

**2011 Breeding Bird Survey
Report for the
Antrim Wind Power Project**

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1.0 PROJECT DESCRIPTION

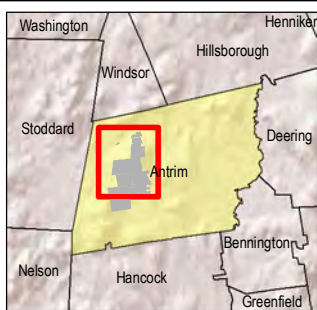
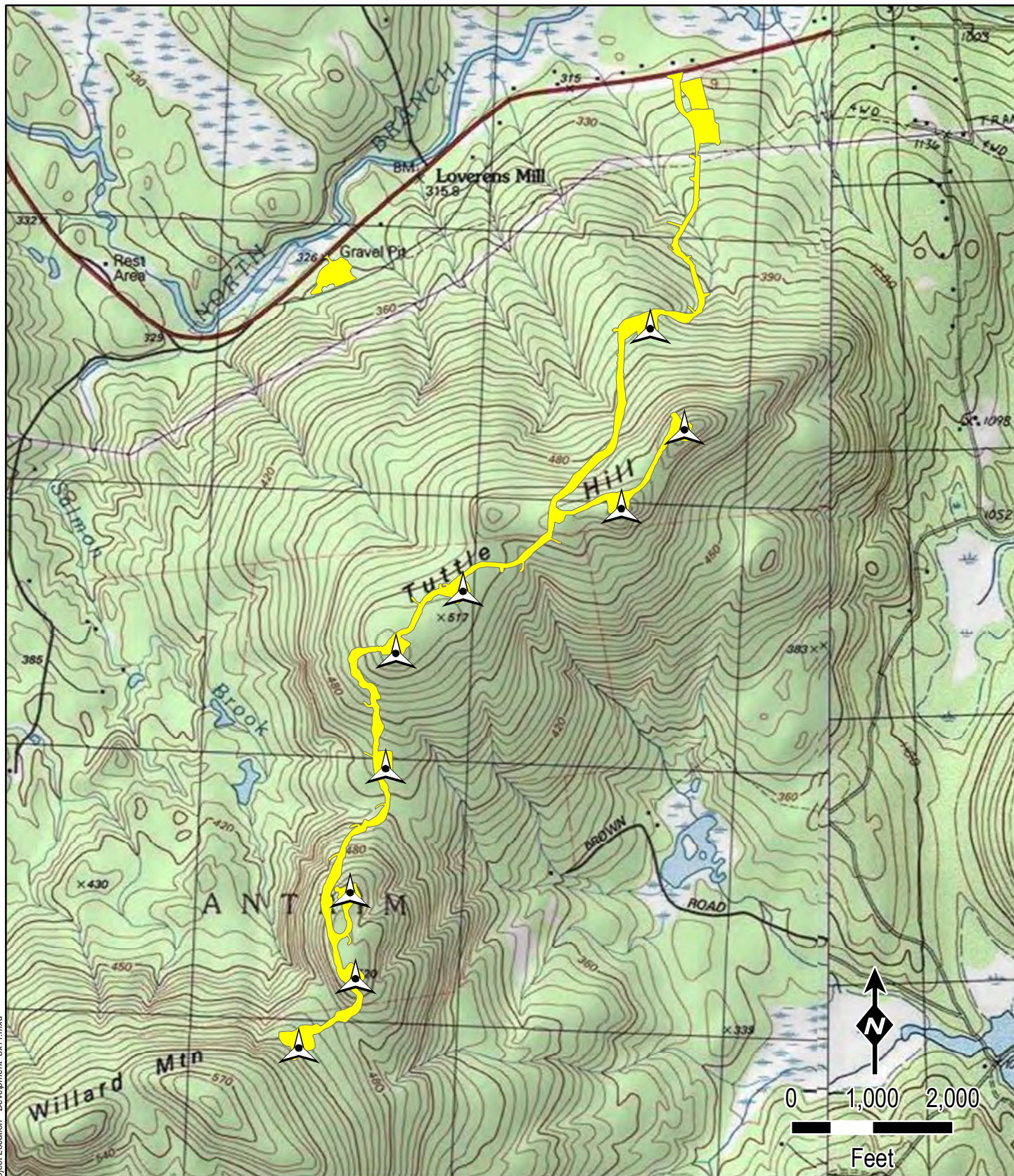
Antrim Wind Energy LLC (AWE) is proposing to construct the Antrim Wind Energy Project (Project) on Tuttle Hill and Willard Mountain in the Town of Antrim, Hillsborough County, New Hampshire. The proposed Project is sited entirely on privately owned land that is leased by AWE. The proposed Antrim Wind Energy Project involves the construction of 9 wind turbines, an electrical collection system and interconnection substation, approximately 3.6 miles of new access road, and an operations and maintenance building. There will be no new electrical transmission lines, other than collector system lines, constructed as part of this Project. The total direct impact for the access roads, the turbine pads, and electrical collector system will be approximately 57.3 acres.

The proposed project is sited on the ridges of Tuttle Hill which is oriented east-northeast to west-southwest. The ridges are approximately parallel to NH Route 9, which is about 0.75 miles to the north. Between the ridgeline and Route 9 is an existing transmission corridor containing both an 115kV transmission line and a 34.5kV distribution circuit; the proposed Project will interconnect with the existing 115kV line. See Figure 1, for a map of the Project area and Project elements.

1.1 Objectives

The primary objective of this study was to document use of the proposed project area by breeding bird species. The primary components of this study include:

- Compiling a species index and relative abundance for birds breeding in the project area;
- Calculating frequency of occurrence for each species by dividing the number of survey points where each species was detected by the total number of survey points; and
- Characterizing the cover type and habitat at each survey point.



Legend



Proposed WTG Location



Proposed Disturbance Area

Antrim Wind Energy

ANTRIM WIND ENERGY PROJECT

ANTRIM, NH

Figure 1

Layout of Development

Produced by: CTRC

1/29/2015

2.0 STUDY METHODOLOGY

2.1 Survey Protocol

Breeding bird surveys in the Antrim Wind Energy Project vicinity consisted of two major components: point count surveys for breeding birds and habitat evaluations at survey locations. A draft survey protocol was sent out to New Hampshire Fish and Game and United States Fish and Wildlife Service in March 2011, for review and comment. A consultation meeting with NH DES and United State Fish and Wildlife Service (USFWS) took place on April 6, 2011. These agencies reviewed the proposed protocol for the breeding bird survey and generally agreed with the proposed methodologies for this survey.

Point count survey procedures were based upon methods used in the Vermont Institute of Natural Science's *Mountain Birdwatch* program (VINS 2005) and Bird Studies Canada's *High Elevation Landbird Program (HELP)* (Whittam and Ball 2002, and 2003). These surveys were performed during the early morning hours starting at first light. Twelve points were selected on the ridge area, with half outside of the proposed project area and half within the project area. See Figure 2 for the location of survey points.

Habitat evaluation was performed using methods described by James and Shugart (1970). Quantitative estimates of vegetation were made using tenth-acre (0.04-hectare) circular plots, consisting of a 37-foot (11.28-m) radius around a center point. These plots were located at each survey point.

For more detail on the methods and protocols used for this study, see Appendix A.

2.2 Data Analysis

Data were entered and stored in a numerical database or spreadsheet format.

Both Federal and New Hampshire lists of endangered and threatened species were reviewed to confirm whether any listed species were found on the site. Additionally, the lists of Federal Birds of Conservation Concern in Bird Conservation Region 14 (Atlantic Northern Forest) and the Birds of Conservation Concern in USFWS Region 5 (USFWS 2008) were also reviewed.

The following summaries and statistics were generated, as applicable, to address the objectives and goals of this study:

- Species lists and indices of relative abundance; and
- Frequency of occurrence for each species.

Relative abundance is summarized using the maximum and average number of individuals for each transect. The maximum number of individuals is the highest count of different individuals for each species at a point. The average number of individuals is the mean of all survey counts for each species. The total number of individuals is the sum of all counts from all surveys for all species and does not account for the same individual seen during separate surveys. Frequency of

occurrence is the number of points where each species was detected divided by the total number of survey points.

Natural Communities

- Existing Roads
- Clearcut / Cleared Field
- Hemlock - Beech - Oak - Pine Forest
- Hemlock - Oak - Northern Hardwood Forest
- Hemlock - Spruce - Northern Hardwood Forest
- Northern Hardwood - Spruce - Fir Forest
- R.O.W. Clearing
- Red Maple - Red Oak - Cinnamon Fern Forest
- Red Maple - Sensitive Fern swamp
- Red Maple - Sphagnum Basin swamp
- Red Oak - Pine Rocky Ridge
- Rich Red Oak Rocky Woods
- Semi-Rich Oak - Sugar Maple Forest
- Sugar Maple - Beech - Yellow Birch Forest
- Temperate acidic cliff

Breeding Bird Point Count Locations

Id	Natural Community
1	Hemlock - Oak - Northern Hardwood Forest
2	Hemlock - Spruce - Northern Hardwood Forest
3	Hemlock - Spruce - Northern Hardwood Forest
4	Hemlock - Beech - Oak - Pine Forest
5	Northern Hardwood - Spruce - Fir Forest
6	Red oak - pine rocky ridge
7	Semi-Rich Oak - Sugar Maple Forest
8	Semi-Rich Oak - Sugar Maple Forest
9	Hemlock - Beech - Oak - Pine Forest
10	Hemlock - Beech - Oak - Pine Forest
11	Hemlock - Spruce - Northern Hardwood Forest
12	Hemlock - Spruce - Northern Hardwood Forest

Legend

- ◆ Breeding Bird Survey Location
- Proposed Disturbance Area

Hillsboro and Stoddard 7.5-Minute USGS Topographic Quadrangles



ANTRIM WIND ENERGY PROJECT

ANTRIM, NH

Figure 2

Breeding Bird Point Count Locations and Natural Communities Map

Produced by: CTRC

7/7/2015

3.0 RESULTS AND DISCUSSION

3.1 Summary of Breeding Bird Surveys

In spring of 2011, 12 survey points for breeding bird surveys were selected based on available habitat found in the Project area by analysis of aerial photography and site visits. Points were spaced a minimum of 250 m apart. The points sited outside the project area were located at least 500 feet from potential turbine locations. See Figure 2 for point count locations.

A total of 2 breeding bird surveys were completed on June 7 and June 16, 2011.

3.1.1 *Species Identified*

A total of 131 birds were counted, all identified to species. These comprised 25 species in 19 genera. An additional 14 species in 13 genera were observed incidentally during June 2011 in the Antrim vicinity, but not at the breeding bird survey points. See Appendix B, Table 1 for the species list. Some of the incidental sightings were not within the project area, were at lower elevation and may have been in different cover types than those found on the point count survey.

Thirteen, or 52 percent, of the species identified during the 2011 surveys are considered neotropical migrants.

3.1.2 *Relative Abundance and Frequency of Occurrence*

The total number of individuals observed was used to assess the relative abundance for each species.

The maximum number of breeding individuals at all 12 point counts combined was 131 individuals. The most abundant birds observed were the ovenbird (*Seiurus aurocapillis*) and blackburnian warbler (*Dendroica fusca*), each making up 12.98 percent of the birds observed. The red-eyed vireo (*Vireo olivaceus*) was the next most abundant bird observed, and accounted for about 10.69 percent of the total number of breeding birds.

The frequency of occurrence, which gives an indication of the distribution of a given species across the site, is calculated by the number of points the species was observed divided by the total number of points. The ovenbird, blackburnian warbler, red-eyed vireo and the black-throated blue warbler (*Dendroica caerulescens*) were observed at the most survey points, with each found at 8 of the 12 survey points. A summary of the frequency of occurrence for all species can be found in Appendix B, Table 1.

3.2 Species of Concern Within the Project Area

3.2.1 Federal and State Listed Species

No Federal-listed or New Hampshire state-listed species were found at point count locations or within the project during breeding bird surveys. Incidental observations of the State-listed endangered common nighthawk (*Chordeiles minor*) were made during trips to the site to do breeding bird surveys. On June 6, a nighthawk was heard vocalizing between 7:30 PM and 9:00 PM from near point 12, from the area north of Willard Mountain. On June 7, a nighthawk was also heard vocalizing in the same area at approximately 4:15 AM. On the next breeding bird survey trip to the site, up to 4 common nighthawks were observed between approximately 7:00 PM and 8:30 PM on June 15 foraging over the valley north of Tuttle Hill. After dark (about 8:30) and up until 9:10 PM the nighthawks were heard vocalizing, still north of Tuttle Hill. The following morning a series of nighthawk calls were heard from between points 1 and 2, with the calls originating from north of the ridge, in the same area as heard the previous night. Breeding habitat for common nighthawks consists of open areas of bare bedrock or gravel. This site is forested and this habitat does not naturally occur on the site, so it is not likely that any of these birds nested on the site. There is a recent clear cut on the south east side of Willard Mountain, however much of this area is vegetated with ground cover.

3.2.2 Federal Birds of Conservation Concern

No bird listed on either the Federal Birds of Conservation Concern in Bird Conservation Region 14 (Atlantic Northern Forest) or the Birds of Conservation Concern in USFWS Region 5 (USFWS 2008) were observed at the site during breeding bird surveys or incidentally at the site during breeding season.

3.2.3 State of New Hampshire Special Concern Species

No State Species of Special Concern were observed at the site either during breeding bird surveys or incidentally.

3.3 Results of Vegetation Survey

Vegetation surveys on tenth-acre (0.04 hectare) plots were completed at all 12 point count locations during the last week of August following methods described by James and Shugart (1970). This methodology was developed specifically for making habitat measurements associated with estimating bird populations. The raw data is attached in Appendix B, Table 2.

The entire site is forested, and most of the site is currently populated by young to mature tree cover. Trees that are between 3 and 15 inch diameter breast height (DBH) make up 94% of the trees found within the vegetation plots. Large trees (greater than 15" DBH), while present throughout the site, made up a small proportion (6%) of the trees found in the survey plots. The density of trees on the site is relatively low, with an average of 29 tree stems greater than 3

inches observed per plot. Woody species less than 3 inches in diameter were also found in relatively low densities on the site with an average of 12 shrub size woody stems observed per plot. Hardwood species were dominant on the site, making up 65% of trees counted in the plots, while softwoods made up 35 percent of all species counted. Most habitat types found on the site had some component of softwood present, however. Red spruce was the most abundant softwood species observed in the plots. The most common hardwood species were red maple, red oak, American beech, and yellow birch. The largest diameter tree was a red maple located at point 10, with a DBH of 24 in.

Canopy cover on the site ranged from approximately 36% to 95%, and the average canopy cover overall was 77%. Each point count location was in forested areas, and canopy height ranged from 45 feet to 70 feet, with an average canopy height of 60 feet among the 12 point count location. Ground cover observed ranged from about 5% at sites with the heaviest canopy cover to about 85%, and on average ground cover was 33%.

The majority of the survey points (1, 2, 3, 5, 11, and 12) can be characterized as one of the various types of Northern Hardwood Forest, in accordance with the “Natural Communities of New Hampshire, Second Edition” (Sperduto and Nichols 2011). Types found on the site include Hemlock-Spruce, Spruce-Fir, and Hemlock-Oak Northern Forest.

Other common vegetation communities identified at the surveys points can be characterized as Hemlock-Beech-Oak-Pine Forest (points 4, 9, 10), Red Oak-Pine Rocky Ridge (point 6), and Semi-Rich Oak-Sugar Maple Forest (points 7 and 8).

All of these forest communities will have varying degrees of canopy dominance from primarily hardwoods, a mix of hardwood and softwood, or softwood dominated stands. The composition of hardwood and softwood depends on soils, slope and aspect, and this site has the full range of variation.

4.0 SUMMARY OF FINDINGS

Breeding birds observed at 12 point counts consisted of 25 breeding species in the project area. The ovenbird and blackburnian warbler were the most commonly observed species, and each accounted for 12.98 percent of the average number of birds during the surveys. The following most common bird based on their average counts was the red-eyed vireo (10.69 percent). These three species were present at 8 of the 12 survey points. An additional 14 species were observed incidentally in the Antrim vicinity in June 2011, in addition to those observed at point count locations.

No Federal-listed or New Hampshire state-listed species were found at point count locations or within the project during breeding bird surveys. Incidental observations of the State-listed endangered common nighthawk were made during trips to the site to do breeding bird surveys. None of these birds were observed within the project area, and suitable breeding habitat is not found within the project area so it is not likely any common nighthawks are breeding on the project site.

No bird listed on either the Federal Birds of Conservation Concern in Bird Conservation Region 14 (Atlantic Northern Forest) or the Birds of Conservation Concern in USFWS Region 5 were observed at the site during breeding bird surveys or incidentally at the site during breeding season. No State Species of Special Concern were observed at the site either during breeding bird surveys or incidentally.

5.0 REFERENCES

- James, F. C. and H. H. Shugart, Jr. 1970. A Quantitative Method of Habitat Description. Audubon Field Notes 24: 727-736.
- Sperduto, D.D. and William F. Nichols. 2011. Natural Communities of New Hampshire. 2nd Ed. NH Natural Heritage Bureau, Concord, NH. Pub. UNH Cooperative Extension, Durham, NH.
- U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. Online version available at: <http://www.fws.gov/migratorybirds/>
- VINS. 2005. Mountain Bird Watch Protocol. Unpublished survey protocol by the Vermont Institute of Natural Sciences. Available online at: <http://www.vinsweb.org/cbd/allspeices.html>
- Whittam, B. and M. Ball. 2002. Developing a Protocol for Monitoring the Bicknell's Thrush (*Catharus bicknelli*) and Other High Elevation Bird Species in Atlantic Canada. Unpublished report by Bird Studies Canada. Available online at: <http://www.bsc-eoc.org/download/bithreport.pdf>.
- Whittam, B. and M. Ball. 2003. High Elevation Landbird Program: 2002 Report. Bird Studies Canada, February 2003.

APPENDIX A

Breeding Bird Survey Protocol For the Antrim Wind Energy Project & Data Forms and Instructions

Breeding Bird Survey Protocol for the Antrim Wind Energy Project

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1.0 INTRODUCTION

1.1 Project Description

Antrim Wind Energy LLC (AWE) is proposing to construct the Antrim Wind Energy Project (Project) on Tuttle Hill and Willard Mountain in the Town of Antrim, Hillsborough County, New Hampshire. The proposed Project is sited entirely on privately owned land that is leased by AWE. The Project will include: up to ten (10) wind turbines for a nameplate capacity of approximately 20mw; an access road; collection lines; and an interconnection substation.

The ridgeline on which the project is proposed to be developed is a mostly contiguous ridgeline which runs east-northeast to west-southwest. The ridge is nearly parallel to NH Route 9, which is approximately $\frac{3}{4}$ of a mile to the north. Between the ridgeline and Route 9 is an existing transmission corridor containing both a 115 kV transmission line and a 34.5 kV distribution circuit; the proposed Project will interconnect with this existing transmission.

AWE has contracted TRC Companies (TRC) to conduct the breeding bird survey for the Project to determine what effects, if any, the proposed project may have on breeding birds in the Project vicinity.

1.2 Goals and Objectives

The goal of breeding bird surveys within the proposed Antrim Wind Energy Project area is to document the pre-construction presence, diversity and relative abundance of breeding bird species in the proposed area of development.

The specific objectives of breeding bird surveys are to:

- ◆ produce a comprehensive list of breeding bird species in the project area and in adjacent areas outside of the “zone of influence” of the project area;
- ◆ compile a species index and relative abundance for birds breeding in the project area;
- ◆ calculate frequency of occurrence for each species;
- ◆ characterize habitat that is available for species which occur in the project area; and
- ◆ qualitatively assess the general patterns of breeding bird use in the vicinity of the proposed project.

2.0 STUDY PROTOCOL

Breeding bird surveys for the Antrim Wind Energy Project will be performed using point count methods. This protocol was developed based on methods used for the Vermont Institute of Natural Science's *Mountain Birdwatch* program (VINS 2005) and Bird Studies Canada's *High Elevation Landbird Program (HELP)* (Whittam & Ball 2002, and 2003). Other recent protocols which have been referenced include: VINS *Breeding Landbird Monitoring Program* Volunteer Training manual (VINS 2008); VINS *Mountain Birdwatch 2.0 Volunteer Training manual* (VINS 2010); and *Mountain Birdwatch Protocol and Standard Operating Procedures for Monitoring High-Elevation Landbirds in the Northern Appalachian and Laurentian Regions* (Hart and Lambert 2008). The USFWS and state lists of rare, threatened and endangered birds will be reviewed, and will include consideration of birds of concern and any applicable conservation plans.

2.1 Site Selection

Point counts will be conducted within the area proposed for project development and adjacent to the proposed project area. The surveys will be made up of twelve point count locations. Points along individual transects will be 250 m apart (Whittam & Ball 2002, VINS 2005). Each point will consist of a central location from where observations will be made. Each of the points will be located with Global Positioning System (GPS). Elevation will also be recorded for each point, based on aerial survey topographic data and GPS data.

The ultimate point locations will be selected based on aerial photography, topography and field reconnaissance. Half of the points (six) will be in a transect along the ridge within the project area. The remaining six points will be in areas outside of the "zone of influence" from the project area, and will be sited a minimum of 500 feet from the zone of influence. Some or all of the survey transect may be located in areas where there are no trails. Flagging will be used as necessary to locate transects and to mark each survey point; no permanent markers will be used. All flagging will be removed upon the final survey. Cutting of vegetation will be avoided to the extent practical. Access along the study transect will be limited to on-foot only.

2.2 Number and Timing of Surveys

All breeding bird point count surveys will be conducted between June 1 and June 21. These periods correspond with the height of breeding and vocal activity for migratory songbirds in the Atlantic Northern Forest (Hart and Lambert 2008). Surveys will start approximately 45 min before local sunrise, and will be completed by 8:00 AM.

All points shall be visited at least twice during the study period. Surveys will only be performed in weather conditions that do not hamper observations; therefore, inclement weather may preclude surveys. Acceptable weather conditions are defined by temperatures that are above 35°F, and absence of rain and/or wind that could interfere with intensity or audibility of bird sounds. Steady drizzle, prolonged rain and/or windy periods that interfere with audibility are not acceptable for sampling. Wind speeds must be less than 4 on the Beaufort scale to allow proper audibility of bird sounds. Surveys may be delayed up to 30 minutes if weather conditions are poor upon arrival at a survey site, however, if poor conditions persist after that time, surveys will be rescheduled for another morning (VINS 2005).

2.3 Breeding Bird Survey Protocol

Breeding bird surveys will consist of performing point counts (or listening periods) at each of the determined points. These surveys will focus on identifying and quantifying bird species present. The procedure will adhere to that which is described in the VINS *Breeding Landbird Monitoring Program Volunteer Training Manual* (VINS 2008).

At least six points will be assessed consecutively during the same survey event. The survey at each point will consist of 10 minutes of silent listening. Stopwatches will be used to mark time. Observers will record all birds that are detected (seen or heard) during the listening period, and will record the approximate distance and behavior of the birds from the observation point as described in VINS 2008.

Personnel performing the surveys will be experienced bird watchers who are familiar with breeding bird species found in the northeast, and are able to identify them by sight and by sound. Training for this survey will help eliminate error or bias, and will include listening to breeding bird vocalizations and studying field guides.

2.4 Data Collection

Breeding bird observations will be recorded directly onto field cards and Data Coding Sheets based on those provided in the VINS *Breeding Landbird Monitoring Program – Volunteer Training Manual* (VINS 2008). Data sheets for breeding bird surveys at the Antrim Wind Energy Project are provided in Appendix A. Data over the course of each 10 minute listening period will be divided into 2, 3 and 5 minute segments. Information such as observer, route name, date, start time at each point, and weather information will also be entered on each data sheet. Weather information will include temperature, cloud conditions, precipitation, and wind direction and speed (Beaufort scale).

Species of birds seen or heard outside of point count areas during surveys will be noted separately as incidental observations in order to establish a comprehensive species

occurrence list. An Incidental Observation Form is provided with the data sheets in Appendix A.

2.5 Habitat Evaluation Protocol

Habitat parameters associated with point count locations will be quantified using methods described by James and Shugart (1970). This methodology was developed specifically for making habitat measurements associated with estimating bird populations; it is still used by the national Breeding Bird Survey (USGS 2009b), as well as other current studies.

Quantitative estimates of vegetation will be made using tenth-acre (0.04-hectare) circular plots, consisting of a 37-foot (11.28-m) radius around a center point. For point count transects, tenth-acre habitat evaluation plots will coincide with listening station locations. Along trail-based transects, a 40-foot offset will be used to avoid cataloging the area of the trail. One plot will be evaluated alongside each survey point, with the offset side determined in each instance through a random coin toss. For spot-mapping parcels, tenth-acre plots will be centered on randomly selected grid points within the interior of the parcel (James and Shugart 1970, Ring et al. 2005). No less than six total tenth-acre plots will be measured within the spot mapping parcel.

Data collected at each tenth-acre plot will include:

- species and size class of all trees encountered within the plot;
- estimated number (and dominant species) of woody stems less than 3 inches diameter at breast height;
- estimated canopy cover and ground cover; and
- estimated canopy height.

All data will be recorded onto a data sheet (see Appendix B). Vegetation density will be quantified using these data, and calculations will be performed as described in James and Shugart (1970).

This effort will deviate from the James and Shugart (1970) protocol in the use of certain tools to gather data. Instead of using a “reach stick” to determine diameter, a forester’s diameter tape will be used. Instead of using a bright yardstick at the center of the 37’-foot-radius circle, the center will be marked with flagging tape, and a measuring tape or a laser range finder (LRF) will be used to determine distance (any flagging used will be removed at the end of the survey). Finally, instead of using a mirror and level to determine canopy height, the LRF will be used.

3.0 LITERATURE CITED

- Hart, Julie A. and J.D. Lambert (eds.). 2008. Mountain Birdwatch: Protocol and Standard Operating Procedures for Monitoring High-Elevation Landbirds in the Northern Appalachian and Laurentian Regions. Accessed online, March 2011, at: <http://www.nebirdmonitor.org/tools-resources/methodspdfs/mbwprotocol>
- James, F. C. and H. H. Shugart, Jr. 1970. A Quantitative Method of Habitat Description. Audubon Field Notes 24: 727-736.
- VINS. 2005. Mountain Birdwatch protocol. Unpublished survey protocol by the Vermont Institute of Natural Sciences.
- VINS. 2008. Breeding Landbird Monitoring Program: Volunteer Training Manual. March 2008. Accessed online, March 2011, at: <http://www.vtecostudies.org/PDF/NPS%20Survey%20Instructions.pdf>
- VINS. 2010. Mountain Birdwatch 2.0 Volunteer Training Manual. Accessed Online, March 2011 at: <http://www.vtecostudies.org/MBW/pdf/MBW2%20Volunteer%20Manual%20Dec%202010.pdf>
- USGS. 2009b. Breeding Bird Census. Accessed online, March 2011, at: <http://www.pwrc.usgs.gov/birds/bbc.html>
- Whittam, B. & M. Ball. 2002. Developing a protocol for monitoring the Bicknell's thrush (*Catharus bicknelli*) and other high elevation bird species in Atlantic Canada. Unpublished report by Bird Studies Canada. Accessed online, March 2011, at: www.bsc-eoc.org/download/bithreport.pdf
- Whittam, B. & M. Ball. 2003. High Elevation Landbird Program: 2002 Report. Bird Studies Canada, February 2003.

APPENDIX A:

Point Count Data Sheets

- ◆ *Point Count Transect Field Card*
- ◆ *Transect Data Coding Sheet*
- ◆ *Incidental Observation Form*

POINT COUNT FIELD CARD

DATE: _____ OBSERVERS: _____ LOCATION: _____ POINT #: _____
COMMENTS: _____

Start time: _____ Temp: _____ %Clouds: _____ Rain: _____ Windsp: _____ End time: _____

π =0-3 minutes

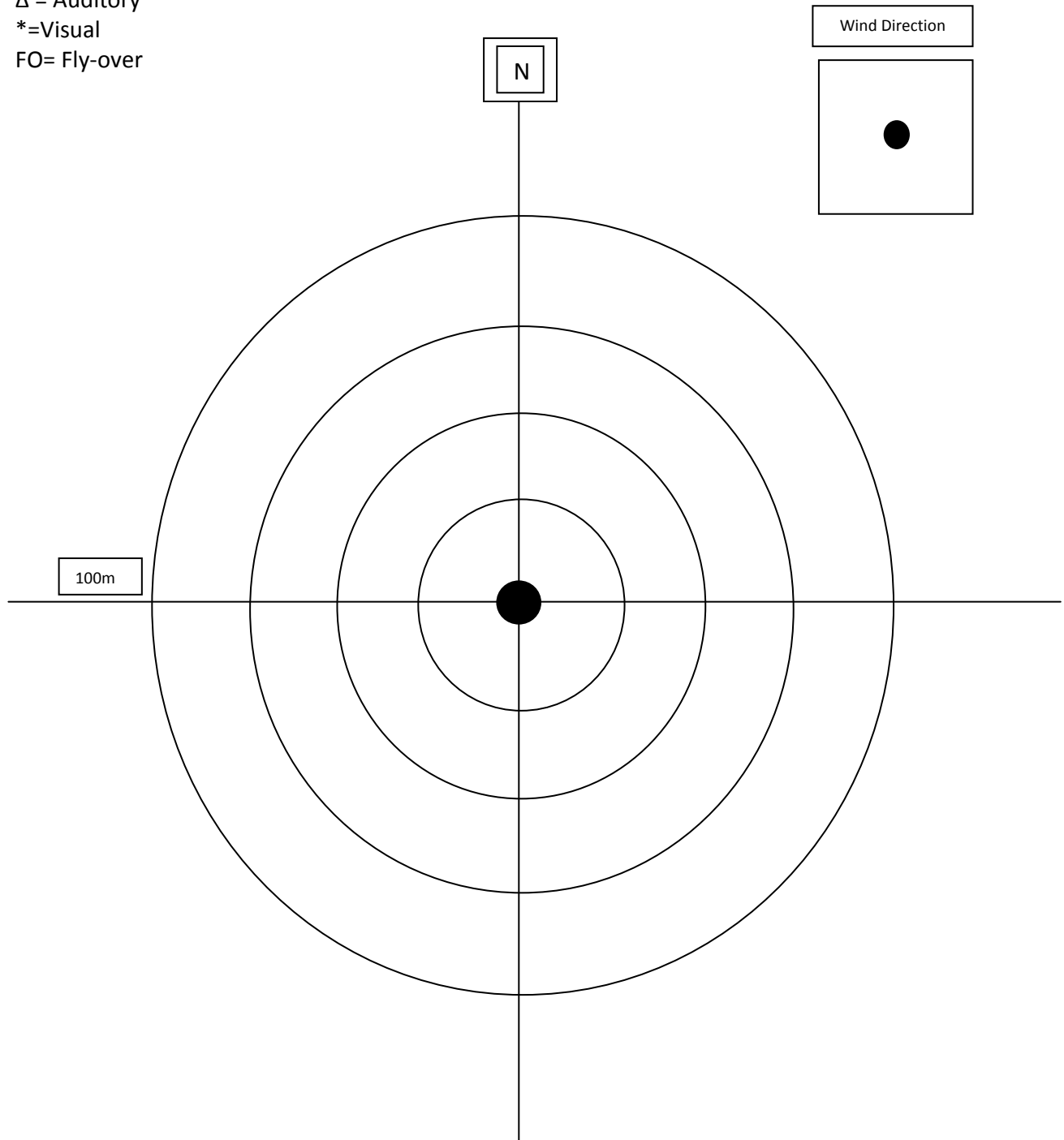
ϵ =3-5 minutes

#=5-10 minutes

Δ = Auditory








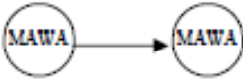


*=Visual

FO= Fly-over



Standard symbols used for mapping bird locations.

Magnolia Warbler in this example

	Position of singing male
	Approximate position of singing male
	Calling, sex unknown
	Female observed
	Male observed
	Observed, sex unknown
	Pair observed together, assumed
	Known change in position
	Assumed change in position
	Nest

This key from VINS Breeding Landbird Monitoring Program – Volunteer Training Manual (VINS 2008)

Observer(s)		Route name		Date	
Start time	End time	Temperature	Sky code (0-6)	Wind code (0-5)	

[illegible]

This Data Sheet Adapted From Vermont Institute of Natural Science Mountain Birdwatch – All Species Data Coding Sheet

WIND CODES (Beaufort Wind Scale):

- 0: < 1 *mph*; smoke rises vertically
- 1: 1-3 *mph*; wind direction shown by smoke drift
- 2: 4-7 *mph*; wind felt on face; leaves rustle at times
- 3: 8-12 *mph*; leaves and small twigs in constant motion; light flag extended
- 4: 13-18 *mph*; raises dust and loose paper; small branches in motion
- 5: 19-24 *mph*; small trees sway; crested wavelets on inland waters

SKY CODES (Sky Condition):

- 0: clear, or very few clouds
- 1: partly cloudy (roughly halfclouded)
- 2: mostly cloudy (overcast; few sky openings)
- 3: fog or smoke (impairs visibility beyond 30 m)
- 4: light drizzle
- 5: constant snow
- 6: constant rain

Incidental Wildlife Observation Form

Antrim.Wind.Power Project

Species Observed:

:

Age (A/I/U) :

Gender (M/F/U):

Date of Observation:

Time of Observation:

Observer:

Recorded by:

Location:

GPS:

Habitat Description:

NOTES:

APPENDIX B:
Data Sheet for Habitat Evaluations

Vegetation Data Sheet			
Location:		Study Plot:	Plot Size:
General Area Description:		Date:	
Topography:		Observer:	
Tenth-acre circles			
Trees		Diameter Size Classes (inches): A= <3 B = 3-6, C = 6-9, D = 9-15, E = 15-21, F = 21-27, G = 27-33, H = 33-40, I = >40	
Species and Size Class		Circle #: _____	Shrubs Number of woody stems less than 3 inches DBH intercepted in 2 armlength transects: Note species
1			
2			
3			
4			
5			Ground Cover 20 random + or - sitings through ocular tube for presence or absence of green vegetation: Note species
6			
7			
8			
9			
10			
11			
12			Canopy Cover 20 + or - sitings through ocular tube for presence or absence of green vegetation on transect: Note species
13			
14			Canopy Height Maximum canopy height in feet: Note species
15			
16			
17			
18			
19			
20			
21			
22			
23			Photos
24			
25			
26			
27			Slope and Bearing
28			
29			
30			
31			Other Notes
32			

Species Abbreviations: black spruce-PIMA; red spruce-PIRU; white spruce-PIGL; hemlock-TSCA; balsam fir-ABBA; N. white cedar-THOC; quaking aspen-POTR; bigtooth aspen-POGR; balsam poplar-POBA; hop-hornbeam-OSVI; yellow birch-BEAL; gray birch-BEPO; paper birch-BEPA; alder-ALRU; Am. beech-FAGR; Am. mtn. ash-SOAM; showy mtn. ash-SODE; serviceberry-AMAR; pin cherry-PRPE; sugar maple-ACSA; red maple-ACRU; striped maple-ACPE; mtn. maple-ACSP; black ash-FRNI; white ash-FRAM; green ash-FRPE

APPENDIX B

TABLES

Table 1

Breeding Bird Species Observed within the Antrim Wind Energy Project Vicinity					
Common Name	Latin Name	Residence*	Number Observed	Relative Abundance	Frequency of Occurrence
Species Observed During Formal Breeding Bird Surveys					
American Goldfinch	<i>Carduelis tristis</i>	L/US	1	0.76%	0.08%
Black and White Warbler	<i>Mniotilta varia</i>	NT	5	3.82%	0.41%
Blackburnian Warbler	<i>Dendroica fusca</i>	NT	17	12.98%	0.67%
Black-capped Chickadee	<i>Poecile atricapillus</i>	L	2	1.53%	0.08%
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	US/NT	10	7.63%	0.67%
Blue Jay	<i>Cyanocitta cristata</i>	US/L	4	3.05%	0.33%
Cedar Waxwing	<i>Bombycilla cedrorum</i>	L/US	2	1.53%	0.08%
Chesnut-sided Warbler	<i>Dendroica pensylvanica</i>	NT	2	1.53%	0.08%
Common Yellowthroat	<i>Geothlypis trichas</i>	NT	2	1.53%	0.08%
Eastern Wood Pewee	<i>Empidonax</i>	NT	4	3.05%	0.33%
Golden-crowned Kinglet	<i>Regulus calendula</i>	L/US	2	1.53%	0.17%
Hairy Woodpecker	<i>Picoides villosus</i>	L	6	4.58%	0.50%
Hermit Thrush	<i>Catharus guttatus</i>	US	9	6.87%	0.58%
Magnolia Warbler	<i>Dendroica magnolia</i>	NT	3	2.29%	0.17%
Morning Dove	<i>Zenaida macroura</i>	US/L	1	0.76%	0.08%
Myrtle Warbler	<i>Dendroica coronata</i>	US/NT	12	9.16%	0.58%
Ovenbird	<i>Seiurus aurocapillus</i>	US/NT	17	12.98%	0.67%
Purple Finch	<i>Carpodacus purpureus</i>	L/US	1	0.76%	0.08%
Red-breasted Nuthatch	<i>Sitta canadensis</i>	L/US	2	1.53%	0.17%
Red-eyed Vireo	<i>Vireo olivaceus</i>	NT	14	10.69%	0.67%
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	NT	3	2.29%	0.25%
Scarlet Tanager	<i>Piranga olivacea</i>	NT	3	2.29%	0.25%
Slate-colored Junco	<i>Junco hyemalis</i>	L/US	5	3.82%	0.33%
Winter Wren	<i>Troglodytes troglodytes</i>	US	2	1.53%	0.17%
Veery	<i>Catharus fuscescens</i>	NT	2	1.53%	0.08%
Total Species Observed During Formal Surveys		25			
Total Individuals Observed During Formal Surveys			131		
Species Recorded as Incidental Observations during Summer 2011					
American Redstart	<i>Detophaea ruticilla</i>	NT			
Barred Owl	<i>Strix varia</i>	US/L			
Blue-headed Vireo	<i>Vireo solitarius</i>	US/NT			
Broad-winged Hawk	<i>Buteo platypterus</i>	NT			
Brown Creeper	<i>Certhia americana</i>	na			
Common Nighthawk	<i>Chordeiles minor</i>	NT			
Cooper's Hawk	<i>Accipiter cooperii</i>	US/L			
Least Flycatcher	<i>Empidonax minimus</i>	NT			
Pileated Woodpecker	<i>Picadae</i>	L			
Red-tailed Hawk	<i>Buteo jamaicensis</i>	US/L			
Ruffed Grouse	<i>Bonasa umbellus</i>	L			
Turkey Vulture	<i>Cathartes aura</i>	US			
Wild Turkey	<i>Meleagris gallopavo</i>	L			
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	US			
Total Species Observed Incidentally		14			
Total Breeding Bird Species Recorded in 2011		39			
* L – Local year round resident; US – Migrates within US; NT – Neotropical migrant					

Table 2

[illegible]

Trees						Shrubs (< 3 inch dbh)		% Ground Cover	% Canopy Cover	Canopy Height (ft)	Photo #	% Slope	Compass Bearing	Notes
Date	Point	Habitat Plot	Species	Size Class	#	Species	#							
			ACRU	E	1									
			FRAM	B	2									
			FRAM	C	1									
			PIST	C	1									
			PIST	F	1									
			TSCA	D	1									
			BEAL	D	1									
			BEAL	E	1		7							
					24									
8/31/2011	5	1	PIRU	B	5	PIRU	8	11	91.75	70	39-42	8%	184	A few boulders, old moose bark browsing
			PIRU	D	1	ACPE	1							
			QURU	B	2	FAGR	1							
			QURU	D	2									
			PIST	E	1									
			PIST	F	1									
			BEPA	D	1									
			ACRU	B	5									
			ACRU	C	5									
			ACRU	D	3									
			ACRU	E	1									
			ACPE	B	2									
			BEAL	B	3									
			TSCA	D	1									
			FAGR	B	2		10							
					35									
8/31/2011	6	1	PIRU	B	1	FAGR	5	4.75	94.25	65	43-46	4%	224	Rock outcrops, several very large diameter/hollow trees, a few snags, good wildlife habitat
			TSCA	B	1									
			TSCA	C	5		5							
			TSCA	D	8									
			TSCA	E	2									
			FAGR	E	2									
			BEAL	D	1									
			ACRU	E	1									
					21									
9/1/2011	7	1	PIRU	B	2	FAGR	5	9	80	60	73-76	12%	246	irregular terrain, numerous large boulders
			BEPA	B	1	ACRU	1							

[illegible]

Trees						Shrubs (< 3 inch dbh)		% Ground Cover	% Canopy Cover	Canopy Height (ft)	Photo #	% Slope	Compass Bearing	Notes
Date	Point	Habitat Plot	Species	Size Class	#	Species	#							
9/1/2011	10	1	PIRU	B	2	COCO	1	19.5	84	65	59-62	24%	244	Many large boulders, moose bark browse
			BEAL	B	6	BEAL	2							
			BEAL	C	3	FRAM	10							
			BEAL	D	2	ASCP	1							
			ACRU	B	3	ACPE	6							
			ACRU	C	1	COAL	1							
			ACRU	D	1									
			ACRU	E	1									
			ACRU	F	1									
			ACPE	B	7		21							
			OSVI	B	1									
			OSVI	C	1									
			FRAM	B	2									
			FRAM	D	1									
					32									
9/1/2011	11	1	PIRU	B	4	ACRU	2	33	80.25	60	47-50	28%	284	moose bark browsing
			PIRU	C	3	LYLI	1							
			PIRU	D	2									
			PIRU	E	1									
			BEPA	D	2									
			QURU	B	1									
			QURU	E	1									
			PRSE	C	1									
			OSVI	B	1									
			OSVI	C	1									
			FAGR	B	1		3							
			ACRU	B	3									
			ACRU	C	4									
			ACRU	D	3									
					28									
9/1/2011	12	1	PIRU	B	3	PIRU	6	49	71	65	55-58	24%	202	steep slope, large boulders
			PIRU	C	2	VILA	1							
			PIRU	D	16	ILMU	1							
			PIRU	E	1	BEAL	2							
			BEPA	C	1		10							