

BREEDING BIRD SURVEY
FOR THE ROARING BROOK WIND POWER PROJECT,
LEWIS COUNTY, NEW YORK

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PPM ENERGY

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**Breeding Bird Study for the Roaring Brook Wind Power Project,
Lewis County, New York.**

Executive Summary

To determine the type and number of nesting bird species present at the Roaring Brook Wind Power Project (hereafter, the “Project”) site in Lewis County, New York, a study of birds breeding within the Project boundary was conducted. The study was conducted after an avian risk assessment suggested that there could possibly be suitable habitat on site for New York State endangered, threatened, and, or species of concern, as well as forest interior nesting birds. The Project is located within a New York State Important Bird Area that is designated as an interior forest nesting bird site. Two objectives of the study were: (i) to determine the status of federal or New York State listed species, species of special concern, and forest interior birds that may be nesting on site and if they were present, determine the locations of those nesting areas; and (ii) to identify the approximate the numbers of individuals/territories, and distribution of all bird species within the proposed turbine areas.

A total of 39 point counts was established within the Project site, corresponding approximately to proposed turbine locations. The point counts were situated in forest along low ridges that transverse the Project site. The points were generally spaced by at least 250 m. Point counts were conducted on four days (June 20-24, 2007). Two complete surveys were conducted at each point. Each point count location was surveyed daily for 5 minutes during which time birds seen or heard were recorded. Also recorded were the distance and compass direction of each bird from the point count location, as well as whether a bird was heard vocalizing or seen.

A total of 1,761 individuals of 55 species was detected at the 39 point counts. All but one, a single Northern Harrier, or perhaps a very few of these species are likely nest within the Project boundary. The assemblage of species nesting on the Roaring Brook site is a modest assemblage of species found in forest, forest edge, brush, and to a lesser extent farmland/grassland habitats. Songbirds accounted for 74.5% of species, with few raptors (one Northern Harrier and a few Turkey Vultures), three woodpecker species, one owl species (Great Horned), four waterbird species (no waterfowl, two shorebirds), two gamebird species, and two other types of species (Mourning Dove and Black-billed Cuckoo).

No federally endangered or threatened species or New York State endangered species were observed during the study, nor are these species likely to nest at the site. Northern Harrier, a New York State threatened species was the only state threatened species present during the nesting surveys. This species was observed one time, flying overhead, and is not likely nesting on site because of the generally unsuitable habitat, including beaver meadows which appear too small for nesting by this species.

No New York State species of special concern were observed on site, although four Green List species (American Bird Conservancy) were observed. These species include Blue-winged Warbler, Canada Warbler, Wilson’s Snipe, and Wood Thrush. These species are either

declining in North America or they have restricted nesting areas and, therefore, small populations.

Ten species accounted for 55.3% of all species observed with five (White-throated Sparrow, Veery, Red-eyed Vireo, American Redstart, and Mourning Warbler) accounting for 34.5% of all species. These birds are songbirds that nest mostly in brush and forest edge, as well as dissected grasslands. There were several species of forest interior nesting species, showing that the basic forest interior community is still somewhat intact, despite heavy logging and road building on site. The presence of some forest edge, brush, and farm/grassland species, including Brown-headed Cowbird, American Goldfinch, American Robin, Common Grackle, Common Yellowthroat, Chestnut-sided Warbler, Red-winged Blackbird, Song Sparrow, and some others, demonstrate that the forest has been fragmented. However, the abundances of these species are relatively small in relation to overall species composition on site. These patterns demonstrate that fragmentation, though it is occurring, has not eliminated the overall forest character of the site.

Biologically significant collision fatalities of nesting birds at the Roaring Brook project are not likely if turbines are constructed. Some habitat fragmentation impacting forest interior nesting birds is likely as sites are cleared for turbines, although the current land-use practices on site will continue to fragment the forest and change the composition of species nesting on site. Disturbance and displacement from project operations, turbines, and roads may result in impacts to some nesting species although the extent of these impacts is not entirely understood. Some species, especially forest edge and farmland nesting birds are likely to habituate, although impacts to forest interior nesting species cannot be predicted accurately because the ultimate disposition and management of the forests on site is not known at this time.

Based on the findings of the breeding bird study and impacts known from other wind power project sites, the following recommendations are made.

- To reduce habitat disturbance and impacts, habitat restoration surrounding the turbines, meteorology towers, roads, and other infrastructure should be done following construction.
- A forest management plan that permits and enhances forest regeneration in a manner that benefits forest interior nesting bird species and minimizes forest fragmentation is recommended.

Introduction

A large number of wind power projects are now being proposed across the United States and in northern and central New York State. Wind power has generally proven to be a clean and renewable electricity source in the United States and Europe, having less impact to humans and wildlife than traditional fossil fuel electric generation. However, impacts to birds have occurred, although those impacts largely have not been biologically significant. That is, the impacts have not caused declines in regional or global populations at the species level. Because larger scale fatalities have been reported from sites such as the Altamont Wind Resource Area in California, some environmental organizations, animal rights groups, and permitting agencies ask that extensive research be conducted at wind plants to determine the magnitude and types of bird impacts likely at new wind plants prior to their construction. In addition, those organizations and agencies would like to see studies to determine the biological significance of impacts.

Most studies that have been conducted in the United States have focused on fatalities caused by birds colliding with wind turbines. In Europe the focus has been different, with emphasis placed on determining the degree of disturbance and displacement of individual birds and species that nest, forage, or otherwise use a particular site. Of the habitat disturbance and displacement studies conducted at wind plants in the United States, most have assessed the impacts of wind power development on grassland birds after projects have been developed, including birds that nest in farm fields, grazing land, and other open habitats (reviewed in Kerlinger 2007). Few studies have addressed displacement and disturbance impacts of wind turbines on forest nesting species.

To determine the magnitude and significance of potential impacts to birds at the proposed Roaring Brook Wind Power Project (hereafter the “Project”) in Lewis County, New York, a Phase I Avian Risk Assessment was conducted in 2007 (Kerlinger 2007). That risk assessment suggested collision impacts to birds would not likely be biologically significant, although Kerlinger suggested a nesting bird study be conducted to determine the species and numbers of birds present at the Project site. Likewise, the New York State Department of Environmental Conservation also frequently recommends nesting bird studies for wind power projects. The rationale for the nesting bird study was mostly to inventory the forest, forest edge, and farmland/grassland nesting species that are present within the Project boundary during the nesting season, including those that are listed by New York State as endangered or threatened or species of special concern, as well as other rare species.

A nesting bird study was conducted at the Project site during June 2007. The results of that study are reported herein, providing a comprehensive list and other details about the nesting species at the Project site. In addition, the numbers and location of listed species, species of concern, and American Bird Conservancy (ABC) Green List species are provided. The results of the nesting bird study may serve to determine which species may be impacted by the Project and could serve as baseline data as to whether nesting species are displaced after construction of the facility. Thus, the information can be used to better assess risk at the Roaring Brook site and to evaluate impacts following construction of turbines.

Objectives of the present study are as follows:

- Determine the presence of federal or New York State endangered or threatened species and New York State species of concern that nest on site; and ABC Green List species.
- Collect data on abundance and location of common and rare nesting birds at the site for determining the degree and magnitude of disturbance impacts, if any, that result from construction of the Project.

Methods

To provide quantitative information on the species of birds that nest within and, in some cases, immediately adjacent to the Project site (Figure 1) point count locations were established to sample nesting birds (Figure 2). The locations of the sampling points/point counts correspond to the approximate locations where turbines would likely be located, which would mostly be the highest topography within the Project boundaries. The habitat at most point counts is forested, although there are dirt roads that have been constructed throughout the project area. Forests are mostly secondary deciduous, although there are some patches of conifers (Kerlinger 2007)

A total of 39 point count locations were established on the site. The point turbine arrays were in “strings” extending roughly from northwest to southeast including two to 12 turbines. Point count locations were spaced so that none were within about 250 m of each other (Table 1, Figure 1 and 2). Most species could easily be heard at distances out to 150 m or more, so most of the areas within the area where turbines and roads would be constructed were included within the area surveyed. The point counts are generally distributed throughout the site (Figure 2).

The order in which the point counts were conducted was changed from day to day to reduce the potential for biasing the data set with respect to time of day sampling was done. In some places, point counts were along or near dirt roads, similar to the U.S.G.S. Breeding Bird Survey protocol, whereas in others, the observer (Dave Tetlow¹) walked for hundreds of meters to the point count locations.

Point count survey research was conducted on four days (June 20-23, 2007) during the peak nesting season for birds in this portion of New York State (Andrle and Carroll 1988). After the point counts were conducted on each day and while driving and walking between point count locations, searches were undertaken for rare, threatened and endangered birds. Thus, additional hours were spent on these dates in an effort to find New York State listed species and species of special concern. In addition, the observer spent two additional days on site earlier in June 2007, while examining habitat on site.

¹ The field technician, Dave Tetlow, is an experienced field technician who has for more than two decades observed and listened to forest and grassland birds in the United States, especially upstate New York. He is very knowledgeable regarding the songs and plumages of species that are likely to be encountered in fields and forests at Roaring Brook. Tetlow has been an atlaser and block buster on both the New York and Pennsylvania breeding bird atlas projects. The former was for the NYS DEC, the latter for the Pennsylvania Game Commission.

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The point count surveys and observations commenced at dawn, when there was enough light to see birds and after they commenced singing. The earliest observations were made just before 05:00 hours EDT (Eastern Daylight Time; 04:00 Eastern Standard Time) and the latest observations were made at about 10:30-11:00 hours EDT. The latest observations were ended was 11:12 EDT. Observations were made on the four dates listed above were done in weather that was conducive to observing and hearing birds (Table 2; no rain or strong wind). A total of 5 minutes was spent at each point count location on each of the two rounds of surveys. During that time the observer listened and looked for birds. This amount of time is two minutes longer (66%) than called for by the protocols used by the U.S.G.S. Breeding Bird Survey. Additional time was taken to record data on some occasions at point count locations.

While walking or driving from point count to point count location, an effort was made to detect endangered, threatened, and species of special concern. In addition to information regarding species identification, the direction (eight cardinal compass directions) and distance (in m) of each bird observed (heard or seen) was recorded. Additional notes were made, if interesting behaviors or other information was observed. Data were recorded on the data sheet provided in Appendix I.

Results and Discussion

A modestly diverse assemblage of species was found during the point counts during the June 2007 nesting bird surveys at the Project site (Tables 3). A total of 1,761 individuals of 55 species were observed. It is likely that all but a few of these species nest on or immediately adjacent to the Project site. A small number of other species may also nest within or immediately adjacent to the proposed turbine area, but were not detected during the conduct of point count surveys.

Species composition was dominated by songbirds, which accounted for three-quarters (41 of the 55; 74.5%) species observed. Of these species there were 12 species of warblers, three vireos, four thrushes, three sparrows, three flycatchers, and assorted other songbird species. There also were 2 species of raptors (Northern Harrier and Turkey Vulture), four woodpecker species, two gamebird species, three waterbird species (no ducks or geese), one owl species, and two other species (Table 3).

Five of the 55 species observed at point count locations (Table 4) accounted for 607 of 1,761 (34.5%) individuals observed and another five species (Table 4) accounted for an additional 20.8% (367 individuals). Together the ten most common species (10 of 55; 18.2%) accounted for 55.3% (974 individuals) of all birds observed on point counts.

Of the ten most often observed birds, all can be characterized as being forest nesting birds. Some, such as Chest-nut sided Warbler, Northern Flicker, and some others, often nest at forest edges. Overall, the birds observed are suggestive of a heavily forested site and a forested site that has been fragmented to varying degrees. Species suggestive of fragmentation or a forest in which there are brushy openings, cutovers, and even small open fields include American Robin, American Goldfinch, Brown-headed Cowbird, Common Grackle, Common Yellowthroat, Chestnut-sided Warbler, Mourning Dove, Killdeer, Red-winged Blackbird, Song Sparrow, Swamp Sparrow, Tree Swallow, Wild Turkey, and perhaps some others.

It is important to note that the presence of some forest edge and brush species, along with waterbirds is a result of wetland areas that lie between the ridges on which turbines would be constructed. These wetlands are often beaver flows that include brushy edges, very small areas of open water (beaver ponds and streams), and areas of emergent vegetation. Species such as Swamp Sparrow, Belted Kingfisher, Wilson's Snipe, Great Blue Heron, and some others likely nest and, or forage in these wet, less wooded areas. Thus, these naturally occurring open areas, along with the forestry practices being used on the Project site, both contribute to potential fragmentation of the larger forests in this area.

With respect to forest interior nesting species, several were found on site. These include Blackburnian Warbler, Black-throated Blue Warbler, Black-throated Green Warbler, Least Flycatcher, Ovenbird, Rose-breasted Grosbeak, Scarlet Tanager, Veery, Winter Wren, Wood Thrush, Yellow-throated Vireo, and some others. These species are particularly susceptible to impacts from forest fragmentation. They were relatively common and generally distributed throughout the site.

Another sign that the forests on site are still viable and not significantly fragmented is obvious from the numbers of edge and farm field species observed vs. the numbers of forest nesting birds. For example, species such as American Goldfinch, Brown-headed Cowbird, Red-winged Blackbird, Song Sparrow, Tree Swallow, Swamp Sparrow, and some others each accounted for less than or equal to only 1% of the overall total of birds observed. They were also seen at few sites, instead of spread widely throughout the study area. This may be a function of the forestry practices during the past decade. Because small trees have come up after cutting, fragmentation has not had a chance to decimate the forest nesting bird community.

There were no federally endangered or threatened species observed during the study, nor were there any New York State endangered species found. A single Northern Harrier, NYS – threatened, was observed flying over the site during the surveys. It was judged to be an adult male and it was observed at one of the southernmost turbines flying northeast. As there is no suitable nesting habitat within the Project boundary, this species is unlikely to nest at the site. It could be nesting in farmland or at marshes outside of the Project site.

With respect to New York State species of special concern, none were observed at any of the point count locations. However, four species that are on the ABC Green List were seen (Table 5): Blue-winged Warblers, Canada Warbler, Wilson’s Snipe and Wood Thrush. These species are either declining or threatened, and, or they have very small geographic ranges. Any of these factors put them at risk of potential population decline and subsequent listing. Currently, all have fairly robust populations (Table 5), although they may commence declines in the near future. None currently have legal protection that is different from other types of common species. It is ironic that the New York State Department of Environmental Conservation allows one of these species to be hunted. Wilson’s Snipe (also called Common Snipe) is legally hunted in New York State with the daily bag limit being 8 per hunter per day and the possession limit being 16. Apparently, these harvests are not considered biologically significant, even though thousands of these birds are shot in the eastern United States annually.

American Bittern, a New York State species of special concern, was observed during the Phase I risk assessment site visit (Kerlinger 2007), but was not observed during the nesting study. The species could nest on site along one of the many wetlands that exist between the ridges where turbines would be placed. The bird observed earlier may also have been nesting outside of the Project boundary. Although it is considered a species of special concern, it is not on the ABC Green List.

Assessment of Impacts to Nesting Birds

Risk of Mortality or Injury Due to Collisions

Turbine collision mortality involving the species that nest in the forest, forest edge, brush, and farm fields, such as those observed at the Project site is likely to be minimal. Fatalities at wind power facilities rarely involve forest or edge nesting species during the nesting season (Erickson et al. 2001, Kerns and Kerlinger 2003, Kerlinger 2002). A majority of species that nest in forest, forest edge, and brush at the Project site rarely fly above the treetops during the

nesting season. These species would, therefore, not likely be at rotor height (about 125-400 feet [~40-122m] above the ground). Most of these species that nest on site spend their time below or only a few feet above the forest canopy during the nesting season. The time these birds may fly above the treetops at rotor swept height is during dispersal in later summer and during migration.

There are some exceptions. Turkey Vultures were killed at the Mountaineer site during the first year of operations (Kerns and Kerlinger 2004), and they have been killed in small numbers at other wind power sites. The Mountaineer site is located on a mountain ridge in West Virginia. Other species that are more aerial during the nesting season include Tree Swallows, which occurred in very low numbers at the Project site. At other wind power sites, swallows are common, but few have been killed.

Northern Harriers have been killed in very small numbers at wind power sites, and do not seem terribly susceptible to collisions, even at sites where they are present year-round and where there are large numbers of turbines (Orloff and Flannery 1992, 1996). Use of locations such as the Altamont and High Winds sites in California, as well as their presence in the grasslands of the Buffalo Ridge in Minnesota suggest that they are not highly susceptible to collisions. During courtship displays, however, these birds fly to more than 100 feet above the landscape and “sky dance,” putting them at greater risk of collision. While hunting these birds tend to fly low, usually less than 100 feet above the ground. Risk to this species has yet to be documented or suggested to be significant, although there are few studies where turbines are located within harrier territories where sky dancing occurs. This species is unlikely to be at great risk at Roaring Brook because they do not nest on site and will rarely hunt on site.

Overall, collision risk during the nesting season to forest nesting and other species nesting at the Roaring Brook site is likely to be minimal.

Risk of Habitat Disturbance and Displacement of Nesting Birds

Studies conducted at other wind power sites have demonstrated that species from different habitats seem to react in different ways to the presence of tall structures, including wind turbines. Grassland and open country birds in particular have been reported to be disturbed and displaced to varying degrees by wind turbines. A study of several nesting songbird species in Minnesota, on Conservation Reserve Program grasslands showed that some species avoided the area within 100 or more meters of turbines (Leddy et al. 1999). In Wyoming, Mountain Plovers would generally not nest within 200 m of turbines (Johnson et al. 2000). At the Ponnequin Wind Energy Facility in Colorado, Horned Larks foraged directly beneath turbines and that species, along with Western Meadowlarks foraged near the bases of turbines in the Altamont of California. Some grassland birds in the Altamont Pass Wind Resource Area also perched on lattice turbine towers (Curry & Kerlinger, LLC observations) strongly suggesting these birds were not greatly disturbed by these structures.

Forest nesting birds have not been studied well in North America. A short-term study at the Searsburg, Vermont site many miles to the east of the Roaring Brook site attempted to examine displacement and disturbance impacts. At that mixed, mountaintop conifer-hardwood forest site, disturbance from habitat modification and turbine presence was found to be minimal,

although a few species were reported to avoid the clearings where the turbines were located. Although Blackpolls, White-throated Sparrows, Dark-eyed Juncos and some others sang in close proximity to the forest edge and the turbines one year after construction, other species, most notably Swainson's Thrush, seemed to move away from the turbine areas and deeper into the forest. Whether they moved away from the clearing or the turbine is not known. The Searsburg site was not studied long enough or intensely enough to provide clear answers, although the fact that several species occupied the forest within 20-30 m of the turbines during the post construction surveys strongly suggests that some species do habituate to the presence of wind turbines and clearings in the forest. A long-term study at that site and other forested wind power sites would provide insight into whether or not these birds do habituate and how much they habituate to turbines. Such a study would also provide insight as to which species habituate and which are displaced permanently.

Because forest nesting birds have a canopy over their heads, it is conceivable that tall structures like wind turbines do not cause undue adverse disturbance and do not displace birds great distances. It is also possible that some habituation to the turbines may occur over time. The Searsburg site also did not show major fragmentation impacts (Kerlinger 2002) including invasion/colonization by Brown-headed Cowbirds and American Crows. However, some edge species, fragmentation indicator species, were more numerous in the year after the forest was partially cleared for turbines and roads. At that Project, a condition of the original permits was to have a forest management plan in which the forest was permitted and encouraged to regrow, thereby reducing potential fragmentation impacts to forest nesting birds.

The construction of turbines at the Project site is likely to disturb and displace some species of forest, forest edge, and brushland birds, if it occurs during the nesting season. During the actual construction process, during which earth is moved and heavy equipment is present, along with large numbers of workers, birds are likely to be displaced from territories within 100 or more meters of construction activity. This disturbance will vary by species, but should be limited mostly to the period of construction that lasts a few months. The degree of disturbance will also be lessened if infrastructure is constructed in the latter part or after the nesting season. These impacts will probably be ephemeral in that after construction equipment and workers leave the site and habitats are encouraged to regrow, the birds that may be displaced by construction activity may return to some or most of the areas previously inhabited during the nesting season. This is likely to take decades.

Clearing for roads and turbines and the presence of tall turbines after actual construction will likely cause some disturbance to and displacement of nesting birds. Forest nesting birds and birds of forest edge are not likely to be disturbed to the degree that open country, grassland nesters will be disturbed for the reasons listed above. The latter species do not appear to respond favorably, at least in the short term, to tall structures that break the skyline. As was stated previously, the degree of impact is likely to vary among species with some ignoring turbines and others leaving the area within a few hundred meters of turbines. However, habituation may occur over the course of several years, but the rate and degree of habituation if it occurs is unknown.

The key to preserving the forest bird community of the Project site in the long-term is related to the future health of the vegetative components of the forests at Roaring Brook. Without some sort of long-term forest management plan, the forest interior and other forest community bird species will not be maintained at Roaring Brook whether turbines are constructed or not.

Note. The long-term viability of interior forest nesting bird populations in New York State, including the Project is in jeopardy. Large, mature contiguous forests that are suitable for interior forest nesting birds are currently being eroded as these habitats are replaced by housing, camps, roads, and non-sustainable forestry practices. It is possible that the Project could provide a vehicle for preserving or maintaining a large, privately owned forest in the long term, thereby insuring that the ultimate disposition of these lands benefits threatened wildlife. The Nature Conservancy has a management plan for forests nearby, which could serve as a model for the Project site. If the management plan is done in coordination with that done by the Conservancy nearby, benefits could potentially be maximized.

Recommendations

The following recommendations are made to reduce disturbance to and displacement of grassland nesting species resulting from wind turbine construction at the Roaring Brook site.

- To reduce habitat disturbance and impacts, habitat restoration surrounding the turbines, meteorology towers, roads, and other infrastructure should be done following construction.
- A forest management plan that permits and enhances forest regeneration in a manner that benefits forest interior nesting bird species and minimizes forest fragmentation is recommended.

Literature Cited

Andrle, R.F., and J.R. Carroll. 1988. The atlas of breeding birds in New York State. Cornell University Press, Ithaca, New York.

Donaldson, G.M., C. Hyslop, R.I.G. Morrison, H.L. Dickson, and I. Davidson. 2000. Canadian shorebird conservation plan. Minister of the Environment, Canadian Wildlife Service and BirdLife International, Hull, CA.

Erickson, W., G.D. Johnson, M.D. Strickland, K.J. Sernka, and R. Good. 2001. Avian collisions with wind turbines: a summary of existing studies and comparisons to other sources of collision mortality in the United States. White paper prepared for the National Wind Coordinating Committee, Avian Subcommittee, Washington, DC (www.nationalwind.org).

Erickson, W., J. Jeffrey, K. Kronner, and K. Bay. 2003. Stateline wind project wildlife monitoring annual report, results for the period July 2001 – December 2002. Tech. Rpt. to FPL Energy, Oregon Office of Energy, and Stateline Technical Advisory Committee.

Johnson, G.D., D.P. Young, Jr., W.P. Erickson, C.E. Derby, M.D. Strickland, R.E. Good. 2000. Wildlife monitoring studies at the at the SeaWest Windpower Project, Carbon County, Wyoming. 1995-1999. Prepared for SeaWest Energy Corporation and BLM by WEST, Cheyenne, WY.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, and S.A. Sarappo. 2002. Collision mortality of local and migrant birds at the large-scale wind power development on Buffalo Ridge, Minnesota. Wildlife Society Bulletin 30:879-887.

Kerlinger, P. 2001. Avian mortality study at the Green Mountain Wind Farm, Garrett, Somerset County, Pennsylvania - 2000-2001.

Kerlinger, P. 2002. Avian fatality study at the Madison Wind Power Project, Madison, New York. Report to PG&E Generating.

Kerlinger, P. 2002. An Assessment of the Impacts of Green Mountain Power Corporation's Wind Power Facility on Breeding and Migrating Birds in Searsburg, Vermont. Report to National Renewable Energy Laboratory, US Dept. of Energy, Golden, CO.

Kerlinger, P. 2007. Phase I Avian Risk Assessment for the Roaring Brook Wind Power Project, Lewis County, New York. Prepared for PPM Energy.

Kerns, J., and P. Kerlinger. 2004. A study of bird and bat collision fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: Annual Report for 2003. Prepared for FPL Energy and Mountaineer Wind Energy Center Technical Review Committee.

Kingery, H.E. 1998. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership.

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Koford, R., A. Jain, G. Zenner, and A. Hancock. 2005. Avian mortality associated with the top of Iowa Wind Farm. Report to Iowa Department of Natural Resources.

Larsen, J.K., and J. Madsen. 2000. Effects of wind turbines and other physical elements on field utilization by pink-footed geese (*Anser brachyrhynchus*): A landscape perspective. *Landscape Ecology* 15:755-764.

Leddy, K., K.F. Higgins, and D.E. Naugle. 1999. Effects of wind turbines on upland nesting birds in conservation reserve program grasslands. *Wilson Bulletin* 111:100-104.

Nicholson, C. P. 2001, 2002. Buffalo Mountain Windfarm bird and bat mortality monitoring report: October 2000 – September 2002. Preliminary report. Tennessee Valley Authority, Knoxville, TN.

Levine, E. 1998. Bull's birds of New York State. Cornell University Press, Ithaca, NY.

Orloff, S., and A. Flannery. 1992. Wind turbine effects on avian activity, habitat use, and mortality in Altamont Pass and Solano County wind resource areas, 1989-1991. California Energy Commission, Sacramento, CA.

Orloff, S., and A. Flannery. 1996. A continued examination of avian mortality in the Altamont Pass wind resource area. California Energy Commission, Sacramento, CA.

Rich, T.D., C.J. Beardmore, et al. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Laboratory of Ornithology, Ithaca, NY.

Table 1. GPS locations for nesting bird study point counts at the Roaring Brook Wind Power Project, Lewis County, New York. Point counts are at the locations selected for turbine placement.

Turbine, String and Point Count Numbers	Latitude	Longitude
1	43.72182	-75.61677
2	43.71988	-75.61462
3	43.71907	-75.61136
4	43.71730	-75.60904
5	43.71640	-75.60417
6	43.72101	-75.63120
7	43.72020	-75.62775
8	43.71945	-75.62441
9	43.71394	-75.62627
10	43.71262	-75.62337
11	43.71050	-75.62059
12	43.70947	-75.61695
13	43.70859	-75.61370
14	43.70799	-75.61035
15	43.70605	-75.60765
16	43.70470	-75.60481
17	43.70262	-75.60260
18	43.70043	-75.60105
19	43.69827	-75.59949
20	43.69551	-75.59806
21	43.71232	-75.63392
22	43.71018	-75.63217
23	43.70797	-75.62975
24	43.70616	-75.62618
25	43.69406	-75.60670
26	43.69192	-75.60489
27	43.68974	-75.60327
28	43.70048	-75.63050
29	43.69799	-75.62792
30	43.69520	-75.62668
31	43.69265	-75.62466
32	43.68946	-75.62303
33	43.68806	-75.61129
34	43.68594	-75.60949
35	43.68450	-75.60487
36	43.68272	-75.60240
37	43.68027	-75.60141
38	43.68496	-75.63284
39	43.68309	-75.63004

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Table 2. Summary of dates, times, and weather conditions (temperature, wind direction and speed, and percent cloud cover) for breeding bird point counts conducted at Roaring Brook, New York. Weather conditions are temperature in degrees Fahrenheit, wind direction (one of eight+ cardinal directions, miles per hour), cloud (CC+ percent of sky covered), and precipitation (if it occurred).

Date	Time Start-End (EST)	Weather Conditions
June 20, 2007	04:00-10:20	16°C, WSW-10-15 kph, 20°C, WSW-10-15 kph
June 21, 2007	04:00-11:12	12°C, SW-7-13 kph - 20°C, SW-7-13 kph
June 22, 2007	04:00-11:03	11°C, NW-10-18 kph 15°C, NW-10-18 kph
June 23, 2007	04:00-10:45	8°C, WNW-5-15 kph 14°C, WNW-5-15 kph

Roaring Brook, NY, Wind Breeding Bird Study

Table 3. List of species observed at the Roaring Brook Wind Power Project site, Lewis County, New York, during breeding bird study on four days in June 2007.

Species	6/20/2007	6/21/2007	6/22/2007	6/23/2007	Total
Alder Flycatcher	1	0	0	0	1 – 0.1%
American Goldfinch	0	2	0	4	6 – 0.3%
American Redstart	32	24	26	18	100 – 5.7%
American Robin	7	12	11	21	51 – 2.9%
Black-billed Cuckoo	8	4	2	1	15 – 0.9%
Black-capped Chickadee	5	2	5	15	27 – 1.5%
Belted Kingfisher	2	0	1	0	3 – 0.2%
Brown-headed Cowbird	0	5	0	3	8 – 0.5%
Blue-headed Vireo	0	2	2	3	7 – 0.4%
Blackburnian Warbler	3	0	0	0	3 – 0.2%
Blue-winged Warbler	5	5	0	0	10 – 0.6%
Black-throated Blue Warbler	12	22	11	14	59 – 3.4%
Black-throated Green Warbler	17	11	11	17	56 – 3.2%
Black and White Warbler	4	10	12	0	26 – 1.5%
Canada Warbler	7	14	15	18	54 – 3.1%
Cedar Waxwing	17	2	5	14	38 – 2.2%
Common Grackle	2	1	0	4	7 – 0.4%
Common Raven	1	1	1	0	3 – 0.1%
Common Yellowthroat	3	2	4	2	11 – 0.6%
Chestnut-sided Warbler	25	20	21	23	89 – 5.1%
Dark-eyed Junco	21	17	23	20	81 – 4.6%
Eastern Bluebird	12	3	4	10	29 – 1.6%
Great Blue Heron	0	0	0	1	1 – 0.1%
Great-crested Flycatcher	10	2	1	2	15 – 0.9%
Great Horned Owl	0	0	1	0	1 – 0.01%
Gray Catbird	3	2	1	3	9 – 0.5%
Hairy Woodpecker	0	0	0	2	2 – 0.1%
House Wren	5	5	3	3	16 – 0.9%
Killdeer	0	1	0	1	2 – 0.1%
Least Flycatcher	26	8	18	10	62 – 3.5%
Magnolia Warbler	1	1	1	4	7 – 0.4%
Mourning Dove	1	0	0	3	4 – 0.2%
Mourning Warbler	32	23	20	23	98 – 5.6%
Northern Flicker	9	10	22	23	64 – 3.6%
Northern Harrier	0	0	1	0	1 – 0.1%
Ovenbird	29	9	15	16	69 – 3.9%
Pileated Woodpecker	10	4	2	2	18 – 1.0%
Purple Finch	4	14	7	16	41 – 2.3%
Rose-breasted Grosbeak	11	3	6	3	23 – 1.3%
Red-eyed Vireo	45	33	24	22	124 – 7.0%
Ruffed Grouse	0	0	1	0	1 – 0.1%

Roaring Brook, NY, Wind Breeding Bird Study

Species	6/20/2007	6/21/2007	6/22/2007	6/23/2007	Total
Red-winged Blackbird	0	0	0	3	3 – 0.2%
Scarlet Tanager	4	8	11	9	32 – 1.8%
Song Sparrow	7	3	4	3	17 – 1.0%
Swamp Sparrow	2	1	4	1	8 – 0.5%
Tree Swallow	2	2	3	3	10 – 0.6%
Turkey Vulture	3	0	0	0	3 – 0.2%
Veery	38	33	30	29	130 – 7.4%
Wilson's Snipe	1	0	0	0	1 – 0.1%
Wild Turkey	3	1	1	6	11 – 0.6%
Winter Wren	3	2	6	4	15 – 0.9%
Wood Thrush	13	24	14	12	63 – 3.6%
White-throated Sparrow	36	41	42	36	155 – 8.8%
Yellow-bellied Sapsucker	14	18	17	15	64 3.6%
Yellow-throated Vireo	5	2	0	0	7 – 0.4%
Total	501	409	409	442	1761

Table 4. Ten most common species observed during the 2007 breeding bird study at the Roaring Brook Wind Power Project, Lewis County, New York. Species are ranked in descending order of abundance.

Species	Number Observed	Percentage of Total Birds Observed
1-White-throated Sparrow	155	8.8%
2-Veery	130	7.4%
3-Red-eyed Vireo	124	7.0%
4-American Redstart	100	5.7%
5-Mourning Warbler	98	5.6%
6-Chestnut-sided Warbler	89	5.1%
7-Dark-eyed Junco	81	4.6%
8-Ovenbird	69	3.9%
9-Yellow-bellied Sapsucker	64	3.6%
10-Northern Flicker	64	3.6%
Total	974	55.5%

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Table 5. List of endangered, threatened, special concern, and American Bird Conservancy Green Listed Species observed during June 2007 breeding bird study at the Roaring Brook Wind Power Project site, Lewis County, New York. NYS-T = New York State Threatened; MADT = American Bird Conservancy Green List – Moderately Abundant with Declines or High Threats, RDLP = Restricted Distribution and Low Population. Population data from Canadian Shorebird Conservation Plan, Donaldson et al. 2000; U. S. Shorebird Conservation Plan 2001; and Rich et al. 2004.

Species	Status	Number Seen	North American Population
Blue-winged Warbler	Green List - RDLP	10 – 2 days	390,000
Canada Warbler	Green List - MADT	54 – 4 days	1.4 million
Northern Harrier	New York Threatened	1 – 1 day	1.3 million
Wilson’s Snipe	Green List - MADT	1 – 1 day	2 million*
Wood Thrush	GL - MADT	63 – 4 days	14 million

*New York State Hunting Harvest Limit is 8 per person per day, 16 in possession per person.

Roaring Brook, NY, Wind Breeding Bird Study

Figure 1. Location of the Roaring Brook Wind Power Project, Lewis County, New York.

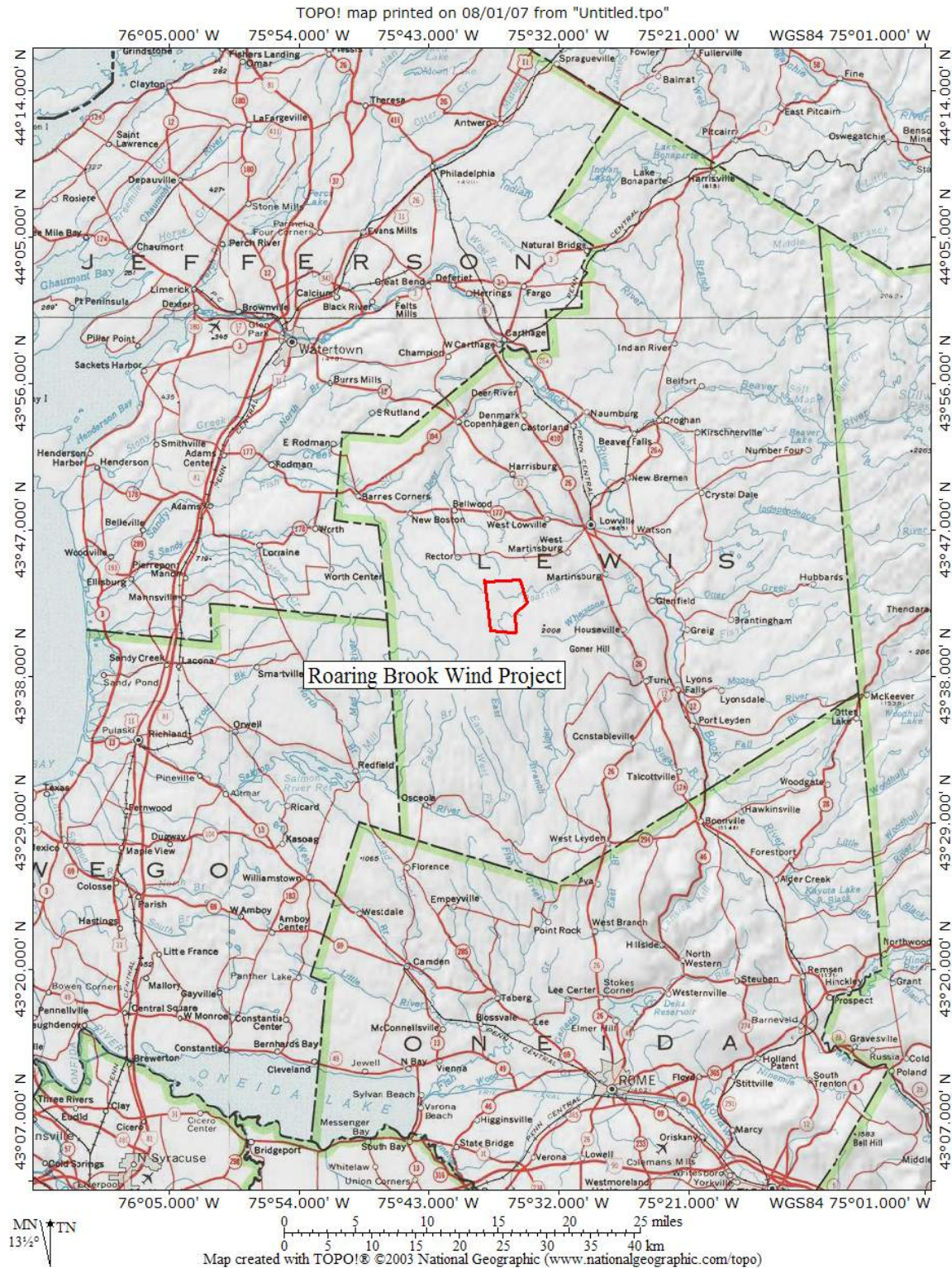
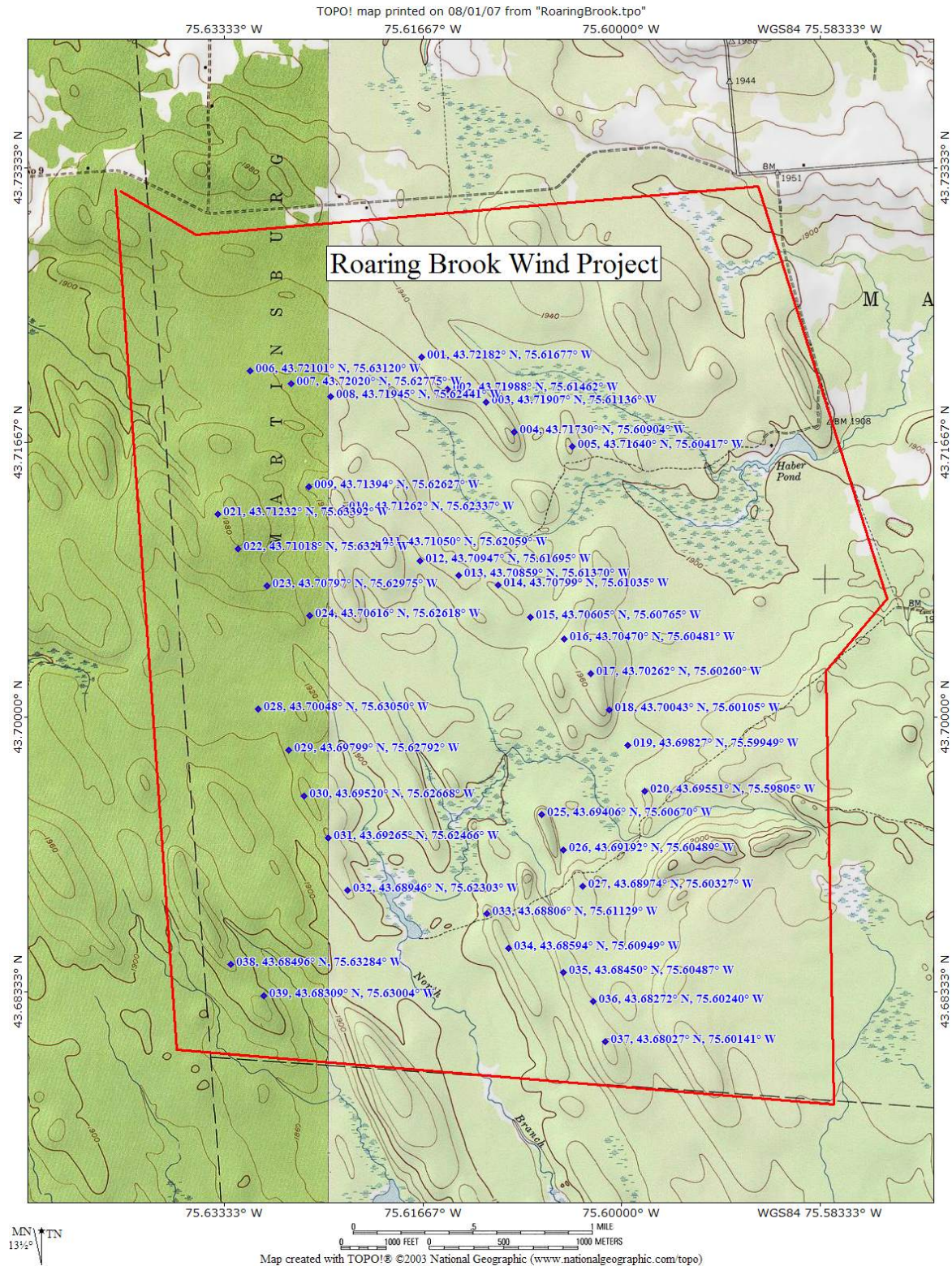


Figure 2. Map showing breeding bird study area and the Roaring Brook Wind Power Project boundary, Lewis County, New York. Locations of point counts were on higher topography (see lat-lons in Table 1 for location of point counts).



Roaring Brook, NY, Wind Breeding Bird Study

Appendix I. Data sheet used to record information gathered during the Roaring Brook Wind Power Project breeding bird study, Lewis County, New York, in spring 2007.

Roaring Brook, NY – 2007 Breeding Bird Study Data Sheet

Observer Name _____ Date _____

Weather: Temp _____ Wind Direction & Speed _____ Precip

Time Start _____ Time End _____

Date	Point Ct #	Species	Number	V/S	Distance/ Direction	Notes/Behavior