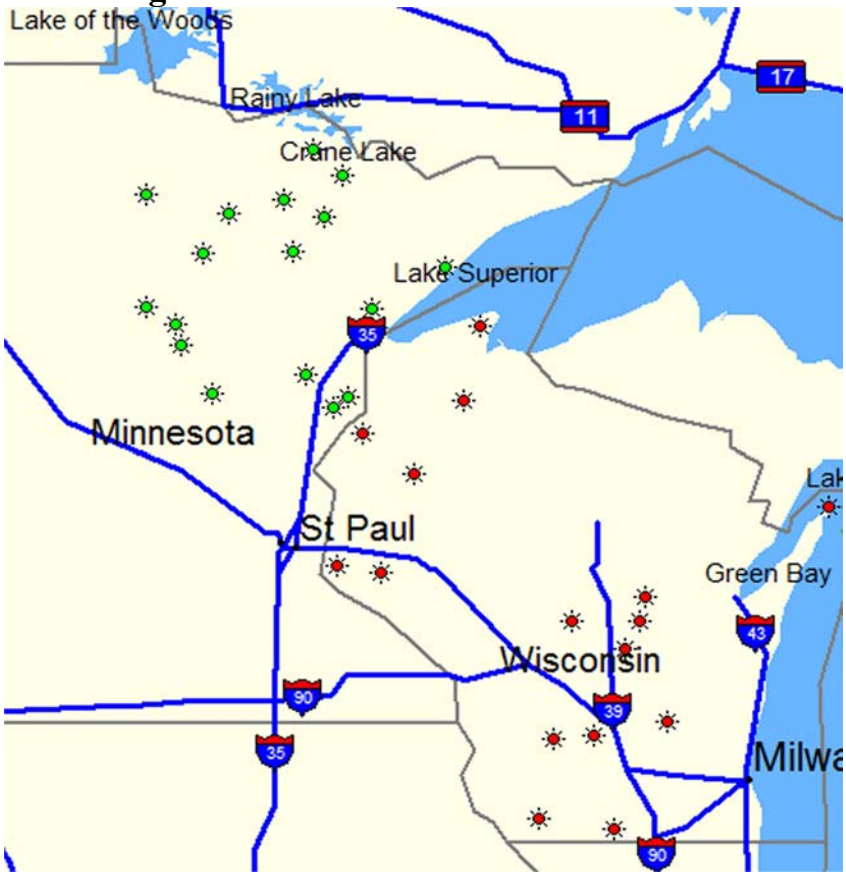

Figure 4: N. Saw-whet Owl detections for each survey period in northern Minnesota and Wisconsin, 2006.

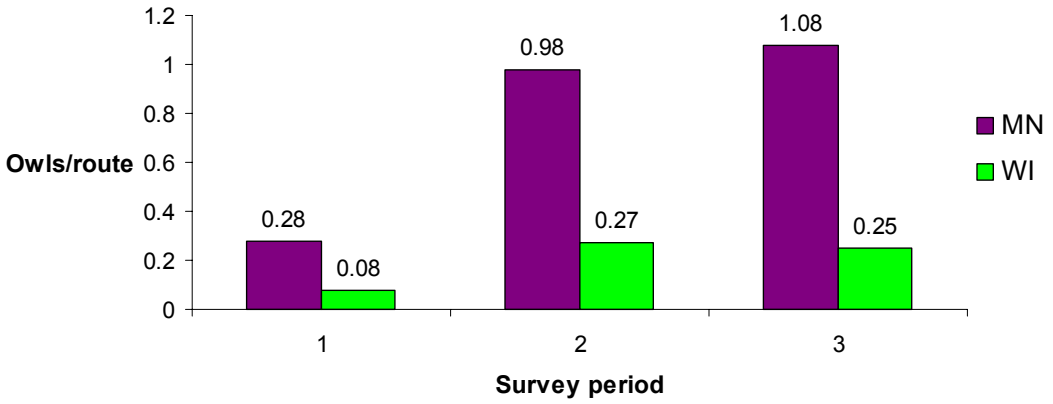

Figure 5: Barred Owl detections for each survey period in northern Minnesota and Wisconsin, 2006.

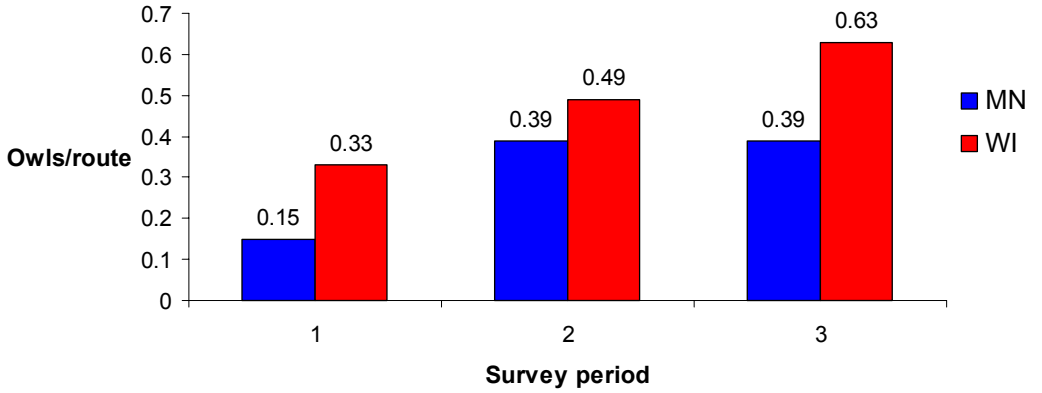

Figure 6: Great Horned Owl detections for each survey period in northern Minnesota and Wisconsin, 2006.

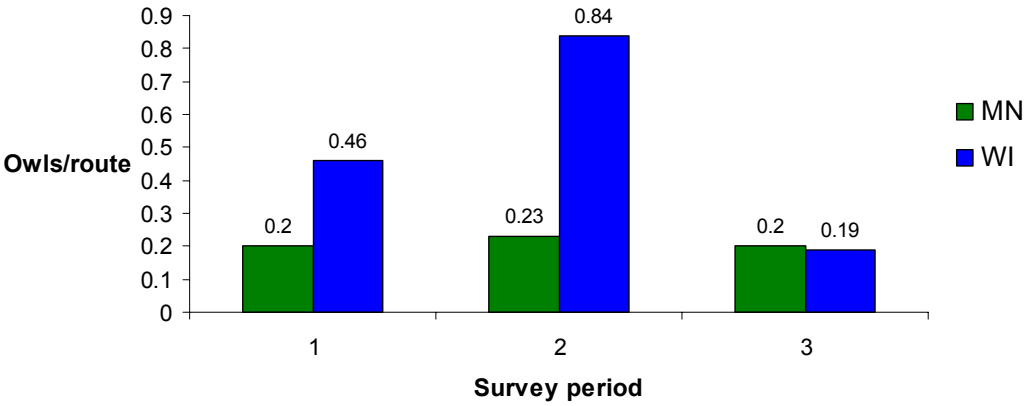

Figure 7: N. Saw-whet Owl detections for each survey period in 2005 and 2006, Minnesota.

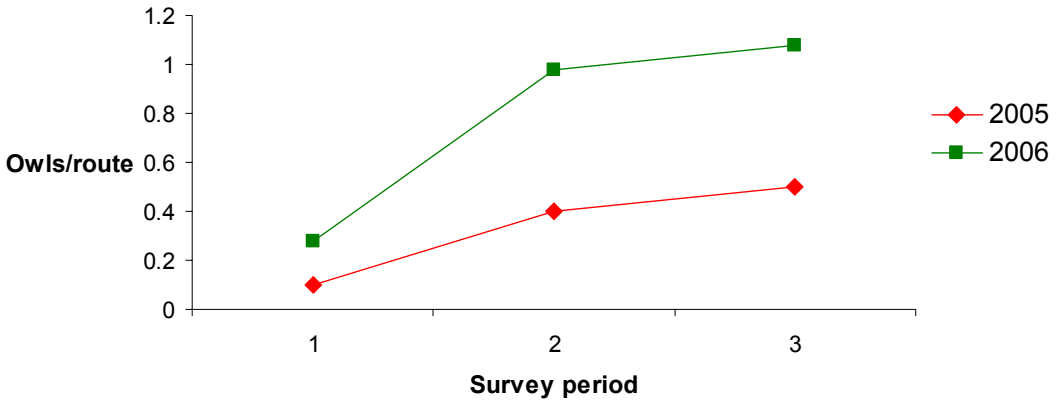

Figure 8: Barred Owl detections for each survey period in 2005 and 2006, Minnesota.

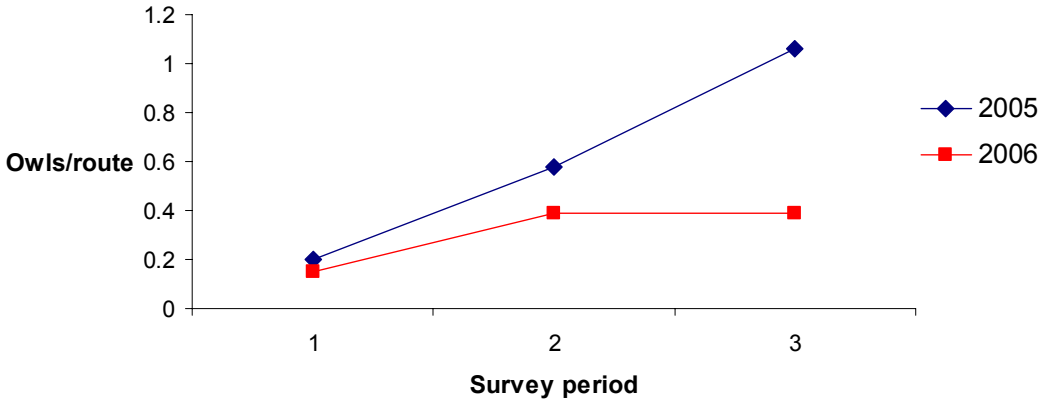

Figure 9: Great Horned Owl detections for each survey period in 2005 and 2006, Minnesota.

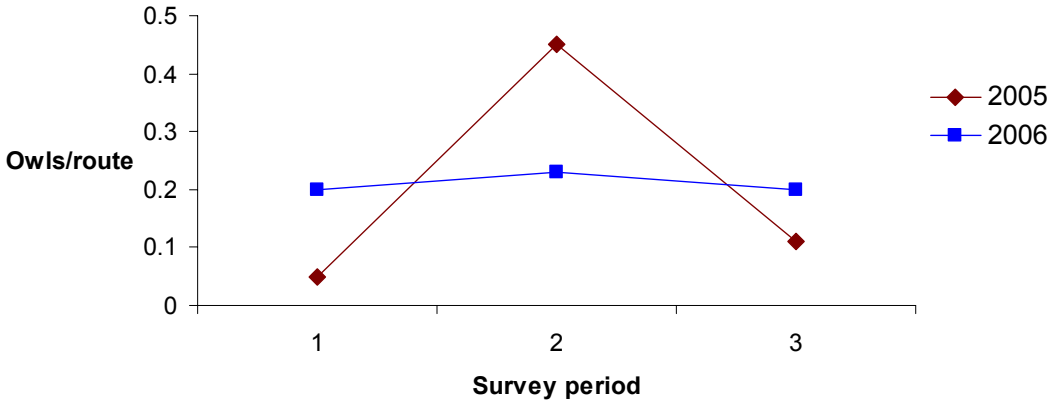

Figure 10: N. Saw-whet Owl detections between routes surveyed in each period vs. pooled surveys in northern Minnesota, 2006.

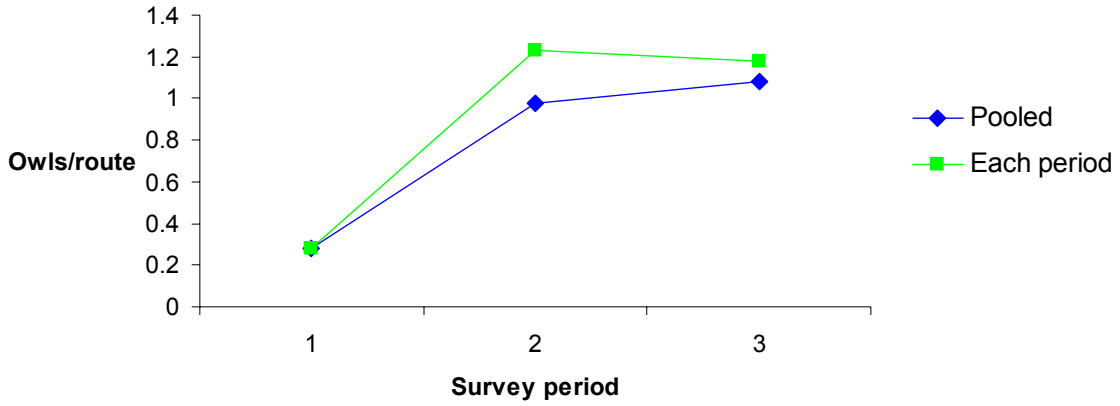

Figure 11: Barred Owl detections between routes surveyed in each period vs. pooled surveys in northern Minnesota, 2006.

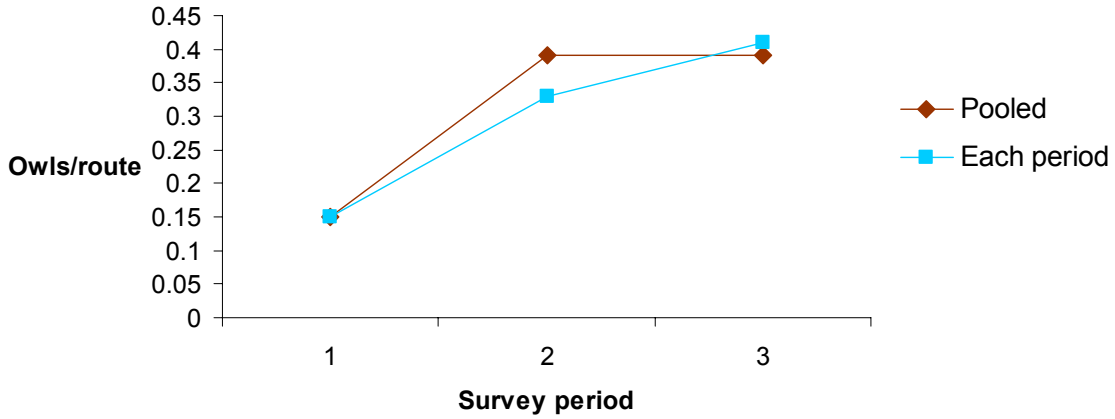

Figure 12: Great Horned Owl detections between routes surveyed in each period vs. pooled surveys in northern Minnesota, 2006.

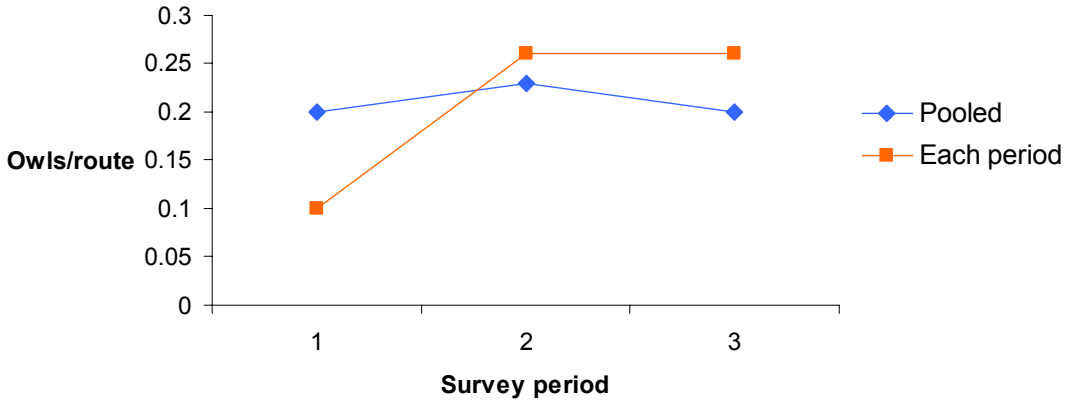

Figure 13: Summary of owls detected for each direction estimate in northern Minnesota.

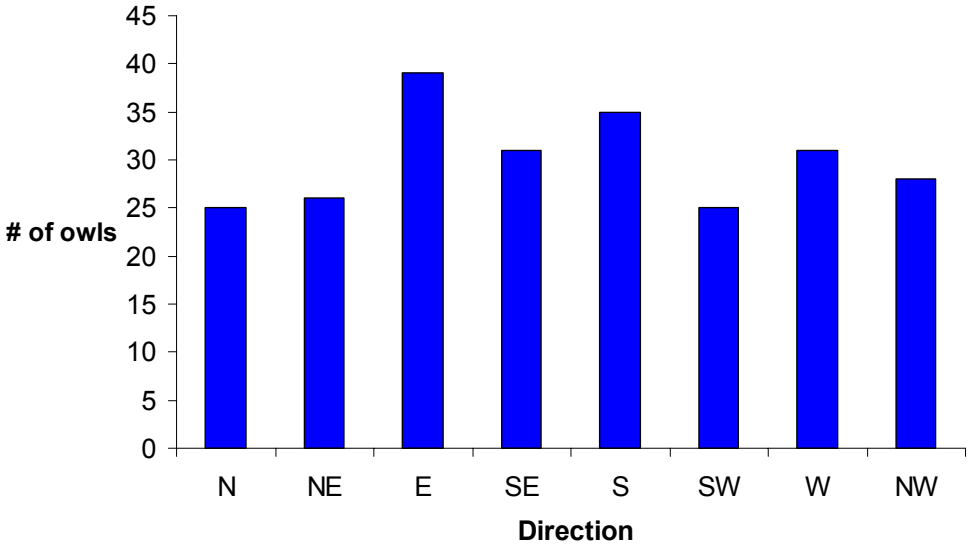

Figure 14: Summary of owls detected for each direction estimate in Wisconsin.