WESTERN GREAT LAKES REGION

OWL MONITORING SURVEY

2007 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 third 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), and the WI-Dept. of Nat. Res. (WI-DNR) to monitor owl populations in the western Great Lakes region. Existing survey routes were used to conduct roadside surveys in Minnesota and Wisconsin. In 2007, the survey effort was expanded throughout the remainder of Minnesota, with routes available in southern and western Minnesota. Volunteers were requested to conduct a survey in each period (Period 1-March 10 to March 18; Period 2-March 19 to April 8; Period 3-April 9 to April 22). 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 2007 was 185, with 108 in Minnesota and 77 in Wisconsin. Of the 185 assigned routes, 80 and 60 routes were surveyed in Minnesota and Wisconsin, respectively. At least two surveys were conducted for 124 of the 140 routes completed, with 83 routes being surveyed three times. The number of participants that signed up to conduct an owl survey was 153, with 116 volunteers returning completed survey sheets.

In total, 536 owls of seven species were recorded on 107 routes, with no owls recorded on 33 routes (Table 2). The top three owl species combined for Minnesota and Wisconsin were Barred Owl, Great Horned Owl, and Northern Saw-whet Owl, respectively. In Minnesota, a total of 230 individual owls comprising seven species was recorded during all survey periods. The mean number of owls/route was 1.00 for Period 1, 1.08 for Period 2, and 1.37 for Period 3. In Wisconsin, a total of 306 individual owls comprising 5 species was recorded during all survey periods. The mean number of owls/route was 2.00 for Period 1, 2.06 for Period 2, and 2.11 for Period 3.

Recommendations and future perspectives for the Western Great Lakes Region owl survey include: 1) provide on-line training and certification to volunteers, 2) possible integration of an on-line data entry system, 3) completing the analysis of seasonal calling activity data, 4) conducting future analysis on abundance trends, habitat associations, and distribution, and 5) 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 2007, the HRBO, in collaboration with the NRRI, MN-DNR, and WI-DNR, coordinated the third 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 2007 Western Great Lakes Region spring owl survey conducted in Minnesota and 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 2007 to conduct a volunteer-based survey in Minnesota and 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

Minnesota and Wisconsin. To test the seasonal variation in calling activity, volunteers were asked to survey their route once during three different survey periods (Period 1 = 10 March to 18 March, Period 2 = 19 March to 8 April, Period 3 = 9 April to 22 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

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 ~138 Frog/Toad survey routes randomly located in a variety of habitat types throughout Minnesota. The start point for the owl survey route corresponded with the start point of the Frog/Toad route.

Additionally, the 31 new routes identified in the Laurentian Forest Province of Minnesota in 2006 were again used in 2007. These routes were randomly selected implementing the same protocol used to identify the initial Frog/Toad survey routes. There are currently 82 survey routes in the Laurentian Forest Province of Minnesota and 87 routes throughout the remainder of southern and western Minnesota.

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 data were separated into three database files which included: 1) general survey data (including overall weather data), 2) station survey data (including station weather and additional species data), and 3) owl data.

RESULTS

VOLUNTEER PARTICIPATION

In 2007, 153 volunteers signed up to conduct owl surveys in Minnesota and Wisconsin, with 112 participants (73%) surveying at least one route. In total, 185 survey routes were assigned to volunteers, with 108 in Minnesota and 77 in Wisconsin. In Minnesota, 64 volunteer teams returned data sheets for 80 routes. Fifty-two volunteer teams surveyed 1 route, nine volunteer teams surveyed 2 routes, two volunteer teams surveyed 3 routes, and one volunteer team surveyed 4 routes. In Wisconsin, 48 volunteer teams returned data sheets for 60 routes in Wisconsin. Thirty-nine volunteer teams surveyed 1 route, seven volunteer teams surveyed 2 routes, one volunteer team surveyed 3 routes, and one volunteer team surveyed 4 routes.

SURVEY WEATHER AND TIMING

Minnesota. The mean start and end temperatures for each survey period were: Period 1) 33.4 °F and 29.2 °F, Period 2) 34.1 °F and 30.7 °F, and Period 3) 46.8 °F and 42.8 °F. The mean wind speed, based on the Beaufort scale, for each period was: Period 1) 1.1, Period 2) 1.3, and Period 3) 1.0. The mean percent cloud cover for each period was: Period 1) 25%, Period 2) 27%, and Period 3) 23%. The mean survey date for each period was: Period 1) 14 March, Period 2) 1 April, and Period 3) 17 April. The mean survey dates for 2007 did not differ substantially compared to 2005 and 2006 (Table 1).

Wisconsin. The mean start and end temperatures for each survey period were: Period 1) 33.9 °F and 30.7 °F, Period 2) 38.1 °F and 35.9 °F, and Period 3) 48.1 °F and 44.9 °F. The mean wind speed, based on the Beaufort scale, for each period was: Period 1) 1.2, Period 2) 1.3, and Period 3) 1.0. The mean percent cloud cover for each survey period was: Period 1) 19%, Period 2) 48%, and Period 3) 15%. The mean survey date for each period was: Period 1) 14 March, Period 2) 30 March, and Period 3) 18 April. The mean survey dates did not differ substantially compared to 2005 and 2006 (Table 1).

Table 1. ***The mean survey dates from 2005 – 2007 for Minnesota and Wisconsin. In 2005, the initial survey did not begin until Period 2 for Wisconsin.***

	Minnesota			Wisconsin		
Year	**1**	**2**	**3**	**1**	**2**	**3**
2005	17 March	4 April	19 April	—	4 April	20 April
2006	16 March	1 April	18 April	17 March	31 March	18 April
2007	14 March	1 April	17 April	14 March	30 March	18 April

OWL ABUNDANCE AND DISTRIBUTION

In total, 536 owls of seven species were recorded on 107 routes, with no owls being detected on 33 routes (Table 2). The top three owl species combined between Minnesota and Wisconsin were Barred Owl, Great Horned Owl, and Northern Saw-whet Owl, respectively. The overall mean number of individual owls detected per route was 1.43 in Period 1, 1.49 in Period 2, and 1.69 in Period 3. The overall mean number of Barred Owls detected between Period 1 and Period 2 went down by 7% from 0.46 to 0.43 owls/route; however, there was a large increase of 47% between Period 2 and Period 3 (0.43 to 0.81 owls/route). The overall mean number of Great Horned Owls detected between Period 1 and Period 2 went down by 14% from 0.63 to 0.54 owls/route, with a continued decline of 13% between Period 2 and 3 (0.54 to 0.47 owls/route). The overall mean number of Northern Saw-whet Owls detected between Period 1 and Period 2 went up 46% from 0.21 to 0.39 owls/route, followed by a decrease of 44% between Period 2 and 3 (0.39 to 0.22 owls/route).

Table 2. ***Total number of individual owls and the number of routes each species was detected in Minnesota and in Wisconsin.***

Owl Species	Minnesota		Wisconsin	
	Individuals	Routes	Individuals	Routes
Barred Owl	72	28	123	33
Great Horned Owl	60	27	132	27
Northern Saw-whet Owl	67	25	29	14
Eastern Screech Owl	3	3	14	8
Long-eared Owl	8	6	8	7
Short-eared Owl	12	4	0	0
Great Gray Owl	7	5	0	0
Unknown Owl	1	1	0	0
Total	230	58[1]	306	49[2]

[1] = total number of routes with at least one owl detected in Minnesota.
[2] = total number of routes with at least one owl detected in Wisconsin.

Minnesota. A total of 230 individual owls comprising 7 species were recorded during all survey periods (Table 3). The top three species detected in Minnesota were Barred Owl, N. Saw-whet Owl, and Great Horned Owl, respectively. The overall mean for Barred Owls was 0.36 owls/route, which was a slight increase compared to 2006 (Figure 5). The overall mean for N. Saw-whet Owls was 0.33 owls/route, which was a substantial decrease compared to 2006 (Figure 5). The overall mean for Great Horned Owls was 0.30 owls/route, which was an increase compared to 2006 (Figure 5). The highest number of individual owls detected during a survey ranged between 1 and 17, comprising between 1 and 4 species. The mean number of owls/route went up 7% between Period 1 (1.00) and Period 2 (1.08), followed by a 21% increase between Period 2 (1.08) and Period 3 (1.37).

Barred Owls were detected in 17 counties within Minnesota including: Winona, Blue Earth, Scott, Anoka, Sherburne, Pine, Aitkin, Todd, Crow Wing, Cass, Hubbard, Roseau, Beltrami, Koochiching, St. Louis, Lake, and Cook (Figure 2). Northern Saw-whet Owls were detected in 13 counties within Minnesota including: Pine, Aitkin, Todd, Cass, Hubbard, Roseau, Lake of the Woods, Beltrami, Koochiching, Itasca, St. Louis, Lake, and Cook (Figure 1). Great Horned Owls were detected in 22 counties within Minnesota including: Houston, Rice, Blue Earth, Scott, Sibley, Hennepin, Anoka, Sherburne, Chippewa, Stevens, Pine, Aitkin, Crow Wing, Cass, Todd, Hubbard, Pennington, Roseau, Beltrami, Koochiching, St. Louis, and Lake (Figure 3).

Short-eared Owls were detected in four counties of Minnesota including: Sibley, Yellow Medicine, Chippewa, and Beltrami (Figure 4). Long-eared Owls were detected in five counties of the Minnesota including: Aitkin, Roseau, Beltrami, Koochiching, and St. Louis (Figure 4). Long-eared Owls detected within the five counties were more evenly spaced compared to the 2006 detections, which had a relatively clumped distribution in two counties. Great Gray Owls were detected in four counties of the Minnesota including: Beltrami, Koochiching, St. Louis, and Lake (Figure 4). Of the seven Great Gray Owls detected, 43% were detected in northern St. Louis County. Finally, Eastern Screech Owls were detected in three counties of Minnesota including: Fillmore, Winona, and Anoka (Figure 4).

Wisconsin. A total of 306 individual owls comprising 5 species were recorded during all survey periods (Table 3). The top three species detected in Wisconsin were Great Horned Owl, Barred Owl, and N. Saw-whet Owl, respectively. The overall mean for Great Horned Owls was 0.89 owls/route, which was a substantial increase compared to 2006 (Figure 6). The overall mean for Barred Owls was 0.83 owls/route, which was an increase compared to 2006 (Figure 6). The overall mean for N. Saw-whet Owls was 0.19 owls/route, which was a slight decrease compared to 2006 (Figure 6). The number of individual owls detected ranged from 1 to 15, comprising between 1 and 3 species. The mean number of owls/route went up 3% between Period 1 (2.00) and Period 2 (2.06), followed by a 2% increase between Period 2 (2.06) and Period 3 (2.11).

Great Horned Owls were detected in 21 counties throughout Wisconsin including: Adams, Bayfield, Buffalo, Burnett, Columbia, Dodge, Dunn, Jefferson, Juneau, Kewaunee, Lafayette, Lincoln, Manitowoc, Marinette, Polk, Rock, Sauk, Sheboygan, St. Croix, Taylor, and Waupaca (Figure 3). Although Great Horned Owls were detected throughout much of Wisconsin, no individuals were detected in northeastern Wisconsin. Barred Owls were detected in 25 counties throughout Wisconsin including: Ashland, Bayfield, Buffalo, Burnett, Columbia, Crawford, Dodge, Douglas, Dunn, Forest, Juneau, Lafayette, Marathon, Marinette, Oconto, Oneida, Polk, Portage, Rusk, Sauk, Sheboygan, Taylor, Vilas, Waupaca, and Wood (Figure 2). Northern Saw-whet Owls were detected in 11 counties in northern and central Wisconsin including: Ashland, Bayfield, Douglas, Dunn, Lincoln, Marathon, Marinette, Oneida, Pierce, Taylor, and Vilas (Figure 1).

Eastern Screech Owls were detected in seven counties throughout Wisconsin including: Buffalo, Chippewa, Dodge, Grant, Sauk, Sheboygan, and Waupaca (Figure 4). Of the 14 E. Screech Owls detected, 36% were detected in Sheboygan County. Long-eared Owls were detected in seven counties in central and southern Wisconsin including: Buffalo, Dunn, Lafayette, Polk, St. Croix, Taylor, and Waupaca (Figure 4).

Table 3. ***Mean and total number of owls/route for each survey period in Minnesota and Wisconsin.***

Region	Period	# Routes[a]	Barred Owl		Great Horned Owl		N. Saw-whet Owl		E. Screech Owl		Long-eared Owl	
			# Obs.[b]	Mean[c]	# Obs.	Mean	# Obs.	Mean	# Obs.	Mean	# Obs.	Mean
Minnesota	1	67	22	0.33	24	0.36	16	0.24	2	0.03	—	—
	2	72	12	0.17	21	0.29	34	0.47	1	0.01	3	0.04
	3	62	38	0.61	15	0.24	17	0.27	—	—	5	0.08
	Subtotal	201	72	0.36	60	0.30	67	0.33	3	0.01	8	0.04
Wisconsin	1	50	32	0.64	50	1.00	8	0.16	6	0.12	4	0.08
	2	52	41	0.79	46	0.88	14	0.27	3	0.06	3	0.06
	3	47	50	1.06	36	0.77	7	0.15	5	0.11	1	0.02
	Subtotal	149	123	0.83	132	0.89	29	0.19	14	0.09	8	0.05
Overall	1	117	54	0.46	74	0.63	24	0.21	8	0.07	4	0.03
	2	124	53	0.43	67	0.54	48	0.39	4	0.03	6	0.05
	3	109	88	0.81	51	0.47	24	0.22	5	0.05	6	0.06
	Total	350	195	0.56	192	0.55	96	0.27	17	0.05	16	0.05

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

Table 3 (continued). ***Mean and total number of owls/route for each survey period in Minnesota and Wisconsin.***

Region	Period	# Routes	Short-eared Owl		Great Gray Owl		Total	
			# Obs.	Mean	# Obs.	Mean	# Obs.[d]	Mean
Minnesota	1	67	2	0.03	1	0.01	67	1.00
	2	72	2	0.03	4	0.06	78	1.08
	3	62	8	0.13	2	0.03	85	1.37
	Subtotal	201	12	0.06	7	0.03	230	1.14
Wisconsin	1	50	—	—	—	—	100	2.00
	2	52	—	—	—	—	107	2.06
	3	47	—	—	—	—	99	2.11
	Subtotal	149	—	—	—	—	306	2.05
Overall	1	117	2	0.02	1	0.01	167	1.43
	2	124	2	0.02	4	0.03	185	1.49
	3	109	8	0.07	2	0.02	184	1.69
	Total	350	12	0.03	7	0.02	536	1.53

[d] Total # observed includes 1 unknown owl species in Period 2 for MN.

SEASONAL VARIATION IN CALLING ACTIVITY

Minnesota and Wisconsin. Seasonal variation in the number of owl detections for each survey period in 2007 was compared between Minnesota and Wisconsin for Barred Owls, Great Horned Owls, and N. Saw-whet Owls. In both states, there was an observed increase in the number of Barred Owl detections per route from Period 1 to Period 3 (Figure 7). However, the trend between each state differed. In Wisconsin, the number of detections increased in each survey period. In Minnesota, a decrease in detections was encountered between Periods 1 and 2, followed by a substantial increase between Periods 2 and 3. In both states, there was an observed decrease in the number of Great Horned Owl detections per route from Period 1 to Period 3 (Figure 8). In both states, there was an observed increase of N. Saw-whet Owl detections between Periods 1 and 2; however, there was a decrease in detections between Periods 2 and 3 (Figure 9).

Minnesota. Seasonal variation in the number of owl detections for each survey period was compared from 2005 to 2007 for Barred Owls, N. Saw-whet Owls, and Great Horned Owls. The trend for Barred Owls between years shows a similar increasing pattern in the number of detections per route between Period 1 to Period 3 (Figure 10). Each year, however, does not show a similar trend pattern. In 2007, an observed decrease in detections per route was found between Periods 1 and 2, unlike 2005 and 2006 which had an increase. In 2006, there was no difference in detections per route between Periods 2 and 3, which is unlike 2005 and 2007 that had an increase in detections. The trend for N. Saw-whet Owls between years shows a similar increasing trend between Periods 1 and 2 (Figure 11). In 2007, there was a decrease in detections between Periods 2 and 3, which is unlike the previous years that slightly increased or remained relatively stable. The trend for Great Horned Owls differed slightly between years (Figure 12). The only substantial increase in detections per route between Periods 1 and 2 was observed in 2005, which was then followed by a decrease in detections between Periods 2 and 3. In 2006, there was virtually no change in the number of detections per route between each survey period. However, there was a slight decrease within each survey period in the number of detections per route in 2007.

Wisconsin. Seasonal variation in the number of owl detections for each survey period was compared between 2006 and 2007. The number of Barred Owl detections per route showed a similar increasing trend between each survey period in 2006 and 2007 (Figure 13). The trend for Great Horned Owls per route differed between each year (Figure 14). The number of detections per route increased between Periods 1 and 2 in 2006, but the number of detections decreased between Periods 1 and 2 in 2007. In both years, there was an observed decrease in detections per route between Periods 2 and 3. The trend in N. Saw-whet Owl detections per route showed a similar pattern in both years (Figure 15). There was an increasing trend in detections between Periods 1 and 2 followed by a slight decrease in detections between Periods 2 and 3.

ADDITIONAL SPECIES

Volunteers were asked to record any additional species detected while conducting an owl survey (Table 4). In Minnesota, 13 additional species were documented. The top four species detected were Canada Goose, American Woodcock, Ruffes Grouse, and Wilson's Snipe. In Wisconsin, 15 additional species were documented. The top four species detected were Canada Goose, American Woodcock, Sandhill Crane, and Wilson's Snipe.

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

	Region		
Species	**Minnesota**	**Wisconsin**	**Total**
Tundra Swan	3+	3+	6+
Canada Goose	64+	60+	124+
Ruffed Grouse	41	10	51
Ring-necked Pheasant	1	5	6
Wild Turkey	1	2	3
Sandhill Crane	11+	25+	36+
Virginia Rail	0	1	1
Sora	0	2	2
Killdeer	7	11	18
Willet	1	0	1
American Woodcock	54	47	101
Wilson's Snipe	34	16	50
Herring Gull	0	2	2
Common Nighthawk	1	0	1
American Robin	2	3	5
Song Sparrow	2	2	4
Fox Sparrow	0	1	1
Total	**222**	**190**	**412**

+ = not quantified (estimated total).

DISCUSSION

VOLUNTEER PARTICIPATION

The number of volunteers that signed up to conduct a survey increased each year from 105 in 2005 to 153 in 2007. This is in part due to an increase in the number of routes available in northern Minnesota in 2006, as well as expanding the survey area throughout Minnesota in 2007. Despite the increase in volunteers, the proportion of assigned routes which were completed decreased compared to 2005 and 2006. In 2007, 76% of assigned routes were completed compared to 85% in 2006. In 2007, the regional breakdown between Minnesota and Wisconsin was 74% and 78% of assigned routes completed, respectively. This represents a 13% decline in Minnesota and a 10% decline in Wisconsin of assigned routes completed compared to 2006. Although the proportion of routes completed decreased, the proportion of routes completed still remains relatively high compared to other owl surveys in North America.

It appears volunteer interest in owl monitoring continues to be high in both states, and a decline in participation rates may be expected as the annual survey gets further away from the unprecedented and well publicized owl irruption of 2005. It is expected that participation rates will remain relatively high within northern Minnesota and southern Wisconsin, as several volunteers from 2006 surveyed the same routes in 2007. In 2008, volunteer recruitment will be focused on the new survey areas of southern and western Minnesota and in northern Wisconsin.

OWL SURVEYS

The number of owls detected increased each year from 2005 to 2007 (2005:n=205, 2006:n=393, and 2007:n=536). However, the increase in raw owl numbers does not reflect survey effort, which increased each year. The number of routes available has increased in Minnesota from 51 in 2005 to 169 in 2007. Also, the number of times a route was surveyed in each period increased in Wisconsin during each year. Despite these changes, the mean number of owls/route accounts for effort and reflects a more appropriate view of population trends.

Minnesota. Although the ranked order has changed from 2005 - 2007, the top three species in Minnesota remain the same: Barred Owl, N. Saw-whet Owl, and Great Horned Owl. The most notable decrease in owls/route was observed for N. Saw-whet Owls from 0.78 in 2006 to 0.33 in 2007. The 2007 N. Saw-whet Owl detection rate was deflated by including routes surveyed throughout the state, which was not the case in 2006 when surveys occurred only in the Laurentian Forest Province (LFP). If only routes done in the LFP were included in the analysis, N. Saw-whet Owl detections would be 0.52 in 2007. Interestingly, there were no N. Saw-whet Owl detections outside of the LFP. Barred Owls had a slight increase in detections from 0.31 in 2006 to 0.36 in 2007. This number was also deflated by including routes throughout the state, with the detection rate going up 20% if only LFP routes were included. Great Horned Owls also had an increase in the detection rate from 0.21 in 2006 to 0.30 in 2007. In contrast to the previous two species, this number was inflated by including routes throughout the state. If only LFP routes were included, the detection rate drops to 0.25 in 2007. This may not be surprising given the habitat conditions may be more suitable for Great Horned Owls outside of the LFP. Regardless of how the detection rate was impacted by including routes throughout the state, all three species show a similar trend in comparison with 2006.

Long-eared Owl detections went down from 0.13 in 2006 to 0.04 in 2007. Not surprisingly, this number is also deflated by including all routes throughout the state. If only LFP routes were included, the detection rate in 2007 would be 0.06, which represents a 33% increase. No Long-eared Owls were detected on routes outside of the LFP in 2007. The decrease in Long-eared Owl detections may be associated with regional or local prey base declines; although, there is limited data available to assess small mammal populations. Great Gray Owl detections were similar to 2006, with no detections occurring outside of the LFP. If only LFP routes were included, the detection rate in 2007 (0.05) was identical to 2006. Although the detection rate for Great Gray Owls remains low, the consistent number of detections suggests that this species may regularly nest within certain regions of the state. Short-eared Owls were mostly detected outside of the LFP, but several individuals were detected in Beltrami County. Interestingly, several of the Short-eared Owls were sighted on the route instead of heard. Eastern Screech Owls were the only species to be exclusively detected outside of the LFP.

Wisconsin. The ranked order of the top three species remained the same compared with 2006: Great Horned Owl, Barred Owl, and N. Saw-whet Owl. There was a relatively large increase in Great Horned Owl detections from 0.54 in 2006 to 0.89 in 2007, which represents a 39% increase. Similarly, Barred Owl detections increased from 0.50 in 2006 to 0.83 in 2007, representing a 40% increase. Interestingly, there has been an observed increase in the detection rate for both species since 2005. The increased detection rate of Barred and Great Horned Owls may not accurately depict population trends, given that more routes were surveyed during at least 2 time periods since 2005. The number of routes surveyed during at least 2 time periods increased from 35% in 2005 to 61% in 2006 and 88% in 2007. In contrast, N. Saw-whet Owl detections decreased slightly from 0.22 in 2006 to 0.19 in 2007, representing a 14% decline. The overall detection rate of N. Saw-whet Owls may be deflated because more routes are surveyed in southern than in northern Wisconsin, with no detections occurring in southern Wisconsin in the last three years.

The overall detection rate of Eastern Screech Owls has continued to increase from 0.01 in 2005 to 0.09 in 2007, representing an 89% increase. This number may be inflated for the same reasons expressed for Barred and Great Horned Owls. However, other factors may be related to the apparent increase in detections, such as the location of routes surveyed in southern Wisconsin. In 2007, 36% of the Screech Owls were detected in Sheboygan County, which was not surveyed in 2005 and 2006. The Long-eared Owl detection rate of 0.05 has remained the same each year from 2005 to 2007. Unlike Minnesota, Long-eared Owls were detected throughout the state. Interestingly, the highest detection rate for Long-eared Owls occurred in Period 1 but decreased in each subsequent time period. This is the opposite finding in Minnesota with no birds detected in Period 1 but increased in each subsequent time period. A similar pattern was observed for Long-eared Owls in 2006. One question that may arise is whether birds in southern and central Wisconsin are, simply, initiating breeding activity earlier than those in northern Minnesota, or are a portion of the birds in each state detected on their northern migration.

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.

Minnesota and Wisconsin. Overall, the trends found in seasonal calling activity for Barred, Great Horned, and N. Saw-whet Owls in 2007 are very similar between states. Barred Owls were the only species to exhibit a slight difference in calling activity between Minnesota and Wisconsin, with a decline in detections in Minnesota and an increase in Wisconsin during Period 2. However, in both states the number of detections increased from Period 1 to Period 3. Great Horned and N. Saw-whet Owls showed nearly identical trends in the detection rates during each survey period for both states. These data suggest that the variables influencing calling activity in the top three species may not be regional but, instead, occur over a much larger landscape. The same conclusion was not found in 2006, when only N. Saw-whet Owls had a similar trend between states. Interestingly, Barred and Great Horned Owls are considered resident species in both states that, presumably, exhibit limited to no movement during winter. In contrast, N. Saw-whet Owls breeding in northern Minnesota and Wisconsin are generally considered migratory. It may be possible that resident species are affected by proximate factors (i.e. weather and photoperiod) differently than migrant species. Further analysis of these data should help determine a more reliable conclusion.

Minnesota. The seasonal calling activity data were compared from 2005 – 2007 for Barred, N. Saw-whet, and Great Horned Owls. The data suggest, for all species, that slight differences do exist between years. Although similar trends in the calling activity data were exhibited for Barred and N. Saw-whet Owls between 2005 and 2006, the 2007 data revealed a slightly different pattern. The trend observed for Great Horned Owls was more similar in 2005 and 2007, with a slightly different pattern observed in 2006. These data may suggest that limiting the survey to one time period could reduce our ability to accurately detect population changes over time. We are currently analyzing these data to determine the significance in these differences between years, as well as determining if weather may be a contributing factor in the variation that seems to exist.

Wisconsin. The 2006 and 2007 seasonal calling activity data were compared for Barred, Great Horned, and N. Saw-whet Owls. Similar trends were observed for Barred and N. Saw-whet Owls between years, suggesting that temporal factors may be controlling calling activity. However, the trend observed for Great Horned Owls showed a large difference between years, suggesting that other factors may be influencing calling activity. It may be possible that weather, either during the survey or preceding breeding activity, may be influencing calling activity. Given that variation exists in the seasonal calling activity between years in Wisconsin and Minnesota, additional data may be required to identify the factors that are influencing calling activity.

Based on the seasonal activity data, it seems unlikely that we will reduce the survey time period in 2008 to one time interval. We are currently considering reducing the number of survey time periods to two instead of three intervals, but no conclusions will be made until results have been obtained from these data.

RECOMMENDATIONS AND FUTURE GOALS

1) We would like to increase the number of participants conducting surveys in southern and western Minnesota and northern Wisconsin. 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 and certification for volunteers, requiring each volunteer to complete and pass the test before conducting a survey. This should help reduce confusion with the survey protocol and increase awareness of owl calls.

3) We continue to work 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 would like to conduct a power analysis for Wisconsin to see how many routes may be required to more accurately detect population changes.

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 for the purpose of creating route maps and 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 is greatly appreciated, 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 in 2007

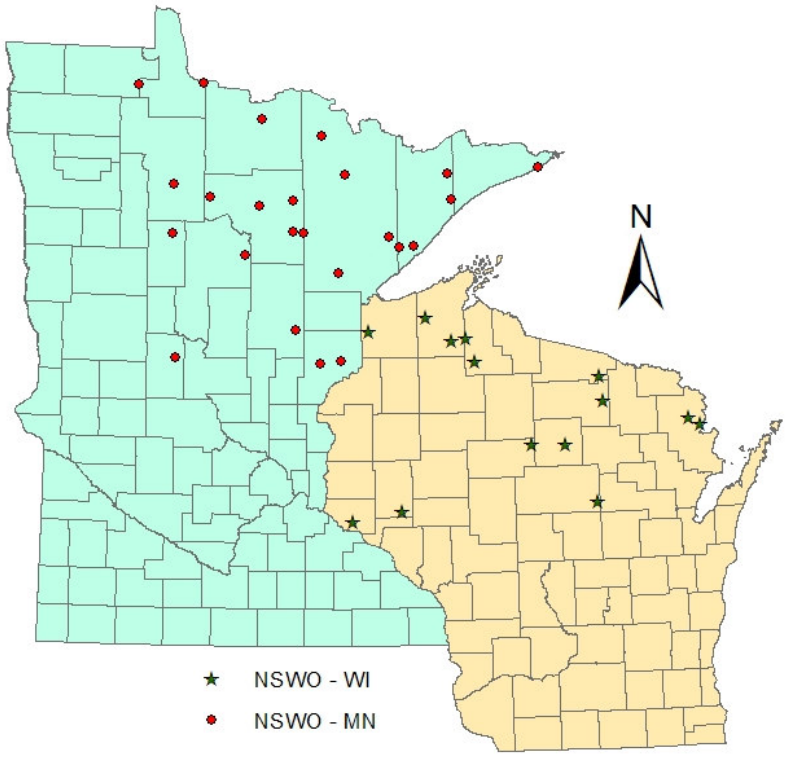

Figure 2: Barred Owl locations in 2007

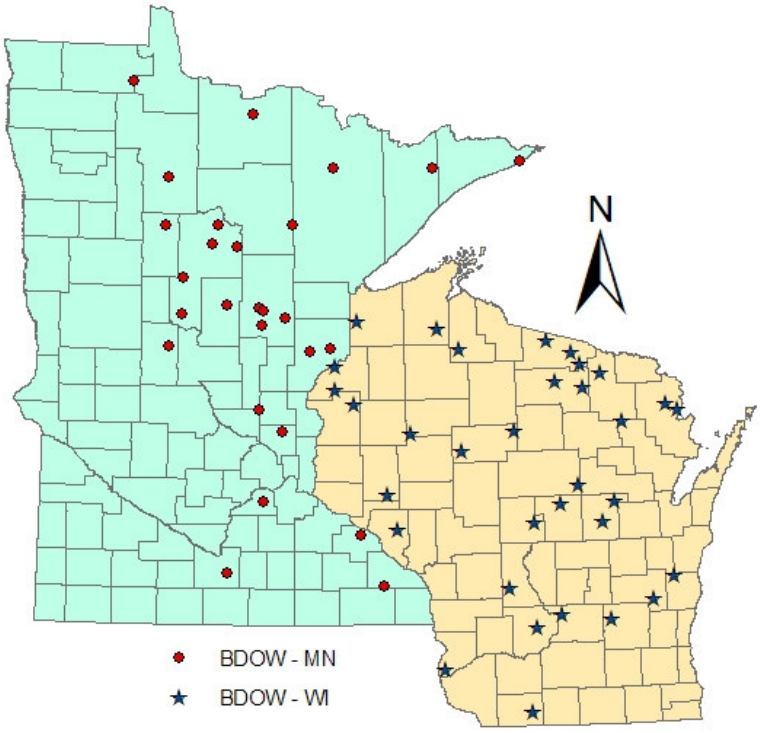

Figure 3: Great Horned Owl locations in 2007

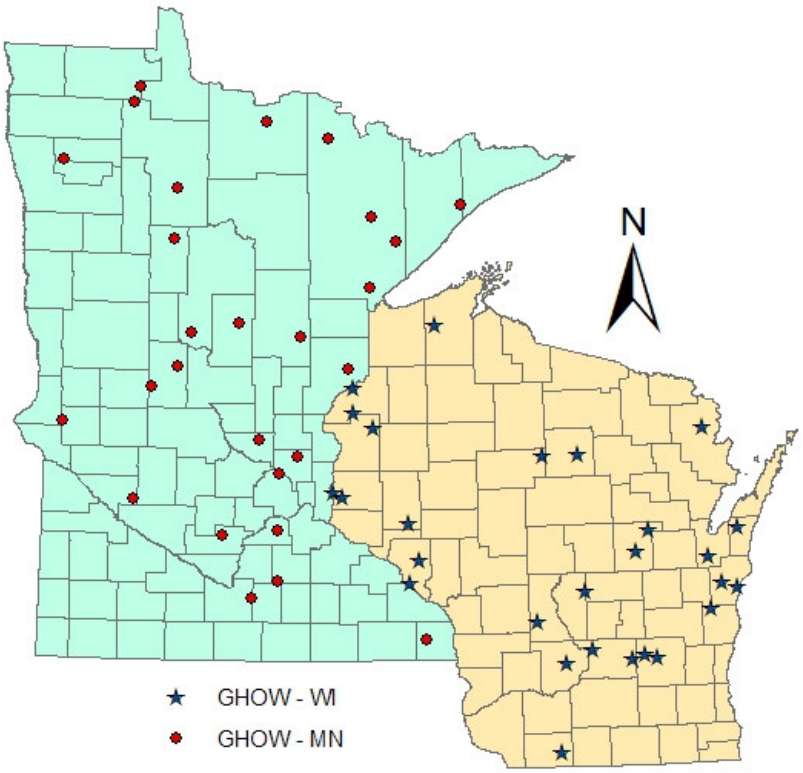

Figure 4: SEOW, LEOW, GGOW, and EASO locations in 2007

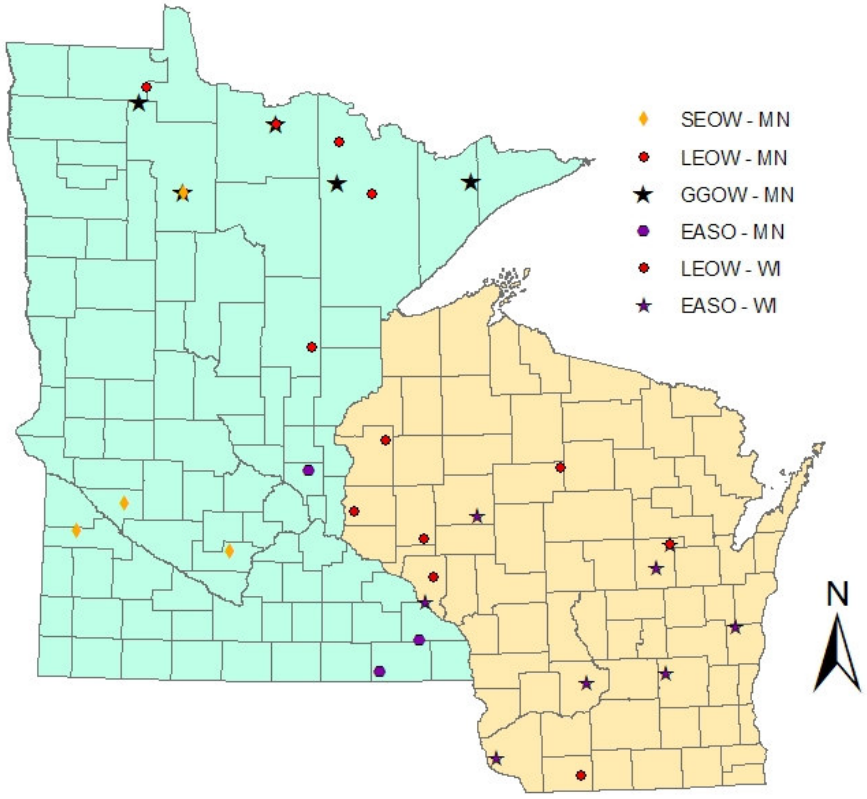

Figure 5: Overall mean values for the top 5 species detected in Minnesota, 2005 - 2007.

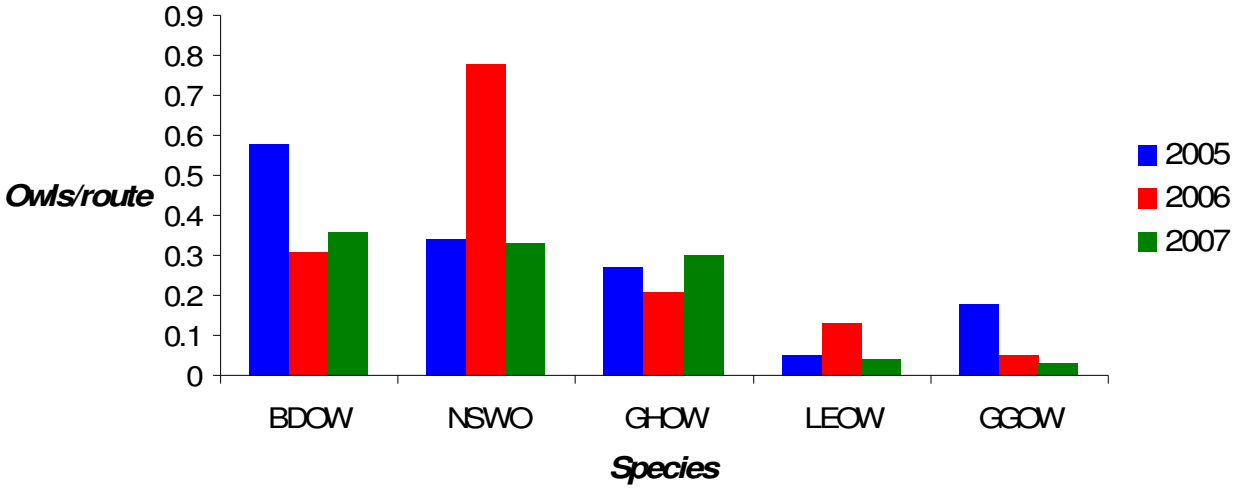

Figure 6: Overall mean values for the top 5 species detected in Wisconsin, 2005 - 2007.

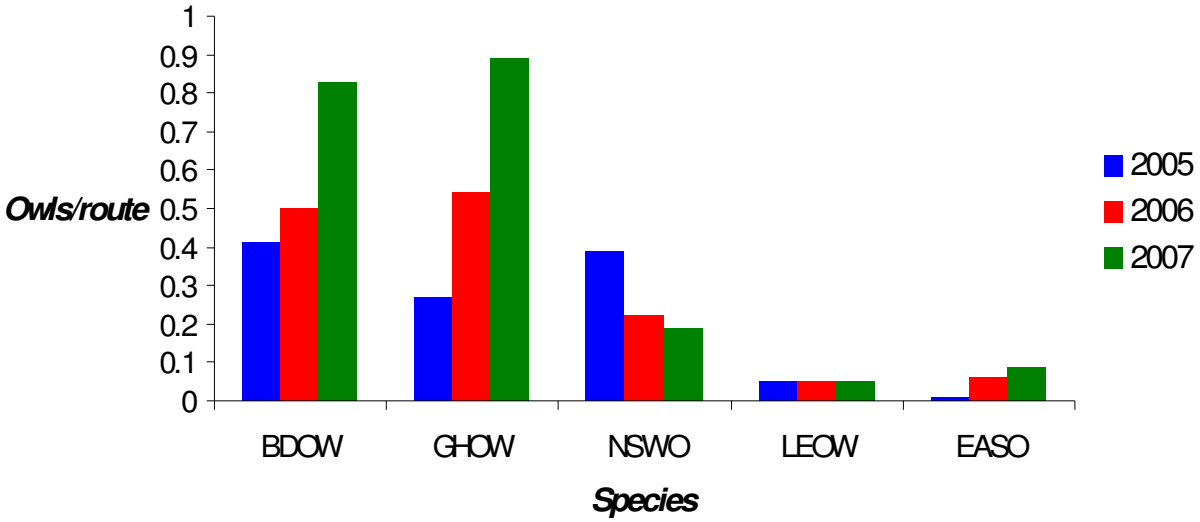

Figure 7: Mean # of Barred Owl detections for each survey period in Minnesota and Wisconsin, 2007.

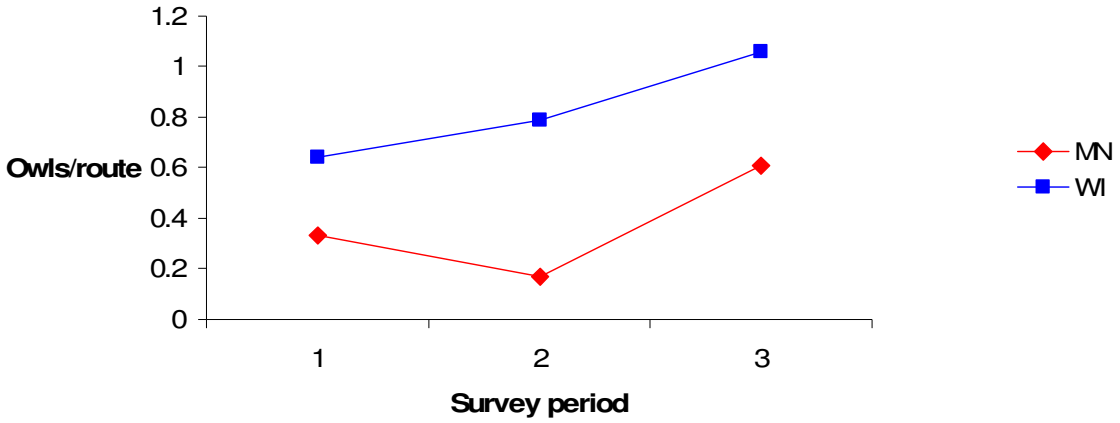

Figure 8: Mean # of Great Horned Owl detections for each survey period in Minnesota and Wisconsin, 2007.

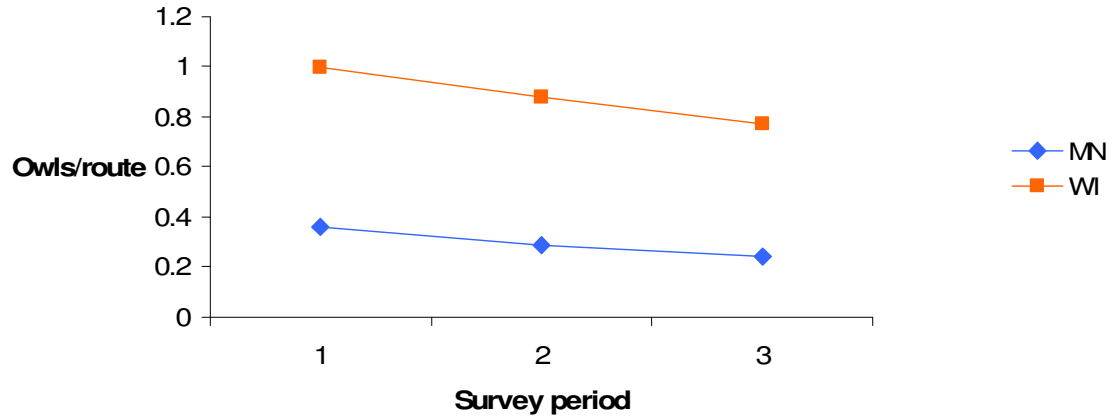

Figure 9: Mean # of N. Saw-whet Owl detections for each survey period in Minnesota and Wisconsin, 2007.

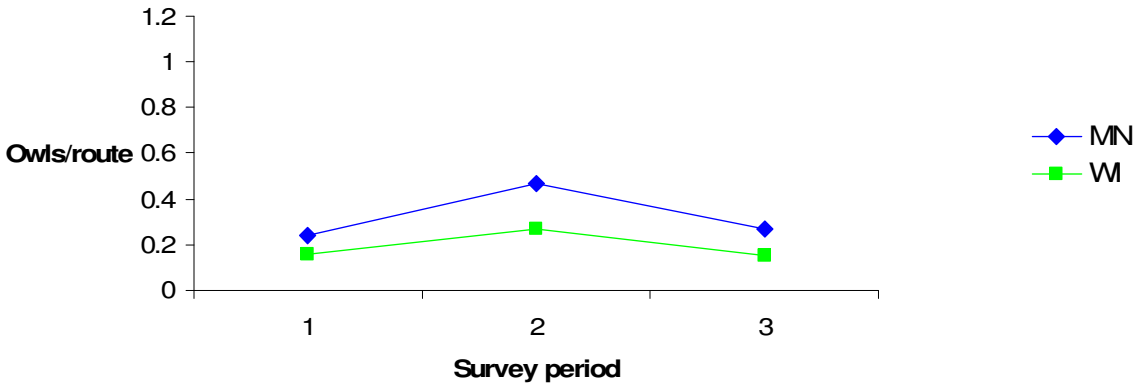

Figure 10: Mean # of Barred Owl detections for each survey period from 2005 - 2007, Minnesota.

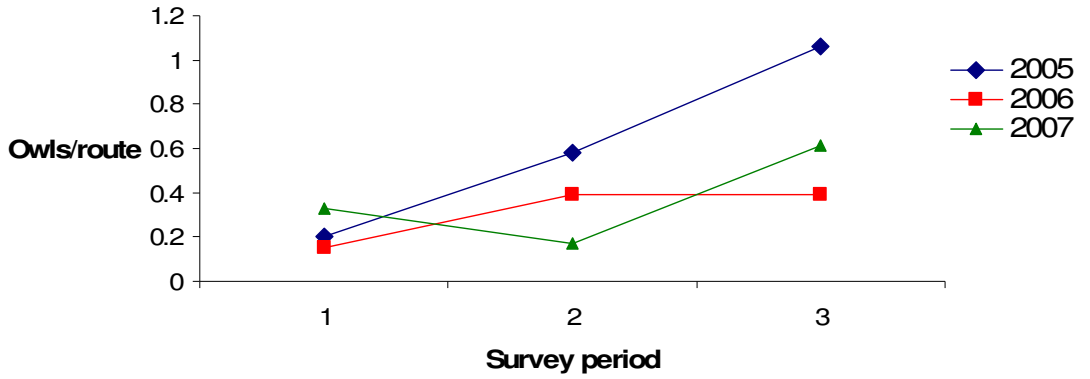

Figure 11: Mean # of N. Saw-whet Owl detections for each survey period from 2005 - 2007, Minnesota.

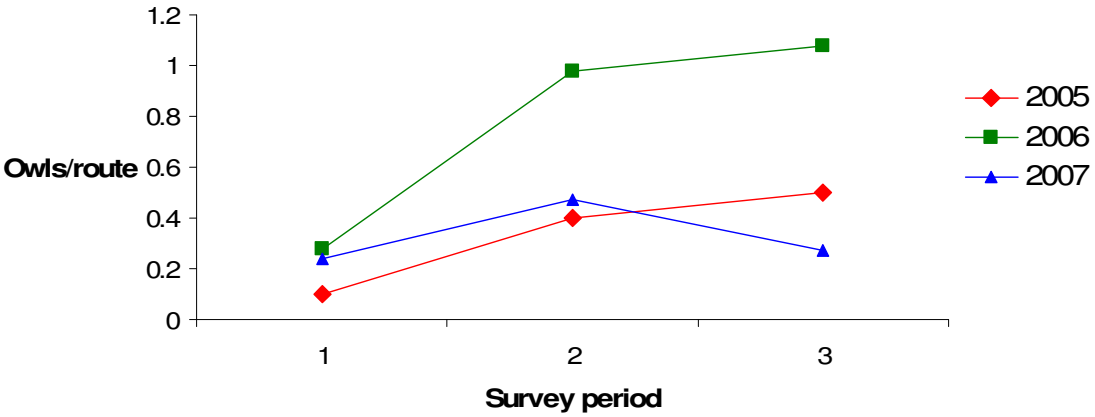

Figure 12: Mean # of Great Horned Owl detections for each survey period between 2005 and 2007, Minnesota.

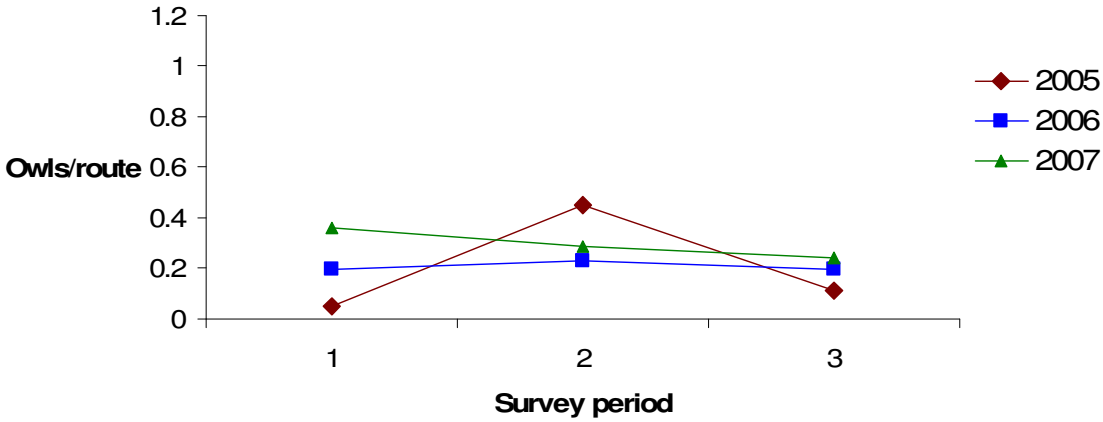

Figure 13: Mean # of Barred Owl detections for each survey period in 2006 and 2007, Wisconsin.

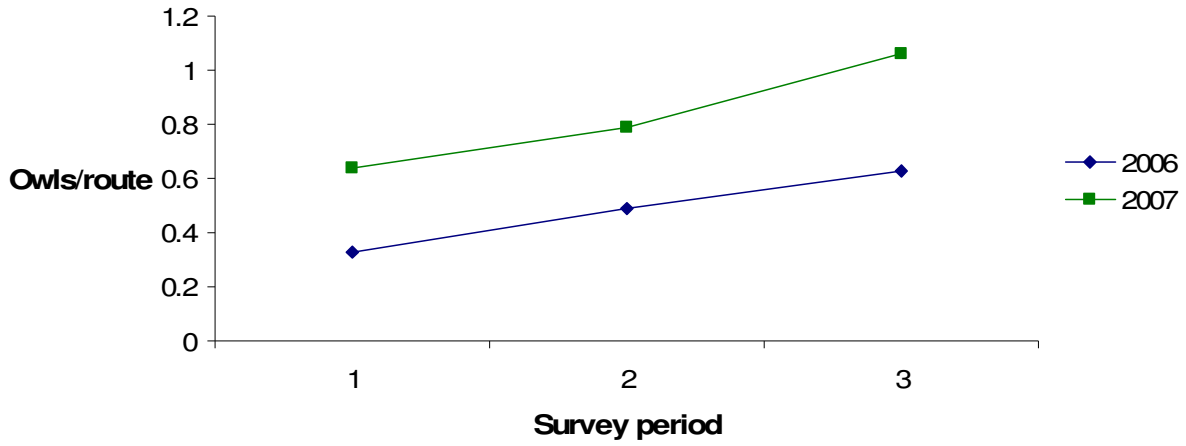

Figure 14: Mean # of Great Horned Owl detections for each survey period in 2006 and 2007, Wisconsin.

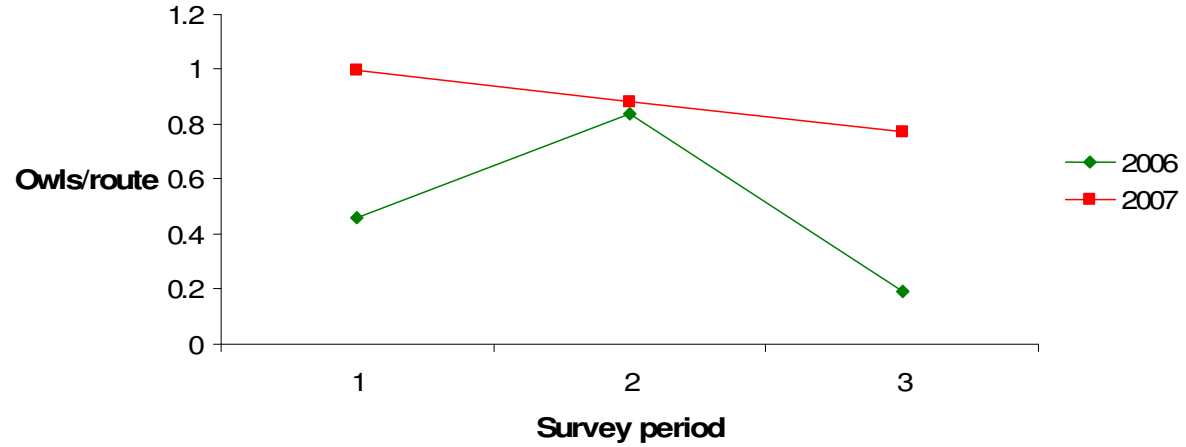

Figure 15: Mean # of N. Saw-whet Owl detections for each survey period in 2006 and 2007, Wisconsin.