2006 Breeding Bird Survey Report for the Kibby Wind Power Project

Prepared for:
TransCanada Maine Wind Development Inc.
8th Floor, 55 Yonge Street
Toronto, Ontario M5E IJ4

Prepared by:
TRC
249 Western Avenue
Augusta, Maine 04330

and

BioDiversity Research Institute
19 Flaggy Meadow Road
Gorham, Maine 04038

December 2006

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 PROJECT DESCRIPTION

TransCanada Energy Ltd. (TransCanada) is proposing to develop, own and operate a 100–200 megawatt (MW) wind power generating facility in the Boundary Mountains of Western Maine known as the Kibby Wind Power Project. The project is in a location for which a similar project proposal by U.S. Windpower was previously approved by the Land Use Regulation Commission (LURC).

The project will be located in Kibby and Skinner Townships (Twp.), an unincorporated area of Franklin County, Maine. At the time the study was conducted, up to four ridgelines were under consideration for turbine locations. However, the project area has been reduced to two ridges, as shown in Figure 1. The property is owned by Plum Creek, and the surrounding areas are currently actively managed for forest products. The Kibby Wind Power Project can take advantage of existing logging roads and cleared areas to access the ridgelines, and forestry activities can continue in a complementary fashion with the project in place. The project will utilize the superior wind resource found in this vicinity to create clean, renewable power generation.

Maine Department of Inland Fisheries and Wildlife (MDIFW) has requested that TransCanada perform surveys for breeding birds in the project area, with an emphasis on Bicknell's thrush.

1.1 Objectives

The primary objective of this study was to document use of the proposed project area by breeding bird species, with a particular focus on detecting Bicknell's thrush. 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 transects where each species was detected by the total number of survey transects;
- Collecting data at site plots for more detailed Bicknell's thrush studies (i.e., spot mapping); and
- Estimating population density of Bicknell's thrush within the project area.

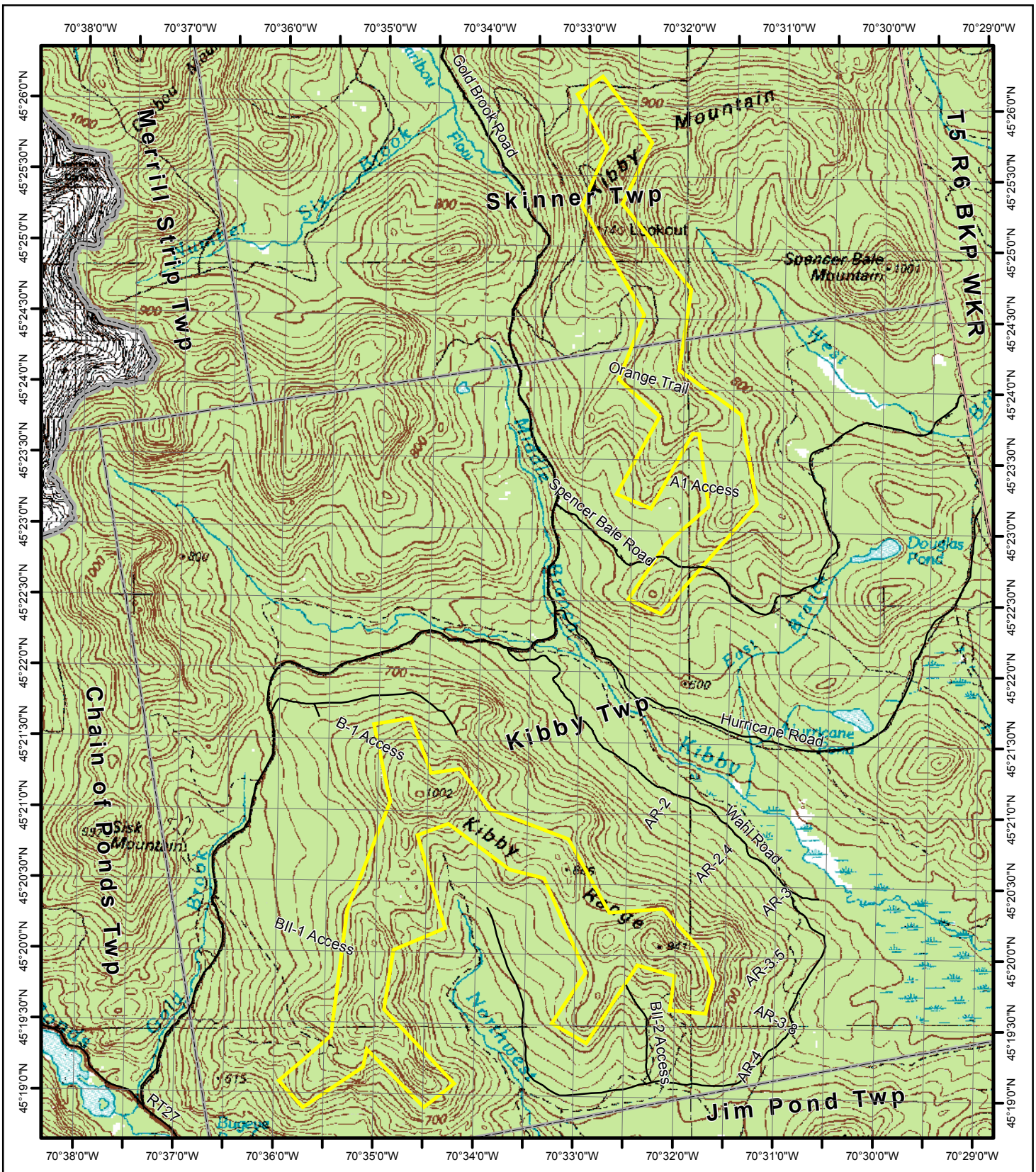
1.2 Prior Studies

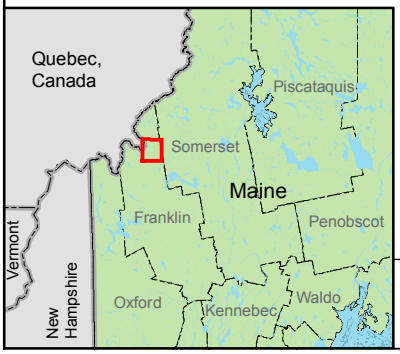
In 1992, U.S. Windpower performed breeding bird surveys in the Kibby vicinity (ND&T 1993). Surveys were performed at 24 points at representative habitats and on or near tops of the mountains or ridges in the project vicinity. Each point was visited four times: twice in the morning (1/2 hour before sunrise to 9 AM); once between 9 AM and 5 PM; and once between 6 PM to 30 minutes after sunset. Each survey point visit lasted for 10 minutes. The study period was from June 1 through July 30. A species list from these surveys is provided in Appendix A.

In June and July 1992, a total of four Bicknell's thrush individuals were observed in the Kibby project area during breeding bird surveys.[1]

During visits in June 2005 to the project area by TRC employees, Bicknell's thrush was not encountered. However, during fall 2005 migration surveys at the fire tower on Kibby Mountain, three Bicknell's thrush and one unidentified thrush were observed.

[1] Note that until 1995, Bicknell's thrush was not recognized as a species by the American Ornithologist Union (AOU), and was considered a gray-cheeked thrush. Though noted as gray-cheeked thrush in the U.S. Windpower report, occurrences during June and July in this area were likely Bicknell's thrush.





Road
Town Boundary
County Boundary
State Boundary
Project Area

Data Notes: *Base map: 100K USGS map;*
Political and road data courtesy of Maine OGIS

1
Kilometers

TRC
249 Western Ave
Augusta, ME 04330

Project Area

Kibby Wind Power Project

Figure: 1

2.0 STUDY METHODOLOGY

2.1 Survey Protocol

Breeding bird surveys in the Kibby Wind Power Project vicinity consisted of three major components: point count surveys for breeding birds, Bicknell's thrush playback to augment point count surveys, and habitat evaluations at survey locations. A consultation meeting with Maine Department of Inland Fisheries and Wildlife (MDIFW) and United State Fish and Wildlife Service (USFWS) took place on February 23, 2006. These agencies reviewed the proposed protocol for the breeding bird and Bicknell's thrush surveys and generally agreed with the proposed methodologies for these surveys. Tom Hodgman, MDIFW, noted particular interest in more detailed surveys to determine density of nesting Bicknell's thrush. An appropriate survey methodology was included in the survey protocol, and study coordinators maintained close contact with Mr. Hodgman during the study period.

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 and at dusk. Seven transects, each consisting of five survey points (for a total of 35 points), were selected within the project area for point count studies. See Figures 2 and 3 for the location of these transects.

Point count surveys which failed to detect Bicknell's thrush were augmented by using playbacks to increase the likelihood of detecting this species. Playback protocol was based on those described by Rimmer et al. (1996), Whittam and Ball (2002 and 2003), and VINS (2005).

If Bicknell's thrush were found breeding in the study area, more detailed studies to estimate population density were to be undertaken. These surveys would use spot-mapping techniques as presented in the United States Department of Agriculture (USDA) Forest Service's *Handbook of Field Methods for Monitoring Landbirds* (Ralph et al. 1993), and the United States Geological Survey (USGS) *Manager's Monitoring Manual: Territory Mapping* (USGS 2006). Close communication with MDIFW would continue throughout this effort.

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 B.

2.2 Data Analysis

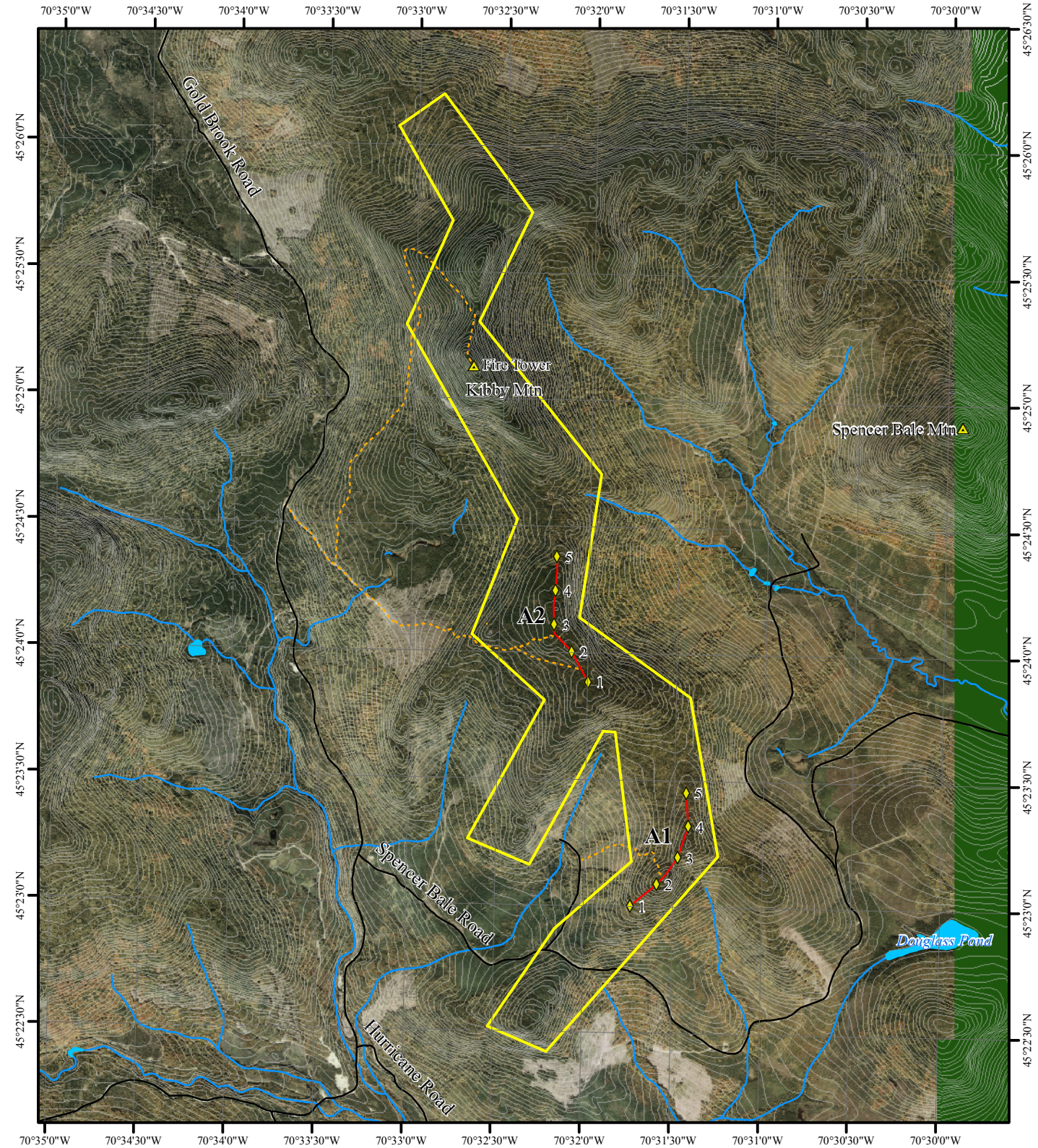
Data were entered and stored in a numerical database or spreadsheet format.

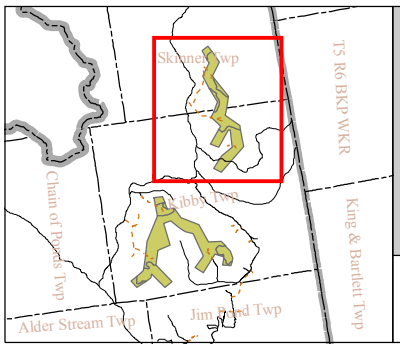
The following summaries and statistics were generated, as applicable, to address the objectives and goals of this study:

- Species lists and indices of relative abundance;
- Frequency of occurrence for each species; and
- Estimation of population density of Bicknell's thrush within the project area.

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 along each transect. 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.

Figure 2: Series-A Transect Locations





Survey Point
Additional Survey Points
Transect
Project Area
Streams
Roads
Trail

1
Kilometers

TRC
249 Western Ave
Augusta, ME 04330

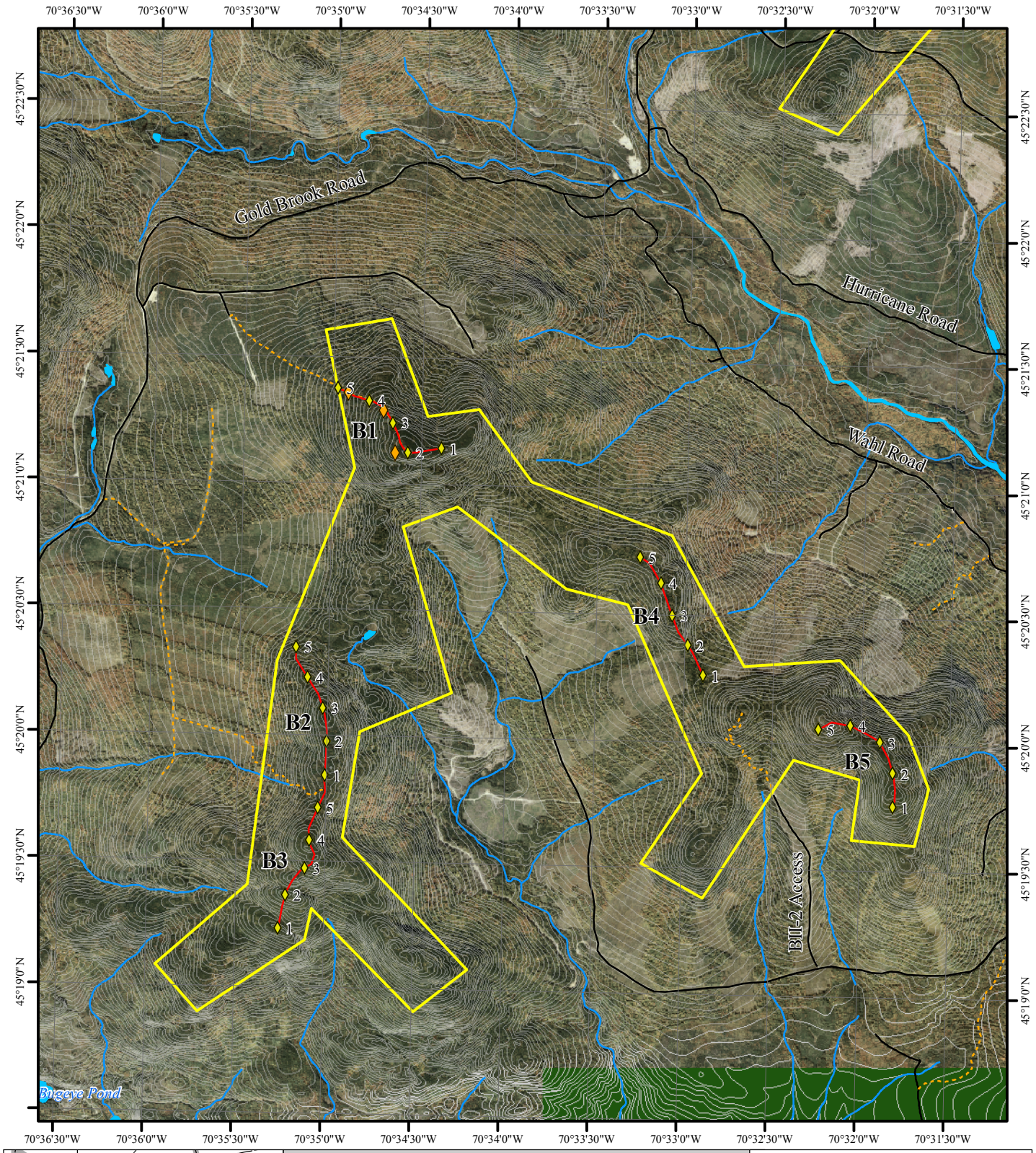
Breeding Bird Survey

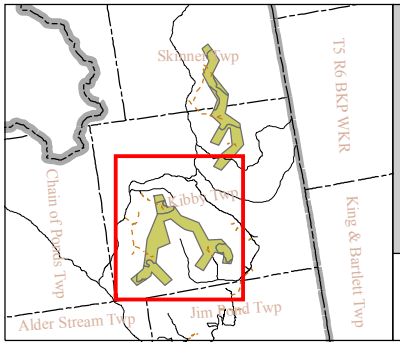
Kibby Wind Power Project

Figure: 2

Data Notes:
Orthophotography captured October 2, 2005 by J.W. Sewall Company;
Hydrography, road, and political data from Maine OGIS

Figure 3: Series-B Transect Locations





Survey Point
Additional Survey Points
Transect
Project Area
Streams
Roads
Trail

Data Notes:
Orthophotography captured October 2, 2005 by J.W. Sewall Company; Hydrography, road, and political data from Maine OGIS

1
Kilometers

TRC
249 Western Ave
Augusta, ME 04330

Breeding Bird Survey
Kibby Wind Power Project

Figure: 3

3.0 RESULTS AND DISCUSSION

3.1 Summary of Breeding Bird Surveys

In spring of 2006, seven transects for breeding bird surveys were selected based on available habitat models for Bicknell's thrush, proposed turbine locations, and analysis of aerial photographs. Each transect consisted of five point count locations spaced 250 m apart, for a total of 35 breeding bird point counts that were used for this study. See Figure 2 and 3 for point count and transect locations.

A total of 29 breeding bird surveys were completed along seven transects between June 1 and June 21, 2006 (see Appendix C, Table 1). Nineteen were completed at first light, and another ten were completed at dusk. Additional surveys were performed at transect B1 (Appendix C, Table 2) due to observations of Bicknell's thrush near and along that transect in early June in an attempt to locate an appropriate area for more detailed Bicknell's thrush surveys (i.e., spot-mapping).

The data was analyzed by survey transect, as opposed to point count or project area, to give the best summary of information gathered while also revealing the diversity of bird habitats within the project area

3.1.1 Species Identified and Avian Diversity

A total of 1,022 birds were counted, with 1,006 identified to species, 4 identified to genera, and 12 unidentified. These comprised 34 species in 23 genera, plus 2 genera not identified to species (Appendix C, Table 3).

An additional 37 species in 30 genera were seen during incidental observation in June 2006 in the Kibby vicinity, but not on the breeding bird survey transects (Appendix C, Table 4). Many of these sightings were at lower elevation and in different cover types than those found on the ridges during other studies or during travel to and from the breeding bird survey transects.

The number of avian species found in the project area during the 2006 surveys is similar to those observed during the surveys performed in 1992 for U.S. Windpower. The numbers of species found in the project area are also comparable to that found in other higher elevation spruce-fir-hardwood forests in the northeast (Rimmer et al. 2006). The most diverse transect was B4, with 19 species recorded. The least diverse was B3 with 13 species. Sixteen, or 47 percent, of the species identified during the 2006 surveys were neo-tropical migrants (Appendix C, Table 3).

3.1.2 Relative Abundance

The maximum, average, and frequency of individuals were used to assess the relative abundance for each species (Appendix C, Table 5).

The maximum number of breeding individuals at all 35 point counts combined was 506 individuals, with Swainson's thrush (*Catharus ustulatus*) making up 20 percent of the birds observed. Slate-colored juncos (*Junco hyemalis*) comprised 11 percent, while myrtle warbler (*Dendroica coronata*), white-throated sparrow (*Zonotrichia albicollis*), and winter wren (*Troglodytes troglodytes*) each accounted for about 10 percent of the maximum number of breeding birds. Transect B1 had the greatest number of possible breeding individuals, with a total of 90.

The total average number of breeding birds along the transects was 248.12 ± 5.52*SD*. Transect A1 had the greatest average number of breeding birds (42) and B4 the next highest (41.7). Swainson's thrush accounted for 26 percent of these averages. Winter wrens accounted for 12.2 percent, white-throated sparrows for 11.8 percent, myrtle warbler for 10.8 percent, and slate-colored juncos for 8.9 percent.

The most common bird detected was the Swainson's thrush. This species was present on every survey and also had the highest average and maximum number detected. Additionally, blackpoll warbler (*Dendroica striata*), golden-crowned kinglet (*Regulus calendula*), magnolia warbler (*Dendroica magnolia*), myrtle warbler, slate-colored junco, winter wren, and white-throated sparrow were found along each transect. The following ten most common species were: blackpoll warbler, boreal chickadee (*Poecile hudsonia*), black-throated blue warbler (*Dendroica caerulescens*), golden-crowned kinglet, hermit thrush (*Catharus guttatus*), magnolia warbler, myrtle warbler, slate-colored junco, winter wren, and white-throated sparrow.

3.2 Summary of Bicknell's Thrush Surveys

During the breeding bird surveys, an emphasis was placed on detecting breeding Bicknell's thrush. Bicknell's thrush is recognized as a "Species of Special Concern" by the State of Maine. This designation refers to "any species of fish or wildlife that does not meet the criteria as Endangered or Threatened but is particularly vulnerable and could easily become a Threatened Species or an Endangered or Extirpated Species due to restricted distribution, low or declining numbers, specialized habitat needs or limits, or other factors, or is a species suspected to be Endangered or Threatened or likely to become so but for which insufficient data are available" (12 M.R.S.A. Part 10 Chapter 701).

Bicknell's thrush breeds in high elevation, high density, complex, small diameter fir-spruce habitats that are somewhat disturbed. Dead standing snags, blown-down trees, and dense regeneration are typical components of this habitat (Rimmer et al. 2001a); (personal communication with Chris Rimmer, August 24, 2006). It is a montane forest specialist, and considered one of the most rare and range-restricted species of the northeast (Rimmer and Faccio 2004).

3.2.1 Bicknell's Thrush Observed During Breeding Bird Surveys

During the breeding bird surveys completed in June 2006, Bicknell's thrush were observed on five occasions along transect B1 (see Appendix C, Table 6). Bicknell's thrush were not found on any other transect. The five observations at B1 all occurred during the first week of June,

scattered among three different points (See Figure 4). During two later surveys at transect B1 (June 18 and 21), Bicknell's thrush was not encountered.

Since B1 was the only transect where Bicknell's thrush was observed, it was the only potential area for estimating Bicknell's thrush density (i.e., spot-mapping). A systematic search for potential Bicknell's thrush habitat was performed along the B1 transect, extending 150 m out from the transect. Three potential sites were identified and then returned to for dawn surveys on June 16, 17, 18, and 19. No Bicknell's thrush were detected during these surveys.

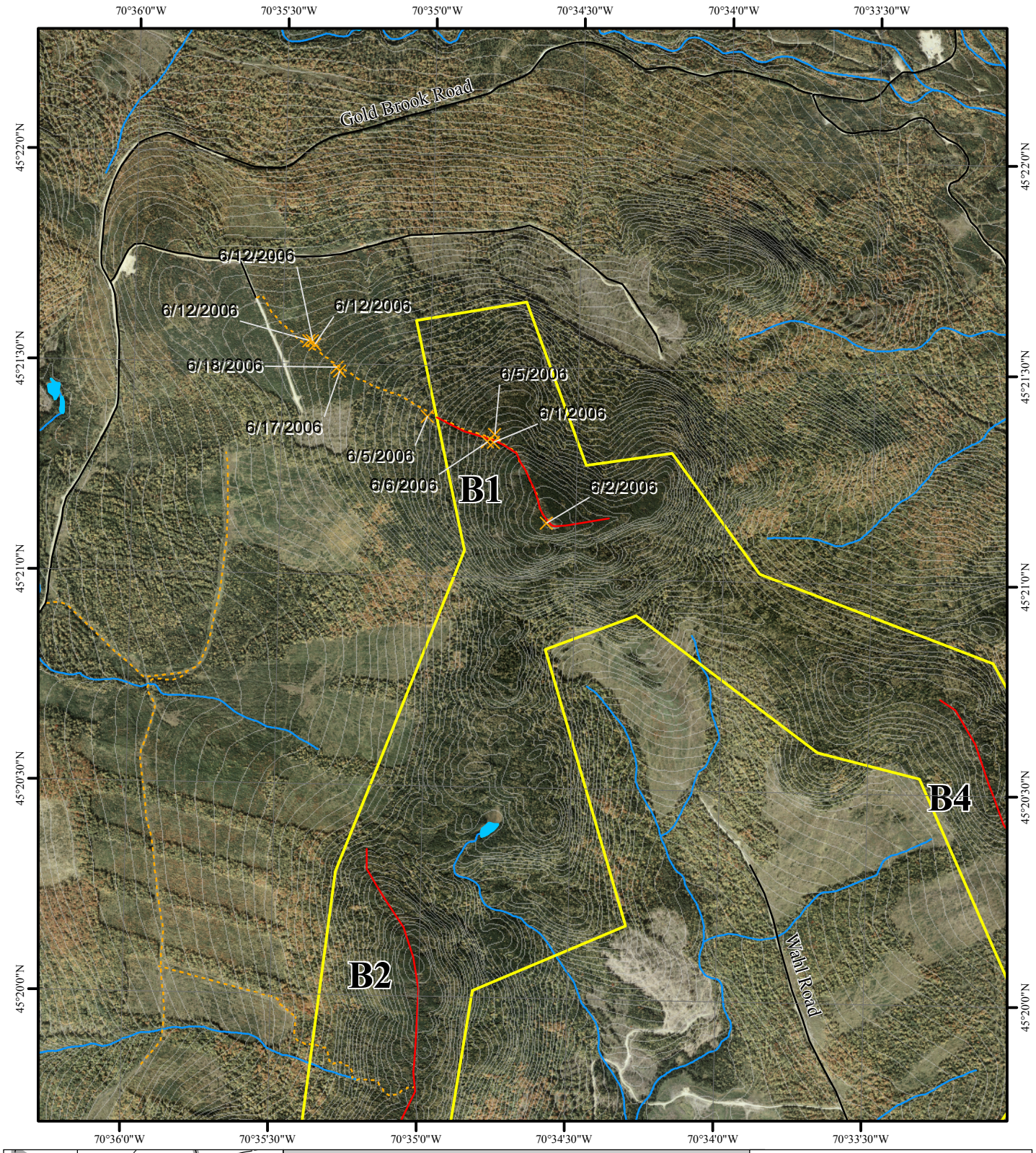
Bicknell's thrush was observed in two locations outside of the project area: one was at a non-ridge area that was cut in 1994, which is dominated by dense, small fir. The access trail to the B1 transect traverses this area (see Figure 5). The other area was near the fire tower on Kibby Mountain. This is a high elevation habitat dominated by dense, small fir (see Figure 6). Singing Bicknell's thrush were observed in these areas throughout the breeding season.

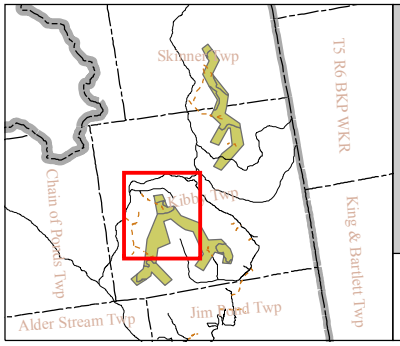
3.2.2 Estimate of Population Density Within Project Area

Few, if any, Bicknell's thrush were thought to nest within the project area during 2006 based on the breeding bird surveys. Individuals were observed at three points, or 9 percent of the survey points, on five occasions. Additionally, these individuals were only observed in the first week of June, early in the breeding season. Further investigation of this area found that there was only a small amount of suitable habitat in this area, and Bicknell's thrush were not detected in these areas again. Without detecting Bicknell's thrush again in this area, spot-mapping was not possible in accordance with Ralph et al. (1993) and USGS (2006) spot-mapping methodologies. These individuals could have been males attempting to attract females to less than prime Bicknell's thrush habitat, or wandering males briefly attempting to establish a home range. An explanation of several characteristics of the reproductive biology of the Bicknell's thrush may help to support these ideas.

The male to female ratio for Bicknell's thrush is skewed toward males, with a sex ratio of 1.8:1 or greater, male to female (Rimmer et al. 2001b; personal communication with Chris Rimmer, August 24, 2006). Male Bicknell's thrush occupy a large, shifting home range (rather than an established, defended territory), which is dependent upon the number and distribution of females in a given area. It is common (and maybe typical) for there to be multiple males per nesting female. In contrast to the male, the female has a fixed territory, the size of which is dependent on an area of suitable habitat large enough to support a nest of fledglings (personal communication with Chris Rimmer, August 24, 2006). Rimmer et al. (2006) found an average breeding home-range for females at East Mountain, Vermont to be 5.43 hectares (ha) ± 1.11 *SE*, and for males 11.99 ha ± 2.74 *SE*. The three potential areas of habitat found around the B1 transect were small patches, each a fraction of a hectare, and would not likely support a female Bicknell's thrush territory. For this reason, the few observations of individuals early in the season suggests a lack of suitable breeding habitat for Bicknell's thrush.

Figure 4: Bicknell's thrush detections during breeding bird surveys





Bicknell's thrush locations during surveys

Transect

Project Area

Streams

Roads

Trail

500

Meters

TRC

249 Western Ave
Augusta, ME 04330

Breeding Bird Survey

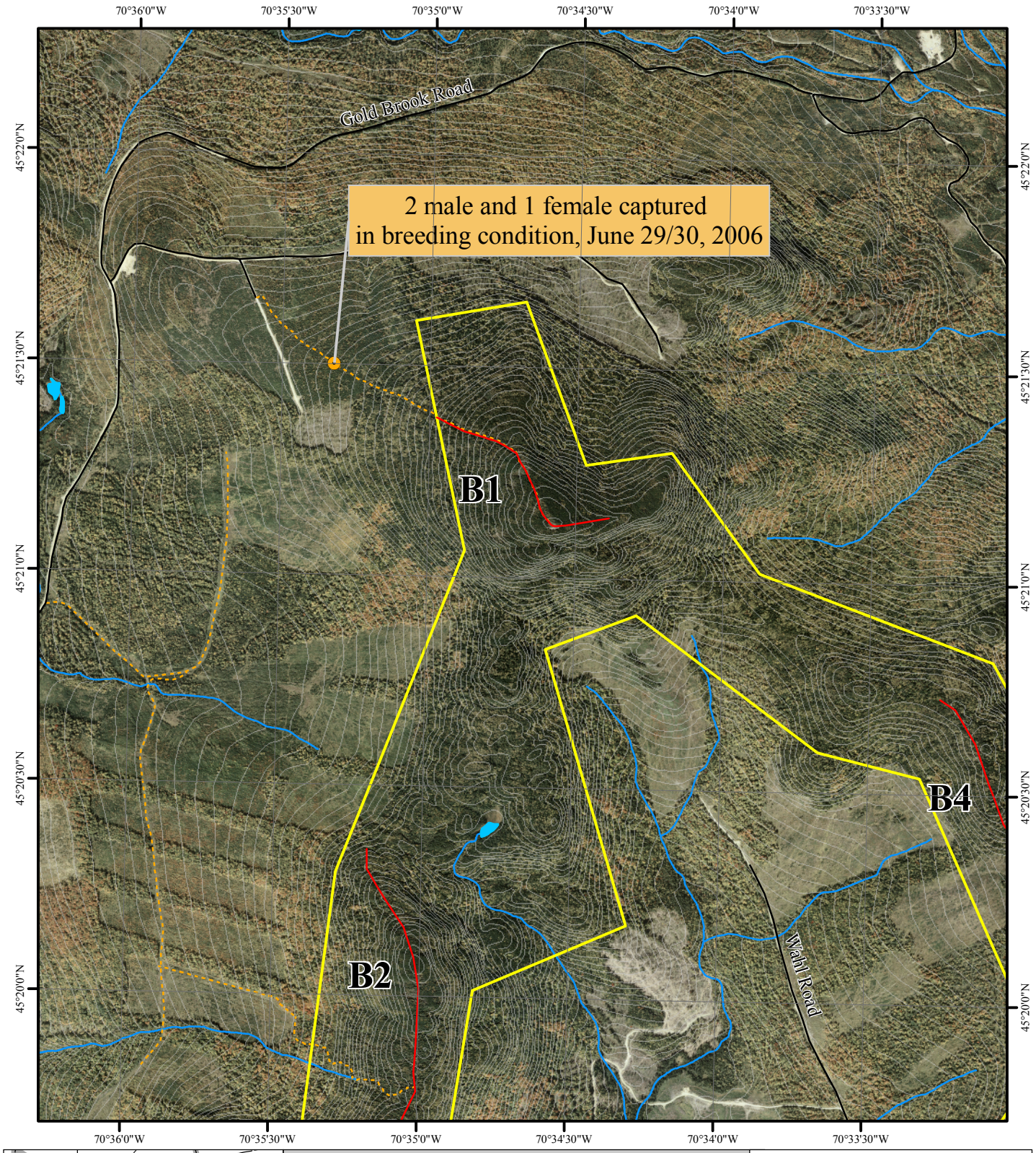
Kibby Wind Power Project

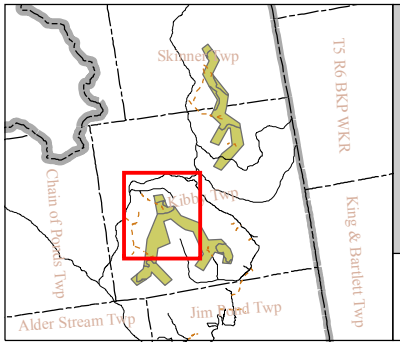
Figure: 4

Data Notes:

Orthophotography captured October 2, 2005 by J.W. Sewall Company; Hydrography, road, and political data from Maine OGIS

Figure 5: Bicknell's thrush capture locations on B1 trail





Bicknell's thrush location
Transect
Project Area
Streams
Roads
Trail

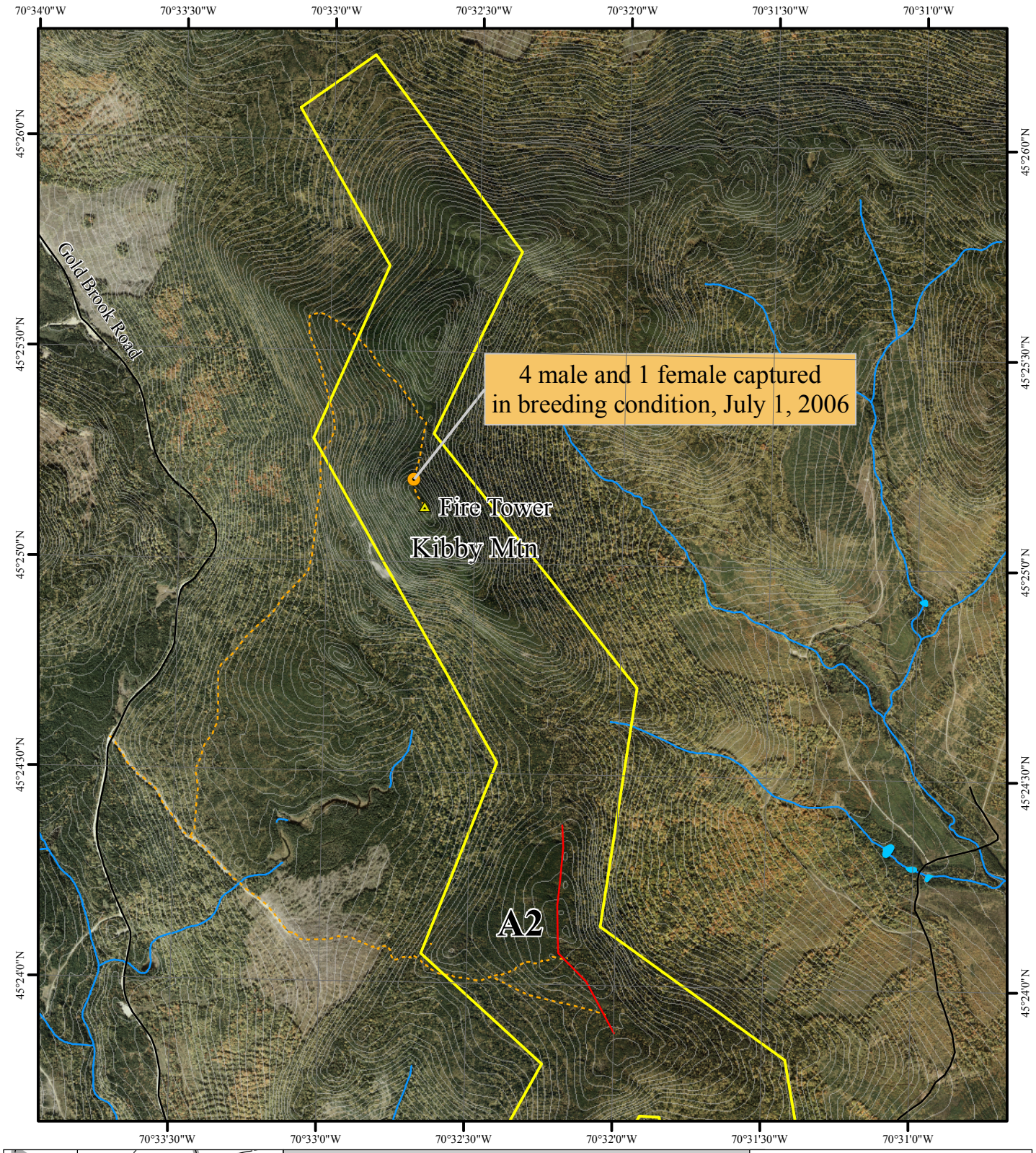
500
Meters

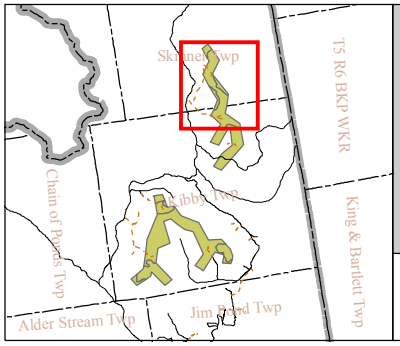
TRC
249 Western Ave
Augusta, ME 04330

Data Notes:
Orthophotography captured October 2, 2005 by J.W. Sewall Company;
Hydrography, road, and political data from Maine OGIS

Breeding Bird Survey
Kibby Wind Power Project
Figure: 5

Figure 6: Bicknell's thrush capture locations at Kibby Mtn.





Bicknell's thrush location
Transect
Project Area
Streams
Roads
Trail

480
Meters

TRC
249 Western Ave
Augusta, ME 04330

Data Notes:
Orthophotography captured October 2, 2005 by J.W. Sewall Company;
Hydrography, road, and political data from Maine OGIS

Breeding Bird Survey
Kibby Wind Power Project
Figure: 6

3.2.3 Other Relevant Studies

As part of an unrelated study, Biodiversity Research Institute (BRI) attempted to capture and band Bicknell's thrush in Kibby and Skinner Townships during the summer of 2006. This was part of a regional project that BRI is involved with, the Appalachian Mountain Mercury Network, which has the following objectives: (1) characterize the mercury levels of forest songbirds and their prey; (2) better understand the synergy of elevated mercury levels and calcium deficiencies in acidified environments and potential negative impacts on songbirds and other invertivores; and (3) link findings to policy and management decision-making.

Along the trail to the B1 transect, in a 12 year old regenerating clear cut, two males and one female Bicknell's thrush in breeding condition were caught during the last week of June. These Bicknell's thrush were heard frequently during the walks up and down the mountain for surveys and were thought to be nesting in the approximately 30 hectare regenerating clearcut.

Additionally, four male and one female Bicknell's thrush in breeding condition were captured and banded near the fire tower on Kibby Mountain on July 1. At least six more were heard calling along the trail within about a half-mile from the fire tower. This is the same area where Bicknell's thrush were observed in the autumn of 2005 by TRC employees.

Neither of these areas (identified in Figures 5 and 6) are within the proposed Kibby Wind Power construction area.

3.3 Other Species of Concern Within the Project Area

3.3.1 Federal and State Listed Species

No Federal-listed endangered or Maine state-listed species were found within the project area during the breeding bird survey.

3.3.2 State of Maine Special Concern Species

The rusty blackbird (*Euphagus carolinus*), is a State Species of Special Concern and several were observed during the spring and summer at various locations along Gold Brook Road and the Wahl Road in Kibby Township. A rusty blackbird was also observed during August 2006 at a fen near transect B2. The rusty blackbird is a boreal species that breeds within forested wetland, scrub-shrub wetland and peat lands (Maine Department of Inland Fisheries and Wildlife 2005). The rusty blackbird has declined more than 50 percent in the past 30 years (Rich et al. 2004). According to Maine's Comprehensive Wildlife Strategy, the rusty blackbird population is estimated at 1,907 ± 793 individuals in Maine. Some objectives for Maine include increasing the population by 100 percent, conserving breeding habitat, clarifying population trends and implementing long-term monitoring procedures (Maine Department of Inland Fisheries and Wildlife, 2005).

3.4 Results of Vegetation Survey

Vegetation surveys were completed at all 35 points during the last week of July and first 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 (Appendix C, Tables 7 and 8).

The majority of points (65 percent) had more trees between 3 and 15 inch diameter breast height (DBH), (a size often described as "pole timber") than trees under 3 inches DBH. The most common conifer species were balsam fir (48.8 percent of all species counted) and red spruce (17.5 percent). Hardwood species were far fewer in overall abundance. The most common hardwood species were paper birch (8.2 percent), American mountain ash (0.008 percent), and yellow birch (0.004 percent). Snags accounted for 21.5 percent of the trees. The largest diameter tree was a yellow birch located at point B2-5, with a DBH of 27.7 in.

The majority of the survey points can be characterized as one of three different forest communities. The most common forest community type identified among all points was the spruce - fir - wood sorrel - feathermoss forest (Gawler and Cutko 2004). This community was found at points along transects B2, B3, and B5, and at the lower elevations of B1 and A2. This community is dominated by both balsam fir and red spruce, though small white birch, yellow birch, and mountain ash maybe associates in this community. Undergrowth in mature forest is sparse to absent, and few shrubs are present other than regeneration of spruce and fir in open canopy areas. The dominant herbs are wood sorrel, blue-bead lily, goldthread, starflower, and Canada dogwood. Ferns and mosses are also a dominant ground cover, and include wood ferns and feathermoss (See appendix D, photo 1 and photo 2).

The second most common vegetation community identified along the transects was a spruce and northern hardwood forest (Gawler and Cutko 2004). This community is found along transect A1 and B4, and the lower elevation parts of B2 and B5. In this forest red spruce tends to be dominant, with some fir, paper birch, yellow birch, red maple, and mountain ash, often as younger trees. Also a sapling/scrub layer is typically well developed, and includes hobblebush and striped maple. Typical herbs are wood sorrel, starflower, and wood ferns (See appendix D, photo 3).

The third most common vegetation community found along the study transects is the fir – heartleaved birch subalpine forest (Gawler and Cutko 2004). This community is found along transect A2 and in the higher elevation parts of transect B1. Balsam fir as well as small paper birches and mountain ash dominate this forest. In areas that have experienced blow downs, fire, or landslides, a dense shrub layer consisting mostly of hobblebush and regenerating fir and mountain ash is usually present. The typical herbs present are blue-bead lily, wood sorrel, starflower, and wood ferns. The community found in the A2 transect was heavily harvested in the past and would not be considered a good example of a subalpine fir community. The area of this community found at B1 is small and is not mapped by the Maine Natural Areas Program (MNAP) (See appendix D, photo 4).

Several areas along these transects (especially B4, B5, and A1) have an open canopy, with a few spruce, fir or birch trees, and a scattered shrub-size fir and hobblebush. The ground cover is dominated by raspberry. The typical herbs are wood ferns, bracken fern, large-leaved goldenrod, and blue-bead lily.

Of the 35 points, only two points (B2-3 and B3-3) are thought to be representative of potential habitat for Bicknell's thrush. These two points had a high density of small diameter conifers. At point B2-3, 485 conifers under 9 inches DBH were counted within a tenth-acre plot. Of this, 414 stems (85 percent) were under 3 inches DBH and over 6 feet tall. The plot had 22 snags, or dead trees, most (59 percent) of which were under 3 inches DBH. At point B3-3, 285 conifers under 9 inches DBH were counted with the tenth-acre plot, and 188 stems (66 percent) were under 3 inches DBH and over 6 feet tall. This plot had 54 snags, with 47 percent under 3 inches DBH. No Bicknell's thrush were observed during the breeding bird surveys at these points, and these patches of dense habitat were estimated to be under an acre in size. Due to the small size of the patches and the lack of other suitable patches nearby, these representative habitats would not be considered preferred habitat for Bicknell's thrush (Rimmer et al. 2001a) (see section 3.2.2 for discussion concerning Bicknell's thrush territory size).

4.0 SUMMARY OF FINDINGS

Breeding birds counted at 35 point counts consisted of 34 breeding species in the project area. At each transect, a maximum of 506 individuals and an average of 248.12 ± 5.52 individuals were observed. Swainson's thrush accounted for 26 percent of the average number of birds during the surveys. They were also the only bird present during every point count survey. The following most common birds based on their average counts were slate-colored junco (8.9 percent), myrtle warbler (10.8 percent), white-throated sparrow (11.8 percent), and winter wren (12.2 percent). These four species were present at more than 85% of the surveys. An additional 37 species were observed incidentally in the Kibby vicinity in June 2006, in addition to those observed on the transects. (See Appendix C).

Bicknell's thrush was found only along transect B1. Due to their presence at B1, additional surveys were completed at this transect. Additionally, a search for appropriate habitat around B1 was completed, resulting in the addition of three more point counts to the B1 area. Bicknell's thrush was detected at transect B1 only during the first week of June, in the first four surveys. In the following six surveys in the area, no Bicknell's thrush were identified. Due to the lack of Bicknell's thrush detections, spot mapping to estimate population density in this area was not possible. The three potential habitats that were found around B1 were small in size, each estimated at less than a hectare. Rimmer et al. (2006) found an average breeding home-range for females at East Mountain, Vermont to be 5.43 ha ± 1.11 *SE*, and for males 11.99 ha ± 2.74 *SE*.

Bicknell's thrush were continually heard during the survey period (June 1 to June 21) along the trail leading to the proposed project area, in a regenerating clear cut. Three Bicknell's thrush (two males, one female) in breeding condition were captured and banded in that area (June 29 and 30) by BRI as part of an unrelated study.

Another site near the proposed construction area has suitable habitat and appears to support a population of breeding Bicknell's thrush. This is based on two seasons of observations of Bicknell's thrush presence during other studies, as well as preliminary habitat assessment by BRI. At the fire tower on Kibby Mountain, Bicknell's thrush were heard singing and calling in the autumn of 2005. On July 1, 2006, five Bicknell's thrush (four males, one female) were captured and banded on the trail leading to the fire tower, about 100 m from the tower. At least six more Bicknell's thrush were heard in the area from the trail to the fire tower.

5.0 REFERENCES

Gawler, S. C., and A. R. Cutko. 2004. Natural Landscapes of Maine: A Classification of Vegetated Natural Communities and Ecosystems. Maine Natural Areas Program. Department of Conservation. Augusta, ME.

James, F. C. and H. H. Shugart, Jr. 1970. A Quantitative Method of Habitat Description. Audubon Field Notes 24: 727-736.

Maine Department of Inland Fisheries and Wildlife. 2005. Maine's Comprehensive Wildlife Strategy. Available online at: http://www.maine.gov/ifw/wildlife/compwildlifestrategy/tableofcontents.htm

McMahon, J. 1990. The Biophysical Regions of Maine: Patterns in the Landscape and Vegetation. University of Maine, Orono, ME.

Northrop, Divine & Tarbell, Inc. (ND&T). 1993. LURC Permit application for the U.S. Windpower New England Wind Energy Station: Vol II, Sec.S: Wildlife and Fisheries.

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of Field Methods for Monitoring Landbirds. Gereral Technical Report. PSW-GTR-144. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture. Available online at: http://www.fs.fed.us/psw/publications/documents/gtr-144/

Rich, T. D., D. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, T. C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.

Rimmer, C.C. 2006. Personal communication, August 24. 2006.

Rimmer, C. C., J. L. Atwood, K. P. McFarland, and L. R. Nagy. 1996. Population Density, Vocal Behavior, and Recommended Survey Methods for Bicknell's Thrush. Wilson Bulletin. 108(4): 639-649.

Rimmer, C.C., K.P. McFarland, and J.D. Lambert. 2001a. Conservation assessment for Bicknell's thrush (Catharus bicknelli). USDA Forest Service, Eastern Region. Draft, November, 2001.

Rimmer, C. C., K. P. McFarland, W. G. Ellison, and J. E. Goetz. 2001b. Bicknell's Thrush (*Catharus bicknelli*). *In* The Birds of North America, No. 592 (A. Poole & F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Rimmer, C. C., and S. D. Faccio. 2004. Ecology and Demography of Bicknell's Thrush on East Mountain, East Haven, Vermont: Evaluating Potential Impacts of Wind Turbine Construction. Vermont Institute of Natural Science. Woodstock, VT. Available online at: http://www.vinsweb.org/assets/pdf/EastMt2004.pdf

Rimmer, C. C., S. D. Faccio, K. P. McFarland, and B. Collins. 2006. Ecology and Demography of Bicknell's Thrush on East Mountain, East Haven, Vermont: Evaluating Potential Impacts of Wind Turbine Construction. Vermont Institute of Natural Science. Woodstock, VT. Available online at: http://www.vinsweb.org/assets/pdf/East_Mt_2005_Final_Report.pdf

USGS. 2006. Manager's Monitoring Manual: Territory Mapping. Available online at: http://www.pwrc.usgs.gov/monmanual/techniques/territorymapping.htm

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

U.S. Windpower 1992 Breeding Bird Species List

U.S. Windpower Ridge Top Breeding Bird List 1992

Ruffed Grouse	*Bonasa umbellus*
Hairy Woodpecker	*Picoides villosus*
Black-backed Woodpecker	*Picoides arcticus*
Least Flycatcher	*Empidonax minimus*
Solitary Vireo	*Vireo solitarius*
Red-eyed Vireo	*Vireo olivaceus*
Gray Jay	*Perisoreus canadensis*
Common Raven	*Corvus corax*
Tree Swallow	*Tachycineta bicolor*
Black-capped Chickadee	*Poecile atricapillus*
Boreal Chickadee	*Poecile hudsonica*
Red-breasted Nuthatch	*Sitta canadensis*
Winter Wren	*Troglodytes troglodytes*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Veery	*Catharus fuscescens*
Gray-cheeked Thrush	*Catharus minimus*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
American Robin	*Turdus migratorius*
Cedar Waxwing	*Bombycilla cedrorum*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Magnolia Warbler	*Dendroica magnolia*
Black-throated Blue Warbler	*Dendroica caerulescens*
Yellow-rumped Warbler	*Dendroica coronata*
Black-throated Green Warbler	*Dendroica virens*
Blackburnian Warbler	*Dendroica fusca*
Palm Warbler	*Dendroica palmarum*
Bay-breasted Warbler	*Dendroica castanea*
Blackpoll Warbler	*Dendroica striata*
American Redstart	*Setophaga ruticilla*
Ovenbird	*Seiurus aurocapilla*
Mourning Warbler	*Oporornis philadelphia*
Common Yellowthroat	*Geothlypis trichas*
Canada Warbler	*Wilsonia canadensis*
Fox Sparrow	*Passerella iliaca*
White-throated Sparrow	*Zonotrichia albicollis*
Chipping Sparrow	*Spizella passerina*
Dark-eyed Junco	*Junco hyemalis*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Pine Grosbeak	*Pinicola enucleator*
Purple Finch	*Carpodacus purpureus*
Pine Siskin	*Carduelis pinus*

APPENDIX B

Bicknell's Thrush and Breeding Bird Survey Protocol For the Kibby Wind Power Project & Data Forms and Instructions

Bicknell's Thrush (*Catharus bicknelli*) and Breeding Bird Survey Protocol
For
Kibby Wind Power Project

Prepared by:
TRC Environmental Corporation

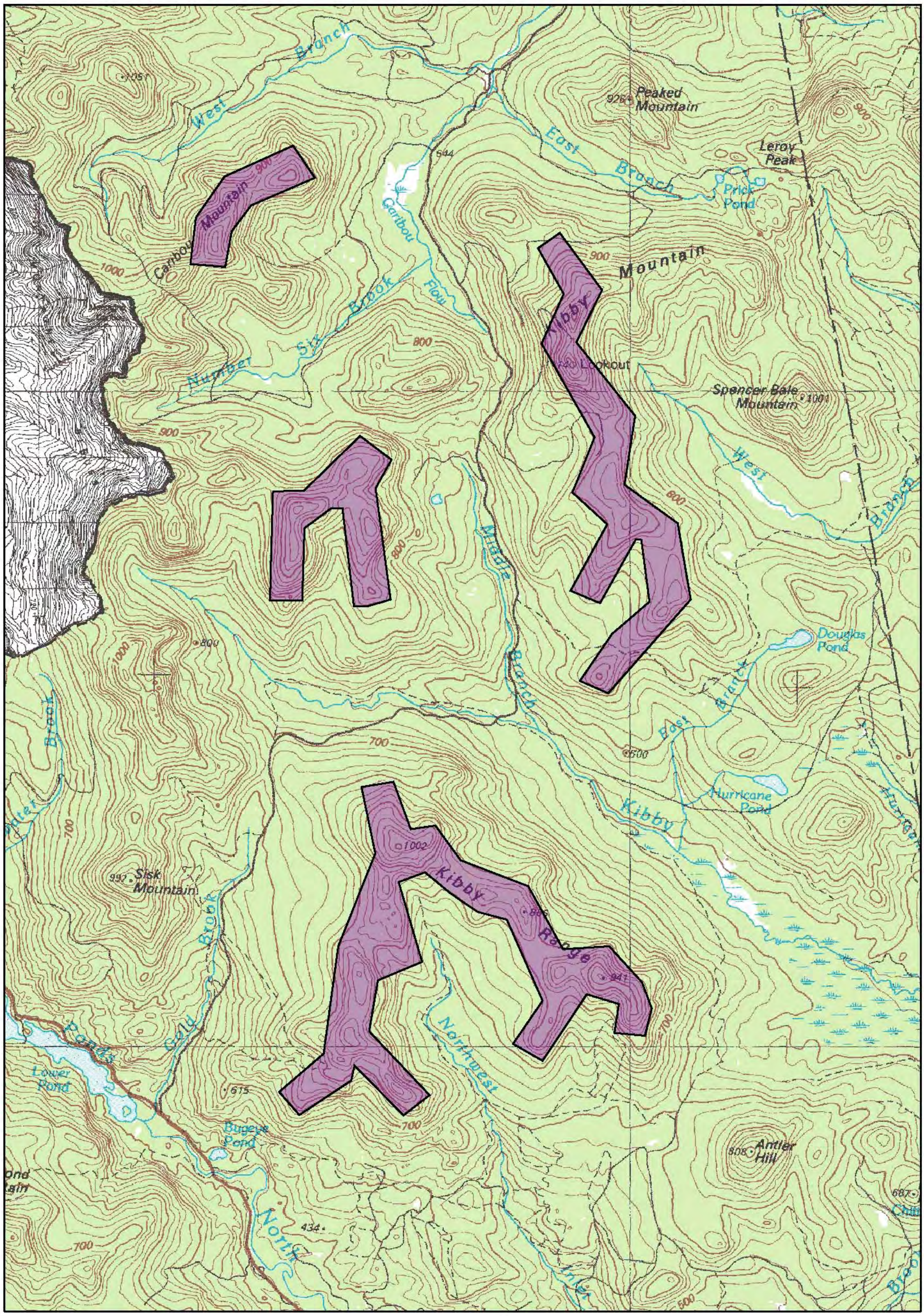
April 2006

TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION

TransCanada Energy Ltd. (TransCanada) is proposing to develop, own and operate a 100–200 megawatt (MW) wind power generating facility in the Boundary Mountains of Western Maine known as the Kibby Wind Power Project. The project is in a location for which a similar project proposal by U.S. Windpower was previously approved by the Land Use Regulation Commission (LURC).

The project area is four ridgelines located in an unincorporated area of Franklin County, Maine, as shown in Figure 1. Turbine locations are currently anticipated to be established along two of the ridgelines within the project area. The property is owned by Plum Creek, and the surrounding areas are currently actively managed for forest products. The Kibby Wind Power Project can take advantage of existing logging roads and cleared areas to access the ridgelines, and forestry activities can continue in a complementary fashion with the project in place. The project will utilize the superior wind resource found in this vicinity to create clean, renewable power generation.


West Branch
Peaked Mountain
East Branch
Leroy Peak
Prick Pond
Caribou Mountain
Caribou Flow
Six Brook
Number
Mountain
Kibby
Lookout
Spencer Bale Mountain
Middle Branch
Douglas Pond
Hurricane Pond
Kibby Range
Stick Mountain
Cold Brook
Ponds
Lower Pond
Bugeye Pond
Northwest
Antler Hill
LANDS WITHIN THE UNITED STATES
LANDS WITHIN CANADA
PROJECT LOCATION
N
0
0.5
1
Miles
SITE LOCATION
TRC
KIBBY WIND POWER PROJECT
PROJECT LOCATION MAP
FIGURE 1
R:\Projects\GIS_2005\42298_Kibby\FIG1.mxd

2.0 STUDY PROTOCOL

2.1 Introduction

2.1.1 General Breeding Bird Surveys

As part of pre-construction analyses, several studies will be performed that will help determine avian use of the project area. The goals of breeding bird surveys, in particular, are to produce a comprehensive list of breeding bird species in the project area, and to qualitatively assess the general patterns of breeding bird use in the vicinity of the proposed Kibby Wind Power Project.

Habitat evaluation will be performed in areas associated with each of the breeding bird survey locations. This evaluation will serve to estimate the availability of suitable habitat for the various breeding bird species which occur in the project area.

2.1.2 Bicknell's Thrush Component

During breeding bird surveys, an emphasis will be placed on detecting breeding Bicknell's thrush (*Catharus bicknelli*), which are recognized by the State of Maine as a "Species of Special Concern". This title refers to "any species of fish or wildlife that does not meet the criteria as Endangered or Threatened but is particularly vulnerable and could easily become a Threatened Species or an Endangered or Extirpated Species due to restricted distribution, low or declining numbers, specialized habitat needs or limits, or other factors, or is a species suspected to be Endangered or Threatened or likely to become so but for which insufficient data are available" (12 M.R.S.A. Part 10 Chapter 701).

Prior to 1995, Bicknell's thrush was considered a sub-species to the gray-cheeked thrush (*Catharus minimus*) (Ouellett 1993, American Ornithologist's Union 1995). Bicknell's thrush has specialized habitat needs and is restricted in distribution in Maine (and other New England states and New York) to high elevation (700 m and higher) stunted spruce-fir forests and is found in low numbers in most of these areas (Atwood et al. 1996). The species also breeds in Canada, mainly in small, high elevation pockets of habitat in southern Quebec, the highlands of New Brunswick, and Cape Breton Island. The Canadian Wildlife Service identified the Bicknell's Thrush as one of its highest priority species for monitoring, research and conservation (Whittam and Ball 2003).

Suitable Bicknell's thrush habitat occurs at higher elevations within the project area, and the species has been observed within the project area. Most recently, Bicknell's thrush were observed on Kibby Mountain during fall avian migration surveys conducted in 2005.

2.1.3 Prior Survey Results

Northrop, Divine & Tarbell, Inc. (ND&T 1993) documented the results of breeding bird surveys (performed in 1992) as part of the permit application to LURC for U.S. Windpower's former project located in this area. This permit application describes breeding bird surveys at 24 points located in representative habitats and on or near tops of the mountains or ridges in the project vicinity. Each point was visited four times: twice in the morning (½ hour before sunrise to 9 AM); once between 9 AM and 5 PM; and once between 6 PM to ½ hour after sunset. Each survey point visit lasted for 10 minutes. The study period was June 1 through July 30.

In total, this 1992 study identified 37 species of breeding birds during ridge top surveys (see attached Appendix A). Listed among these is the gray-cheeked thrush (*Catharus minimus*), with a total of four individuals recorded over the course of the study (ND&T 1993).

During recent site visits during June 2005, while investigating potential meteorological tower sites, 22 species of breeding birds were observed in the project area (see attached Appendix B). Bicknell's thrush were not observed during these site visits. Three Bicknell's thrush and one thrush that could not be differentiated as a Bicknell's or a gray-cheeked were, however, observed during fall 2005 foraging migrant surveys conducted near the fire tower on Kibby Mountain.

2.2 Objectives

The primary objective of this survey is to document use of the proposed project area by breeding bird species, with a particular focus on detecting Bicknell's thrush. 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 routes where each species was detected by the total number of survey routes; and
- Estimating population density of Bicknell's thrush within the project area.

2.3 Methods

Spring 2006 breeding bird surveys will be performed using point count methods. The survey protocol for point counts is 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). Surveys will be augmented by use of playbacks for Bicknell's thrush, as described by Rimmer et al 1996, Whittam and Ball 2002 and 2003, and VINS 2005. Early season point counts will be used to help site survey plots for more detailed Bicknell's thrush studies.

Bicknell's thrush surveys will be conducted using spot-mapping techniques. The survey protocol for spot mapping is based on methods presented in the United States Department of Agriculture (USDA) Forest Service's *Handbook of Field Methods for Monitoring Landbirds"* (Ralph et al.1993), and the United States Geological Survey (USGS) *Manager's Monitoring Manual: Territory Mapping* (USGS 2006a).

2.3.1 Site Selection

2.3.1.1 Breeding Bird Point Counts

Point counts will be conducted at intervals along survey transects. Approximately seven total survey transects will be established on ridges within the project area. Each survey transect will be made up of five points, each 250 m apart (Whittam & Ball 2002, VINS 2005). The location of these transects will be selected based on aerial photography and topography. Each of the five points along the survey transect will consist of a central point from where observations will be made. Each of the points along the transect 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. Flagging may be used to locate transects and each survey point, however, all flagging will be removed upon the final survey and no permanent markers will be used. Habitat evaluation plots will also be sited at each point. Details on methods for the habitat evaluation are in Section 2.7.

Transects will be located on existing trails to the extent possible. Several will be located in areas where there are no trails. In these cases, access will be marked with survey tape, however, cutting vegetation will be avoided to the extent practical. In all areas access will be limited to on foot only. Some transects will be sited based on the criteria described below, for siting Bicknell's thrush survey plots. The purpose of this is to establish presence/absence of Bicknell's thrush in specific areas before commencing intensive spot-mapping studies.

2.3.1.2 Bicknell's Thrush Spot Mapping

Spot mapping will be conducted on two separate plots: one on each of the ridges where construction is proposed. Each plot will be approximately 10 hectare (ha) in size, based on plot size recommendations by Robbins (1970) for plots within closed habitats. Plot size may need to be adjusted, based on location specific conditions, including topography and habitat patch size and shape. Plots will be located at or above elevations that are known to be suitable for this species, and within areas of suitable vegetation.

Based on a habitat model by Lambert et al. (2005), Bicknell's thrush are expected at or above elevations of 802 m to 720 m between 45° and 46° latitude. Using this model, TRC has mapped those areas within Kibby and Skinner Townships that meet or exceed this elevation. Color aerial photography was then used to determine the occurrence of areas of suitable vegetation (greater than 50 percent balsam fir) within the >720 m elevation zone. From the resultant map, areas of sufficient size for spot mapping studies

(able to contain a square or rectangular plot of 10-30 ha) have been selected on each of the two project ridgelines where turbines will be proposed (see Appendix C).

Based on this delineation of suitable spot-mapping locations, breeding bird survey point count transects will also be located in these areas. The locations of the spot mapping plots will be determined based on the results of the first round of breeding bird point counts. Spot-mapping plot locations will be located in areas where Bicknell's thrush are detected during early season point counts.

Once locations are selected based on point count results, actual plot size and dimensions will be determined. USGS (2006) notes that the larger the plot size, the more reliable the resulting data, due to the difficulty in mapping edge territories. For this reason, we propose to use the largest plot size practical, although this may be limited given the difficult terrain within the study area. Exact plot dimensions will be refined in the field.

Spot mapping plots will be marked, using flagging, in a grid at 50 m intervals (as suggested for dense vegetation in Ralph et al. 1993) or less, if extremely dense vegetation necessitates smaller intervals. If vegetation at chosen plot sites is too dense to be navigable, we will revert to methods described by Rimmer et al. (1996) for spot mapping under such circumstances. In such cases, vantage points will be located throughout the plot area from which observations can be made. Vantages should be scattered throughout the area as to provide adequate coverage. Ralph et al. (1993) suggests that 25 m of coverage can be expected from a given location in dense vegetation. Each vantage point will be located using GPS, and will be navigated to using map and compass.

Detailed maps of each plot will be created for use during surveys. All plot perimeters will be located using GPS.

2.3.2 Number and Timing of Surveys

2.3.2.1 Breeding Bird Point Counts

All breeding bird point count surveys will be conducted between May 28 and June 21, with the possibility of extending surveys to July 15 should field survey conditions warrant. Surveys occurring between May 28 and June 10 will focus on siting Bicknell's thrush spot-mapping parcels. Surveys will be conducted at dawn or dusk. Dawn surveys will occur between 4:30 AM and 6:30 AM (VINS 2005), and dusk surveys will occur between 7:00 PM and 10:00 PM (Whittam & Ball 2002).

All five points along each survey transect 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 35ºF, 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).

2.3.2.2 Bicknell's Thrush Spot Mapping

Spot mapping for Bicknell's thrush will be conducted between May 28 and July 15. This timeframe allows for initial presence/absence of Bicknell's thrush to be established using point count surveys, then establishment and layout of study parcels prior to spot-mapping commencement. Surveys will be conducted at dawn or dusk. Dawn surveys will occur between 4:30 AM and 6:30 AM (VINS 2005), and dusk surveys will occur between 7:00 PM and 10:00 PM (Whittam & Ball 2002).

Each plot will be visited for a target of eight times over the course of the breeding season (USGS 2006a, Ralph et al. 1993). As with breeding bird surveys, spot mapping of Bicknell's thrush will be limited to days with appropriate weather conditions.

2.3.3 Breeding Bird Survey Protocol

2.3.3.1 Breeding Bird Point Counts

Breeding bird surveys will consist of performing point counts (or listening periods) at each of five determined points along each of the established transects. The survey protocol for 2006 breeding bird surveys at the Kibby Wind Power Project is based on methods used for the *Mountain Birdwatch* program (VINS 2005) and the *High Elevation Landbird Program* (*HELP*) (Whittam & Ball 2002, 2003). These surveys will focus on identifying and quantifying bird species present.

All five points along a survey transect will be assessed consecutively, in 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.

If no Bicknell's thrush are detected upon completion of the survey at a given transect, the observer will conduct playback surveys specific to this species at each point as he hikes back out. Playback surveys will consist of a one-minute broadcast of Bicknell's thrush vocalizations (as used and provided by the VINS Mountain Birdwatch Program), followed by 2 minutes of silent listening at each station (VINS 2005).

Personnel performing the surveys will be experienced bird watchers familiar with breeding bird species found in the project area (as reflected in Appendices A and B), and 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.

2.3.3.2 Bicknell's Thrush Spot Mapping

The survey protocol for spot mapping is based on methods presented in the USDA Forest Service's *Handbook of Field Methods for Monitoring Landbirds* (Ralph et al. 1993), and the USGS *Manager's Monitoring Manual: Territory Mapping* (USGS 2006a).

It is expected that a single survey of a 10 ha plot will take at least 3-4 hours per visit; it follows that larger parcels will require more time (USGS 2006a). For plots greater than 10 ha, two observers may perform the survey, working in different areas of the plot (Ralph et al. 1993).

Spot mapping events will consist of one observer (or two for plots >10 ha) walking marked gridlines within the plot area. Surveys will begin at a different location for each visit and proceed by walking gridlines systematically until the entire area has been covered. Surveyors will proceed along their route at a moderate pace to avoid attracting attention from birds and avoid causing alarm calls from birds in the area. Surveyors may stop as necessary to confirm observations of Bicknell's thrush and other bird species, take notes, and to mark on their map. The location of each Bicknell's thrush that is detected will be marked on a detailed map of the plot. Information regarding behavior will also be annotated.

If vantage points are used instead of marked gridlines, due to density of vegetation, then observers will divide their time evenly among the vantages, such that all can be reached during the morning hours.

Personnel performing the surveys will be experienced bird watchers familiar with breeding bird species found in the project area (as reflected in Appendices A and B). In particular, observers will be able to differentiate the song and call notes of Bicknell's thrush from other thrushes that may be encountered. Training for this survey will help eliminate error or bias, and will include listening to thrush vocalizations and studying field guides.

If little Bicknell's thrush activity is noted after three spot mapping events, the plot may be located to optimize data collection. Any changes in study plan or plot location will be communicated to MDIFW.

2.3.4 Data Collection

2.3.4.1 Breeding Bird Point Counts

Breeding birds will be recorded directly onto a Data Coding Sheet based on that used by the VINS Mountain Birdwatch Program (VINS 2005, see Appendix D). 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.

2.3.4.2 Bicknell's Thrush Spot Mapping

All observations of Bicknell's thrush will be recorded on a detailed map specific to each plot. These maps will include notes such as time of observation, direction of travel (if bird is moving), simultaneous observations, type of vocalization, etc. Appropriate codes for such observations (based on those presented in Ralph et al. 1993) will be provided on each plot map (see example, Appendix D). Information such as observer, plot name, date, start and end time, 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).

Other breeding bird species seen or heard during spot mapping surveys will be noted separately as incidental observations in order to establish a comprehensive species occurrence list.

2.3.5 Habitat Evaluation Protocol

2.3.5.1 Breeding Bird Point Counts

In order to be consistent with habitat data that will be collected on spot mapping parcels, habitat parameters along point count transects will be quantified using methods described by James and Shugart (1970). This method is discussed in more detail, below, as it is specifically associated with spot mapping surveys.

Tenth-acre habitat evaluation plots (as described below) will parallel each point count transect. Along trails 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.

2.3.5.2 Bicknell's Thrush Spot Mapping

Habitat parameters in spot mapping plots 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 2006b), 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. Tenth-acre plots will be centered on randomly selected grid points within the interior of each spot

mapping parcel (James and Shugart 1970, Ring et al. 2005). No less than six total tenth-acre plots will be measured within each 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 based on that presented in James and Shugart (1970) (see Appendix E). Vegetation density will be quantified using these data, and calculations will be performed as described in James and Shugart (1970).

3.0 REFERENCES

American Ornithologist's Union. 1995. Fortieth Supplement to the American Ornithologist's Union Check-List of North American Birds. Auk 112:819-830.

Atwood, J.L., C.C. Rimmer, K.P. McFarland, S.H. Tsal, and L.R. Nagy. 1996. Distribution of Bicknell's thrush in New England and New York. Wilson Bull. 108: 650-661.

Campbell, G., B. Whittam and s. Chisholm. 2005. Bird Studies Canada: Bicknell's Thrush in New Brunswick Forests. http://www.bsc-eoc.org/download/BITHNBforests2005.pdf

Faaborg, J. & S. B. Chaplin. 1988. Ornithology: An Ecological Approach, Laboratory Manual and Field Exercises. Prentice-Hall, Inc.

James, F. C. and H. H. Shugart, Jr. 1970. A Quantitative Method of Habitat Description. Audubon Field Notes 24: 727-736.

Northrop, Divine & Tarbell, Inc. (ND&T). 1993. LURC Permit application for the U.S. Windpower New England Wind Energy Station: Vol II, Sec.S: Wildlife and Fisheries.

Ouellet, H. 1993. Bicknell's Thrush: taxanomic status and distribution. Wilson Bull. 105:545-572.

Ralph et al. 1993. Handbook of Field methods for Monitoring Landbirds. Gen. Tech. Rep. PSW-GTR-144. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture. Available online at: http://www.fs.fed.us/psw/publications/documents/gtr-144/

Rimmer, C.C., J.L. Atwood, K.P. McFarland, and L.R. Nagy. 1996. Population density, vocal behavior, and recommended survey methods for Bicknell's thrush. Wilson Bull. 108(4): 639-649.

Ring, R., S. Sharbaugh, and N. Dewitt. 2005. Breeding Ecology and Habitat Associations of the Arctic Warbler in Interior Alaska Final Report - 2005 Field Season. Unpublished report by the Alaska Bird Observatory. Available online at http://www.alaskabird.org/ABOResearch/ABOARWAFinalRep05.pdf

VINS 2005. Mountain BirdWatch protocol. Unpublished survey protocol by the Vermont Institute of Natural Sciences, available online at: www.vinsweb.org/cbd/allspecies.html

USGS. 2006a. Manager's Monitoring Manual: Territory Mapping. Available online at: http://www.pwrc.usgs.gov/monmanual/techniques/territorymapping.htm

USGS 2006b. Breeding Bird Census. Available online 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, available online 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:
U.S. Windpower
Ridge Top Breeding Bird List 1992

U.S. Windpower Ridge Top Breeding Bird List 1992

Ruffed Grouse	*Bonasa umbellus*
Hairy Woodpecker	*Picoides villosus*
Black-backed Woodpecker	*Picoides arcticus*
Least Flycatcher	*Empidonax minimus*
Solitary Vireo	*Vireo solitarius*
Red-eyed Vireo	*Vireo olivaceus*
Gray Jay	*Perisoreus canadensis*
Common Raven	*Corvus corax*
Tree Swallow	*Tachycineta bicolor*
Black-capped Chickadee	*Poecile atricapillus*
Boreal Chickadee	*Poecile hudsonica*
Red-breasted Nuthatch	*Sitta canadensis*
Winter Wren	*Troglodytes troglodytes*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Veery	*Catharus fuscescens*
Gray-cheeked Thrush	*Catharus minimus*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
American Robin	*Turdus migratorius*
Cedar Waxwing	*Bombycilla cedrorum*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Magnolia Warbler	*Dendroica magnolia*
Black-throated Blue Warbler	*Dendroica caerulescens*
Yellow-rumped Warbler	*Dendroica coronata*
Black-throated Green Warbler	*Dendroica virens*
Blackburnian Warbler	*Dendroica fusca*
Palm Warbler	*Dendroica palmarum*
Bay-breasted Warbler	*Dendroica castanea*
Blackpoll Warbler	*Dendroica striata*
American Redstart	*Setophaga ruticilla*
Ovenbird	*Seiurus aurocapilla*
Mourning Warbler	*Oporornis philadelphia*
Common Yellowthroat	*Geothlypis trichas*
Canada Warbler	*Wilsonia canadensis*
Fox Sparrow	*Passerella iliaca*
White-throated Sparrow	*Zonotrichia albicollis*
Chipping Sparrow	*Spizella passerina*
Dark-eyed Junco	*Junco hyemalis*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Pine Grosbeak	*Pinicola enucleator*
Purple Finch	*Carpodacus purpureus*
Pine Siskin	*Carduelis pinus*

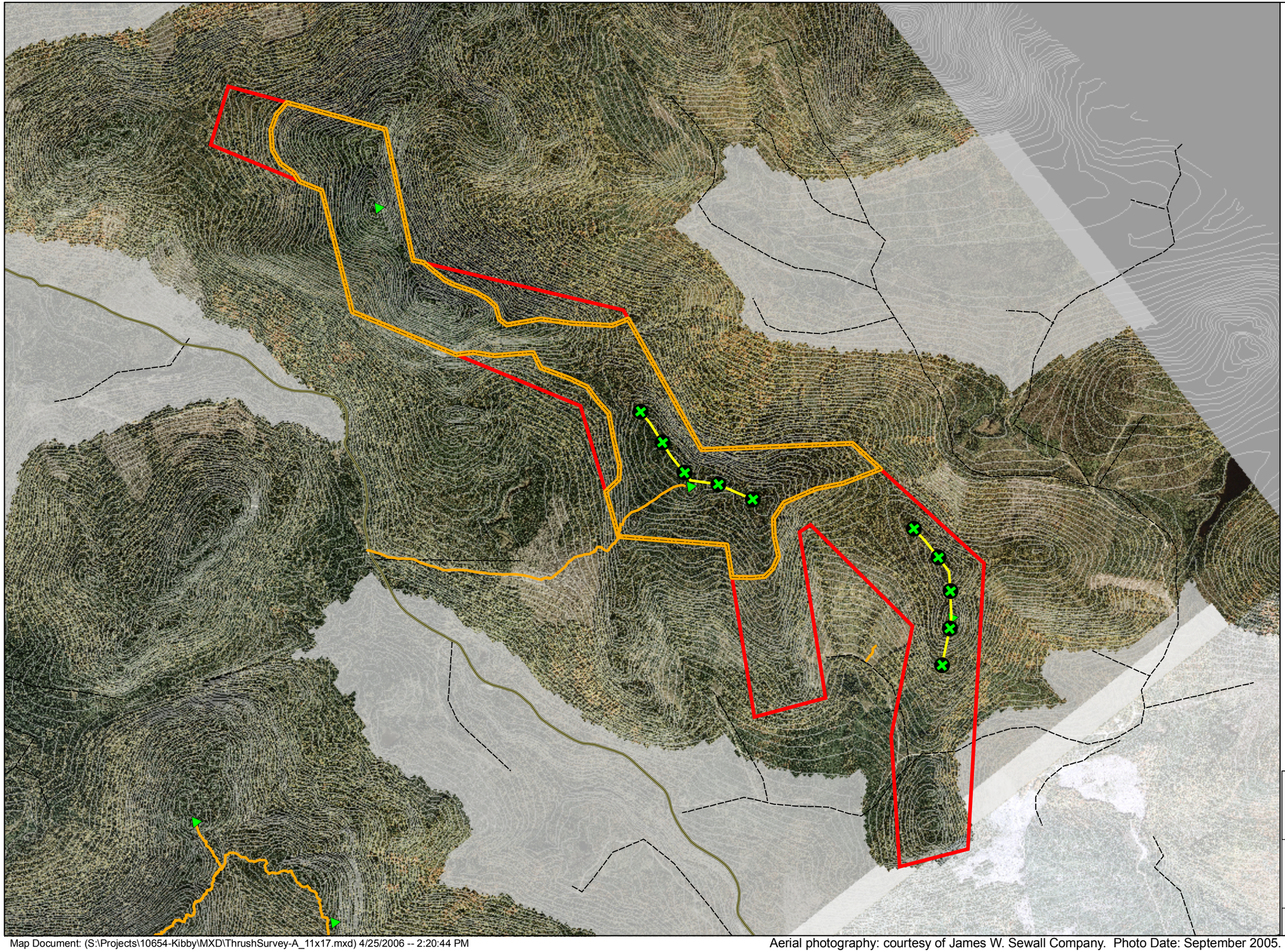
APPENDIX B:
TRC Breeding Bird List
June 2005 Site Visits

APPENDIX B

TRC Breeding Bird List June 2005 Site Visits

Ruffed Grouse	*Bonasa umbellus*
Sharp-shinned Hawk	*Accipiter striatus*
Red-tailed Hawk	*Buteo jamaicensis*
Great Horned Owl	*Bubo virginianus*
Northern Flicker	*Colaptes auratus*
Least Flycatcher	*Empidonax minimus*
Tree Swallow	*Tachycineta bicolor*
Black-capped Chickadee	*Poecile atricapillus*
Winter Wren	*Troglodytes troglodytes*
Golden-crowned Kinglet	*Regulus satrapa*
Swainson's Thrush	*Catharus ustulatus*
American Robin	*Turdus migratorius*
Nashville Warbler	*Vermivora ruficapilla*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Magnolia Warbler	*Dendroica magnolia*
Black-throated Blue Warbler	*Dendroica caerulescens*
Yellow-rumped Warbler	*Dendroica coronata*
Bay-breasted Warbler	*Dendroica castanea*
Blackpoll Warbler	*Dendroica striata*
American Redstart	*Setophaga ruticilla*
Common Yellowthroat	*Geothlypis trichas*
White-throated Sparrow	*Zonotrichia albicollis*
Dark-eyed Junco	*Junco hyemalis*
Pine Grosbeak	*Pinicola enucleator*
Pine Siskin	*Carduelis pinus*

APPENDIX C:
Stratified Map of Potential Bicknell's Thrush Habitat in the Project Area



Legend

- Survey Point
- Transect
- Met Tower Location
- Project Boundary
- Bicknell's Thrush Study Area
- Elevation: below 720 meters
- Elevation: above 720 meters
- Countour Line (Interval: 20 ft)
- BeaudryRd
- Log Road
- Access Trail

N

300
Meters

TRC

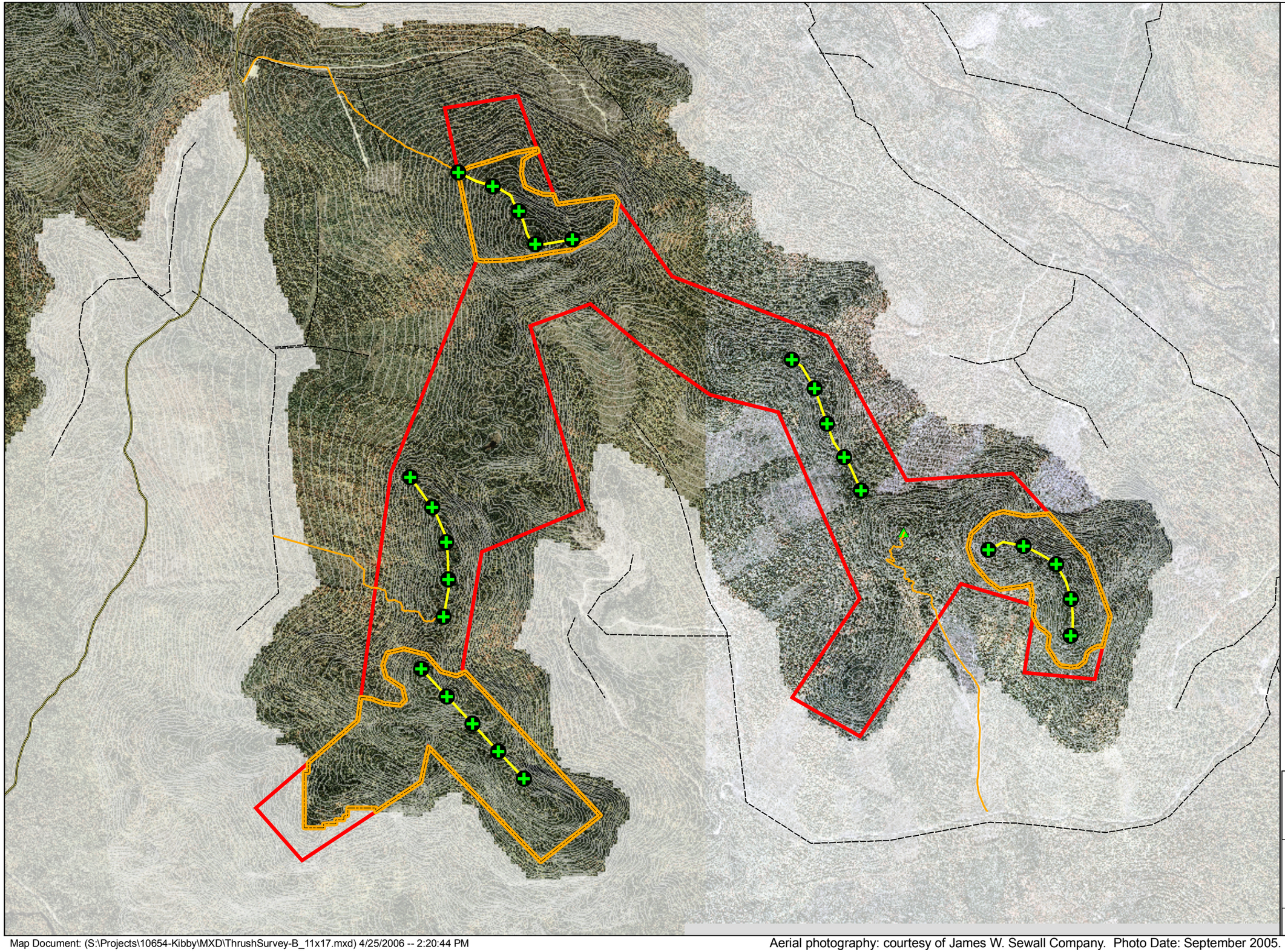
Kibby Wind Power Project

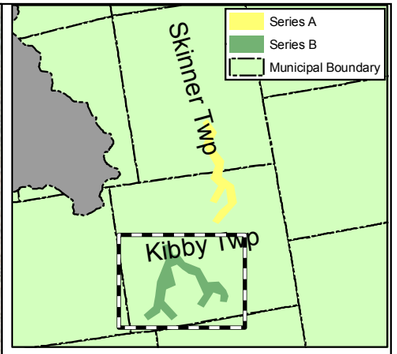
Breeding Bird Survey Transects

Series A

Map Document: (S:\Projects\10654-Kibby\MXD\ThrushSurvey-A_11x17.mxd) 4/25/2006 -- 2:20:44 PM

Aerial photography: courtesy of James W. Sewall Company. Photo Date: September 2005.





Legend

- Survey Point
- Transect
- Met Tower Location
- Project Boundary
- Bicknell's Thrush Study Area
- Elevation: below 720 meters
- Elevation: above 720 meters
- Countour Line (Interval: 20 ft)
- BeaudryRd
- Log Road
- Access Trail

N

300
Meters

TRC

Kibby Wind Power Project

Breeding Bird Survey Transects

Series B

Map Document: (S:\Projects\10654-Kibby\MXD\ThrushSurvey-B_11x17.mxd) 4/25/2006 -- 2:20:44 PM

Aerial photography: courtesy of James W. Sewall Company. Photo Date: September 2005.

APPENDIX D:
Point Count Data Sheet
and
Circle Plot Map with Example Observation Codes

BREEDING BIRD SURVEY DATA SHEET			
Transect		Start Time	Date
Observer		End Time	
WEATHER	Temperature	sky code (0-6)	Wind Speed (0-5)
Sky Codes: 0 = clear or a few clouds, 1 = partly cloudy/variable, 2 = cloudy/overcast, 3 = fog, 4 = drizzle, 5 = showers, 6 = rain			
Wind codes: 0 = calm, 1 = 1-3 mph, 2 = 4-7 mph, 3 = 8-12 mph, 4 = 13-18 mph, 5 = 19-25 mph			

Start Time	Point #	Species	Approx Dist. (m)	Behavior Code

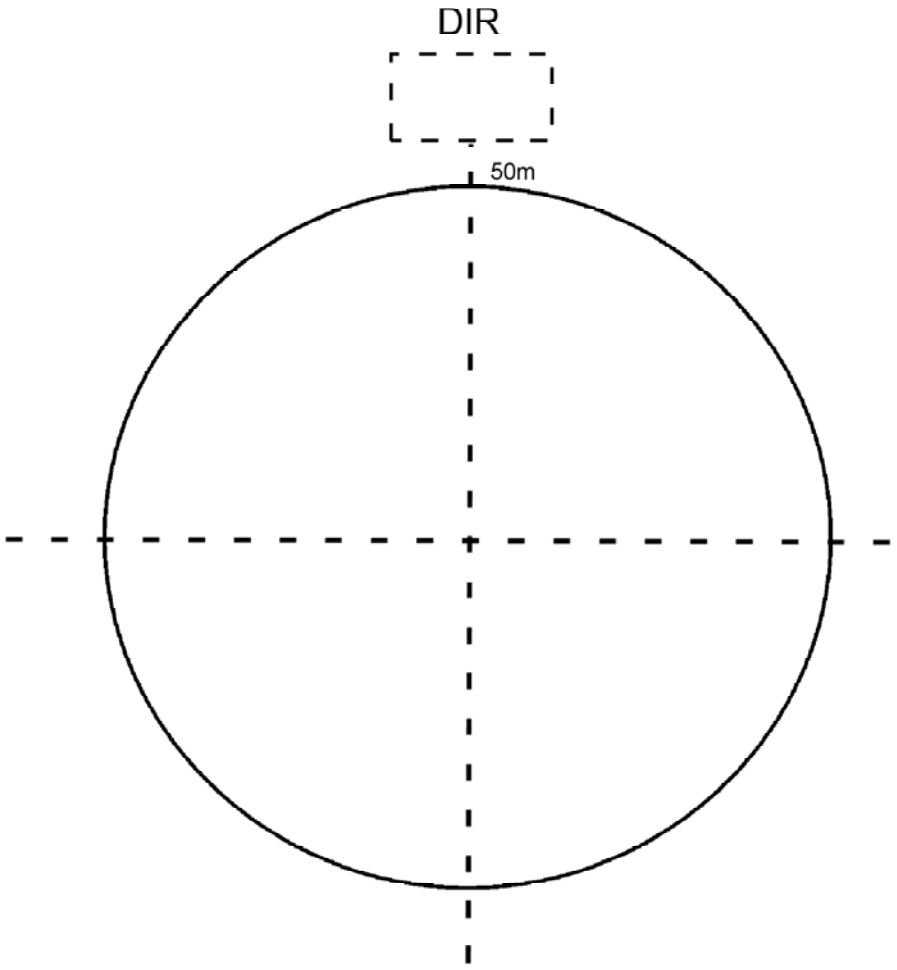
Start Time	Point #	Species	Approx Dist. (m)	Behavior Code

Behavior codes: **S** = singing male, **C** = calling, **D** = drumming, **I** = individual seen, **F** = family group, **N** = active nest

Data sheet based on VINS Mountain Birdwatch - FBMP Data Coding Sheet

POINT COUNT LOCATION MAP
FOR BICKNELL'S THRUSH
Kibby Wind Power Project, Maine

Date	Transect	Start Time
Observer	Point	End Time



MAPPING SYMBOLS

CODE		
S	BITH	Position of singing male
S	BITH	Approximate position of singing male
S	BITH — BITH	Simultaneous song of 2 males
S	BITH → BITH	Known change in position
S	BITH ⋯→ BITH	Assumed change in position

CODE		
M	BITH	Male observed
F	BITH	Female observed
C	BITH	Calling, sex unknown
P	BITH	Pair together, assumed mated
N	✱ BITH	Nest location
O	BITH	Observed, sex unknown

This form derived from Ralph et al. 1993

APPENDIX E:
Data Sheet for Spot Mapping 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 = 3-6, B = 6-9, C = 9-15, D = 15-21, E = 21-27, F = 27-33, G = 33-40, H = >40					
Species*	Circle 1	Circle 2	Circle 3	Circle 4	Circle 5	Circle 6
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Shrubs	Number of woody stems less than 3 inches DBH intercepted in 2 armlength transects					

Ground Cover	20 random + or - sitings through ocular tube for presence or absence of green vegetation					

Canopy Cover	20 + or - sitings through ocular tube for presence or absence of green vegetation					

Canopy Height	Maximum canopy height in feet					

* Use abbreviated descriptions of trees, shrubs, or herbs to designate species to be identified later (e.g. smooth bark, heart-shaped leaf). It is important to identify only the 5 dominant species.

To check adequacy of sample:	Total # trees in 5 circles x 2.0 =	equals estimated trees per acre
	Total # trees in 6 circles x 1.6 =	
	Difference =	

If the difference is less than 25 trees, the sample is adequate. If it is greater than 25 trees, continue sampling list of random plots until tolerance is achieved. Multipliers are: 7 circles x 1.4, 8 circles x 1.3, 9 circles x 1.1 and 10 circles x 1.0.

APPENDIX C

Tables

Table 1. Breeding Bird Surveys Completed in June 2006

Transect		A1	A2	B1	B2	B3	B4	B5	All
1-Jun	AM			1					1
	PM								
2-Jun	AM	1		1	1				3
	PM								
5-Jun	AM		1				1	1	3
	PM	1		1					2
6-Jun	AM		1	1					2
	PM						1	1	2
7-Jun	AM						1	1	2
	PM								
12-Jun	AM		1						1
	PM		1		1	1			3
13-Jun	AM		1		1	1			3
	PM				1	1			2
14-Jun	AM				1	1			2
	PM								
15-Jun	AM								
	PM								
16-Jun	AM	1							1
	PM								
18-Jun	AM								
	PM			1					1
21-Jun	AM			1					1
	PM								
Subtotal AM		2	4	4	3	2	2	2	19
Subtotal PM		1	1	2	2	2	1	1	10
TOTAL		3	5	6	5	4	3	3	29

Table 2. Additional B1 Habitat Breeding Bird Surveys

Date	Comments
June 16, AM	No Bicknell's thrush observed
June 17, AM	No Bicknell's thrush observed
June 18, AM	No Bicknell's thrush observed
June 19, AM	No Bicknell's thrush observed

Table 3. Species Present During Breeding Bird Surveys

Family	AOU Code	Common Name	Latin Name	Residence*	Nest Found
Anatidae	Waterfowl	Unknown Waterfowl	*Anatidae spp.*		
Phasianidae	RUGR	Ruffed Grouse	*Bonasa umbellus*	L	
	YBSA	Yellow-bellied Sapsucker	*Sphyrapicus varius*	US	
	DOWO	Downy Woodpecker	*Picoides pubescens*	L	
	HAWO	Hairy Woodpecker	*Picoides villosus*	L	
	BBWO	Black-backed Woodpecker	*Picoides arcticus*	L	Y
Picidae	Woodpecker	Unidentified Woodpecker	*Picadae spp.*		
	YBFL	Yellow-bellied Flycatcher	*Empidonax flaviventris*	NT	
Tyrannidae	LEFL	Least Flycatcher	*Empidonax minimus*	NT	
	BHVI	Blue-headed Vireo	*Vireo solitarius*	US/NT	
Vieonidae	REVI	Red-eyed Vireo	*Vireo olivaceus*	NT	
	GRJA	Gray Jay	*Perisoreus canadensis*	L	
Corvidae	BLJA	Blue Jay	*Cyanocitta cristata*	US/L	
	BCCH	Black-capped Chickadee	*Poecile atricapillus*	L	
Paridae	BOCH	Boreal Chickadee	*Poecile hudsonica*	L	
Sittidae	RBNU	Red-breasted Nuthatch	*Sitta canadensis*	L/US	
Certhiidae	BRCR	Brown Creeper	*Certhia americana*	L/US	
Troglodytidae	WIWR	Winter Wren	*Troglodytes troglodytes*	US	
Regulidae	GCKI	Golden-crowned Kinglet	*Regulus calendula*	L/US	
	BITH	Bicknell's Thrush	*Catharus bicknelli*	NT	
	SWTH	Swainson's Thrush	*Catharus ustulatus*	NT	Y
Turdidae	HETH	Hermit Thrush	*Catharus guttatus*	US	
Bombycillidae	CEDW	Cedar Waxwing	*Bombycilla cedrorum*	L/US	
	NAWA	Nashville Warbler	*Vermivora ruficapilla*	NT	
	PAWA	Palm Warbler	*Dendroica palmarum*	NT	
	MAWA	Magnolia Warbler	*Dendroica magnolia*	NT	
	BTBW	Black-throated Blue Warbler	*Dendroica caerulescens*	US/NT	
	MYWA	Myrtle Warbler	*Dendroica coronata*	US/NT	
	BTGW	Black-throated Green Warbler	*Dendroica virens*	NT	
	BLPW	Blackpoll Warbler	*Dendroica striata*	US/NT	
	AMRE	American Redstart	*Detophaga ruticilla*	NT	
	OVEN	Ovenbird	*Seiurus aurocapillus*	US/NT	Y
Parulidae	MOWA	Mourning Warbler	*Oporornis philadelphia*	NT	
	WTSP	White-throated Sparrow	*Zonotrichia albicollis*	US	Y
Emberizidae	SCJU	Slate-colored Junco	*Junco hyemalis*	L/US	Y
Fringillidae	PUFI	Purple Finch	*Carpodacus purpureus*	L/US	
Unknown	Unknown	Unidentified passerine	NA		
Total Species	36				

* L – Local year round resident; US – Migrates within US; NT – Neotropical migrant

Table 4. Incidental avian reporting in project area

Family	Common Name	Latin Name
Cathartidae	Turkey Vulture	*Cathartes aura*
Anatidae	American Blackduck	*Anas rubripes*
	Sharpshinned Hawk	*Accipiter striatus*
	Broadwing Hawk	*Buteo platypterus*
Accipitrinae	Red-tail Hawk	*Buteo jamaicensis*
	Spotted Sandpiper	*Actitis macularius*
Scolopacidae	Wilson's Snipe	*Gallinago delicate*
Strigidae	Great Horned Owl	*Bubo virginianus*
Trochilidae	Ruby-throated Hummingbird	*Archilocus colubris*
	Northern flicker	*Colaptes auratus*
Picidae	Pileated woodpecker	*Dryocopus pileatus*
	Eastern Wood Pewee	*Contopus virens*
Tyrannidae	Alder Flycatcher	*Empidonax alnorum*
	American Crow	*Corvus brachyrhynchos*
Corvidae	Common Raven	*Corvus corax*
Hirundinidae	Tree swallow	*Tachycineta bicolor*
Regulidae	Ruby-crowned kinglet	*Regulus calendula*
	Veery	*Catharus fuscescens*
Turdidae	American Robin	*Turdis migratorius*
Mimidae	Gray Catbird	*Dumetella carolinensis*
	Tennessee Warbler	*Vermivora peregrina*
	Northern Parula	*Parula americana*
	Yellow Warbler	*Dendroica petechia*
	Chestnut-sided warbler	*Dendroica pensylvanica*
	Blackburnian warbler	*Dendroica fusca*
	Bay-breasted warbler	*Dendroica Castanea*
	Northern Waterthrush	*Seiurus noveboracensis*
Parulidae	Common Yellowthroat	*Geothlypis trichas*
	Lincoln's sparrow	*Melospiza lincolnii*
	Chipping sparrow	*Spizella passerina*
	Fox sparrow	*Passerella iliaca*
Emberizidae	Song sparrow	*Melospiza melodia*
Cardinalidae	Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Icteridae	Rusty Blackbird	*Euphagus carolinus*
	Pine Grosbeak	*Pinicola enucleator*
	Pine Siskin	*Carduelis pinus*
Fringillidae	American goldfinch	*Carduelis tristis*
Total	37	

Table 5. Maximum count, average, and frequency of species by transect

	A1			A2			B1			B2			B3			B4			B5			Total			Species	
AOU Species Code	**Max**	**Ave**	**Freq**	**Max**	**Ave**	**Freq**	**Max**	**Ave**	**Freq**	**Max**	**Ave**	**Freq**	**Max**	**Ave**	**Freq**	**Max**	**Ave**	**Freq**	**Max**	**Ave**	**Freq**	**Max**	**Total Ave**	***SD***	**Ave Freq**	***SD***
Waterfowl	0	0	0	0	0	0	0	0	0	1	0.2	0.2	0	0	0	0	0	0	0	0	0	1	0.20	0.08	0.03	0.07
RUGR	1	0.33	0.33	0	0	0	3	0.5	0.17	1	0.2	0.2	0	0	0	0	0	0	0	0	0	5	1.03	0.20	0.10	0.13
YBSA	2	0.67	0.33	0	0	0	0	0	0	0	0	0	0	0	0	3	1.33	0.67	0	0	0	5	2.00	0.52	0.14	0.25
DOWO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.33	0.33	0	0	0	1	0.33	0.12	0.05	0.12
HAWO	1	0.33	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.33	0.12	0.05	0.12
BBWO	0	0	0	1	0.2	0.2	1	0.17	0.17	0	0	0	0	0	0	0	0	0	1	0.33	0.33	3	0.70	0.13	0.10	0.13
Woodpecker	1	0.33	0.33	0	0	0	0	0	0	1	0.4	0.4	0	0	0	0	0	0	0	0	0	2	0.73	0.18	0.10	0.17
YBFL	0	0	0	0	0	0	1	0.17	0.17	0	0	0	1	0.75	0.75	0	0	0	0	0	0	2	0.92	0.28	0.13	0.26
LEFL	0	0	0	2	0.6	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.60	0.23	0.06	0.14
BHVI	2	2	1	0	0	0	0	0	0	1	0.2	0.2	0	0	0	4	2	0.67	0	0	0	7	4.20	0.96	0.27	0.39
REVI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.67	0.67	1	0.33	0.33	3	1.00	0.26	0.14	0.25
GRJA	0	0	0	2	0.4	0.2	0	0	0	2	0.8	0.4	0	0	0	0	0	0	5	1.67	0.33	9	2.87	0.63	0.13	0.17
BLJA	0	0	0	1	0.2	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.20	0.08	0.03	0.07
BCCH	2	0.67	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.67	0.25	0.05	0.12
BOCH	0	0	0	4	1	0.4	6	1.17	0.5	7	2	0.8	5	2	0.5	0	0	0	4	1.33	0.33	26	7.50	0.83	0.36	0.29
RBNU	2	0.67	0.33	0	0	0	1	0.17	0.17	0	0	0	1	0.25	0.25	0	0	0	0	0	0	4	1.09	0.25	0.11	0.14
BRCR	0	0	0	1	0.2	0.2	0	0	0	0	0	0	0	0	0	2	1.33	0.67	0	0	0	3	1.53	0.50	0.12	0.24
WIWR	8	5.67	1	6	2.4	1	8	4.5	1	7	4.6	1	4	2.75	1	6	3.33	0.67	12	7	1	51	30.25	1.65	0.95	0.36
GCKI	5	1.67	0.67	3	0.8	0.6	3	1	0.67	2	0.8	0.6	2	1	0.75	2	1	0.67	1	0.33	0.33	18	6.60	0.40	0.61	0.25
BITH	0	0	0	0	0	0	2	0.83	0.67	0	0	0	0	0	0	0	0	0	0	0	0	2	0.83	0.31	0.10	0.24
SWTH	10	6.33	1	14	9	1	15	8.33	1	17	12.6	1	19	12	1	16	9.67	1	11	6.67	1	102	64.60	2.42	1.00	0.35
HETH	2	1	0.67	4	1	0.6	1	0.17	0.17	0	0	0	1	0.25	0.25	4	1.67	0.67	1	0.33	0.33	13	4.42	0.61	0.38	0.28
CEWA	0	0	0	2	0.4	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.40	0.15	0.03	0.07
NAWA	0	0	0	0	0	0	0	0	0	1	0.2	0.2	1	0.5	0.5	0	0	0	0	0	0	2	0.70	0.19	0.10	0.18
PAWA	0	0	0	0	0	0	1	0.17	0.17	0	0	0	0	0	0	0	0	0	0	0	0	1	0.17	0.06	0.02	0.06
MAWA	2	1.33	0.67	3	1.4	0.8	6	1.33	0.33	5	1.8	0.8	2	1.25	0.75	3	1.67	1	1	0.33	0.33	22	9.11	0.47	0.67	0.33
BTBW	2	1.33	0.67	0	0	0	0	0	0	1	0.6	0.6	0	0	0	6	3.67	1	0	0	0	9	5.60	1.36	0.32	0.41
MYWA	7	6	1	13	6.4	1	7	2.33	1	5	2.6	1	5	2.5	1	7	3.67	0.67	8	3.33	0.67	52	26.83	1.69	0.91	0.35
BTGW	3	1.67	1	0	0	0	1	0.17	0.17	1	0.2	0.2	0	0	0	4	2.33	1	0	0	0	9	4.37	0.96	0.34	0.44
BLPW	1	0.33	0.33	5	2.6	1	5	2.67	1	4	1.6	0.8	3	2	1	1	0.67	0.67	5	2.33	1	24	12.20	0.93	0.83	0.38
AMRE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.33	0.33	0	0	0	1	0.33	0.12	0.05	0.12
OVEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.33	0.33	0	0	0	1	0.33	0.12	0.05	0.12
MOWA	1	0.67	0.67	0	0	0	0	0	0	0	0	0	0	0	0	1	0.33	0.33	0	0	0	2	1.00	0.26	0.14	0.25
WTSP	10	8	1	6	2.4	1	13	6.83	1	11	6.2	1	1	0.25	0.25	5	2.67	1	6	3	1	52	29.35	2.83	0.89	0.41
SCJU	7	2.67	1	10	4.6	0.8	11	5	1	9	2.2	0.6	6	2.5	1	7	3	0.67	6	2	1	56	21.97	1.18	0.87	0.35
PUFI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.33	0.33	1	0.33	0.12	0.05	0.12
Unknown	1	0.33	0.33	0	0	0	5	0.83	0.17	0	0	0	0	0	0	3	1.67	0.67	0	0	0	9	2.83	0.64	0.17	0.24
Overall/Total	70	42		77	33.6		90	36.3		76	37.2		51	28		79	41.7		63	29.3		506	248.12	5.52		
Species Richness	18			16			17			15			13			19			14			34				

Table 6. Summary of Bicknell's thrush detections in the project area

Date	Point	Time	Notes
1-Jun	B1-4	4:38	Singing at 11 to 20m.
2-Jun	B1-2	5:25	Calling at less than 10m.
5-Jun	B1-4	20:58	Calling at 21 to 30m after playback.
5-Jun	B1-5	21:13	Singing at 21 to 30m after playback
6-Jun	B1-4	4:35	Singing and calling at 21 to 30m.

Table 7. Vegetation survey data by transect point: Trees

Trans.	Plot	SNAG						ABBA					SOAM			
		A	B	C	D	E	F	A	B	C	D	E	A	B	C	D
B1	1	149	12					47	103	7			1	4		
B1	2							38	11							
B1	3	12	17	1				7	22	17	8					
B1	4	11	4	2				41	6	6	1			1	1	
B1	5	1	9	6	1			13	2	2	2				1	
B2	1	4	5	2				27	12	11	4					
B2	2	43	10	5	1			47	83	8			4			
B2	3	13	6	2	1			363	53				2			
B2	4	11	18	5				109	23	5					3	
B2	5	4	2	3				5	12	3			1		1	
B3	1	3	3	1				64	11	2						
B3	2	12	14	3				93	29	3						
B3	3	26	21	6	1			135	68	7	1		1	2		
B3	4	53	10					52	57	10	1			1		
B3	5	16	3	2	2			11	19	7	4					
B4	1	6	2	1	1					4	2		1			
B4	2	1		1	1	2	1			2	2					
B4	3	2	10	3				1	3	3						2
B4	4	5	13	7	1			2	9	12	1					
B4	5	4	4	4	2				1	2	1			1		
B5	1	15	17	2	1				8	9	3					
B5	2	58	46	3				17	39	7						
B5	3	7		2	5				6	8	1				1	
B5	4	3	1	1	2			4	3	5	5	1				
B5	5	2	6	2	1			7	1	4						
A1	1	16	1	2				2	4	5						
A1	2	2	2	12	3			12	15	10	2					
A1	3	17	13	4	1			77	21	2	2		2	1	1	
A1	4	3	4	4	3			44	2	8	3					
A1	5	3	4	4	3			2	4	6	2					
A2	1	25	28	7				2	24	27	3			1	1	
A2	2	4	7	7	1				4	16	7					
A2	3	7	3	6	1			62	7	3	3					
A2	4	33	8					35	75	21	1					
A2	5	20	11	5	3			13	24	6				1	1	2

Trans.	Plot	PIRU					PIMA				BEPA					
		A	B	C	D	E	A	B	C	D	A	B	C	D	E	F
B1	1	2	18	14							3	1				
B1	2															
B1	3		1	2							1	1	2			
B1	4	5	3		1		1		1		8	14		1		
B1	5	6	6	2	2		3				1	3	2			
B2	1	7	1	1	4								6	7		
B2	2	7	8		1						1	4	3			
B2	3	44	11								8					
B2	4	8	4	12							1	3		1		
B2	5	1	1		1						1	5	5	2		
B3	1	63	17	5	6	2						3	1			
B3	2	49	11	8	1						1					
B3	3	53	16	6								2	1			
B3	4	21	13	12							20	1				
B3	5	6	4	6	4						1		2	3	1	
B4	1												3	1		
B4	2	11	3												1	
B4	3	4	3	3	3											
B4	4	10	10	4							1	1	7	5		
B4	5											11			1	
B5	1	21	9	6	3						5	15	9	2		
B5	2	14	6	2	1						2	4	1			
B5	3	13	5	1	2							1	1	1		1
B5	4	8	4	1	1						1		3	2		
B5	5	8	6								1	4	4	3		
A1	1	4	6		1						17	49	8			
A1	2	5	2	2	6	1							6	4		
A1	3	13	25	6							3	1	2	1		
A1	4	5	2	13	2								3			
A1	5	8	13	7	5						1			4		
A2	1	11	4	3	1						7	5	7	2		
A2	2	2	2	7	2								1	1	1	
A2	3	5	12	3	3						2	4	3			
A2	4	6	10	7	1						32	11				
A2	5	8	7	3	2							9	7			

Trans.	Plot	BEAL							PIGL					THOC				ACRU				PRPE			ACPE	SARA
		A	B	C	D	E	F	G	A	B	C	D	E	A	B	C	D	A	B	C	D	A	B	D	A	A
B1	1																									
B1	2																									
B1	3																									
B1	4																									
B1	5																									
B2	1																									
B2	2				1																					
B2	3								7																	
B2	4		1						2	1		1														
B2	5	2	1		3	1		1																		
B3	1													1					1							
B3	2													1												
B3	3																									
B3	4																									
B3	5						1																			
B4	1	1	1			1			3	8	12	6	1												1	
B4	2		1		3	1			2	2	1	1														1
B4	3		1	1	1				1	1	1	3	1													1
B4	4								5	2	6	4														
B4	5								18	12	7	4														
B5	1																									
B5	2																									
B5	3																									
B5	4		1			1																				
B5	5																									
A1	1																	1					4	1		
A1	2																									
A1	3																					1				
A1	4																									
A1	5																									
A2	1																									
A2	2																									
A2	3																									
A2	4																									
A2	5								1	3	1															

Table 7 continued. Vegetation data summary by transect point

Trans.	Plot	Total							Total A, B, & C	Total Conifer A, B, & C
		A	B	C	D	E	F	G		
B1	1	202	138	21	0	0	0	0	361	191
B1	2	38	11	0	0	0	0	0	49	49
B1	3	20	41	22	8	0	0	0	83	49
B1	4	66	28	10	3	0	0	0	104	63
B1	5	24	20	13	5	0	0	0	57	34
B2	1	38	18	20	15	0	0	0	76	59
B2	2	102	105	16	3	0	0	0	223	153
B2	3	437	70	2	1	0	0	0	509	478
B2	4	131	50	25	2	0	0	0	206	164
B2	5	14	21	12	6	1	0	1	47	22
B3	1	131	35	9	6	2	0	0	175	163
B3	2	156	54	14	1	0	0	0	224	194
B3	3	215	109	20	2	0	0	0	344	285
B3	4	146	82	22	1	0	0	0	250	165
B3	5	34	26	17	13	1	1	0	77	53
B4	1	12	11	20	10	2	0	0	43	27
B4	2	15	6	4	7	4	1	0	25	21
B4	3	9	18	11	9	1	0	0	38	20
B4	4	23	35	36	11	0	0	0	94	60
B4	5	22	29	13	7	1	0	0	64	40
B5	1	41	49	26	9	0	0	0	116	53
B5	2	91	95	13	1	0	0	0	199	85
B5	3	20	12	13	9	0	1	0	45	33
B5	4	16	9	10	10	2	0	0	35	25
B5	5	18	17	10	4	0	0	0	45	26
A1	1	40	64	15	2	0	0	0	119	21
A1	2	19	19	30	15	1	0	0	68	46
A1	3	113	61	15	4	0	0	0	189	144
A1	4	52	8	28	8	0	0	0	88	74
A1	5	14	21	17	14	0	0	0	52	40
A2	1	45	62	45	6	0	0	0	152	71
A2	2	6	13	31	11	1	0	0	50	31
A2	3	76	26	15	7	0	0	0	117	92
A2	4	106	104	28	2	0	0	0	238	154
A2	5	42	55	23	7	0	0	0	120	66

Key

Tree and Shrub Species

Code	Common name	Latin name
ABBA	Balsam fir	*Abies balsamia*
ACPE	Striped maple	*Acer pennsylvanica*
ACRU	Red maple	*Acer rubra*
AMEL	Serviceberry	*Amelancere sp.*
BEAL	Yellow birch	*Betula alleghaniensis*
BEPA	White birch	*Betula glauca*
PIGL	White spruce	*Picea glauca*
PIMA	Black spruce	*Picea mariana*
PIRU	Red spruce	*Picea rubra*
PRPE	Pin cherry	*Prunus pennsylvanica*
SARA	Red elderberry	*Sambucus racemosa*
SNAG	Snag/Dead tree	
SOAM	American mountain ash	*Sorbus americana*
SODE	Showy mountain ash	*Sorbus decora*
THOC	Northern white cedar	*Thuja occidentalis*
VILA	Hobblebush	*Viburnum latifolia*

Size Classes

Code	DBH
A	<3
B	3-6
C	6-9
D	9-15
E	15-21
F	21-27
G	27-33

Table 8. Vegetation survey data by transect: Shrub and ground cover

Trans.	Plot	Date	Shrubs	Ground Cover %	Canopy Cover %	Canopy Height (ft)	Species	Slope/ bearing	Comments	Shrubs (in order of abundance)	Ground Cover
B1	1	28-Jul	12	25	80	17.4	PIRU	-4% @298		ABBA	Wood sorel, ferns, blue bead lily, indian pipe, star flower, gold thread, Canada dogwood, sedge, wild sasparilla, grass
B1	2	28-Jul	159	95	0	14.032	ABBA	-3% @158		Raspberry, BEPA, BEAL, ABBA	
B1	3	28-Jul	87	65	50	36.22	ABBA	2% @32		ABBA, BEPA, raspberry, SOAM	
B1	4	28-Jul	90	70	45	19.268	PIRU	11% @320		Raspberry, BEPA, BEAL, ABBA, VILA, PIRU	
B1	5	28-Jul	111	80	50	52.315	PIRU	14% @330		Raspberry, VILA, ABBA, BEPA, SOAM	
B2	1	2-Aug	28	80	70	44.841	PIRU	8% @50		VILA, ABBA, PIRU, BEPA, SOAM	Canada dogwood, wood sorel, blue bead lily, fern, dedge, starflower, white lily of the valley, wild sasparilla, aster, fern, indian pipe, blueberry, cranberry, gold thread
B2	2	2-Aug	3	40	90	33.404	ABBA	3% @140		ABBA, mtn maple, SOAM, BEAL, BEPA, PIRU	
B2	3	2-Aug	50	15	60	17.2	ABBA	23% @125	Lots of sphagnum	ABBA, PIRU, BEPA, SOAM, mtn holly	
B2	4	2-Aug	85	75	40	34.47	PIRU	-2% @220, 40% @40		ABBA, BEPA, BEAL, raspberry, SOAM	
B2	5	2-Aug	74	45	55	51.068	NA	26% @165		VILA, ABBA, mtn maple, ACPE, SARA	
B3	1	3-Aug	62	NA	75	53.296	NA	-20% @250		ABBA, PIRU, blueberry, SOAM, ACRU	Blue bead lily, hayscented fern, bracken fern, Canada dogwood, goldthread, indian pipe, painted trillium, star flower, white lily of the valley, cranberry, uk viburnum, wild sasparilla
B3	2	3-Aug	78	55	60	30.575	NA	-5% @195		ABBA, PIRU, blueberry, BEPA, BEAL, THOC, SOAM, mtn maple	
B3	3	3-Aug	114	40	70	35.846	ABBA	-18% @240		ABBA, blueberry, SOAM, PIRU, BEPA	
B3	4	3-Aug	31	20	65	36.76	NA	3% @10		ABBA, PIRU, blueberry	
B3	5	3-Aug	84	60	90	43.67	ABBA	2% @56		VILA, ABBA, SOAM, BEPA	
B4	1	1-Aug	123	65	70	64.532	PIGL	-6%@40		VILA, ACRU, ACPE, ABBA, PIRU, PIGL, SARA, BEAL, BEPA, AMEL, currant, SOAM	Fern, woodsorel, star flower, bluebead lily, Canada dogwood, indian pipe, white lily of the valley, wild sasparilla
B4	2	1-Aug	102	90	65	59.425	PIGL	-20%@190		VILA, raspberry, currant, SOAM, SARA, BEPA, ABBA, BEAL,	
B4	3	1-Aug	74	90	50	48.19	NA	25%@280		VILA, PIGL, raspberry, BEAL, BEPA, SARA, SOAM	
B4	4	1-Aug	37	65	90	43.76	ABBA	-20%@308		ABBA, PIRU, PIGL, SOAM, ACPE	
B4	5	1-Aug	113	80	35	50.1	PIGL	-1.5% @320		Raspberry, VILA, SOAM, SARA, ABBA, PIRU, BEAL, BEPA	
B5	1	4-Aug	64	60	50	50.19	NA	-22%@160		ABBA, PIRU, SOAM, BEPA	Wood sorel, star flower, white lily of the valley, wild sasparilla, wood fern crrant, Canada dogwood, Clintonia, gold thread, large leaved goldenrod, whorled aster, long beech fern, hay scented fern, bracken fern, grass, sedge
B5	2	4-Aug	159	65	55	37.04	PIRU	-1%@110; -21%@15	Half of site flat, half sloped	ABBA, PIRU, SOAM, BEPA	
B5	3	4-Aug	N/A	80	45	56.54	N/A	9%@235		VILA, ABBA, ACPE, SOAM, raspberry, PIRU, BEPA, american beech	
B5	4	4-Aug	44	80	80	56.92	ABBA	8%@333		Raspberry, ABBA, VILA, SARA, BEPA, BEAL, PIRU	
B5	5	4-Aug	126	90	20	45.161	PIRU	-25%@205	Relatively open flat site	Raspberry, ABBA, VILA, SARA, BEPA, PIRU	
A1	1	20-Jun	89	85	85	53	NA	10% @120		VILA, ACPE, SOAM, mtn maple, SARA, ABBA	Interupted fern, woodsorel, Clintonia borealis, Canada dogwood, white lily of the valley, bristly sasparilla, twisted stalk, largeleaf goldenrod, starflower, false hellebore, hayscented fern, Polypody
A1	2	20-Jun	21	70	65	61.1	NA	10%@33		VILA, ABBA, currant, SOAM	
A1	3	20-Jun	42	45	55	32.1875	NA	19deg@240	Ledge outcrop on south side	ABBA, PIRU, SOAM, BEPA	
A1	4	20-Jun	60	70	50	44.8	NA	none		ABBA, BEPA	
A1	5	20-Jun	77	80	60	53.8	NA	2deg@250		VILA, ABBA, SOAM	
A2	1	31-Jul	19	75	90	52.62	NA	19%@190		ABBA, SODE, SOAM, AMEL,	Fern, woodsorel, bluebead lily, Canada dogwood, star flower, wild sasparilla, bluebead lily, indian pipe, blueberry, goldthread
A2	2	31-Jul	17	75	60	48.145	PIRU	17deg@45%		ABBA, PIRU, BEPA, SOAM, VILA	
A2	3	31-Jul	31	60	65	44.425	NA	10%@10	Thicker fir patch nearby	ABBA, raspbery, BEPA, PIRU, currant, SOAM	
A2	4	31-Jul	46	45	70	40.54	ABBA	14%@95		ABBA, PIRU, SOAM	
A2	5	31-Jul	8	40	60	56.06	PIRU	-28%@340		ABBA, PIRU, VILA	

*Note: Shrubs -- A list of all woody species under 6ft. In some cases may be more than the number of shrubs counted on a shrub transect of the point. Most common shrubs are listed first.

APPENDIX D

Photographs

Photo 1: Survey point B2-1, representative of spruce, fir, wood sorel, feathermoss forest community

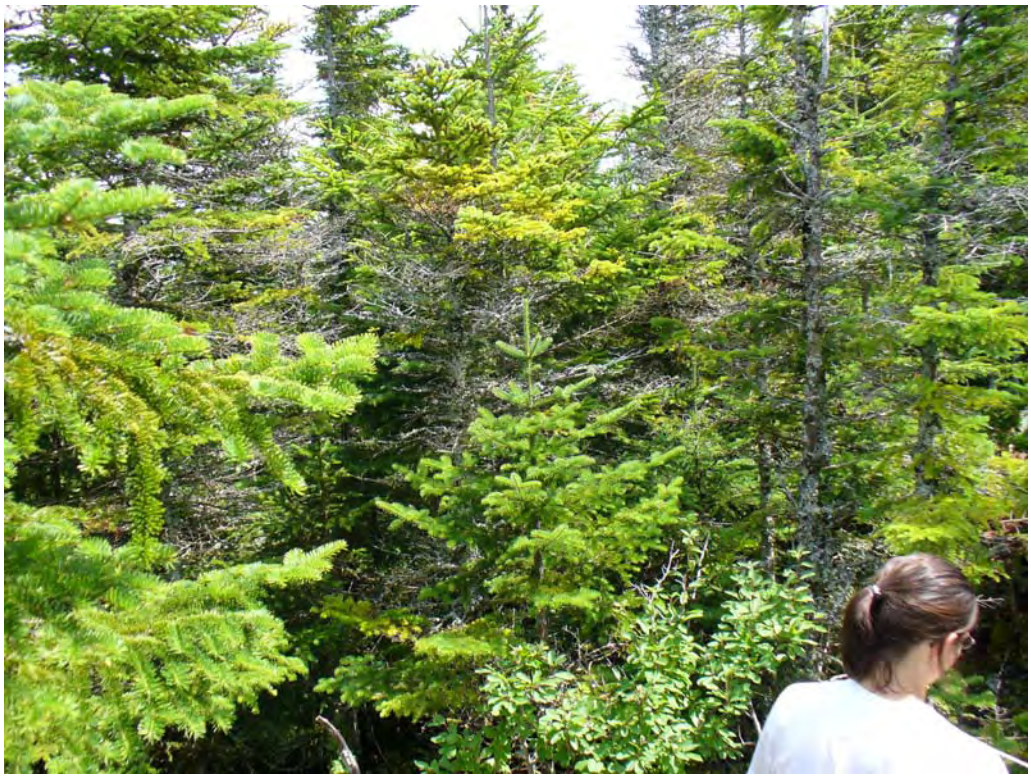


Photo 2: Survey point B2-3, representative of a spruce, fir, wood sorel, feathermoss forest community

Photo 3: Survey point A1-1, representative of a spruce and northern hardwood forest community

Photo 4: Survey point A2-4, representative of a fir – birch subalpine forest community