

4.0 Discussion

4.1 Nocturnal Marine Radar Survey

The nocturnal radar study was designed to collect data that could be used to characterize nocturnal migration over the project area and also be used in a larger statewide comparison of results from numerous sites (M. Woythal, NYSDEC, pers. comm.). In the analysis, the radar data were not corrected for differences in detectability with distance from the radar unit or due to ground clutter on the radar screen. Also, the 2-dimensional area represented by the radar image was treated as a 1-dimensional 3-km “front” perpendicular to the direction of migration, and all targets counted in the radar image during the sampling period were treated as if they had crossed the front. Thus, passage rate estimates should be considered a sample or index of the actual number of targets passing through the area.

Measurements from radar studies potentially are highly variable due to a number of factors including observer bias and the radar settings affecting target detection. To minimize these biases, efforts were made to standardize data collection and radar settings as much as possible. For example, the radar was operated under the shortest pulse length setting with the gain control turned up to near the highest setting. While short wave-length and high gain insure detection of small targets, these settings also have the effect of producing atmospheric or background noise on the screen which consequently can obscure small targets. To “clean up” the screen the anti-sea clutter [which minimizes clutter and noise close to the radar] was slowly turned up to the point where background noise was dispersed and limited primarily to the outer edge of the screen. The anti-rain clutter [which reduces interference from small targets throughout the survey area (e.g., rain drops)] was kept at the lowest setting so that no small targets would be eliminated. These settings insure that small targets such as individual passerines can be detected by the radar. Also during sampling, specific functions or capabilities of the radar were used to determine data values to minimize observer bias. For example, the electronic bearing line and variable range marker used in offset mode allowed the compass bearing of a target trail and the speed at which the target was moving to be measured by the radar as opposed to estimated by the observer or measured with a hand held scale.

Results from the nocturnal radar study conducted at the St. Lawrence Windpower project area differ in some aspects from other sites studied in New York and the eastern U.S. (Table 7). Mean passage rates for fall 2006 were higher (346 t/km/hr) than the average for NY and the eastern U.S. (262 t/km/hr); however, these results are not the highest passage rates reported at other New York sites. Similar passage rates were observed at a proposed site in Jordanville, New York, located in central New York. Mean flight direction for the St. Lawrence Windpower study was 209°, slightly more southwesterly than other studies conducted during fall migration. This prevailing direction may be related more to the shape of the shoreline located within 1.5 km of the radar station than with flight direction over the entire project area (see Figure 3). Mean flight height of targets was approximately 490.4 m, which is similar to other studies in NY and the eastern U.S. The highest percentage of targets occurred above the zone of risk from turbine blades. The percent of targets (7.7%) which flew through the zone of risk, defined as below 125 m, was similar to other studies where flight height was recorded with vertical mode radar.

Given the nature of avian migration in New York and along the Great Lakes shorelines, passage rates are expected to be slightly higher at the St. Lawrence Windpower project area in spring than in the fall. A radar study conducted near the Lake Erie shoreline in New York (Chautauqua) reported passage rates approximately 1.5 times higher in spring than in fall (Table 7). Additionally, passage rates at the St. Lawrence Windpower project area may be influenced locally by the close proximity of the radar unit to the shoreline (<1.5 km). Though this distance was recommended by NYSDEC and USFWS, passage rates may be lower further inland where actual turbine construction is proposed. Despite higher than average passage rates near the shoreline, collision risk to migrants within the project area is expected to be low given the average flight height and proportion of targets passing within the zone of risk.

Table 7. Results of radar studies at proposed and existing wind project sites in the U.S.

Site	Passage Rates (t/km/hr)		Mean Flight Height (m)		% Targets below 125 m		Mean Flight Direction	
	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr
St. Lawrence Windpower, NY (this report)	346		490		7.7		209.2	
Dairy Hills, Wyoming Co., NY (Young et al. 2006)	170	234	466	397	10	15	180	14
Flat Rock, NY (Mabee et al. 2005)	158		415		8		184	
Chautauqua, NY (Cooper et al. 2004a,b)	238	395	532	528	5	4	199	29
Prattsburgh (1), NY (Mabee et al. 2004, 2005)	200	170	365	319	9	18	177	18
Clinton County, NY (Mabee et al. 2006)	197	110	333	338	12	20	162	30
Marble River, NY (Woodlot Alternatives 2006a,b)	152	254	438	422	5	11	193	40
Jordanville, NY (Woodlot Alternatives 2005a, b)	380	409	440	371	6	21	208	40
Prattsburgh (2), NY (B. Roy, pers. comm. 2006)	193	277	516	370	3	16	188	22
West Hill, NY (Woodlot Alternatives 2005)	732	160	664	291	3	25	223	31
High Sheldon, NY (Woodlot Alternatives 2005)	197	112	422	418	3	6	213	29
Fairfield Top Notch, NY (B. Gary, NYDEC, pers. comm.)	691	509	516	419	4	20	198	44
Searsburg, VT (Roy and Pelletier 2005a, 2005b)	178	404	556	523	4	6	203	69
Sheffield, VT (Roy et al. 2005)	109	199	564	522	1	6	200	40
Martindale, PA (Plissner et al. 2005)	187		436		8		188	
Casselman, PA (Plissner et al. 2005)	174		448		7		219	
Mount Storm, WV (Young et al. 2004)	199		410		16		184	
Mean	262	269	470	410	6.5	14	195	34

Note: Some values are approximations based on the limited information provided in the report or averaged over more than one sampling location (e.g., Flat Rock, Mount Storm).

4.2 Raptor Migration Surveys

Typical raptor species for central New York were observed during the surveys (Table 8). Bald eagle, a federally-listed species, was observed once during the fall surveys. This individual was recorded flying above 125 m and outside of the zone of risk from turbine blades. Several northern harrier, a state threatened species, were recorded within the project area during spring and fall migration. Northern harrier are, in general, low-level fliers and all individuals recorded during the surveys were flying below the zone of risk. Two New York species of special concern, Cooper's hawk and sharp-shinned hawk, were also observed during surveys.

Based on a standardization of raptors observed per survey hour, the St. Lawrence Windpower project area has less traffic during spring migration than the known hawk watch sites in New York. The nearest spring hawk watch site to the project area, Derby Hill Bird Observatory, was somewhat variable over the same survey days; however, the overall mean number of raptors observed per surveyor hour was greater (Table 8). Large numbers of broad-winged hawks were observed at Derby Hill on 4/21/06; however, surveys within the St. Lawrence Windpower project area failed to record high numbers of this species passing over the site. Passage rates at the St. Lawrence Windpower project area for spring migration are based on four surveys in April and May. Derby Hill Bird Observatory recorded pulses of turkey vulture, red-tailed hawk, and red-shouldered hawk during the last two weeks of March 2006. Higher numbers of sharp-shinned hawk, Cooper's hawk, bald eagle, and golden eagle were also observed in the six weeks prior to April 14. It was also recommended by NYSDEC to conduct Spring surveys in March to look for bald and golden eagles. The spring raptor migration surveys will be continued in 2007 to include the earlier part of the spring season (March).

There are no fall hawk watch sites along the lake shoreline in central New York. The nearest fall site, Kestrel Haven located in south central New York, was generally lower than the St. Lawrence Windpower project area in terms of raptors counted per surveyor hour; however, count data for this site is only available for 2005 so a direct comparison of actual survey days could not be made. Fall hawk watch sites further south and east, such as Franklin Mountain, record similar numbers of migrant raptors, which are likely taking advantage of ridgelines of the western Appalachian Mountains; however timing is different among the sites. Higher numbers of raptors per surveyor hour were seen earlier in the fall season at the St. Lawrence Windpower project area than at more southern sites. This may be a reflection of the more northern latitude of the site or summer residents, such as red-tailed hawk, turkey vulture, and northern harrier, still in the area.

Table 8. Number of raptors observed per surveyor hour in the project area and at six established New York spring/fall hawk watch sites in 2006.

Spring 2006	St. Lawrence Windpower	Ripley Hawk	Hamburg	Derby Hill
4/14/06	11	29	1	20
4/21/06	13	47	49	344
5/02/06	2	16	2	6
5/12/06	4	25	1	45
Average	7.5	29.25	13.25	103.75
Fall 2006	St. Lawrence Windpower	Franklin Mt.	Mohonk Preserve	Mount Peter
9/23/06	15	1	no survey	1
9/30/06	20	3	2	5
10/07/06	17	10	no survey	3
10/13/06	10	3	11	7
10/20/06	3	no survey	no survey	no survey
10/27/06	7	20	11	5
10/30/06	6	15	16	10
11/05/06	6	1	no survey	1
11/07/06	8	0	no survey	2
11/11/06	4	2	no survey	no survey
Average	9.6	9	10	3.4

Daily count data acquired from HMANA 2006.

Exposure indices are a common method for estimating risk to individual species from wind turbines. During both migratory seasons, non-raptor species had the highest exposure index due to high use of the area by waterfowl and waterbirds, such as Canada goose and gull species (Table 2). At the St. Lawrence Windpower project area, raptors in general did not have high exposure indices due to either low numbers recorded or flight heights outside of the zone of risk. Turkey vulture had the highest exposure index; they were commonly observed and were most often observed flying in the zone of risk. While these species have been recorded as fatalities at other monitored wind plants, the number of fatalities are relatively small (see Erickson et al. 2001, 2002). Red-tailed hawk was seen less frequently but was often seen flying in the zone of risk. In contrast, northern harrier were often recorded, particularly during fall migration, but rarely observed flying into the zone of risk and has rarely been recorded as fatalities at other monitored wind facilities (see Erickson et al. 2001, 2002).

4.3 Breeding Bird Survey

The results of the breeding bird surveys were typical of agricultural settings in central New York. Frequently recorded species included European starling, bobolink, and red-winged blackbird. A few woodland species, such as wood thrush and ovenbird, were observed in small wooded areas and wetlands scattered throughout the project area. Several species of gulls and waterfowl are also present in the area due to proximity to the shoreline. The closest breeding bird survey (Watertown; Sauer 2005) reported similar species occurrences and abundances. Four species listed by the NYSDEC were observed within the St. Lawrence Windpower project area: northern harrier, horned lark, grasshopper sparrow, and vesper sparrow. Northern harrier is listed as NY

state threatened. The remaining three species are listed as Special Concern species for New York (NYSDEC 2003). Bobolink, a commonly occurring species within the project area (Table 3) and wood thrush are included on the 2002 Birds of Conservation Concern list for Lower Great Lakes/St. Lawrence Plain region (USFWS 2002) in which the Cape Vincent project area occurs. Henslow's sparrow, a NY state threatened species, was recorded during breeding bird surveys conducted on an adjacent project area; however, this species was not seen during counts within the St. Lawrence Windpower project area though habitat for this species exists.

Based on the breeding bird survey data collected in 2006, the St. Lawrence Windpower project area does not appear to have any large or unusual populations of breeding resident birds. Mortality results from two other eastern wind plants studied indicate that turbines on eastern mountain ridgelines result in between 4 and 8 bird fatalities per turbine per year (see Kerns and Kerlinger 2004 and Nicholson 2002, 2003). In both these studies it was estimated that approximately two-thirds of the avian fatalities were migrants. Provided impacts at the St. Lawrence Windpower project area are similar, it is not expected that breeding resident birds are at great risk from the wind project. Due to the diversity of birds recorded in the mixed farmland habitat, impacts are expected to be spread over several commonly observed species. Potential impacts to breeding habitat of sensitive species will be estimated based on a proposed turbine layout mapped on habitat (vegetation types) for the project area. Results from sensitive species surveys, mapping of potential habitat for sensitive species, and anticipated turbine layout will be included in the final report prepared after spring surveys in 2007.

4.4 Nocturnal AnaBat Surveys

Passage Rates

To date monitoring studies of wind projects have shown a few common trends in bat mortality. Risk to bats from turbines appears to be unequal across species and seasons where increased mortality occurs during the post breeding or fall migration season (roughly mid-July through September) among migrant bats species (see Johnson 2005). Some studies have shown apparent low risk from turbines to resident bat populations (Johnson et al. 2003) while others have shown that mortality is not correlated with AnaBat call rates (Nicholson 2002, 2003). The post-construction mortality data collected at existing regional projects appears to be the best available predictor of mortality levels and species composition for proposed wind projects.

The number of bats detected per night at the project met tower was highest in the spring (19.7 calls/night) and summer (22.0 calls/night). These results contrast with results of mortality studies of bats at wind projects in the U.S., which have shown a peak in mortality in August and September (see Johnson 2005). While the survey efforts varied among the different studies, the studies that included AnaBat surveys and fatality surveys showed a general association between the timing of bat calls and timing of mortality, with both peak call rates and peak mortality occurring during the fall. Lower bat activity was recorded at the project met tower during fall migration (9.26 calls/night) than other times during the year. Bat activity collected at the project met tower may suggest lower mortality rates for bats at the St. Lawrence Windpower project.

Bat activity captured at non-met locations during migration seasons and summer was significantly higher than that recorded at the met tower. Activity at the non-met sampling locations range from 29–33 calls/night during migration seasons to 56 calls/night during summer breeding season. Consistent differences in bat activity between met and non-met locations is

likely due largely to habitat at the sampling locations. Acoustic sampling at the met tower, located in an open pasture and a location recommended by federal and state agencies, should be more reflective of bat activity in areas where turbines will be constructed. The differences between the met tower station and non-met stations are likely due to the relative abundance of bats occurring in pastures versus more diverse habitat such as edge or woodlots. Ultimately, predicted risk to migratory and breeding bats using acoustic monitoring appears to be limited based on previous studies at other wind sites where there have been conflicting results.

Species Identification

While interspecific variation in echolocation call structure exists among the *Myotis* species, significant variation can exist intraspecifically among individuals and populations (Broders et al. 2004). Plasticity among calls of an individual based on a number of factors (e.g., habitat, presence of conspecifics, etc.) can further confound species identification (Barclay and Brigham 2004). Given the similarity of *Myotis* species, both morphologically and acoustically, these species are generally acknowledged as being among the more difficult to identify. To determine presence of a federally endangered *Myotis* species, Indiana bat (*Myotis sodalis*), within the St. Lawrence Windpower project area, all call files with signatures resembling *Myotis* species were submitted for quantitative analysis to NYSDEC-recommended bat biologist, Eric Britzke. A total of 208 call files were analyzed using a classification model based on discriminant function analysis (DFA) that utilizes 10 quantitative measures of individual call sequences. As is typical of AnaBat call analysis, the majority of the calls (n=76) were still unable to be categorized to species using the procedure. Of those calls with adequate signatures, 22 had call parameters similar to eastern red bat, 50 to little brown bat, 44 to northern myotis, and 16 to Indiana bat. Calls with characteristics of Indiana bat were recorded at several locations within the project area from May 9 – September 21, with about half of the calls occurring at one sampling location between May 23 – 29, 2006. No sampled nights at any site had >2 call files with characteristics of Indiana bat. Due to the probabilistic nature and opportunity for misidentification and inaccuracy in species identification, multiple calls of a species must be detected in a single night to determine species presence (Britzke et al. 2002). This is a conservative approach, but serves to ensure that variation caused by inaccurate identification is not included in the species identification results. Based on this approach, there are not enough files to statistically support the presence of Indiana bats at any of the sites or nights examined (E. Britzke, pers. communication).

Though statistical analysis of *Myotis* species calls recorded by the AnaBats failed to conclusively document Indiana bat, the St. Lawrence Windpower project area is within the recognized range of the species. Indiana bat are known to winter in a hibernaculum near Watertown. Movement of females dispersing from hibernacula to breeding areas has been tracked by NYSDEC from 2002 – 2006 (NYSDEC 2006). Individuals have been recorded traveling up to 40 miles from wintering caves and several dispersing females were reported in Clayton, New York, located within 10 miles northeast of the proposed St. Lawrence Windpower project area. Suitable roosting habitat, characterized by trees or snags >5 inches in diameter with exfoliating bark and cracks/crevices (USFWS 1999), is likely present within the project area. Additionally, several riparian areas and wetlands, such as farm ponds and floodplain forests, within the project area provide foraging habitat for the Indiana bat and other bat species.

The results of the AnaBat surveys along with available information suggest that Indiana bats may occupy the site in low density. Because of the status of this species, further investigations

including habitat mapping and potentially mist-netting surveys are warranted. Additional study scope, methods, and objectives will be discussed with the NYSDEC and USFWS and implemented in 2007. Detailed habitat mapping for the species, with a focus on suitable trees/woodlots for maternal colonies, is recommended. The utility of mist-netting to confirm presence/absence of the species and likelihood of impacts based on relative density within the project area will be further evaluated in consultation with the agencies.

5.0 Ongoing Studies

Several of these studies at the St. Lawrence Windpower project area are ongoing. In spring 2007, the radar survey will resume for a 45-day period. Additional spring raptor surveys will be conducted to capture earlier migrants that may have been missed due to a late start in spring 2006. Other ongoing study components include winter raptor and waterfowl surveys and sensitive species surveys and habitat mapping. Results from this report and the ongoing studies will be compiled in a final report following completion of the field surveys in spring 2007. Results in this interim report should be considered preliminary at this time until the final analysis is complete.

6.0 References

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