

**Avian Studies for the Sanilac County Michigan Wind Power Project:
Summary of 2007 Field Seasons - Annual Report**



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30 November 2007
Report Number 2007-13



MICHIGAN STATE
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Introduction

Many areas near the shorelines of the Great Lake's possess winds adequate for the efficient generation of wind energy. These shorelines have also been documented to provide important migration corridors for migratory raptors and waterfowl. Although Sanilac County is predominantly an agricultural area, waterbirds, raptors, and waterfowl traverse this region of the Michigan during migration. Due to the potential for avian collisions with wind turbines the value of this research is heightened by the importance of this area to birds combined with the proposed wind energy development.

The research detailed in this report was conducted in order to determine the avian use of an area proposed for wind power development in Sanilac County (Erickson and Gehring 2007). These data will help wind energy developers and resource managers to make appropriate decisions regarding the potential impacts to birds and the methods in which they might reduce those impacts.

Study Site and Methods

Study site and description

Research was conducted in Sanilac County, located in east-central Michigan, USA. The area is primarily flat, agricultural lands (88%) with small woodlots and fencerows (5%) dispersed throughout the project site. The agricultural crops include: corn, beans, alfalfa, and winter wheat. It is anticipated that the turbine and facility locations will be sited almost entirely in agricultural fields (Figs. 1 and 2).

Large bird surveys

We established a raptor and other large bird viewing station near the center of the project area. This station, placed next to a meteorological monitoring tower, provided the a good viewshed of the proposed project site, given the vegetation openness and slight elevation compared to other areas (Figs. 3 and 4). Following methods similar to those used by Hawkwatch International, we conducted 6-hour surveys at this station in April and May 2007 and in September and October 2007. When conducting weather-dependent research, some flexibility in scheduling is needed and some surveys were missed due to inclement conditions.

During surveys each raptor, large bird, and sensitive status species was recorded in addition to the bird's flight path, flight direction, approximate flight altitude (lowest and highest flight altitude), whether it flew within the proposed project area, and the distance to each bird. Technicians used landmarks as reference when measuring distance to birds and flight altitude. Technicians also recorded the behavior and habitat use of each bird. Behavior categories were as follows: perched (PE), soaring (SO), flapping (FL), flushed (FH), circle soaring (CS), hunting (HU), gliding (GL), and other (OT, noted in comments). Any comments or unusual observations were also noted. Weather data were collected in concert with large bird surveys; specifically, temperature, wind speed, wind direction, and cloud cover. The date, start, and end time of the observation period, species or best possible identification, number of individuals, sex and age class, distance from plot center when first observed, closest distance, height above ground, activity, and habitat(s) were recorded.

Songbird surveys

In an effort to quantify the songbird use of the proposed project area we collected data using methods similar to those used in studies estimating breeding bird densities (Reynolds 1995, Johnson et al. 2000). Eight point count locations were established within the proposed project area (Fig. 3). Surveys were conducted in June 2007 with an emphasis on counting breeding birds.

Surveys at point count sites were 15 min. long and initiated at sunrise. I recorded the following data: date, survey start time, survey end time, temperature, wind speed, wind direction, cloud cover. Each individual bird observed during a survey was recorded by species, as well as the azimuth to the bird, method of detection, gender (if possible), distance from the observer, estimated flight height (if applicable), and other comments.

Results and Summary

Large bird surveys

During the 19 large bird surveys conducted in the spring of 2007 observers detected 1,717 large birds of 18 species. The 30 large bird surveys conducted in the fall of 2007 included 10,120 large birds of 16 species. There was a mean of 90.4 birds

detected per survey (16.7 birds / hour) in the spring and 337 birds per survey (57.0 birds / hour) in the fall (Table 1). In the spring the raptor group was the most abundant of the bird groups per survey (44.6 birds / survey, 8.2 birds / hour; Fig. 5), followed by waterfowl (36.8 birds / survey, 6.8 birds / hour, Fig. 6), and waterbirds (i.e., gulls, etc.; 7.7 birds / survey, 1.4 birds / hour; Fig. 7). However, in the fall waterfowl were the most abundant per survey (202.6 birds / survey, 34.3 birds / hour; Fig. 8), followed by waterbirds (i.e., gulls, etc.; 94.9 birds / survey, 16.0 birds / hour; Fig. 9), and raptors (40.1 birds / survey, 6.8 birds / hour; Fig. 10). Raptors were the most frequently occurring species group (100% of surveys) in both spring and fall; similarly waterfowl was detected at 100% of surveys in the spring (Tables 2, 3). The most common raptor species observed in both the spring and fall was the Turkey Vulture (583 and 1,091 birds, respectively) which arrived in May but then migrated in October (Table 4, Figs.11, 12). The Red-tailed Hawk was the second most common raptor species in both the spring and fall (111 and 59 birds in spring and fall, respectively) and was present throughout the survey periods (Table 4, Fig.13,14). The Broad-winged Hawk was frequently observed in the spring but not in the fall (119 and 1 bird, respectively), and Northern Harrier demonstrated the opposite trend (9 in the spring and 45 in the fall, (Table 4, Figs.15-18). The remaining raptors were observed in relatively lower frequencies (Table 4, Figs. 19-23).

The mean flight altitude of raptors was 173.4 m in the spring and 50.1 m in the fall. Assuming the wind turbine rotor-swept area (RSA) would be 26 – 74 m above the ground, 6.2% of birds in the spring flew below the RSA, 28.8% within the RSA, and 65.0% above the RSA. In the fall 31.2% flew below the RSA, 47.0% flew within the RSA, and 22.0% flew above the RSA. Given the lack of defined topographical features in the project area migrating raptors were widely distributed in their flight paths traveling north or south, depending on the season. Turkey Vultures tended concentrate much of their circle soaring behavior approximately 2.4 -3.2 km directly west of the large bird observation site. This area was partially forested and likely served as roosting area for this social bird. Given the high numbers of migrating large birds moving through this area and the potential for a high percentage of them flying within the RSA it may be appropriate to collect additional data at the large bird survey site.

Table 1. Avian abundance and richness in Sanilac County, MI in a site proposed for the development of wind energy. Data were collected in the spring and fall of 2007 at a large bird survey site.

	Large Bird Survey	
	Spring 2007	Fall 2007
No. Individuals	1717.0	10120.0
No. Species	18.0	16.0
Mean No. Species / Survey	7.0	5.8
Mean No. Species / Hour	1.2	1.0
Mean No. Birds / Survey	90.4	337.0
Mean No. Birds / Hour	16.7	57.0

Table 2. Mean bird abundance and percent frequency of occurrence in Sanilac County, MI in a site proposed for the development of wind power. Data were collected in the spring of 2007 at a large bird survey site.

Group	Mean Abundance ^a	% Freq. of Occurrence ^b
Waterbirds	44.6	89.5%
Waterfowl	36.8	100.0%
Raptors	8.2	100.0%

^a Mean Abundance = mean number of individuals observed per survey

^b % Freq. of Occurrence = percent of all surveys where bird group was observed

Table 3. Mean bird abundance and percent frequency of occurrence in Sanilac County, MI in a site proposed for the development of wind power. Data were collected in the fall of 2007 at a large bird survey site.

Group	Mean Abundance ^a	% Freq. of Occurrence ^b
Waterbirds	94.9	86.7%
Waterfowl	202.6	86.7%
Raptors	40.1	100.0%

^a Mean Abundance = mean number of individuals observed per survey

^b % Freq. of Occurrence = percent of all surveys where bird group was observed

Table 4. Raptor abundance and richness in Sanilac County, MI in and around a site proposed for the development of wind power. Data were collected in the spring and fall of 2007 at a large bird survey site.

Species	No. Birds	
	Spring 2007	Fall 2007
American Kestrel	1	1
Broad-winged Hawk	119	1
Cooper's Hawk	15	7
Northern Harrier	9	45
Red-tailed Hawk	111	59
Rough-legged Hawk	2	0
Turkey Vulture	583	1091
Unknown raptor	5	1

Songbird surveys

I completed 1 visit to 8 point counts in the proposed project area on June 30, 2007. Surveys of point count stations detected 323 birds of 28 species (Table 5, Appendix A.). I detected a mean of 40.4 birds per point count visit (mean of 9.9 species / survey; Table 5). The 3 most abundant bird groups per survey were the blackbirds (26.9 birds / survey), followed by sparrows (6.9 birds / survey), and finches/buntings (1.4 birds / survey) (Table 5). Blackbirds and sparrows were present at 100% of the point counts surveys and finches/buntings were present at 75% of the surveys (Tables 6). These species are typically found in more open habitats, such as the agricultural fields and field edges common in this project area. The Bobolink was one of the blackbird species detected in these point counts, typically in alfalfa fields and winter wheat stubble. This species is thought to be declining throughout much of its range due to a loss of grassland habitats. Similarly, I detected a Lincoln's Sparrow which is also thought to be declining due to loss of grassland habitats.

Table 5. Avian abundance and richness in Sanilac County, MI in a site proposed for the development of wind energy. Data were collected at point counts sites in June of 2007.

No. of Birds	
No. of Individuals	323.0
No. Species	28.0
Mean No./ Survey	40.4
Mean No. Species / Survey	9.9

Table 5. Mean bird abundance and percent frequency of occurrence in Sanilac County, MI in a site proposed for the development of wind power. Data were collected in June 2007 at point count sites.

Group	Mean Abundance ^a	% Freq. of Occurrence ^b
Blackbirds	26.9	100.0
Corvids	0.5	25.0
Doves	0.5	25.0
Finches/Buntings	1.4	75.0
Flycatchers	0.3	25.0
Other Passerines	1.9	50.0
Raptors	0.4	25.0
Shorebird	0.1	12.5
Sparrows	6.9	100.0
Thrushes	0.8	62.5
Vireos	0.1	12.5
Warblers	0.5	50.0
Waterbirds	0.1	12.5

^a Mean Abundance = mean number of individuals observed per survey

^b % Freq. of Occurrence = percent of all surveys where bird group was observed

Additional data to be analyzed

Bat detectors were installed according to the protocol (Erickson and Gehring 2007). J. Gruver at WEST, Inc. will be analyzing those data for inclusion in the larger Sanilac County report to BPAE.

Acknowledgments

R. Sting and J. Bobick collected the much of the data for this project. W. Erickson provided leadership and guidance. I would like to express my gratitude to S. Pulich and M. Sakurada (BP Alternative Energy) for their collaboration and funding. My colleagues at the Michigan Natural Features Inventory provide logistical and technical support; especially, Yu Man Lee, Sue Ridge, Nancy Toben, Rebecca Rogers, and Helen Enander.

Literature Cited

- Erickson, W., and J. Gehring. 2007. Protocol for the Wildlife Baseline Study for the Sanilac County Michigan Wind Power Project (Draft). Research proposal submitted to BP Alternative Energy.
- Johnson G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd and D. A. Shepherd. 2000. Avian Monitoring Studies At The Buffalo Ridge, Minnesota Windresource Area: Results Of A 4-Year Study. Technical report prepared for Northern States Power Company, 414 Nicollet Mall, 8th Floor Minneapolis, Minnesota 55401.
- Reynolds, R.T., J.M. Scott, and R.A. Nussbuam. 1980. A variable circular-plot methods for estimating bird numbers. *Condor* 82:309-313.



Figure 1. Wildlife surveys were conducted in Sanilac County, Michigan, in a site proposed for wind energy development (outlined in blue). Forest cover demarked in purple.

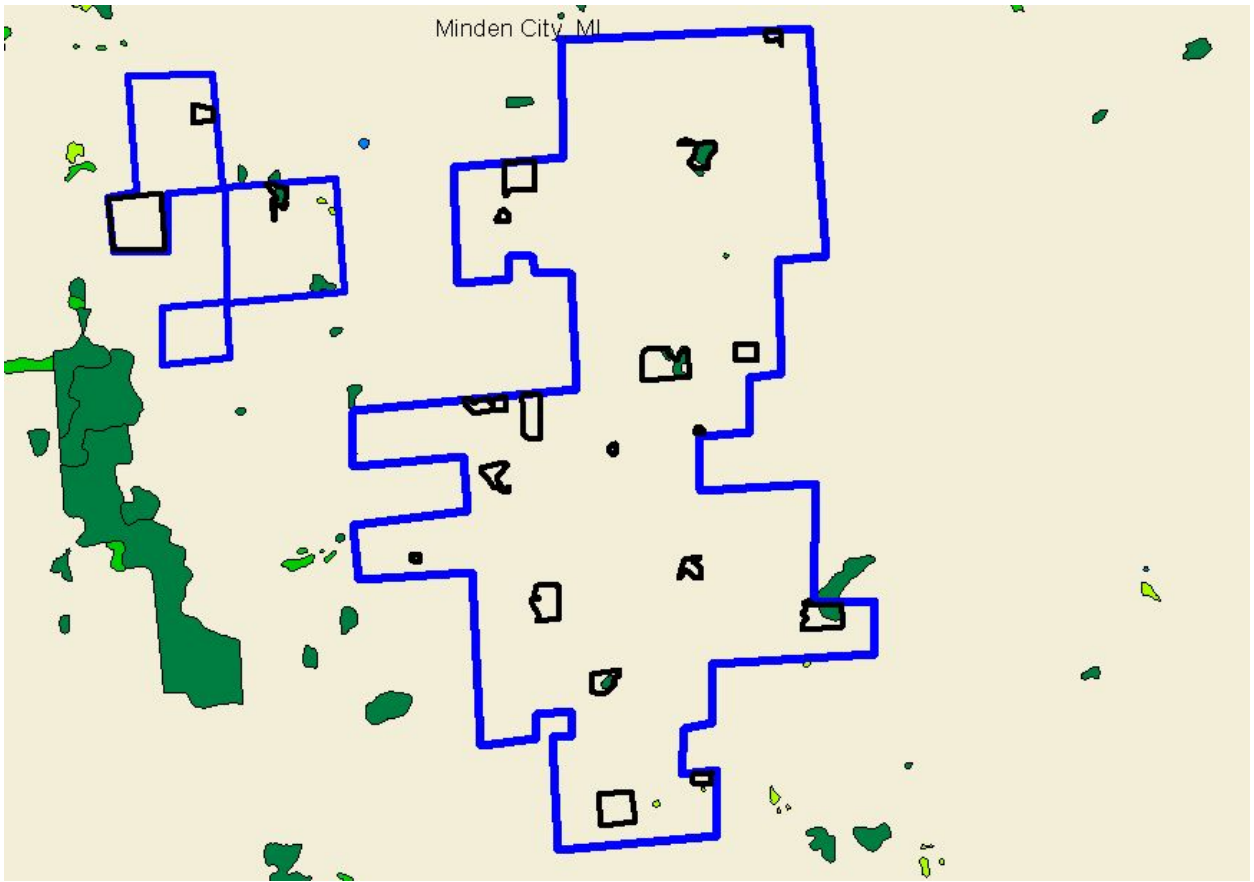


Figure 2. Wildlife surveys were conducted in Sanilac County, Michigan, in a site proposed for wind energy development (outlined in blue). National Wetlands Inventory database wetlands are in green polygons. Forest cover is outlined in black.



Figure 3. Large bird surveys were conducted in Sanilac County, Michigan, near a site proposed for wind energy development (pink dot) during the months of April, May, September, and October 2007. Songbird point counts were conducted in June 2007 throughout the proposed project area (orange dots).



Figure 4. We conducted large bird surveys for proposed for wind energy development in Sanilac County, Michigan. The open area near a Meteorological monitoring tower provided the best possible view shed of the project area. The site was surveyed in April and May 2007 and September and October 2007.

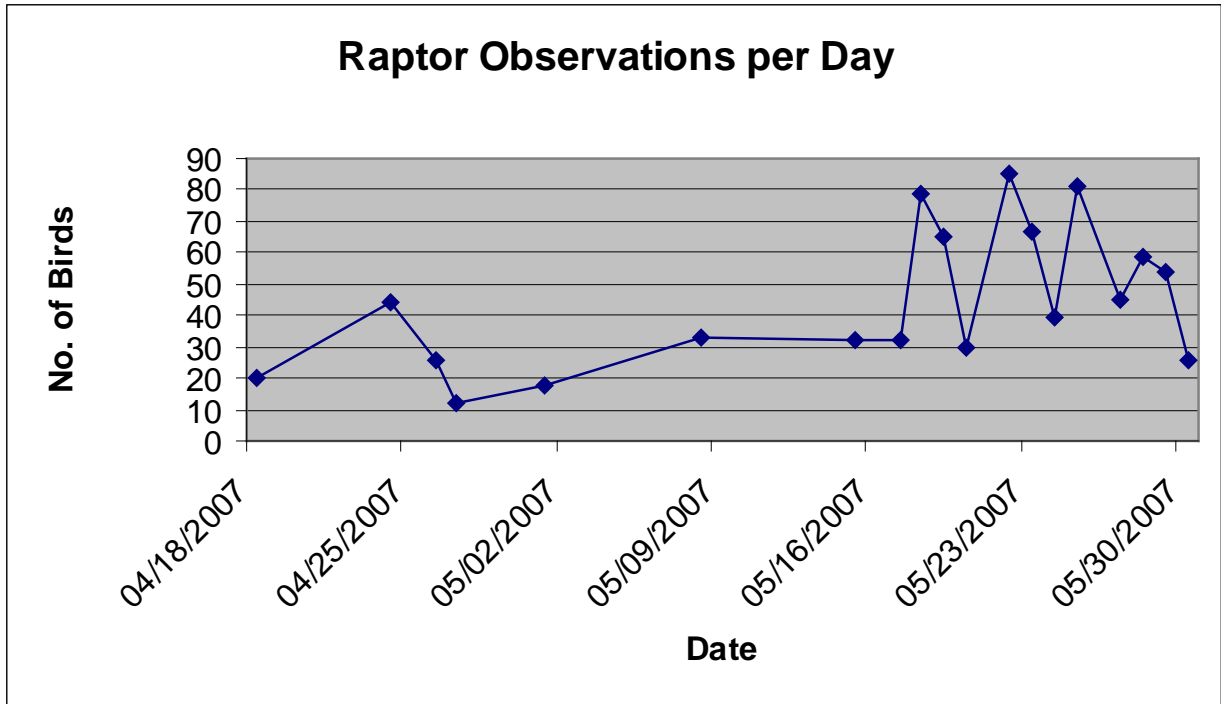


Figure 5. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of raptors observed were quantified by survey day. Surveys were conducted in April and May 2007.

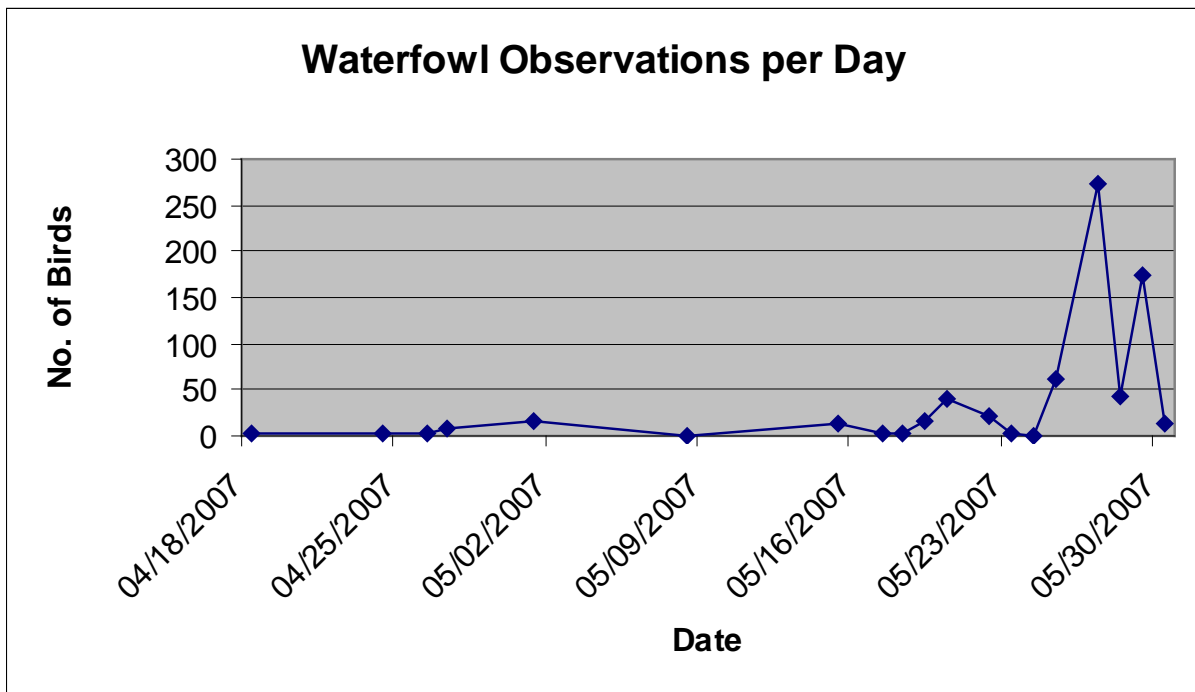


Figure 6. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of waterfowl observed were quantified by survey day. Surveys were conducted in April and May 2007.

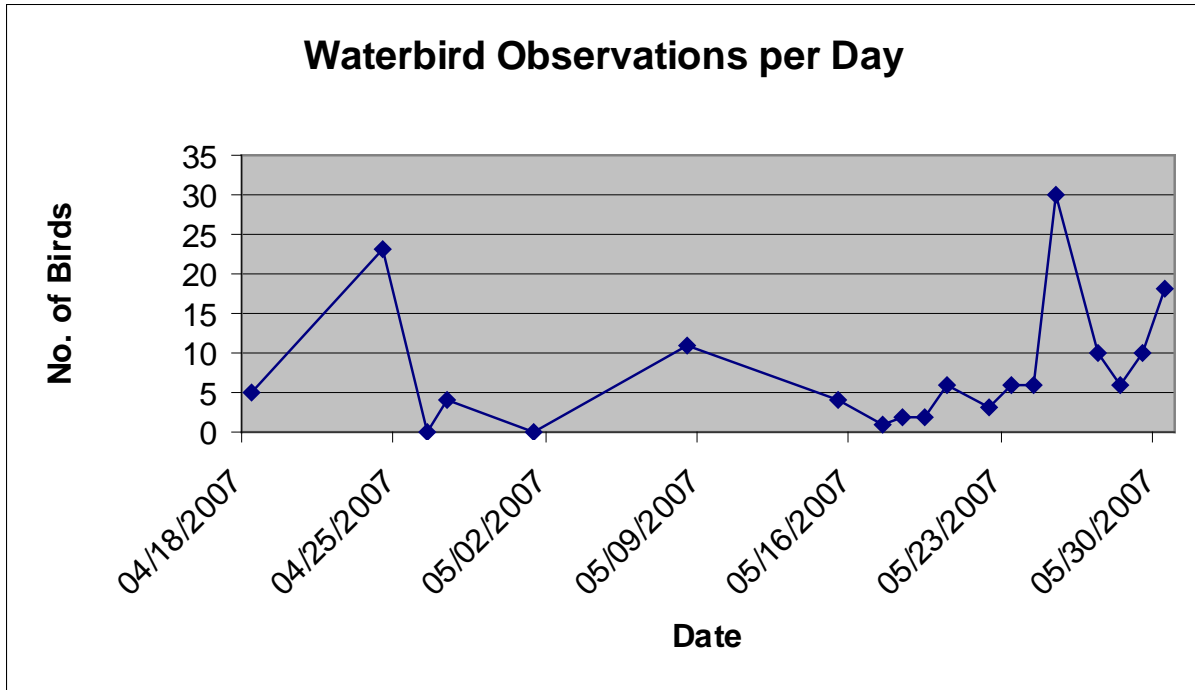


Figure 7. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of waterbirds observed were quantified by survey day. Surveys were conducted in April and May 2007.

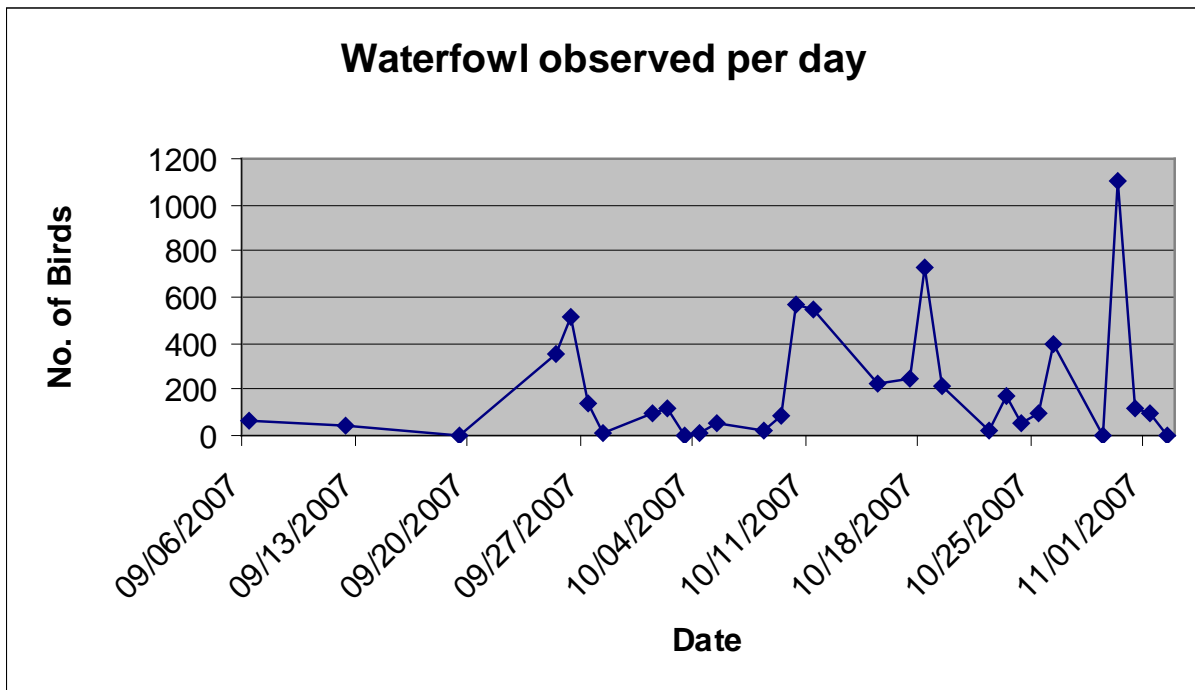


Figure 8. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of waterfowl observed were quantified by survey day. Surveys were conducted in September and October 2007.

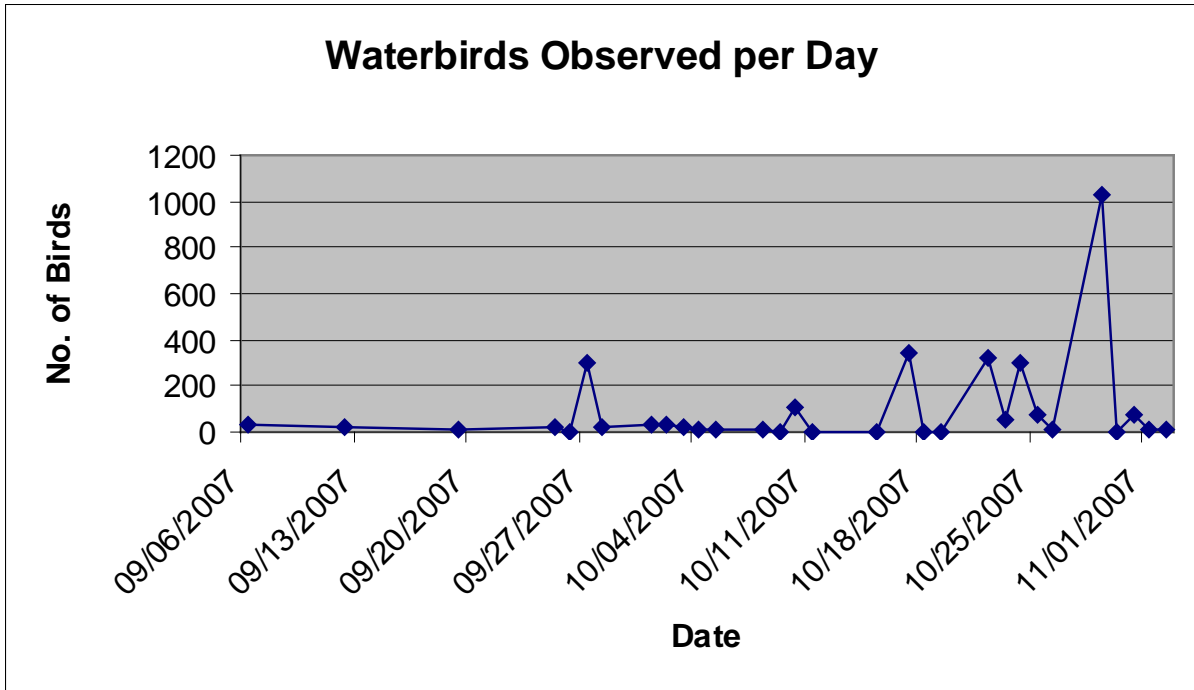


Figure 9. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of waterbirds observed were quantified by survey day. Surveys were conducted in September and October 2007.

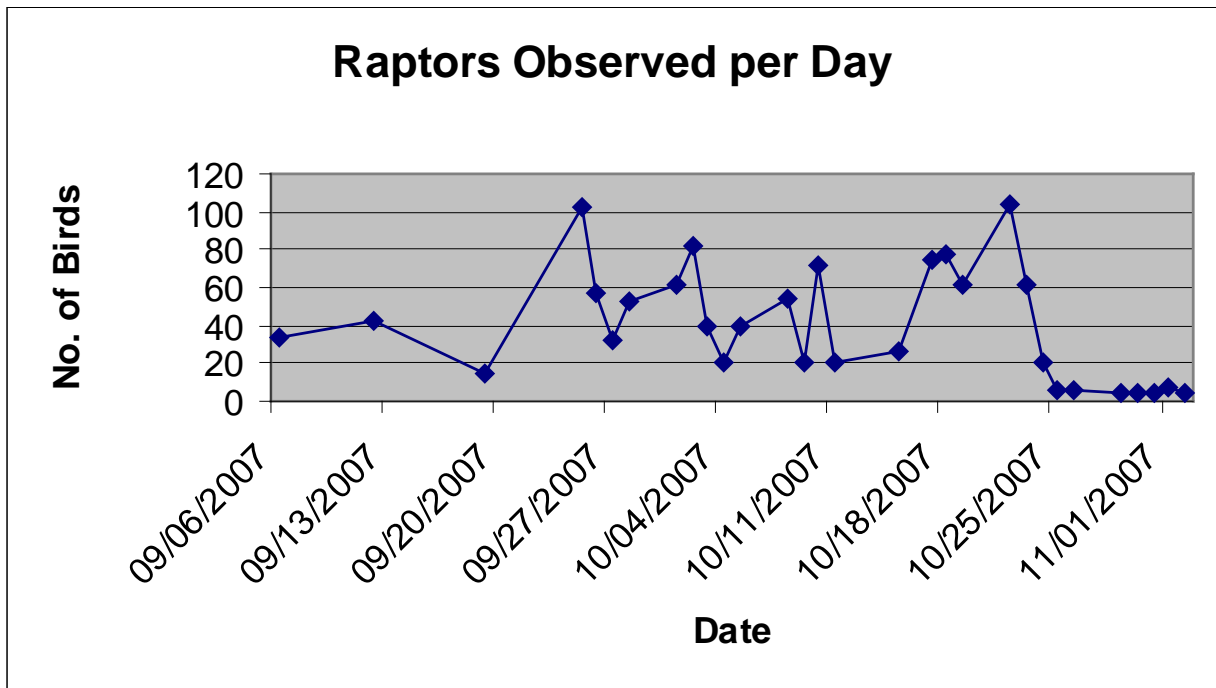


Figure 10. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of raptors observed were quantified by survey day. Surveys were conducted in September and October 2007.

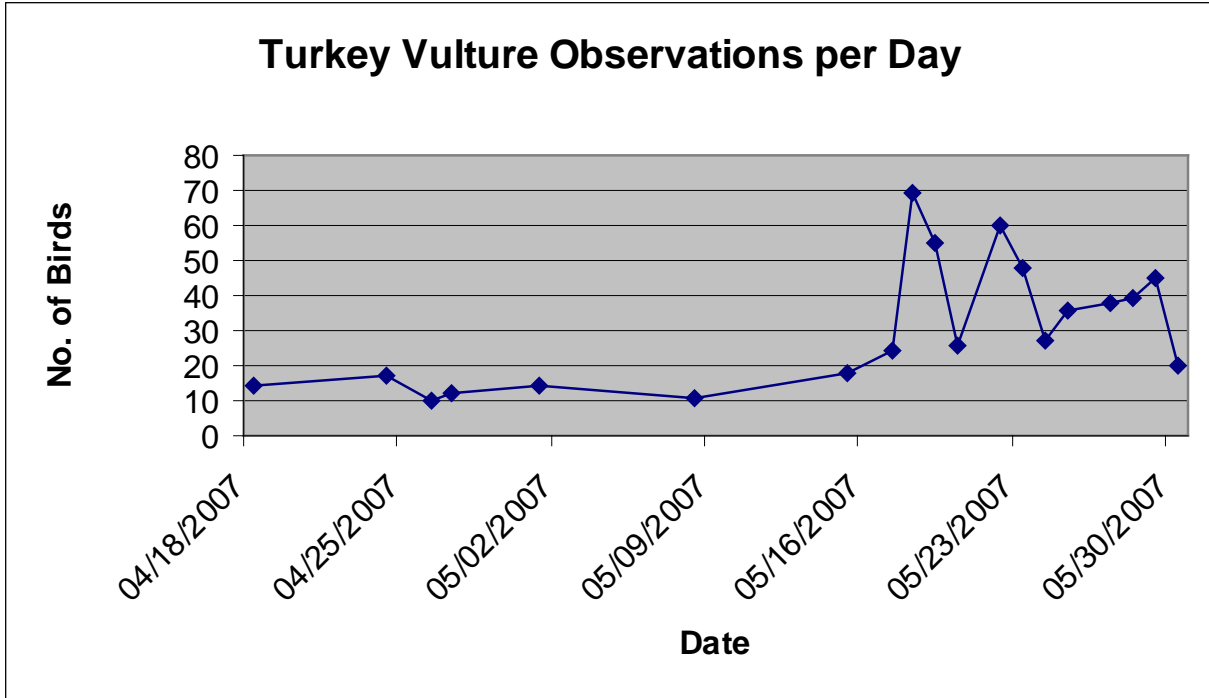


Figure 11. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of Turkey Vultures observed were quantified by survey day. Surveys were conducted in April and May 2007.

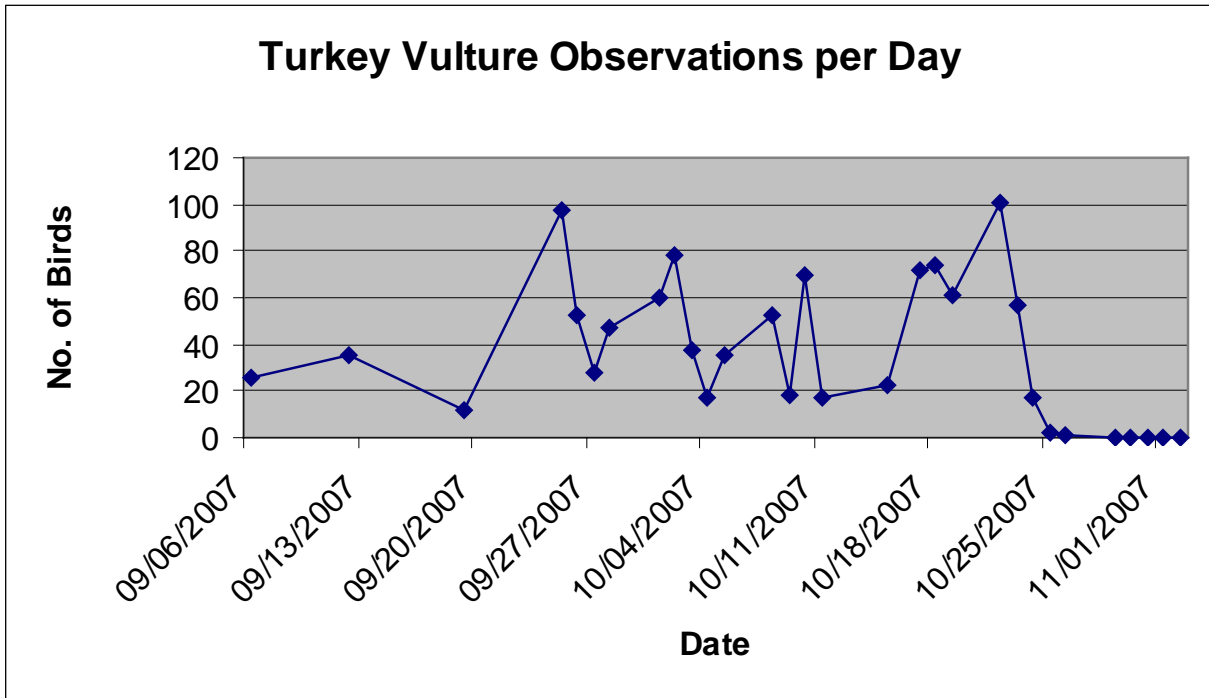


Figure 12. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of Turkey Vultures observed were quantified by survey day. Surveys were conducted in September and October 2007.

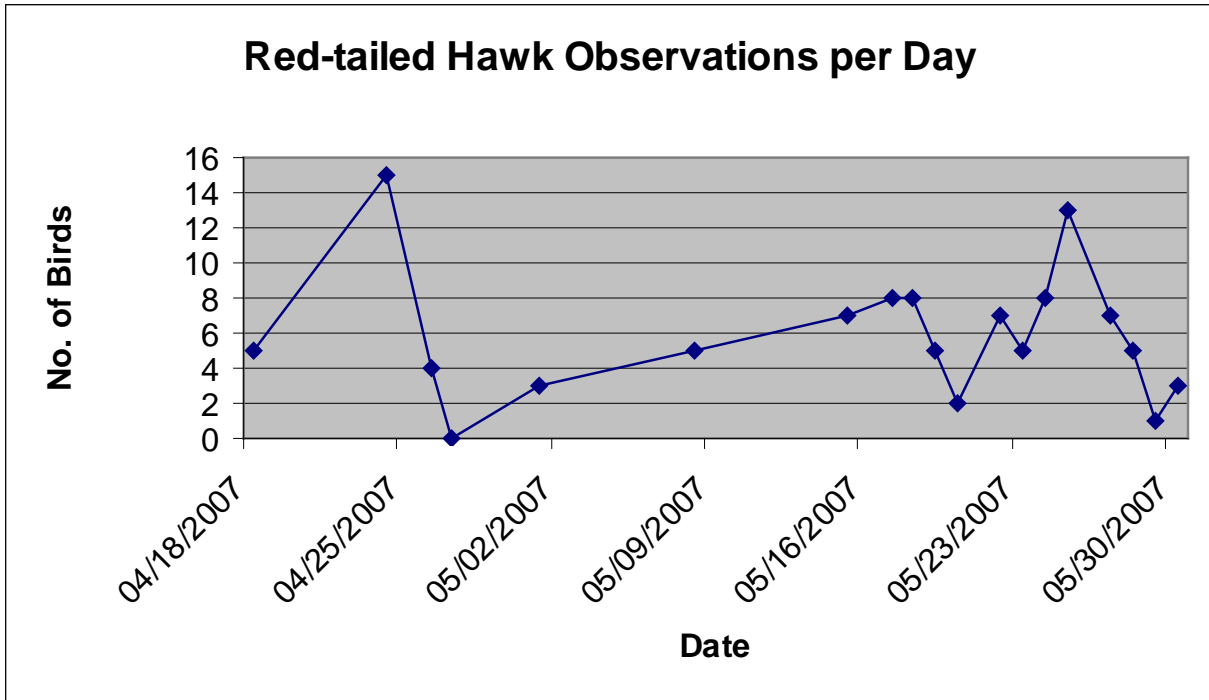


Figure 13. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of Red-tailed Hawks observed were quantified by survey day. Surveys were conducted in April and May 2007.

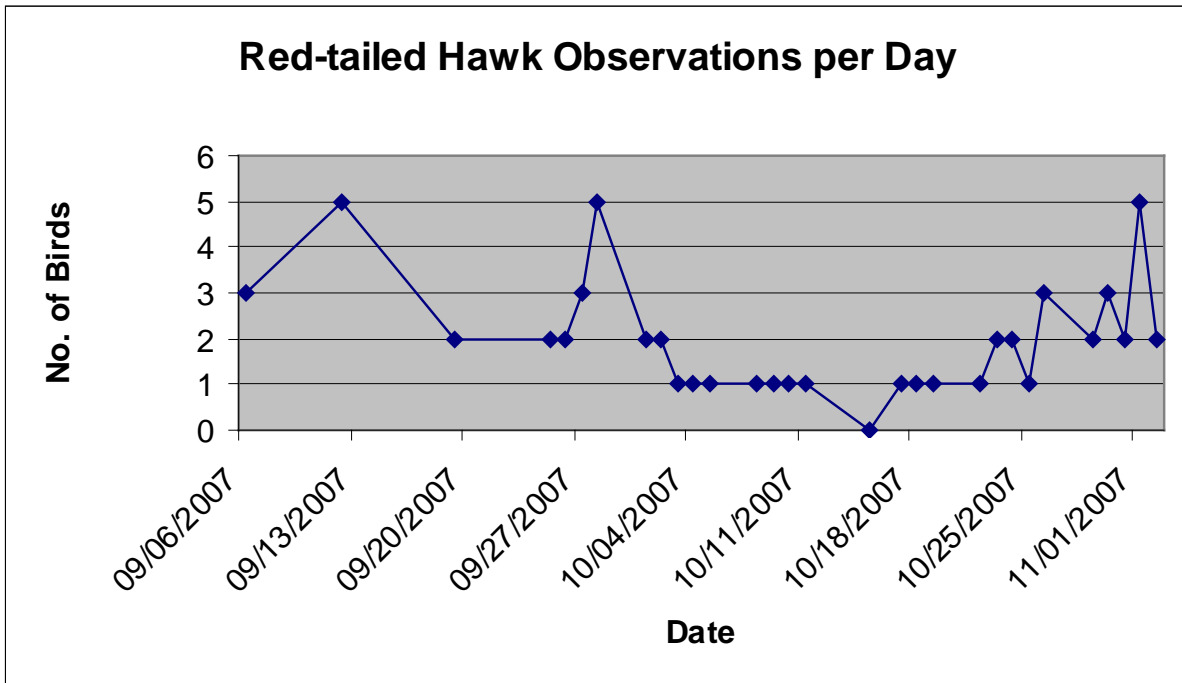


Figure 14. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of Red-tailed Hawks observed were quantified by survey day. Surveys were conducted in September and October 2007.

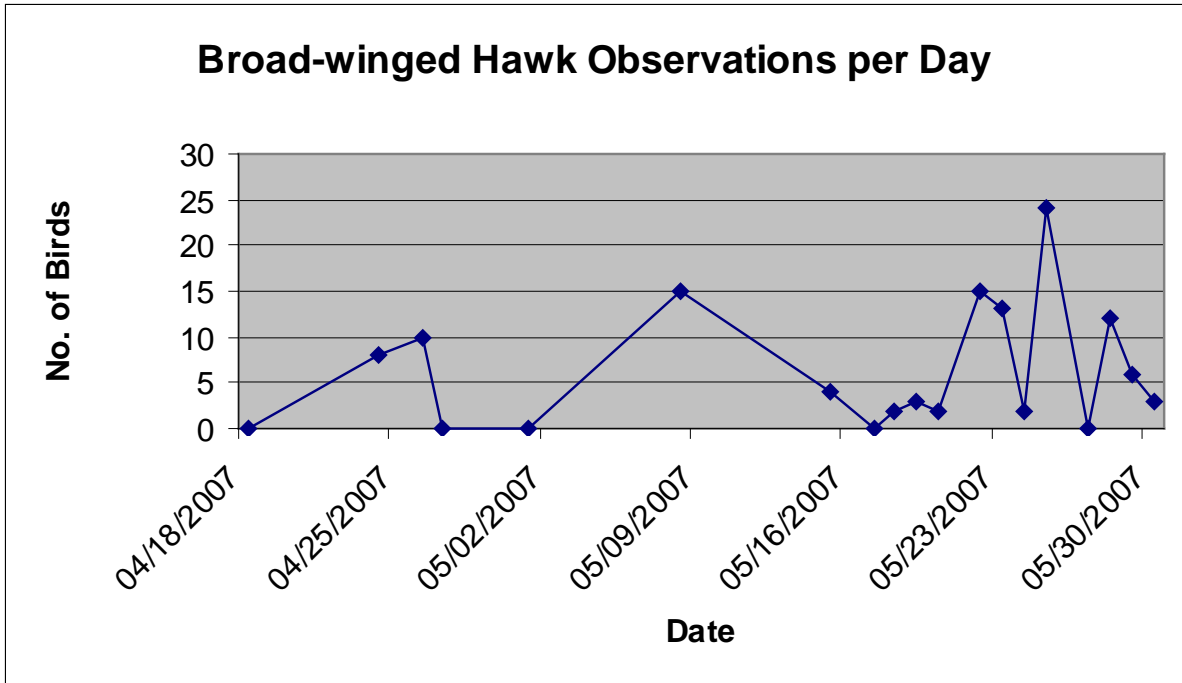


Figure 15. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of Broad-winged Hawks observed were quantified by survey day. Surveys were conducted in April and May 2007.

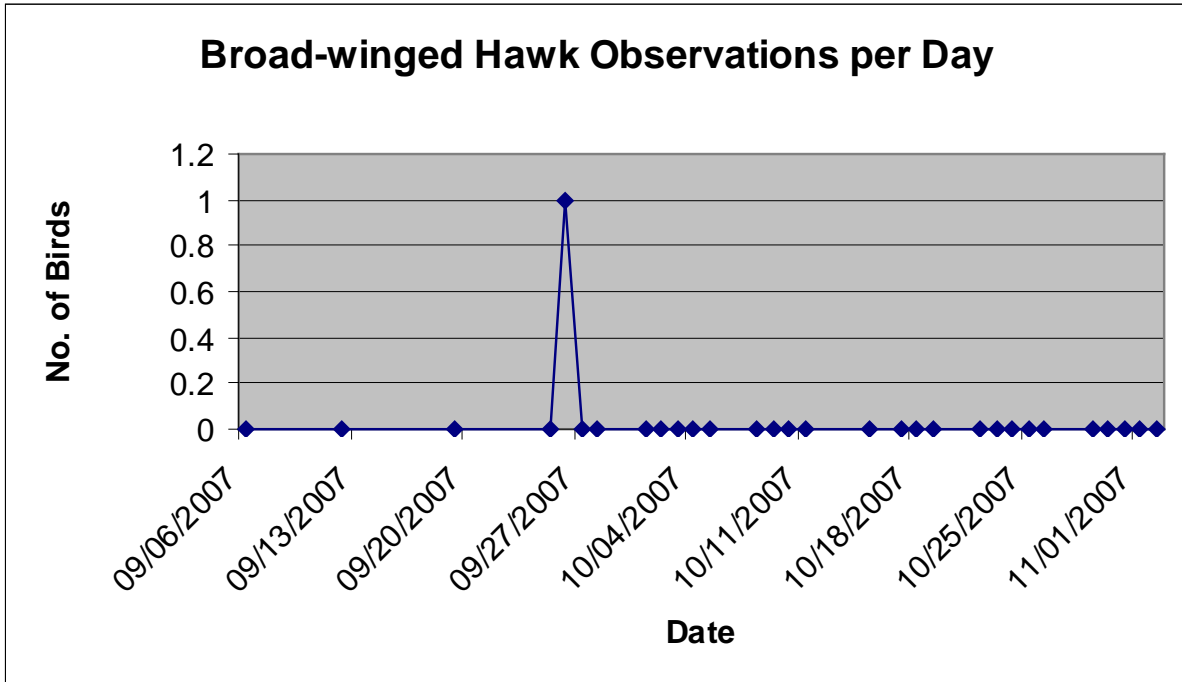


Figure 16. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of Broad-winged Hawks observed were quantified by survey day. Surveys were conducted in September and October 2007.

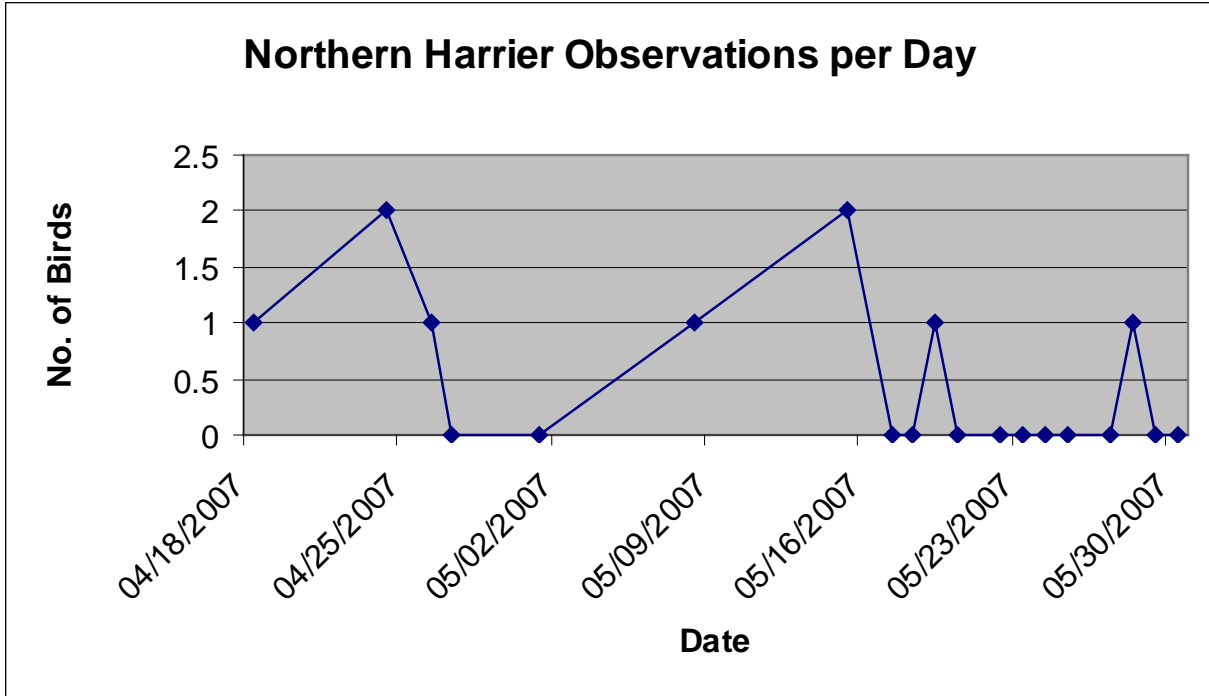


Figure 17. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of Northern Harriers observed were quantified by survey day. Surveys were conducted in April and May 2007.

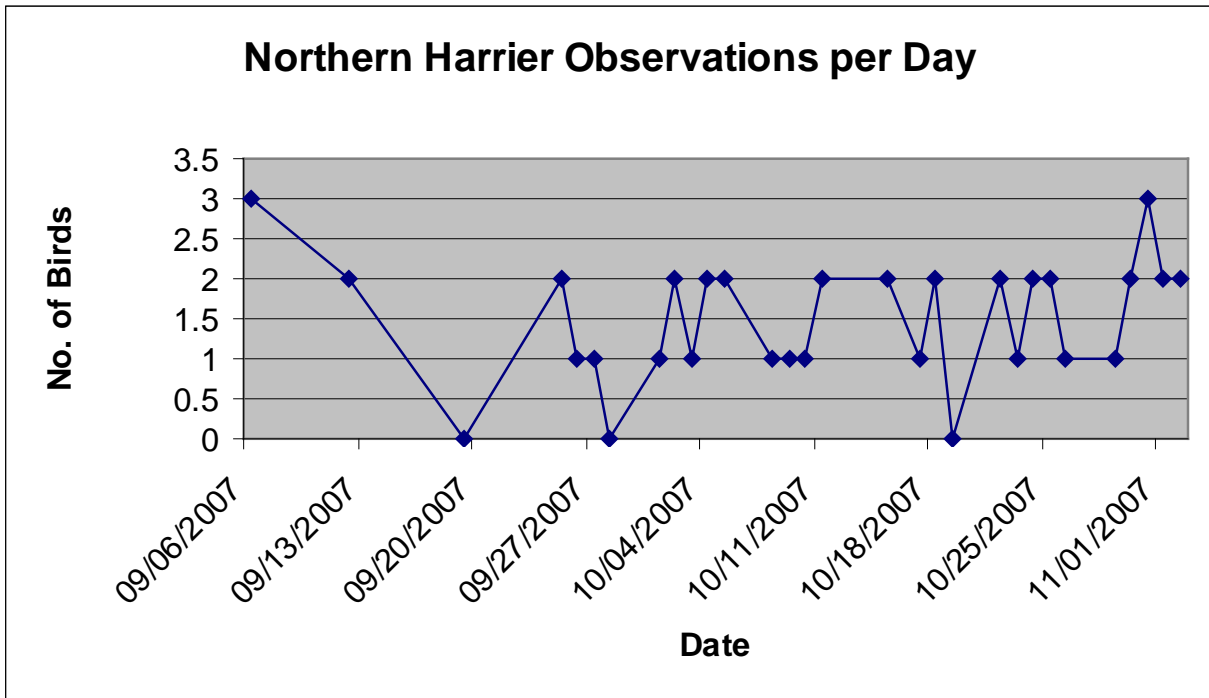


Figure 18. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of Northern Harriers observed were quantified by survey day. Surveys were conducted in September and October 2007.

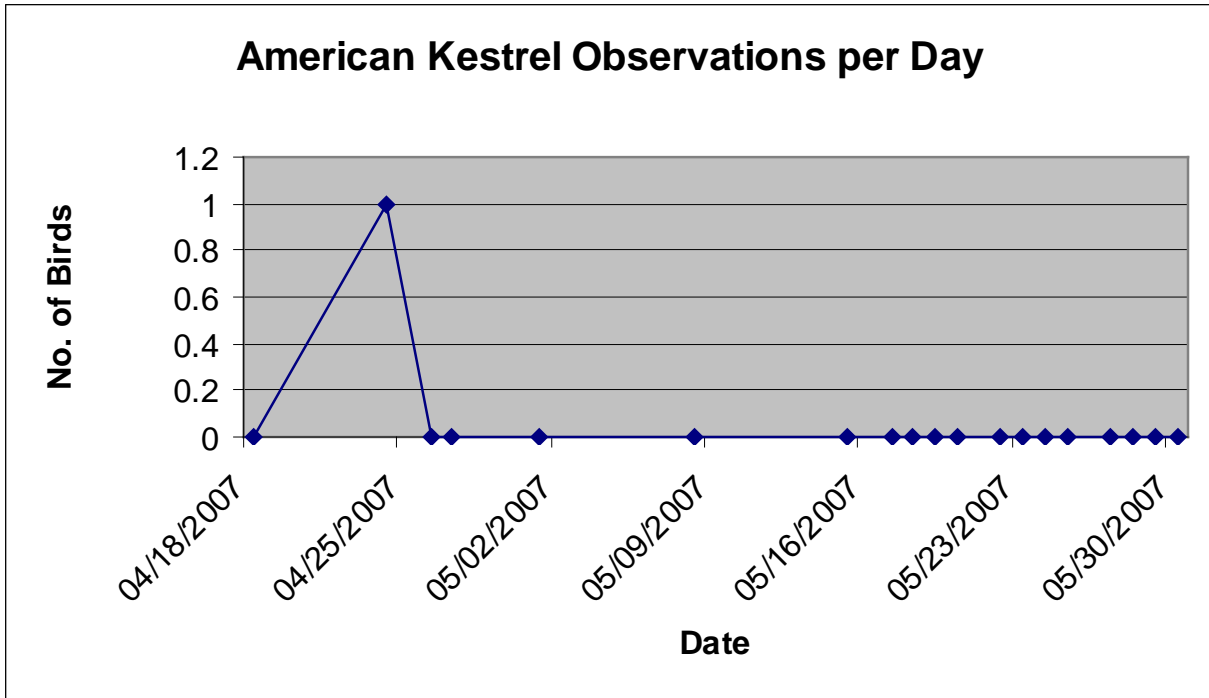


Figure 19. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of American Kestrels observed were quantified by survey day. Surveys were conducted in April and May 2007.

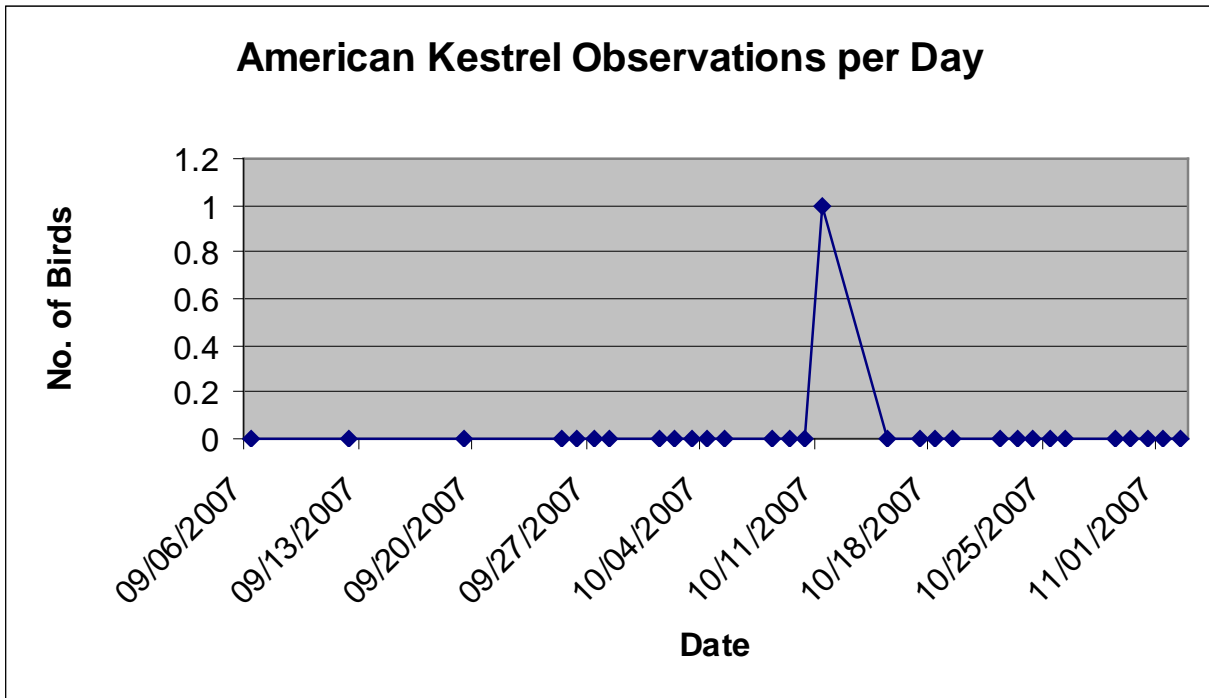


Figure 20. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of American Kestrels observed were quantified by survey day. Surveys were conducted in September and October 2007.

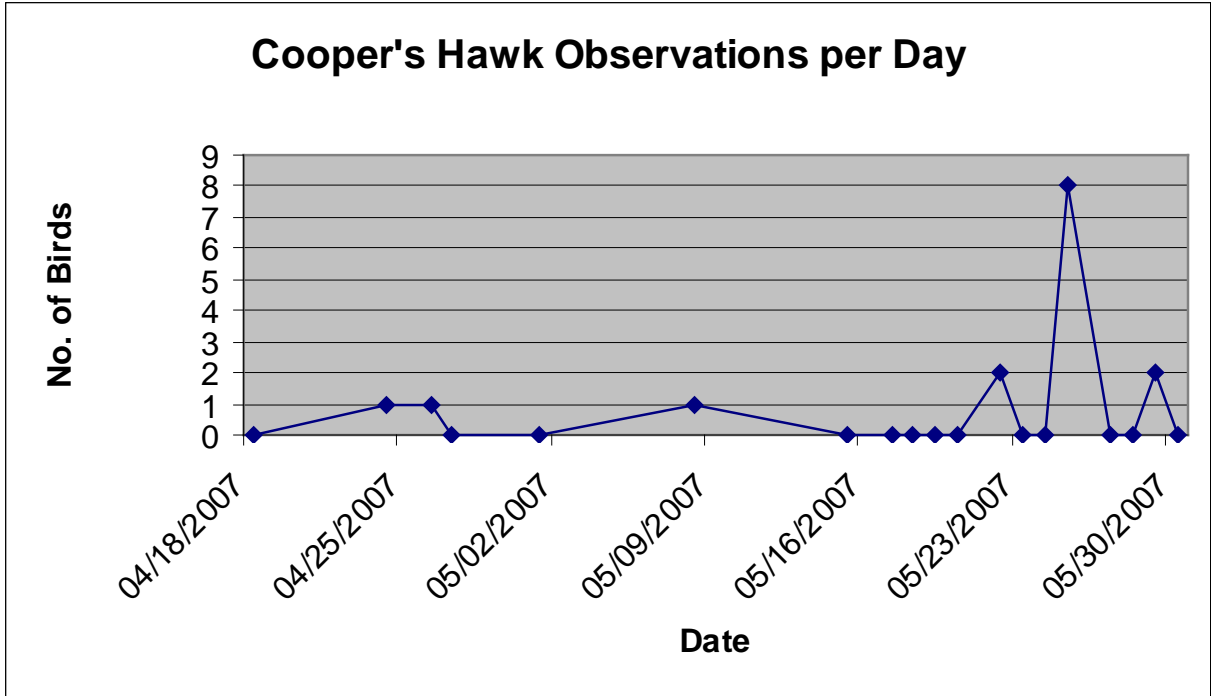


Figure 21. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of Cooper's Hawks observed were quantified by survey day. Surveys were conducted in April and May 2007.

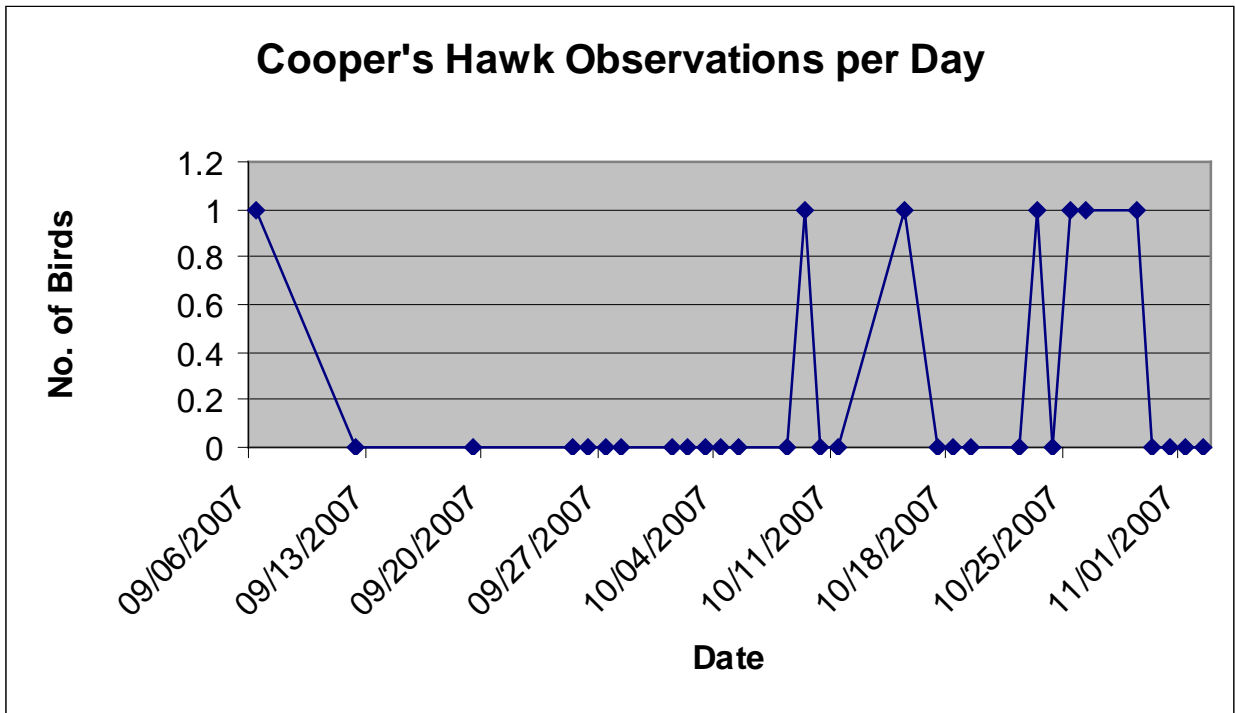


Figure 22. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of Cooper's Hawks observed were quantified by survey day. Surveys were conducted in September and October 2007.

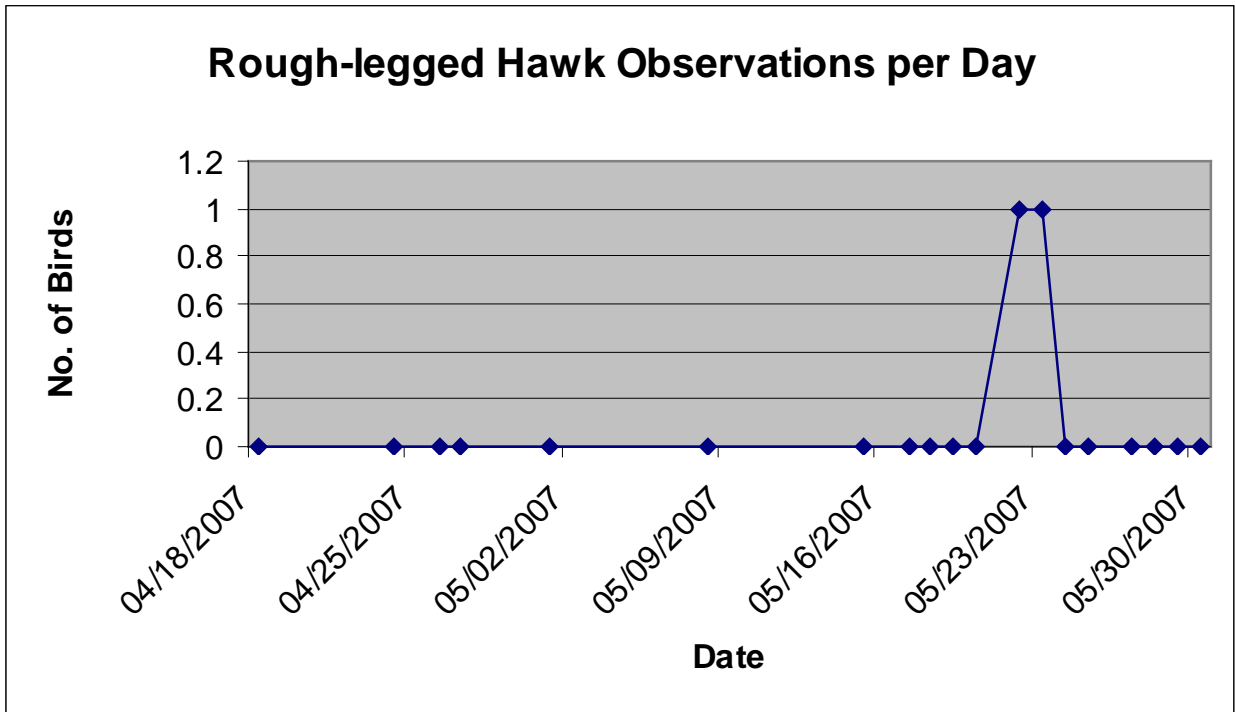


Figure 23. Large bird surveys were conducted in Sanilac County, Michigan and the numbers of Rough-legged Hawks observed were quantified by survey day. Surveys were conducted in April and May 2007.

Appendix A. List of bird species observed during bird surveys conducted in Sanilac County, Michigan, in a site proposed for wind energy development. These sites were surveyed in June 2007 for bird use.

Species^a

Turkey Vulture
Sandhill Crane
Killdeer
Mourning Dove
Eastern Wood Pewee
Great-crested Flycatcher
Barn Swallow
Blue Jay
American Crow
House Wren
Gray Catbird
American Robin
Eastern Bluebird
Cedar Waxwing
European Starling
Red-eyed Vireo
Common Yellowthroat
Bobolink
Red-winged Blackbird
Common Grackle
Brown-headed Cowbird
Eastern Meadowlark
American Goldfinch
Chipping Sparrow
Song Sparrow
Savannah Sparrow
Lincoln's Sparrow
House Sparrow

^a names of birds follow the *AOU Check-list of North American Birds*