LAND USE REGULATION COMMISSION GRID SCALE WIND ENERGY DEVELOPMENT APPLICATION

EXHIBIT 11A

Stetson II Wind Project
T8 R4 NBPP, Washington County, Maine

Table of Contents

Appendices

1.0 INTRODUCTION

Stetson Wind II, LLC (Stetson II) is proposing the development of a 17-turbine, 25.5-megawatt (MW) wind project within a 580-acre project area on Jimmey and Owl Mountains in T8 R4, NBPP, Washington County, Maine. The project area is currently zoned as General Management Subdistrict (M-GM) and includes protection subdistricts for wetlands and streams. Stetson II is seeking approval from the Land Use Regulation Commission (LURC) for development of the proposed wind project and ancillary structures.

Stantec Consulting (Stantec) completed a wetland delineation and vernal pool survey of the Stetson II project area in the fall of 2007 and spring of 2008. Wetland delineations and vernal pool surveys also were completed along a road corridor extending from Route 169 to the top of Jimmey Mountain. This report of our findings is intended to provide information normally required for Maine LURC permitting and contains:

- A Site Location Map (Appendix A);
- Maps presenting the location of resources within the project area (Appendix B);
- A summary of wetlands present within the project area (Appendix C, Table C-1);
- A summary of vernal pools on the site (Appendix C, Table C-2);
- Additional wetlands data (Appendix C, Table C-3);
- LURC Land Use Guidance Maps (Appendix D);
- Representative site photographs (Appendix E); and
- Significant Vernal Pool data sheet (Appendix F).

2.0 SURVEY METHODS

2.1 Wetland Delineation Survey Methods

Wetland boundaries under state and federal jurisdiction were determined using the technical criteria described in the U.S. Army Corps of Engineers (Corps) *Wetland Delineation Manual*.[1] The majority of the fieldwork was completed on November 12-16, 2007, and November 26-30, 2007, under seasonally-appropriate (i.e., growing season) field conditions. The southern portion of Owl Mountain was delineated on December 5, 2007, during winter conditions. Due to the timing of the delineation and the snow cover present, Stantec conducted a growing season site visit in June 2008 to Wetlands 60, 63, 64 and 65 to confirm their boundaries. Additional wetlands (Wetlands 66-72) were also delineated during this site visit.

Wetland boundaries were marked with pink, numbered flagging and surveyed using Trimble® Pro-XR GPS receivers. Streams and *Wetlands of Special Significance* (P-WL1) were identified based on criteria in the LURC Land Use Regulations and Standards (Chapter 10). Identification of *Wetlands of Special Significance* (P-WL1) was limited to observable conditions within the project area and information provided by natural resource agencies. Representative wetland photographs are included in Appendix E.

2.2 Vernal Pool Survey Methods

A vernal pool survey was conducted throughout the project area. As suggested by the Maine Department of Inland Fisheries and Wildlife (MDIFW), a second site visit was performed to those pools that had the potential to meet the Maine Department of Environmental Protection (MDEP) classification of a Significant Vernal Pool (i.e., those pools that were determined to be natural). The purpose of the vernal pool survey was to identify and evaluate vernal pool habitat. The vernal pool survey focused on areas identified as potential vernal pools during the November and December 2007 wetland delineations. The results of this vernal pool survey were derived using standard field techniques and represent observations made during the amphibian breeding season. Vernal pools are dynamic habitats that vary in water level, vegetative

[1] Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual.* Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station. Vicksburg, MS.

cover, and other physical characteristics during the course of a year, as well as from year to year. In addition, the breeding activity of amphibians, particularly the initiation of breeding, is dependent upon seasonal environmental parameters such as temperature and precipitation. Due to this variability, the presence and number of egg masses may differ between breeding seasons and during the course of a given breeding season. The presence, absence, and number of egg masses presented in this report reflect the results of the 2008 survey event. Based on observations of the on-site vernal pools, the survey event conducted by Stantec was at the appropriate seasonal period for characterizing vernal pools.

Each vernal pool area was thoroughly surveyed by slowly wading through the pool basin, counting amphibian egg masses, and noting other vernal pool-dependent species use. Data were collected on obligate and facultative species use of the pool. The data were used to determine if the pools met the criteria of a Significant Vernal Pool as defined in Chapter 335 Section 9 of the Natural Resources Protection Act (NRPA). According to this section, a vernal pool is a natural, temporary to semi-permanent body of water occurring in a shallow depression that typically fills during the spring or fall and may dry during the summer. Vernal pools have no permanent inlet or outlet and no viable populations of predatory fish. In addition, a Significant Vernal Pool must contain at least one of the following:

- 40 or more wood frog (*Rana sylvatica*) egg masses;
- 20 or more spotted salamander (*Ambystoma maculatum*) egg masses;
- 10 or more blue spotted salamander (*Ambystoma laterale*) egg masses;
- Presence of fairy shrimp (*Eubranchipus* spp.) in any life stage;
- Presence of any state-listed threatened or endangered species such as Blanding's turtle (*Emydoidea blandingii*), spotted turtle (*Clemmys guttata*), or ringed boghaunter dragonfly (*Williamsonia lintneri*); or
- Presence of the following rare species: ribbon snake (*Thamnophis sauritus*), wood turtle (*Clemmys insculpta*), swamp darner dragonfly (*Epiaeschna heros*), or comet darner dragonfly (*Anax longipes*).

Additionally, man-made pools such as skidder ruts, old borrow pits, all-terrain vehicle trails, and ditches do not meet the definition of a Significant Vernal Pool under NRPA Chapter 335.[2] However, regardless of whether or not the pool is natural, the Corps may regulate each vernal pool under the Clean Water Act if the project involves impacts to Corps-jurisdictional wetlands (i.e., the Corps does not have jurisdiction over vernal pools if pools do not exist within a jurisdictional wetland).

2.2 Agency Contacts

The Maine Natural Areas Program (MNAP), MDEP, USFWS, and MDIFW were contacted for information regarding documented occurrences of rare, threatened and endangered species and communities within or in the vicinity of the project area. The Maine Historic Preservation Commission (MHPC), Aroostook Band of Micmacs, Passamaquoddy Tribe of Indians, Houlton Band of Maliseet Indians, and the Penobscot Indian Nation were also contacted for information regarding significant historic resources within or in the vicinity of the project area. See Section 4.1 below for a summary of responses received to date.

3.0 SURVEY RESULTS

3.1 General Site Description

The project area consists of an approximately 580-acre corridor extending north from Route 169 across the ridgelines of Jimmey and Owl Mountains in T8 R4 NBPP, Washington County, Maine. General topography consists of a north-south-oriented ridgeline with generally gently sloping sides. The northern portion of Owl Mountain, however, is dominated by steeper slopes. With the exception of two temporary meteorological towers on the central portion of Owl Mountain and the northern portion of Jimmey

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[2] LURC regulations do not currently recognize or regulate vernal pools that are not mapped by MDIFW. However, these areas within the delineation limits may be of concern to the Corps, MDIFW, and USFWS.

Mountain, there are no existing structures within the development area.[3] The majority of the ridgelines are characterized as second-growth Beech-Birch-Maple and Spruce-Northern Hardwood ecosystems with portions of Spruce-Fir-Northern Hardwood Forest included within this matrix forest ecosystem.[4] These upland forests have been disturbed by multiple timber harvests and are bisected by two existing logging roads and numerous skidder trails. Typical upland species present in the tree layer include big-toothed aspen (*Populus grandidentat*a), sugar maple (*Acer saccharum*), paper birch (*Betula papyrifera*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), eastern hemlock (*Tsuga canadensis*), and red spruce (*Picea rubens*). The shrub layer includes saplings of the above-mentioned species, as well as elderberry (*Sambucus canadensis*), striped maple (*Acer pensylvanicum*), hobblebush (*Viburnum lantanoides*), and hophornbeam (*Ostrya virginiana*). The herbaceous layer consists of seedlings of the above-mentioned species, as well as evergreen wood fern (*Dryopteris intermedia*), red raspberry (*Rubus idaeus*), Christmas fern (*Polystichum acrostichoides*), hay-scented fern (*Dennstaedtia punctilobula*), wild strawberry (*Fragaria virginiana*), and partridgeberry (*Mitchella repens*).

Soil mapping within the project area was completed by Albert Frick Associates.[5] Soils present in the project area include:

- Monson silt loam, a somewhat excessively drained soil formed in glacial till on knolls of till plains, and on hills, ridges, and mountains;
- Knob Lock silt loam, a well-drained to excessively drained organic soil found on mountains and hills;
- Masadaris silt loam, a somewhat excessively to excessively well-drained soil formed from outwash and stratified drift material, found in the upper positions of landforms;
- Adams silt loam, very deep, excessively and somewhat excessively drained soils formed in glacial-fluvial or glacio-lacustrine sand. They occur on outwash plains, deltas, lake plains, moraines, terraces, and eskers, found in the upper positions of landforms;
- Elliottsville silt loam, a moderately deep, well-drained soil formed in glacial till on till plains, hills, ridges, and mountains;
- Chesuncook silt loam, a very deep, moderately well-drained soil on till plains, hills, ridges and mountains formed in dense glacial till;
- Telos silt loam, a somewhat poorly drained soil on till plains, hills, and ridges formed in dense glacial till. These soils are shallow to dense basal till and very deep to bedrock;
- Monarda silt loam, a very deep, poorly drained soil on lower slopes or in slight depressions on till plains formed in dense glacial till; and
- Burnham silt loam, a very deep, very poorly drained soil formed in dense glacial till found in depressions on glaciated uplands.

3.2 WETLAND DELINEATION SUMMARY

Stantec delineated 77 wetlands within the project area. These wetlands are summarized in Appendix C, Table C-1, which includes the wetland classification, presence of LURC-jurisdictional streams, presence of vernal pools, and Wetland Protection Subdistrict. Wetlands described in Table C-1 correspond to the numbered wetlands on the figures in Appendix B. Additional wetland information (e.g., common vegetation, soil, and hydrological characteristics) is presented in Appendix C, Table C-3.

3.2.1 Sensitive Wetland Resources

The entire project area is mapped a General Management Subdistrict (M-GN) with inclusions of shoreland and wetland protection subdistricts. These areas are appropriate for forest or agricultural management activities and do not require the special protection afforded by the protection subdistricts or the M-NC or M-HP management subdistricts. However, field delineations have identified wetlands that would be subject to regulation as Wetland Protection Subdistricts. According to the criteria listed in the Land Use

[3] The temporary, 60-meter high towers were permitted by LURC Development Permit 4786, on December 5, 2007.
[4] Gawler, S.C. and A.R. Cutko, 2004. Natural Landscapes of Maine: A Classification of Vegetated Natural Communities and Ecosystems, Maine Natural Areas Program, Maine Department Of Conservation, Augusta, Maine.
[5] A detailed (Class C) soil survey of the area is presented in Exhibit 15-A of this LURC Application.

Districts and Standards (Chapter 10), there are 19 *Wetlands of Special Significance* (P-WL1) within the project area. Within the project area, freshwater wetlands within 25 feet of stream channels are considered *Wetlands of Special Significance* (P-WL1) (see Appendix C, Table C-1). Additionally, Wetlands 64, 69, and 71 meet the threshold of 20,000 square feet of open water, emergent vegetation, or aquatic vegetation (P-WL1(c)ii). The stream channels mapped within these wetland areas also meet the criteria for Shoreland Protection Subdistrict (P-SL2). The Shoreland Protection Subdistrict includes areas located within 75 feet of a stream channel.

3.3 VERNAL POOL SURVEY RESULTS

Stantec identified potential vernal pools during the November and December 2007 wetland delineation. Potential vernal pools were then revisited on May 5 and 6 2008, and May 28 and 29, 2008. During supplemental field work conducted on June 24 and 25, 2008, two additional potential vernal pools were documented. Although these two pools were observed outside of the amphibian breeding season, they will be considered functioning vernal pools for the purposes of this application. In total, 17 pools were confirmed to be functioning vernal pools (see Appendix C, Table C-2). Of these 17 vernal pools, one (VP 15) was found to be a Significant Vernal Pool as defined by the NRPA.

4.0 REGULATORY INFORMATION

4.1 AGENCY CORRESPONDENCE

The following provides a brief summary of responses received from state and federal agencies regarding natural and historic resources in the vicinity of the project area. For additional information, refer to Exhibits 12B, 12C, 13, and 14A of this permit application. To date, responses have not been received from the Aroostook Band of Micmacs, Passamaquoddy Tribe of Indians, Houlton Band of Maliseet Indians, or the Penobscot Indian Nation.

- According to MNAP, there are no rare or exemplary botanical features documented within the project area.
- According to the MDIFW wildlife biologist, there are no Essential Habitats or Significant Wildlife Habitats located within the project area. There is a documented record of yellow lampmussel (*Lampsilis cariosa*) in Upper Hot Brook Lake. Yellow lampmussel is listed as Threatened in the State of Maine.
- The MDIFW fisheries biologist noted the presence of Upper Hot Brook Lake to the east of the project area, which is managed for warm water fish species. He also noted the presence of Webster Stream and several unnamed streams in proximity to the project area. He indicated that these streams likely support native fish species such as eastern brook trout (*Salvelinus fontinalis*).
- The USFWS stated that there are no records of federally threatened or endangered species occurring within the project area. This correspondence did note the presence of an active bald eagle nest in Upper Hot Brook Lake. The bald eagle is protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The proposed project is not expected to impact transient bald eagles or conflict with either the Bald and Golden Eagle Protection Act or the Migratory Bird Treaty Act.
- The MHPC recommended a Phase I Archaeological Survey be completed on the site. TRC Consulting subsequently completed a Phase I Archeological Survey of the project area. A written report summarizing the results of this survey is included in Section 14 of this LURC application.
- According to the MDEP, there are no Significant Wildlife Habitats within the project area.

4.2 STATE AND FEDERAL REGULATIONS

LURC and the Corps regulate the wetlands identified within the project area. Under the provisions of Section 404 of the Clean Water Act, the Corps regulates activities within waters of the United States, which include navigable waters and all their tributaries, adjacent wetlands, and other waters or wetlands where degradation or destruction could affect interstate or foreign commerce. The Corps has issued a

Programmatic General Permit for the State of Maine that merges the federal and state permit review process for many projects. In Maine, wetlands and waterbodies, as well as other protected natural resources, in unorganized plantations and townships are regulated under LURC's Land Use Districts and Standards (Chapter 10).

The level of permit review required by LURC depends upon the size of the proposed wetland alteration and the P-WL subdistrict involved. If any part of the overall project requires a higher level of review, then the entire project will be reviewed under that higher tier, unless otherwise authorized by LURC. Activities within the P-SL2 associated with the project would require a permit. Projects that impact less than 4,300 square feet of wetland are usually exempt from the Tier permitting process. This exemption only applies to P-WL2 and P-WL3 wetlands. Typically, projects with cumulative impacts to P-WL2 and P-WL3 wetlands between 4,300 and 15,000 square feet are eligible for review under the Tier 1 process. The Tier 2 review process applies to alterations that affect between 15,000 and 43,560 square feet (i.e., 1 acre) of P-WL2 and P-WL3 wetlands not containing critically imperiled (S1) or imperiled (S2) natural communities. Typically, projects altering any area of P-WL1 wetlands, 15,000 up to 43,560 square feet (i.e., 1 acre) of P-W2L or P-WL3 wetlands containing critically imperiled (S1) or imperiled (S2) natural communities, or one acre or more of P-WL2 or P-WL3 wetlands require a Tier 3 review. Alterations of P-WL1 wetlands may be eligible for Tier 1 or 2 review if LURC determines, at the applicant's request, that the activity will have no undue adverse impact on the freshwater wetlands or other protected natural resources present. In making this determination, considerations shall include, but not be limited to, such factors as the size of the alteration, functions of the impacted area, existing development or character of the area in and around the alteration site, elevation differences, and hydrological connection to surface water or other protected natural resources.

According to the Land Use Guidance Maps, the project area does not contain any Wetland Protection Subdistricts. However, fieldwork completed by Stantec indicated there are P-WL1, P-WL2, and P-WL3 wetlands within the delineation limits. Stantec identified 19 P-WL1 wetlands within the project area (see Appendix C, Table C-1). Any proposed development within these areas would be subject to the provisions and regulatory requirements of the prescribed Wetland Protection Subdistrict as outlined in the Land Use Districts and Standards (Chapter 10).

Appendix A
Site Location Map
(see Figure 1 under "Figures" of this Application)

Appendix B
Resource Maps

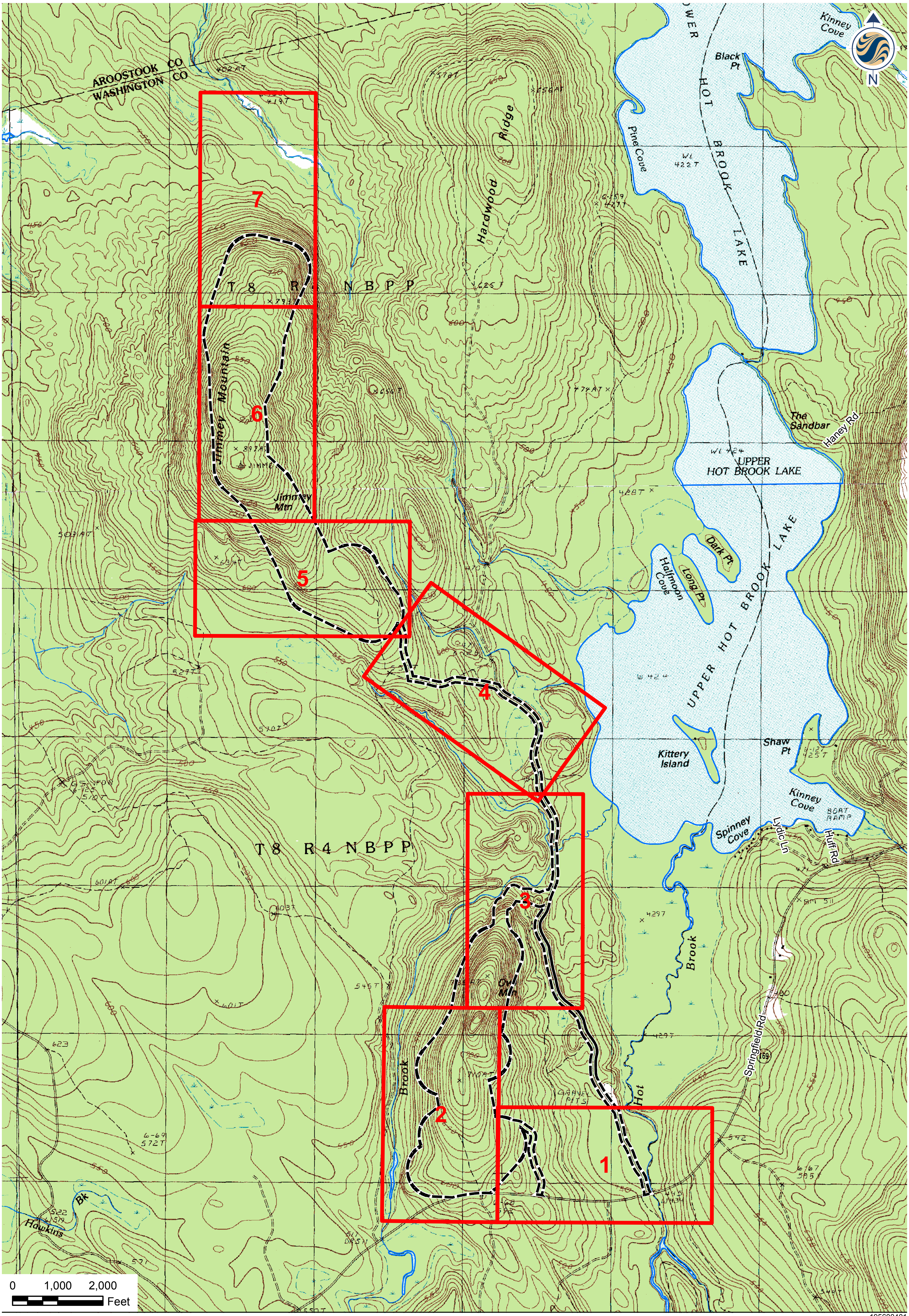

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Figure No.
Key

Title **Wetland Delineation Key Map**

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Legend

- Wetland identified by Stantec
- Vernal pool identified by Stantec
- MDEP stream identified by Stantec
- Delineation limits
- S01 Resource identification
- VP01 Vernal pool identification
- PVP Potential vernal pool identification

Notes

1. Wetland boundaries delineated in accordance with US ACOE 1987 wetland delineation methodology.
2. Wetland boundary flags were located utilizing a Trimble PRO Series Receiver. Expected accuracy of GPS data is within 1 to 2 meters of actual position.
3. Base map information provided by James W. Sewall Company.

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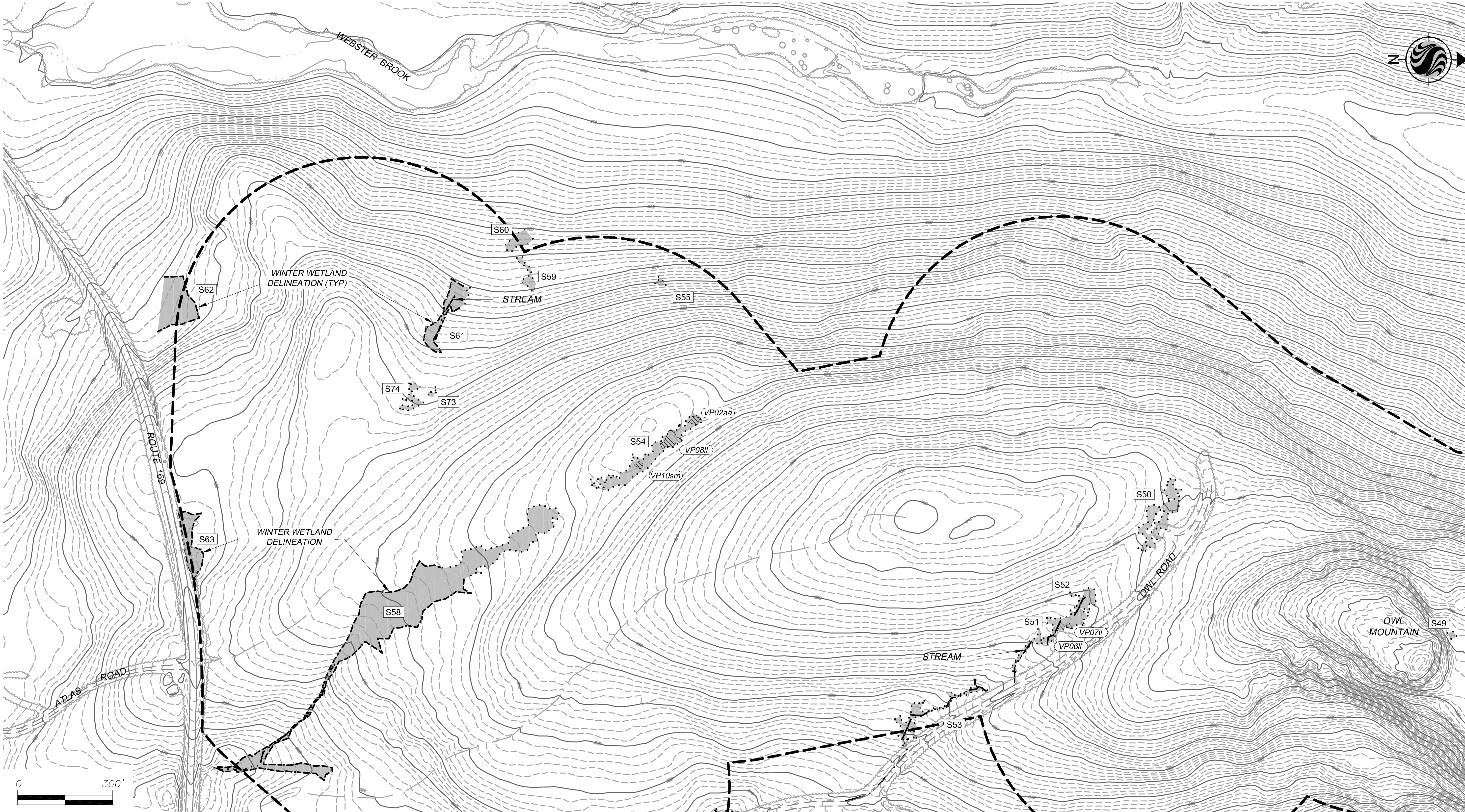
Title

Wetland Delineation Map

Sept. 30, 2008



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Title

Wetland Delineation Map

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Figure No.
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Title
Wetland Delineation Map

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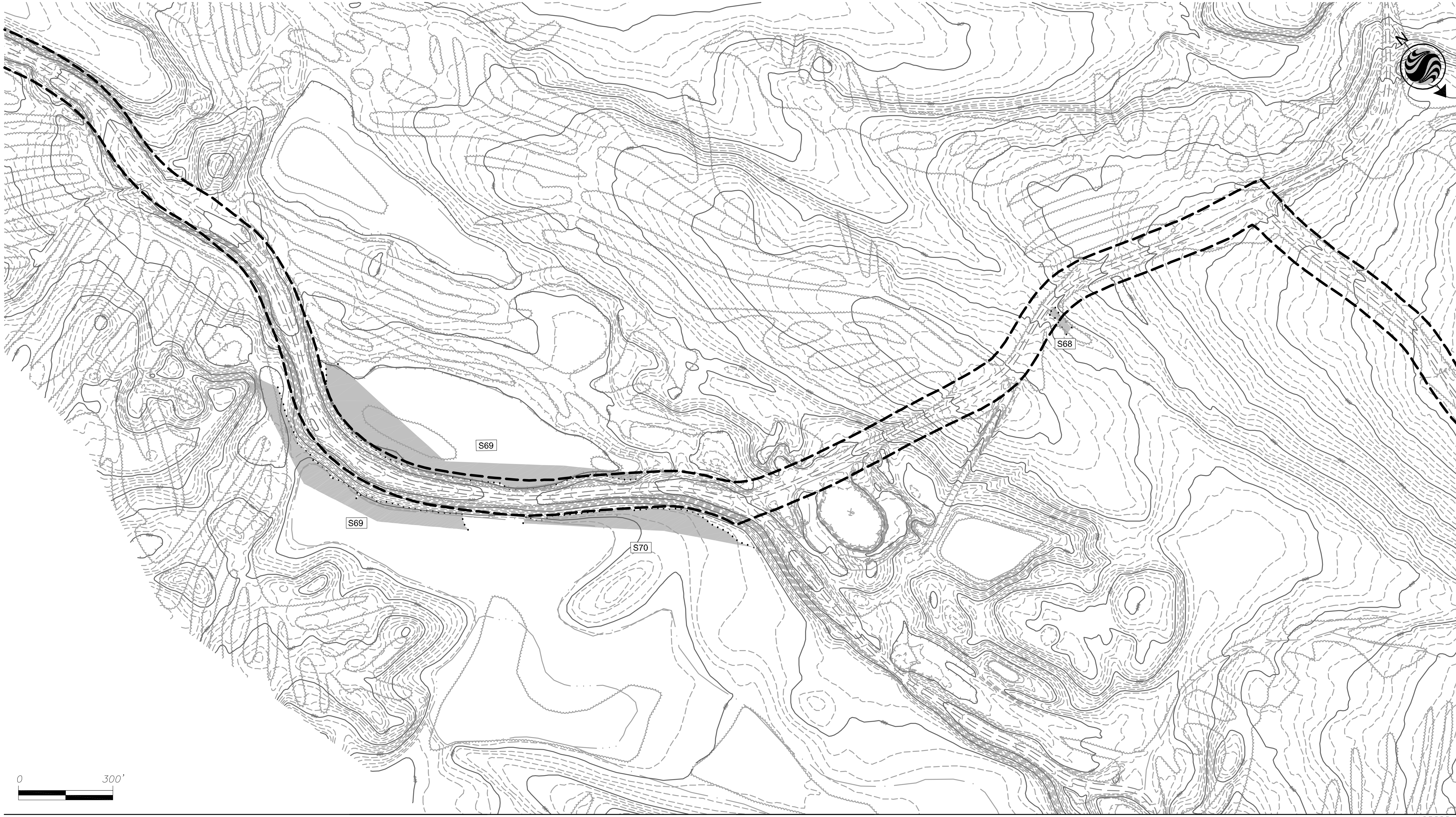

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Figure No.

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Title

Wetland Delineation Map

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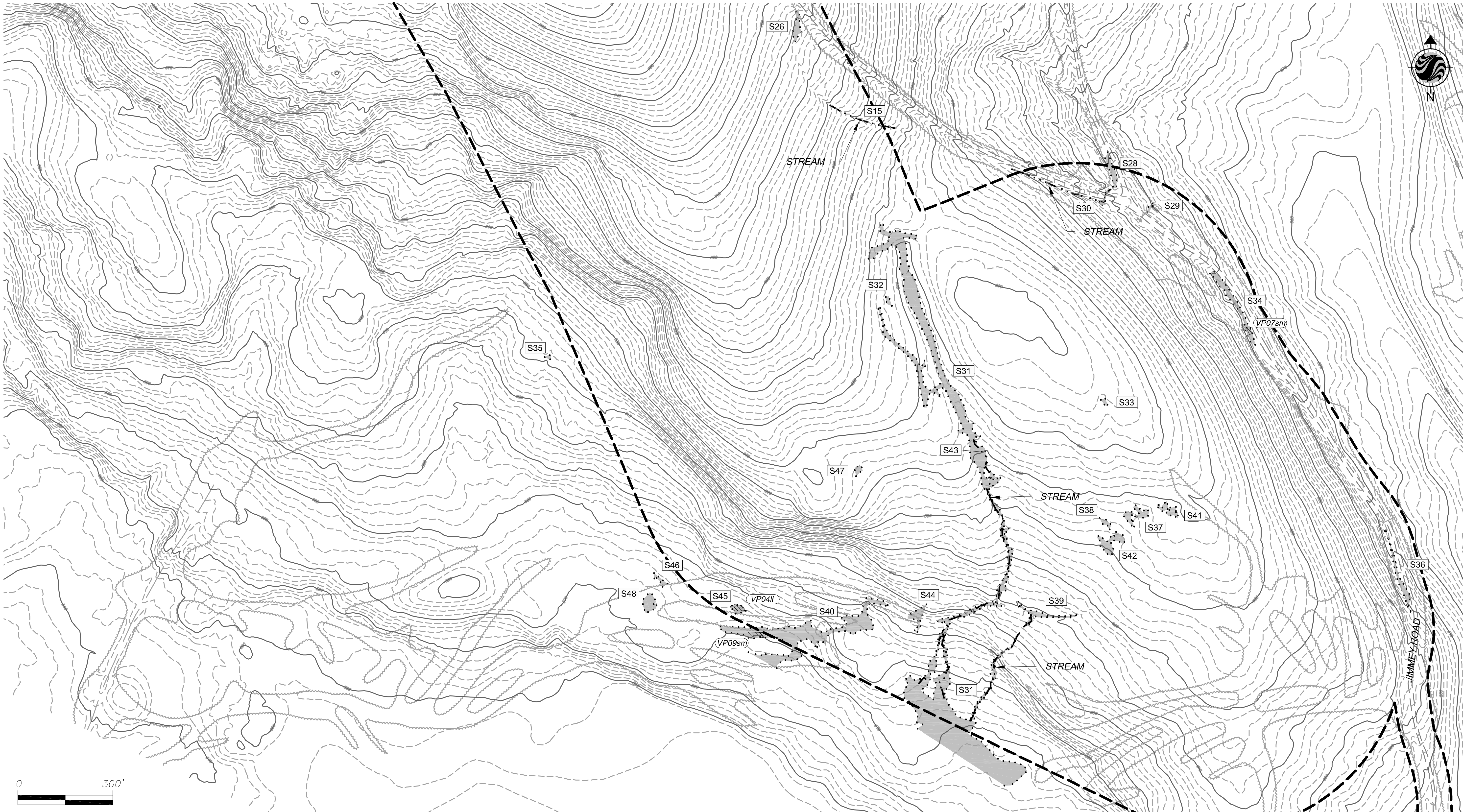

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Title
Wetland Delineation Map

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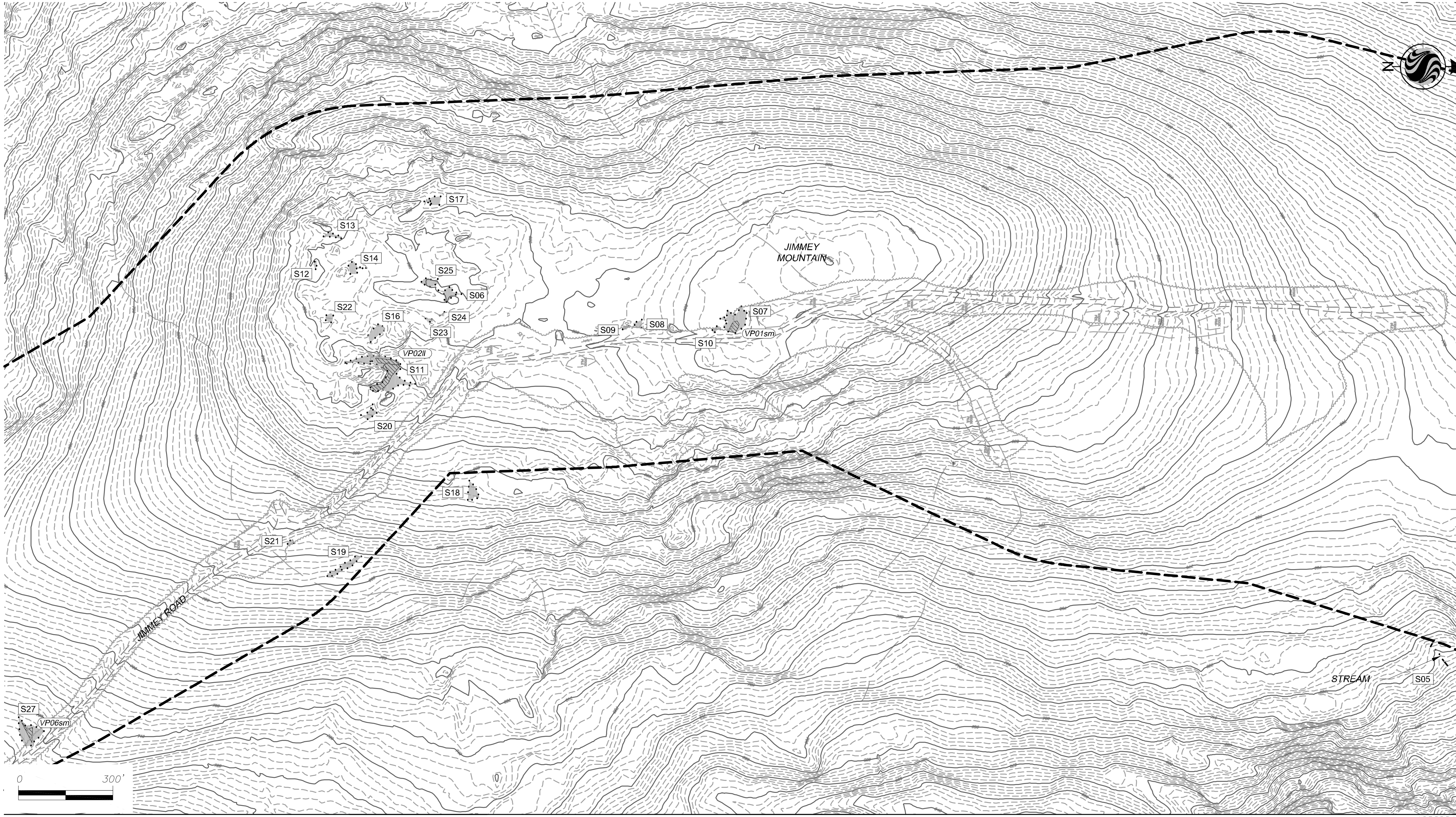

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Title
Wetland Delineation Map
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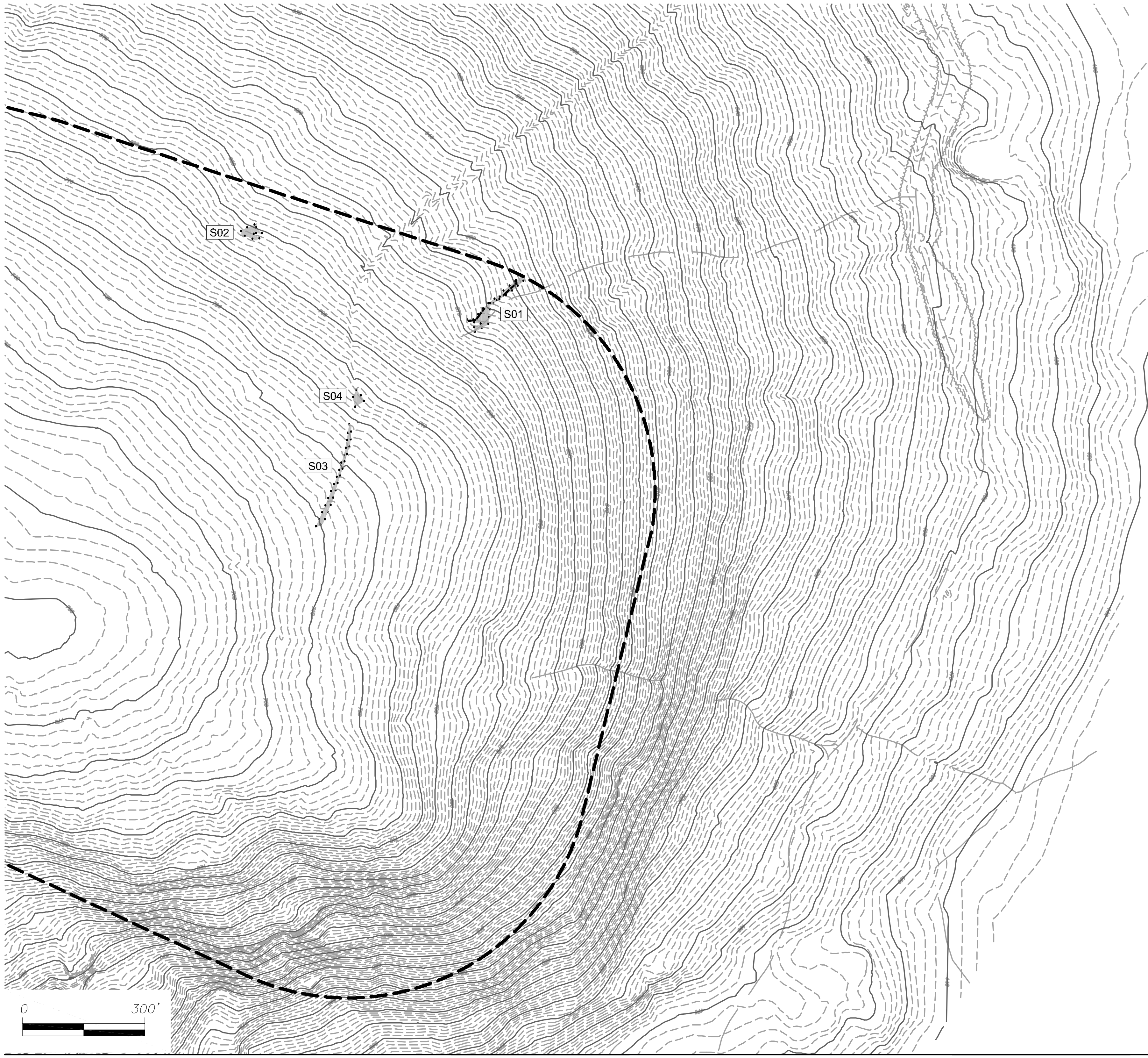

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Title
Wetland Delineation Map

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Appendix C
Additional Wetlands Data

Table C-1. Stetson II Wetlands Matrix

Resource Identification Number	Wetland Type*				Stream	Vernal Pool	WPS**	Notes
	PFO	PSS	PEM	PUB				
1		D			X		P-WL2a, P-WL1c(vi)	Intermittent stream turns into surface drainage
2			D				P-WL2a	Skidder trail
3		D					P-WL2a	Skidder trail
4			D				P-WL2a	Skidder trail
5					X		P-WL2a, P-WL1c(vi)	Located outside of corridor
6		D					P-WL2a	Pit & mound
7		D				VP	P-WL3	Disturbed area adjacent to log landing
8				D			P-WL2a	Disturbed area in swale adjacent to access road
9				D			P-WL2a	Disturbed area in swale adjacent to access road
10				D			P-WL2a	Anthropogenic
11		D	D			VP	P-WL2a	Previously logged
12			D				P-WL2a	Anthropogenic
13			D				P-WL2a	Skidder trail
14			D				P-WL2a	Skidder trail
15					X		P-WL2a, P-WL1c(vi)	Adjacent to access road
16			D				P-WL2a	Skidder trail
17			D				P-WL2a	Skidder trail
18			D				P-WL2a	Skidder trail
19			D				P-WL2a	Skidder trail
20			D				P-WL2a	Skidder trail
21			D				P-WL2a	Swale associated with culvert
22			D				P-WL2a	Skidder trail
23			D				P-WL2a	Skidder trail
24			D				P-WL2a	Skidder trail
25			D				P-WL2a	Skidder trail
26			D				P-WL2a	Skidder trail
27		D				VP	P-WL2a	Skidder trail
28			D				P-WL2a	Swale associated with culvert
29			D				P-WL2a	Swale associated with culvert
30			X		X		P-WL2a, P-WL1c(vi)	Swale associated with culvert
31	D	X	D		X		P-WL1c(vi), P-WL2a, P-WL3	Large, multi-class wetland and streams
32		D					P-WL2a	Skidder trail
33			D				P-WL2a	Skidder trail
34			D			VP	P-WL2a	Swale associated with culvert

Resource Identification Number	Wetland Type*				Stream	Vernal Pool	WPS**	Notes
	PFO	PSS	PEM	PUB				
35			D				P-WL2a	Skidder trail
36			D				P-WL2a	Swale
37		D	D				P-WL2a	Skidder trail
38			D				P-WL2a	Previously logged
39			D		X		P-WL1c(vi), P-WL2a	Contains stream
40			D			VP	P-WL2a	Disturbed area from previous logging activity
41	D	D					P-WL3	Some skidder ruts
42		D					P-WL2a	Some skidder ruts
43					X		P-WL1c(vi)	Defined banks created by surface water
44			D				P-WL2a	Skidder trail
45			D			VP	P-WL2a	Skidder trail
46			D				P-WL2a	Skidder trail
47			D				P-WL2a	Skidder trail
48			D				P-WL2a	Skidder trail
49			D				P-WL2a	Isolated depression
50	D						P-WL3	Upland inclusions
51	D		X		X	VP (2)	P-WL1c(vi), P-WL3	Portions of this wetland have been disturbed
52		D	X				P-WL2a	Pit & mound
53		D			X		P-WL1c(vi), P-WL2a	Portions of this wetland have been disturbed
54	D	X				VP (3)	P-WL3	Pit & mound
55			D				P-WL2a	Seep
56	D	D			X		P-WL1c(vi), P-WL3	Stream parallels road
57	X		D		X		P-WL2a,P-WL3,P-WL1c(vi)	Natural
58	D	D			X		P-WL3,P-WL2a,P-WL1c(vi)	Line finished with snow cover
59	D						P-WL3	Seep
60	D						P-WL3	Seep
61	D						P-WL3	Delineated with snow cover
62	D				X		P-WL1c(vi), P-WL3	Delineated with snow cover
63	D		D				P-WL2a, P-WL3	Delineated with snow cover
64	D	D		D			P-WL1c(ii), P-SL2	Bisected by access road with two culverts
65	D	D	D		X		P-WL1c(vi), P-WL2a	Bisected by access road
66		D				VP	P-WL2a	Adjacent to access road
67	D	D	D		X		P-WL1c(vi), P-WL2a	Bisected by access road with one culvert
68			D				P-WL2a	Disturbed by skidder trail
69	D	D	D				P-WL1c(ii)	Adjacent to access road
70	D						P-WL3	Adjacent to access road

Resource Identification Number	Wetland Type*				Stream	Vernal Pool	WPS**	Notes
	PFO	PSS	PEM	PUB				
71		D		D			P-WL1c(ii)	Adjacent to access road
72***	D		D				P-WL2a, P-WL3	Isolated wetland
73	D						P-WL3	Isolated Wetland
74	D						P-WL3	Isolated Wetland
75		D					P-WL2a	Isolated Wetland
76		D			X		P-WL2a, P-SL2	Connected to stream
77		D					P-WL2a	Isolated Wetland

*Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U. S. Fish & Wildlife Service Publication Number FWS/OBS-79/31.

****** P-WL1: *Wetland Protection Subdistrict*

a) Areas enclosed by the normal high water mark of flowing waters, stream channels, and bodies of standing water, except for constructed ponds less than 10 acres in size which are not fed or drained by flowing waters;

b) Coastal wetlands, together with areas below the high water mark of tidal waters and extending seaward to the limits of the State's jurisdiction; or

c) Freshwater wetlands, as follows:

i) Within 250' of a coastal wetland or of the normal high water mark of any body of standing water greater than 10 acres;

ii) Containing at least 20,000 square feet in total of the following: aquatic vegetation, emergent marsh vegetation, or open water, unless the wetlands are the result of constructed ponds less than 10 acres in size which are not fed or drained by flowing waters;

iii) That are inundated with floodwater during a 100 year flood event;

iv) Containing significant wildlife habitat;

v) Consisting of, or containing, peatlands, except that LURC may determine that a previously mined, peatland or portion thereof, is not a wetland of special significance; or

vi) Within 25' of a stream channel.

P-WL2:

a) Scrub shrub and other non-forested freshwater wetlands, excluding those covered under P-WL1;

b) Constructed ponds less than 10 acres in size which are not fed or drained by flowing waters.

P-WL3: Forested freshwater wetlands, excluding those covered under P-WL1 and P-WL2.

P- SL2 : Areas within 75 feet, measured as a horizontal distance landward, of (a) the normal high water mark of stream channels upstream for the point where such channels drain 50 square miles; (b) the upland edge of those coastal and inland wetlands identified in Section 10.23, N, 2, a, (1)(b) and (c) and (2) and (3); and (c) the normal high water mark of bodies of standing water less than 10 acres in size, but excluding bodies of standing water which are less than three acres in size and which are not fed or drained by a flowing water.

***Wetland 72 includes a potential vernal pool that was identified in 2008. This potential pool will need to be surveyed during the appropriate season to determine if it is functioning as a vernal pool.

Table C-2: Stetson II Vernal Pool Matrix

Vernal Pool #		NRPA		Corps Regulated Vernal Pool	Number of Egg Masses[1]			Presence[2]		Comments
		Vernal Pool	Significant Vernal Pool		Wood Frog	Spotted Salamander	Blue-spotted salamander	Fairy Shrimp	Other Indicator Species[3]	
1	02AA	**X**		**X**	— —	15 15	— —	— —	— —	Natural
2	02LL	**X**		**X**	8 8	21 21	— —	— —	— —	12 Wood frog tadpoles observed during initial visit
3	04LL	**X**		**X**	— —	7 7	— —	— —	— —	3 Spotted salamander tadpoles observed during second visit
5	06LL			**X**	— —	4 4	— —	— —	— —	Man-made
6	07LL			**X**	— —	1 1	— —	— —	— —	Man-made (Skidder trail)
7	08LL	**X**		**X**	1 —	9 9	— —	— —	— —	Natural
8	01SM			**X**	5 5	15 15	— —	— —	— —	Man-made (Skidder trail)
9	06SM			**X**	— —	12 7	— —	— —	— —	Man-made (Skidder trail)
10	07SM			**X**	17 17	45 45	—	—	—	Man-made (Roadside swale)
11	09SM			**X**	—	13 13	—	—	—	Man-made (Skidder trail)
12	10SM	**X**		**X**	—	2 2	—	—	—	Natural

Vernal Pool #		NRPA		Corps Regulated Vernal Pool	Number of Egg Masses[1]			Presence[2]		Comments
		Vernal Pool	Significant Vernal Pool		Wood Frog	Spotted Salamander	Blue-spotted salamander	Fairy Shrimp	Other Indicator Species[3]	
15	05CF	**X**	**X**	**X**	— / —	— / 68	— / —	— / —	— / —	Significant vernal pool

[1] The number in the upper left represents the results of the May 5 and 6 surveys, and the number in the lower right represents the results of the May 28 and 29 surveys.
[2] Presence indicates observation during vernal survey. Use of a "—" indicates that these species were not observed during the vernal pool survey.
[3]BT = Blanding's Turtle; ST = Spotted Turtle; RB = Ringed Boghaunter Dragonfly; WT = Wood Turtle; RS = Ribbon Snake; SD = Swamp Darner Dragonfly; CD = Comet Darner Dragonfly

NS = Not Surveyed
P = Present

Table C-3: Stetson II Wetland Descriptions Table

Wetland Identifier(s)	General Wetland Type	Classification(s)[1]	Resource Protection Subdistrict	Dominant Vegetation	Evidence of Hydrology
1	scrub-shrub, disturbed	PSS	P-WL1 P-WL2	mannagrass, red raspberry, evergreen wood fern	Soils saturated to the surface, inundated
2	emergent, disturbed	PEM	P-WL2	evergreen wood fern, red raspberry, rough-stemmed goldenrod	Soils saturated to the surface, inundated, water stained leaves
3	scrub-shrub, emergent, disturbed	PSS	P-WL2	sensitive fern, yellow birch, red raspberry	Soils saturated to the surface
4	emergent, disturbed	PEM	P-WL2	mannagrass, a sedge, wild strawberry	Soils saturated to the surface
5	Intermittent stream	R4SB3/4	P-WL1 P-WL2	NA	Inundated, drainage patterns
6	scrub-shrub	PSS	P-WL2	a sedge, mannagrass, yellow birch	Inundated
7	scrub-shrub, recently logged	PSS	P-WL3	cinnamon fern, red raspberry, red maple	Soils saturated to the surface, inundated
8	ponded, disturbed	PUB	P-WL2	NA	Soils saturated to the surface, inundated, water stained leaves
9	ponded, disturbed	PUB	P-WL2	NA	Soils saturated to the surface, inundated, water stained leaves
10	ponded, disturbed	PUB	P-WL2	red raspberry, a sedge, yellow birch	Soils saturated to the surface, inundated, water stained leaves
11	scrub-shrub, emergent, disturbed	PEM/PSS	P-WL2	yellow birch, red maple, mannagrass	Soils saturated to the surface, inundated, water stained leaves, water marks
12	emergent, disturbed	PEM	P-WL2	wool-grass, a sedge	Soils saturated to the surface, inundated, water stained leaves
13	emergent, disturbed	PEM	P-WL2	a sedge, swamp dewberry, red maple	Soils saturated to the surface, inundated
14	emergent, disturbed	PEM	P-WL2	red maple, bracken fern, red raspberry	Soils saturated to the surface, inundated

Wetland Identifier(s)	General Wetland Type	Classification(s)[1]	Resource Protection Subdistrict	Dominant Vegetation	Evidence of Hydrology
15	Intermittent stream	R4SB3/4	P-WL1 P-WL2	NA	Sediment deposits, drainage pattern, inundated
16	emergent, disturbed	PEM	P-WL2	pointed broom sedge, wool-grass, common blackberry	Inundated
17	emergent, disturbed	PEM	P-WL2	fowl mannagrass, common blackberry, yellow birch	Soils saturated to the surface, inundated, water stained leaves
18	emergent, disturbed	PEM	P-WL2	common blackberry, blunt broom sedge	Soils saturated to the surface, inundated, water stained leaves
19	emergent, disturbed	PEM	P-WL2	red raspberry, mannagrass, Canada bluejoint	Soils saturated to the surface, inundated
20	emergent, disturbed	PEM	P-WL2	fowl mannagrass, common blackberry, yellow birch	Soils saturated to the surface, inundated, water stained leaves
21	emergent, swale	PEM	P-WL2	red raspberry, soft rush, wool-grass	Soils saturated to the surface, inundated
22	emergent, disturbed	PEM	P-WL2	fowl meadowgrass, swamp dewberry, a sedge	Soils saturated to the surface, inundated
23	emergent, disturbed	PEM	P-WL2	wool-grass, red raspberry, soft rush	Soils saturated to the surface, inundated
24	emergent, disturbed	PEM	P-WL2	wool-grass, red raspberry, soft rush	Soils saturated to the surface, inundated
25	emergent, disturbed	PEM	P-WL2	blunt broom sedge, wool-grass, red raspberry	Soils saturated to the surface, inundated
26	emergent, disturbed	PEM	P-WL2	sensitive fern, *Panicum* spp., evergreen wood fern	Soils saturated to the surface, inundated
27	scrub-shrub, disturbed	PSS	P-WL2	yellow birch, sugar maple, white basswood	Drainage pattern
28	emergent, swale	PEM	P-WL2	common cat-tail, soft rush, black bulrush	Drainage pattern
29	emergent, swale	PEM	P-WL2	fowl mannagrass, wool-grass, black bulrush	Drainage pattern, inundated, water stained leaves
30	emergent, stream, swale	PEM	P-WL1 P-WL2	black bulrush, soft rush, common cat-tail	Soils saturated to the surface, inundated, drainage pattern

Wetland Identifier(s)	General Wetland Type	Classification(s)[1]	Resource Protection Subdistrict	Dominant Vegetation	Evidence of Hydrology
31	Large, multi-class wetland system	PFO/PSS/PEM/R4SB3/4	P-WL1 P-WL2 P-WL3	northeastern mannagrass, cinnamon fern, yellow birch	Soils saturated to the surface, inundated, drainage pattern
32	scrub-shrub, disturbed	PSS	P-WL2	a sedge, a fern, American elm	Soils saturated to the surface, inundated, water stained leaves
33	emergent, disturbed	PEM	P-WL2	a sedge, a fern, yellow birch	Soils saturated to the surface, inundated, water stained leaves
34	emergent, swale	PEM	P-WL2	wool-grass, fowl mannagrass, pointed broom sedge	Soils saturated to the surface, inundated, drainage pattern
35	emergent, disturbed	PEM	P-WL2	wild strawberry, red raspberry, black bulrush	Soils saturated to the surface, inundated
36	emergent, swale	PEM	P-WL2	black bulrush, soft rush, a sedge	Soils saturated to the surface, inundated, drainage pattern
37	scrub-shrub, emergent, disturbed	PSS/PEM	P-WL2	sensitive fern, a fern, green ash	Soils saturated to the surface, inundated, drainage pattern
38	emergent, disturbed	PEM	P-WL2	sensitive fern, a sedge, red raspberry	Soils saturated to the surface, inundated
39	emergent, disturbed, contains intermittent stream	PEM/R4SB3/4	P-WL1 P-WL2	cinnamon fern, sensitive fern, *Chrysosplenium* spp.	Soils saturated to the surface, inundated, drainage pattern
40	emergent, disturbed	PEM	P-WL2	interrupted fern, fowl mannagrass, Canada bluejoint	Soils saturated to the surface, inundated
41	forested, scrub-shrub, partially disturbed	PFO/PSS	P-WL3	spinulose wood fern, yellow birch, sugar maple	Soils saturated to the surface, inundated, water stained leaves
42	scrub-shrub, partially disturbed	PSS	P-WL2	sensitive fern, evergreen wood fern, yellow birch	Soils saturated to the surface, inundated, drainage pattern
43	Intermittent stream	R4SB3/4	P-WL1	NA	drainage pattern, sediment deposits
44	emergent disturbed	PEM	P-WL2	northeastern mannagrass, *Carex* spp., soft rush	Soils saturated to the surface, inundated

Wetland Identifier(s)	General Wetland Type	Classification(s)[1]	Resource Protection Subdistrict	Dominant Vegetation	Evidence of Hydrology
45	emergent, disturbed	PEM	P-WL2	wool-grass, red raspberry, *Aster* spp.	Soils saturated to the surface, inundated, water stained leaves
46	emergent, disturbed	PEM	P-WL2	sensitive fern, fowl mannagrass, red raspberry	Soils saturated to the surface, inundated, water stained leaves
47	emergent, disturbed	PEM	P-WL2	red raspberry, cinnamon fern, *Carex* spp.	Inundated
48	emergent, partially disturbed	PEM	P-WL2	*Aster* spp., red raspberry, wild strawberry	Soils saturated to the surface, inundated, drainage pattern
49	emergent	PEM	P-WL2	mannagrass, evergreen wood fern, *Rubus* spp.	Soils saturated to the surface, inundated
50	forested, partially disturbed	PFO	P-WL3	sensitive fern, cinnamon fern, yellow birch	Soils saturated to the surface, inundated, water stained leaves
51	forested, emergent, intermittent stream	PFO/PEM/R4SB3/4	P-WL1 P-WL3	basswood, red maple, striped maple	Soils saturated to the surface, drainage pattern, water stained leaves
52	scrub-shrub	PSS	P-WL2	red maple, sugar maple	Soils saturated to the surface, inundated
53	scrub-shrub, intermittent stream, disturbed	PSS	P-WL1 P-WL2	*Aster* spp., hay-scented fern, yellow birch	Soils saturated to the surface, inundated, water stained leaves
54	forested with scrub-shrub	PFO/PSS	P-WL3	American elm, black ash, red spruce	Inundated
55	emergent seep	PEM	P-WL2	northeastern mannagrass, cinnamon fern, whorled aster	Drainage patterns
56	forested, scrub-shrub, intermittent stream, disturbed	PFO/PSS/R4SB3/4	P-WL1 P-WL3	cinnamon fern, sensitive fern, Christmas fern	Soils saturated to the surface, inundated, drainage pattern
57	emergent, forested with intermittent stream component	PEM/PFO/R4SB3/4	P-WL1 P-WL2 P-WL3	sensitive fern, American willow-herb, American elm	Soils saturated to the surface, inundated, drainage pattern, water stained leaves
58	forested, scrub-shrub, intermittent stream	PFO/PSS/R4SB3/4	P-WL1 P-WL2 P-WL3	white ash, American beech, fowl meadowgrass	Inundated, water stained leaves

Wetland Identifier(s)	General Wetland Type	Classification(s)[1]	Resource Protection Subdistrict	Dominant Vegetation	Evidence of Hydrology
59	forested, seep	PFO	P-WL3	goldthread, American beech, white ash	Inundated, drainage pattern, water stained leaves
60	forested	PFO	P-WL3	*Osmunda* spp., balsam fir, red maple	Soils saturated to the surface, inundated, water stained leaves
61	forested	PFO	P-WL3	mannagrass, evergreen wood fern, cinnamon fern	Drainage pattern, saturated to the surface
62	forested, intermittent stream	PFO/R4SB3/4	P-WL1 P-WL3	balsam fir, black ash, yellow birch	Inundated
63	forested	PFO/PEM	P-WL2 P-WL3	balsam fir, yellow birch, basswood	Inundated
64	forested, scrub-shrub, unconsolidated bottom	PFO/PSS/PUB	P-WL1 P-SL2	northern white cedar, speckled alder, sensitive fern	Soils saturated to the surface, inundated
65	scrub-shrub, emergent, Forested, perennial stream	PSS/PEM/PFO/R2UB	P-WL1 P-WL2	sensitive fern, red maple, balsam fir, Canada bluejoint	Inundated
66	scrub-shrub	PSS	P-WL2	speckled alder, red maple, sensitive fern	Soils saturated to the surface
67	forested, scrub-shrub, emergent, perennial stream	PFO,PSS,PEM,R2UB	P-WL1	balsam fir, speckled alder, sensitive fern	Soils saturated to the surface
68	emergent	PEM	P-WL3	sensitive fern, *Carex* spp., *Glyceria* spp.	Water stained leaves
69	forested, scrub-shrub, emergent	PFO/PSS/PEM	P-WL1	larch, highbush blueberry, cinnamon fern	Soils saturated to the surface
70	forested	PFO	P-WL3	balsam fir, red maple, sensitive fern	Inundated
71	scrub-shrub, unconsolidated bottom	PSS/PUB	P-WL1	speckled alder, Canada bluejoint, *Carex* spp.	Inundated
72	forested, emergent	PFO/PEM	P-WL2 P-WL3	green ash, balsam fir, *Carex* spp.	Water stained leaves
73	forested	PFO	P-WL3	red maple, balsam fir, yellow birch, green ash, evergreen wood fern, sensitive fern, lady fern, dwarf raspberry, three-seeded sedge	Soil saturated to surface, water stained leaves

Wetland Identifier(s)	General Wetland Type	Classification(s)[1]	Resource Protection Subdistrict	Dominant Vegetation	Evidence of Hydrology
74	forested	PFO	P-WL3	red maple, balsam fir, yellow birch, green ash, evergreen wood fern, sensitive fern, lady fern, dwarf raspberry, three-seeded sedge	Soil saturated to surface, water stained leaves
75	scrub-shrub	PSS	P-WL2	balsam fir, speckled alder, gray birch, yellow birch, green ash, black ash, sensitive fern, tall meadow rue, bluejoint, nodding sedge, fowl mannagrass, dwarf raspberry	Shallow standing water, soil saturated to surface, wetland drainage patterns
76	scrub-shrub, perennial stream	PSS, R2UB	P-WL2 P-SL2	green ash, speckled alder, arrowwood, spotted touch-me-not, sensitive fern, woodland horsetail, American mannagrass	Soil saturated to surface, wetland drainage patterns
77	scrub-shrub	PSS	P-WL2	green ash, speckled alder, arrowwood, spotted touch-me-not, sensitive fern, woodland horsetail, American mannagrass	Soil saturated to surface, wetland drainage patterns

[1] Per Cowardin *et. al* (1979)

Appendix D
LURC Guidance Maps
(see Figure 2 under "Figures" of this Application)

Appendix E
Representative Site Photographs

Photo 1. Typical view of a palustrine emergent wetland (Wetland 12) that has been influenced by skidder activity on Jimmey Mountain. Stantec, November 14, 2007.

Photo 2. Typical view of a palustrine scrub-shrub wetland (Wetland 32) that has been influenced by logging activity on Jimmey Mountain. Stantec, November 16, 2007.

Photo 3. Typical view of a palustrine forested wetland (Wetland 54) within the interior portion of Owl Mountain. Stantec, November 29, 2007.

Photo 4. Typical view of palustrine emergent wetland (Wetland 36) associated with drainage swale adjacent to the Jimmey Mountain access road. Stantec, November 27, 2007.

Photo 5. Typical view of a stream within a larger, multi-class wetland (Wetland 31) on the southern portion of Jimmey Mountain. Stantec, November 16, 2007.

Photo 6. Typical view of a wetland seep (Wetland 55) within a forest on the southern portion of Owl Mountain. Stantec, November 29, 2007.

Photo 7. Typical view of a disturbed portion of a palustrine forested wetland (Wetland 31) on the southern portion of Jimmey Mountain. Stantec, November 16, 2007.

Photo 8. Typical view of upland deciduous forest on the northern portion of Jimmey Mountain. Stantec, November 12, 2007.

Photo 9. Typical view of a mixed wetland (Wetland 31) on the southern portion of Jimmey Mountain. Stantec, November 16, 2007.

Photo 10. Typical view of culvert on the Jimmey Mountain access road, discharging into a palustrine emergent wetland and intermittent stream (Wetland 30). Stantec, November 15, 2007.

Photo 11. Typical view of palustrine emergent wetland (Wetland 28) associated with drainage swale adjacent to the Jimmey Mountain access road. Stantec, November 15, 2007.

Photo 12. Typical view of palustrine emergent wetland (Wetland 40) resulting from skidder disturbance on the southern portion of Jimmey Mountain. Two vernal pools were confirmed within this wetland. Stantec, November 27, 2007.

Photo 13. Typical view of palustrine emergent/palustrine scrub-shrub wetland (Wetland 37) resulting from skidder disturbance on the southern portion of Jimmey Mountain. Stantec, November 27, 2007.

Photo 14. Significant Vernal Pool 05CF within Wetland 66, located on the western side of the Jimmey Access Road. Stantec, May 29, 2008.

Photo 15. Peatland (Wetland 69) located on the west side of the Jimmey Access road. Stantec, June 25, 2008.

Appendix F
Significant Vernal Pool Data Sheet

Stantec Consulting Vernal Pool Data Collection Form

PROJECT: STETSON II DATE: MAY 29, 2008
TOWN/COUNTY: ______ POOL ID: 05CF 1-23
OBSERVERS: CWF, ALTA TIME START: 12:15
LOCATION: (detailed directions to the pool using mapped landmarks) TIME END: 12:30

WEATHER CONDITIONS: ☐ sunny ☐ partly sunny ☒ overcast ☐ raining ☐ snowing

GENERAL SITE CHARACTERISTICS

POOL SETTING
(Photo ID: ______ Location: ______)
(Choose the best description of the physical setting)
- ☐ Isolated Upland Depression
- ☐ Isolated Floodplain Depression
- ☒ Wetland Complex

HABITAT SURROUNDING THE POOL:
(Estimate % cover of each general habitat within 250 feet of the area surrounding the pool. Estimates should total 100%)
- 20 % Wetland
- 75 % Upland Forest
- ____ % Utility Right-of-Way
- ____ % Agriculture
- ____ % Developed
- 5 % Roads

PHYSICAL CHARACTERISTICS

POOL TYPE (Check either Natural, Artificial/Man-made, or Unknown)
- ☒ Natural (e.g. natural depression, oxbow, beaver impoundment)
  - ☒ Disturbed (describe anthropogenic impacts or modifications to the pool)
    Filled with slash on west side, skidder rut in it
- ☐ Artificial/Man-made (check best description below)
  - ☐ road-side ditch ☐ skidder rut ☐ gravel pit ☐ farm pond ☐ impoundment
- ☐ Unknown: ______

POOL DIMENSIONS: Depth: 8 in. Length: 200 ft. Width: 75 ft.

ESTIMATED HYDROPERIOD:
- ☐ Permanent: ______
- ☐ Semi-permanent (drying partially in all years and completely in drought years)
- ☒ Ephemeral (drying out during the growing season in most years)
- ☐ Unknown: ______

PRESENCE/ABSENCE OF AN INLET AND/OR AN OUTLET:
- ☒ No inlet
- ☐ Ephemeral inlet
- ☐ Permanent inlet
- ☐ Other: ______
- ☒ No outlet
- ☐ Ephemeral outlet
- ☐ Permanent outlet
- ☐ Other: ______

PRESENCE/ABSENCE OF FISH
Were fish observed? ☐Yes ☒ No If there are fish present, identify the species: ______

DOMINANT PLANT SPECIES WITHIN THE POOL

Species	Stratum	Species	Stratum
1. Red maple	T, P, S	6. Sensitive fern	H
2. Yellow birch	T, P, S	7.	
3. Balsam fir	T, P, S	8.	
4. Speckled alder	S	9.	
5. Cinnamon fern	H	10.	

PERCENT COVER OF EACH STRATUM:
- 10 % trees
- 50 % shrubs
- 5 % emergent vegetation
- N/A % floating vegetation
- N/A % submergent vegetation

PERCENT COVER OF EXPOSED SUBSTRATE:
- 5 % leaves
- 5 % moss
- 40 % soil/mud
- N/A % rocks/boulders
- 25 % woody debris (branches/twigs)

(Note: Combined estimates of vegetation and exposed substrate cover may be greater than 100%)

Stantec Consulting Vernal Pool Data Collection Form

Biological Characteristics

INDICATOR SPECIES OBSERVATIONS

(Indicate the number of amphibian egg masses of each species present, and note the life stage of each species observed.)

Species	Egg Masses	Tadpoles	Adults	State Listed Species	Presence
Wood frog				* (T) Ringed Boghaunter	
	Egg Masses	**Larvae**	**Adults**	* (E) Blanding's turtle	
Spotted salamander	68			* (T) Spotted turtle	
Blue-spotted salamander				* (SC) Wood turtle	
	Presence			* (SC) Ribbon snake	
Fairy shrimp				* (SC) Comet Darner	
				* (SC) Swamp Darner	

State Listed Endangered (E), Threatened (T), and Special Concern (SC) Species. A photograph is required for any rare species observed.

ADDITIONAL SPECIES OBSERVATIONS

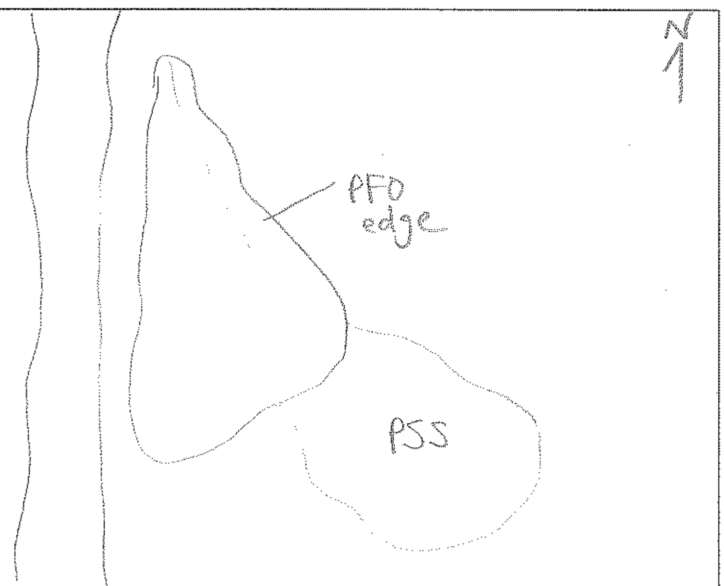
(Indicate the life stage of each species observed.)

Species	Life Stage	Species	Life Stage
Green frog	adult		

Pool Sketch

NOTES

Poor water quality
Low visibility
Water-stained leaves
High up on slope
Pit and mound topography
Water marks on trees
Approximately 10 inches above water surface



Regulatory Determination

Does this pool meet the USACE definition of a vernal pool under the State of Maine PGP? ☒ Yes ☐ No
Does this pool meet the MDEP definition of a vernal pool under the NRPA? ☒ Yes ☐ No

Does this Vernal Pool meet the MDEP definition of a Significant Vernal Pool under the NRPA? ☒ Yes ☐ No

Project Title: Stetson II Wind Project

Wetland ID: S06 **Wetland Classification: Scrub-shrub**

VEGETATION	Stratum and Species	National Wetland Inventory Indicator Status
Trees:		
None listed		
Poles:		
None listed		
Shrubs:		
yellow birch (*Betula alleghaniensis*)		FAC
northern red oak (*Quercus rubra*) [on mounds]		FACU*
red maple (*Acer rubrum*)		FAC
Herbs:		
sedge (*Carex intumescens*)		FACW
mannagrass (*Glyceria* sp.)		OBL
swamp dewberry (*Rubus hispidus*)		FACW
Bryophyte:		
peat moss (*Sphagnum* sp.)		—

EVIDENCE OF WETLAND HYDROLOGY:

- Areas of shallow standing water 1-3 inches deep

EVIDENCE OF HYDRIC SOILS:

Four inch thick organic horizon over a depleted matrix with redox concentrations

Project Title: Stetson II Wind Project

Wetland ID: S07 **Wetland Classification: Scrub-shrub, Forested**

VEGETATION Stratum and Species	National Wetland Inventory Indicator Status
Trees:	
yellow birch (*Betula alleghaniensis*)	FAC
Poles:	
red maple (*Acer rubrum*)	FAC
yellow birch (*Betula alleghaniensis*)	FAC
Shrubs:	
red raspberry (*Rubus idaeus*)	FAC-
red maple (*Acer rubrum*)	FAC
yellow birch (*Betula alleghaniensis*)	FAC
American beech (*Fagus grandifolia*)	FACU
Herbs:	
cinnamon fern (*Osmunda cinnamomea*)	FACW
aster sp. (*Symphyotrichum* sp.)	—
wood fern (*Drypoteris* sp.)	—

EVIDENCE OF WETLAND HYDROLOGY:

- Approximately 12 inches of inundation
- Soil saturated to the surface
- Water-stained leaves
- Trees with shallow roots

EVIDENCE OF HYDRIC SOILS:

Disturbed soil: Depleted B horizon with redox concentrations

Stantec

Project Title: Stetson II Wind Project

Wetland ID: S58 **Wetland Classification: Forested, Scrub-shrub, Intermittent stream**

VEGETATION	Stratum and Species	National Wetland Inventory Indicator Status
Trees:		
white ash (*Fraxinus americana*)		FACU
red maple (*Acer rubrum*)		FAC
yellow birch (*Betula alleghaniensis*)		FAC
eastern hophornbeam (*Ostrya virginiana*)		FACU
Poles:		
white ash (*Fraxinus americana*)		FACU
American beech (*Fagus grandifolia*)		FACU
eastern hophornbeam (*Ostrya virginiana*)		FACU
red maple (*Acer rubrum*)		FAC
Shrubs:		
American beech (*Fagus grandifolia*)		FACU
striped maple (*Acer pensylvanicum*)		FACU
beaked hazelnut (*Corylus cornuta*)		FACU
white ash (*Fraxinus americana*)		FACU
balsam fir (*Abies balsamea*)		FAC
Herbs:		
bluejoint (*Calamagrostis canadensis*)		FACW
bluegrass sp. (*Poa* sp.)		—
wild strawberry (*Fragaria virginiana*)		FACU
lady fern (*Athyrium filix-femina*)		FAC
fowl mannagrass (*Glyceria striata*)		OBL
necklace sedge (*Carex projecta*)		FACW

EVIDENCE OF WETLAND HYDROLOGY:

- Free water at approximately 1.5 inches below ground surface
- Scattered pools of shallow standing water
- Trees with shallow roots
- Water-stained leaves

EVIDENCE OF HYDRIC SOILS:

Gleyed matrix within 10 inches of the top of the mineral soil surface.

Stantec

Project Title: Stetson II Wind Project

Wetland ID: S64

Wetland Classification: Forested, Scrub-shrub, Open water

VEGETATION Stratum and Species	National Wetland Inventory Indicator Status
Trees:	
northern white cedar (*Thuja occidentalis*)	FACW
balsam fir (*Abies balsamea*)	FAC
gray birch (*Betula populifolia*)	FAC
Poles:	
None listed	
Shrubs:	
long-beaked willow (*Salix bebbiana*)	FACW
speckled alder (*Alnus incana*)	FACW
northern white cedar (*Thuja occidentalis*)	FACW
Herbs:	
horsetail (*Equisetum* sp.)	—
sensitive fern (*Onoclea sensibilis*)	FACW
tall meadow-rue (*Thalictrum pubescens*)	FACW
northern blue flag (*Iris versicolor*)	OBL
swamp dewberry (*Rubus hispidus*)	FACW
sedge (*Carex intumescens*)	FACW
cinnamon fern (*Osmunda cinnamomea*)	FACW
Bryophyte:	
peat moss (*Sphagnum* sp.)	—

EVIDENCE OF WETLAND HYDROLOGY:

- Inundation
- Soils saturated to the surface
- Wetland drainage patterns

EVIDENCE OF HYDRIC SOILS:

Histosol (16+ inch thick organic horizon)

Gleyed horizon within 7 inches of the soil surface

Stantec

Project Title: Stetson II Wind Project **Wetland ID: S65**		**Wetland Classification: Scrub-shrub, Emergent, Forested, Perennial Stream**
VEGETATION	Stratum and Species	National Wetland Inventory Indicator Status
Trees:		
balsam fir (*Abies balsamea*)		FAC
red maple (*Acer rubrum*)		FAC
Poles:		
None listed		
Shrubs:		
balsam fir (*Abies balsamea*)		FAC
red maple (*Acer rubrum*)		FAC
speckled alder (*Alnus incana*)		FACW
willow (*Salix* sp.)		—
Herbs:		
sensitive fern (*Onoclea sensibilis*)		FACW
tall meadow-rue (*Thalictrum pubescens*)		FACW
jewelweed (*Impatiens capensis*)		FACW
mannagrass (*Glyceria* sp.)		OBL
bedstraw (*Galium* sp.)		—
duckweed (*Lemna* sp.)		OBL

EVIDENCE OF WETLAND HYDROLOGY:

- Inundation
- Wetland drainage patterns

EVIDENCE OF HYDRIC SOILS:

Histic epipedon (8-16 inch thick organic horizon)

Depleted horizon within 7 inches of the soil surface

Stantec

Project Title: Stetson II Wind Project

Wetland ID: S67

Wetland Classification: Forested, Scrub-shrub, Emergent, Perennial stream

VEGETATION Stratum and Species	National Wetland Inventory Indicator Status
Trees:	
balsam fir (*Abies balsamea*)	FAC
red maple (*Acer rubrum*)	FAC
Poles:	
None listed	
Shrubs:	
balsam fir (*Abies balsamea*)	FAC
red maple (*Acer rubrum*)	FAC
speckled alder (*Alnus incana*)	FACW
Herbs:	
cinnamon fern (*Osmunda cinnamomea*)	FACW
sensitive fern (*Onoclea sensibilis*)	FACW
common scouring-rush (*Equisetum hyemale*)	FACW
tall meadow-rue (*Thalictrum pubescens*)	FACW

EVIDENCE OF WETLAND HYDROLOGY:

- Soil saturated to surface
- Wetland drainage patterns

EVIDENCE OF HYDRIC SOILS:

Histic epipedon (8-16 inch thick organic horizon) over a depleted matrix

Project Title: Stetson II Wind Project

Wetland ID: S70 **Wetland Classification: Forested**

VEGETATION Stratum and Species	National Wetland Inventory Indicator Status
Trees:	
northern white cedar (*Thuja occidentalis*)	FACW
balsam fir (*Abies balsamea*)	FAC
Poles:	
None listed	
Shrubs:	
red maple (*Acer rubrum*)	FAC
striped maple (*Acer pensylvanicum*)	FACU
northern white cedar (*Thuja occidentalis*)	FACW
balsam fir (*Abies balsamea*)	FAC
Herbs:	
sensitive fern (*Onoclea sensibilis*)	FACW
wool-grass (*Scirpus* sp.)	FACW

EVIDENCE OF WETLAND HYDROLOGY:

- Soil saturated to surface
- Wetland drainage patterns

EVIDENCE OF HYDRIC SOILS:

Histic epipedon (8-16 inch thick organic horizon) over a depleted matrix

Stantec

Project Title: Stetson II Wind Project

Wetland ID: S72 **Wetland Classification: Forested, Emergent**

VEGETATION	Stratum and Species	National Wetland Inventory Indicator Status
Trees:		
green ash (*Fraxinus pennsylvanica*)		FACW
balsam fir (*Abies balsamea*)		FAC
red maple (*Acer rubrum*)		FAC
Poles:		
None listed		
Shrubs:		
green ash (*Fraxinus pennsylvanica*)		FACW
red maple (*Acer rubrum*)		FAC
Herbs:		
sedge (*Carex sp.*)		---
sensitive fern (*Onoclea sensibilis*)		FACW
common wood-sorrel (*Oxalis montana*)		FAC-

EVIDENCE OF WETLAND HYDROLOGY:

- Water-stained leaves
- Wetland drainage patterns

EVIDENCE OF HYDRIC SOILS:

Gleyed matrix within 7 inches of the surface

LAND USE REGULATION COMMISSION GRID SCALE WIND ENERGY DEVELOPMENT APPLICATION

EXHIBIT 12A

Stetson II Wind Project
T8 R4 NBPP, Washington County, Maine

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1.0 Introduction

The Stetson II Wind Project is anticipated to affect local wildlife populations in various ways. Initially, the direct loss of habitat will occur from the conversion of vegetated habitats to permanent roads and turbine clearings. Potential indirect effects could also include disturbance effects during and following construction of the project, which could result in short-term avoidance of the area by some species and targeted use of the project area by others, or the conversion of forested habitats to early successional habitats. Wind turbines could also pose a risk of fatalities if birds and bats collide with the turbines. Emerging information from post-construction studies at existing wind farms, with modern turbine structures, suggests that collision rates of birds are generally low, especially in comparison to other sources of avian collision-related mortality. However, bat collisions with turbines have recently become more of a concern, especially for long-distance migratory bats.

To the extent practicable, the project will be designed to reduce potential detrimental effects to local wildlife. Examples of strategies to reduce impacts include minimizing lighting on the turbines and maximizing use of the existing road network to minimize new roads in the area. Additionally, the project has been designed to avoid regulated resources such as wetlands, or areas that are more difficult to work in and possess greater potential for detrimental impacts to the environment such as extremely steep slopes.

A review of available natural resource information in the area and ecological field investigations were conducted to characterize the habitats and wildlife use of the proposed turbine development area. This information helps characterize the habitats present in the project area, identify the predominant wildlife using the area, characterize some of the more critical resource concerns typically associated with wind energy developments, and address any site-specific concerns for the project.

Information used to characterize the existing wildlife communities and their habitats included consultation with state agencies and review of available wildlife habitat databases and published natural resource classification systems. Avian and bat surveys were conducted on Stetson Mountain during the fall of 2006. Additional surveys were conducted on nearby Rollins Mountain during the Spring of 2008. During conversations between Stantec and the Maine Department of Inland Fisheries and Wildlife (MDIFW), the latter commented that these surveys in combination with post construction bat monitoring would provide enough information regarding the area. Other site specific surveys included a review of aerial photography to characterize the predominant cover types and habitats of the project area and surrounding vicinity and wetland mapping, vernal pool and vegetation surveys in the fall of 2007 and spring of 2008.

Consultations that were initiated with natural resource review agencies included:

- Maine Department of Conservation Maine Natural Areas Program (MNAP);
- MDIFW; and
- U.S. Fish and Wildlife Service (USFW).

Available databases of ecological resources and classification systems that were used during this characterization and assessment included:

- Database of Essential Habitats and Sensitive Natural Areas, as categorized by the MDIFW (http://megisims.state.me.us);
- LURC Land Use Maps (http://www.state.me.us/doc/lurc); and
- Natural Landscapes of Maine – the MNAP natural community classification system (Gawler and Cutko 2004).

The following sections outline the regional and local landscape setting, the dominant vegetation types and wildlife species, and the significant natural resources that occur in vicinity of the Stetson II Wind Project. The potential project impacts to natural resources and wildlife are discussed along with resource avoidance strategies and possible mitigation methods. These sections focus on that part of the project where wind turbines are proposed, as well as the access roads required to construct the project and maintain project operations. This area is largely limited to the ridge top, side-slopes and access roads to Owl and Jimmey Mountains.

2.0 Ecological Setting of the Project Area

The project area is located in T8 R4 NBPP, in Washington County. The region is characterized by low-elevation ridgelines, forested areas, and lakes with associated streams and wetland systems. The elevation of peaks in the direct area ranges from approximately 780 feet at Owl Mountain to 910 feet at Jimmey Mountain. The region is generally undeveloped; however, there are some sparsely developed residential and agricultural areas that are mainly located east of the project area, including camps on Upper Hot Brook Lake. The dominant land use is commercial forestry. Other uses include recreational boating, hunting, fishing, and snowmobiling.

The forest communities on Owl and Jimmey Mountains have been heavily influenced by forest management practices both in the short-term and long-term. Harvesting has occurred as recently as within the last year. A substantial logging road has been established leading up Owl Mountain, and another leading to Jimmey Mountain, with multiple spur roads and skidder trails off the main access road. These two major logging roads are accessed directly from State Route 169.

Owl and Jimmey Mountains are largely upland hardwood forest and early successional forest. There are no MNAP-listed critically imperiled or imperiled natural communities in the project area. Additionally, no Significant Wildlife Habitats have been mapped on either mountain. Wetlands are few in number, and are scattered along the upper elevations and along Jimmey Road. See Exhibit 11 for a detailed analysis of wetland and vernal pool resources. Several natural depressions or basins, as well as pools in old skidder tracks or previously cleared areas, hold water seasonally and may serve as breeding sites for so-called “vernal pool” species.

A vernal pool evaluation in the spring of 2008 identified numerous vernal pools. There was one pool in the project area located along Jimmey access road near Webster Brook that met the definition of “significant vernal pool” according to MDIFW rules (c. 10.02(G)). The existing development within its 250 foot buffer habitat includes the Jimmey access road and accounts for 16.7 percent of the total habitat area. The proposed development within this area would require clearing for the collector line and would result in an additional 5.2 percent development within the habitat. Following construction the proposed total clearing would include 21.5 percent of the total habitat buffer area and 79.5 percent will remain undeveloped.

One other potential vernal pool was identified in the project area outside of the typical breeding season. For the purposes of evaluating impacts, Stetson II treated the potential vernal pool as a significant vernal pool. The wetland in which the pool is located is 0.16 acres and the 250 habitat buffer equals 6.74 acres. There is no existing development within its 250 foot habitat area. The proposed development would include clearing 1 acre or 14.1 percent of the habitat area for the collector line.

Two named streams occur in the project area, Hot Brook and Webster Brook. The existing project area land cover types are described in more detail in the following section.

3.0 Existing Vegetation Types and Wildlife Habitat

The dominant land cover types dictate the wildlife communities in the project area. Climate conditions, geology, and past and recent land uses (i.e., forest harvesting) are probably the most significant factors affecting the type and structure of the available habitats. Field surveys conducted in 2008 indicate that the project site is characterized primarily by upland hardwood forest with pockets of emergent, scrub-shrub, and some forested wetlands. Small streams and drainages are scattered throughout the project area. The ridgeline itself consists of predominantly deep, well-drained soils on flat to moderate slopes. Small areas of mixed conifer-deciduous forest or conifer-dominated forest occur sporadically and these occur largely on the steepest slopes or in wetlands.

The project layout was designed to use existing roadways and avoid all wetlands and, therefore, the proposed turbines are sited in previously disturbed upland hardwood forested areas. A description of the natural communities that occur in the project area follows below.

3.1. Upland Hardwood Forest

Upland forested habitats on Owl and Jimmey Mountains largely fall within the Spruce-Fir-Northern Hardwoods Forest Ecosystem. This is a very common, widespread ecosystem throughout most of northern Maine (Gawler and Cutko 2005). A variety of forested natural communities can occur within this ecosystem but only one, Beech-Birch-Maple Forest, predominates in the project area.

Beech-Birch-Maple Forest is the dominant hardwood forest in the State and is ranked by MNAP as S4. It is predominant along the length of the project ridgelines, as well as along the side slopes of the mountain. Common tree species include American beech (*Fagus grandifolia*), paper birch (*Betula papyrifera*), yellow birch (*Betula alleghaniensis*), sugar maple (*Acer saccharum*), striped maple (*Acer pensylvanicum*), and red maple (*Acer rubrum*). White ash (*Fraxinus americana*) is also locally common, and red oak (*Quercus rubra*) is an occasional component of the canopy. Canopy closure is variable and dependant on the intensity of forest harvesting practices that have occurred in the last 5-10 years. Much of the project area on Jimmey Mountain has been heavily logged in the last 5 years, and the canopy is primarily open. Areas not recently affected by harvesting, have a canopy that is often closed, resulting in a shaded forest floor with limited herbaceous and shrub development. Common species include evergreen wood fern (*Dryopteris intermedia*), Christmas fern (*Polystichum acrostichoides*), lady fern (*Athyrium filix-femina*), bluebead lily (*Clintonia borealis*), bunchberry (*Cornus canadensis*), cypress panicgrass (*Dicanthelium dichotomum*), wild sarsaparilla (*Aralia nudicaulis*), and Canada mayflower (*Maianthemum canadensis*).

Areas with open tree canopies from forest harvesting are abundant across the ridgeline. These areas typically have a canopy closure of 60 percent or less, which is atypical of this hardwood forest community. Due to the openness of the canopy, the understory in these areas, which typically includes a suite of a limited number of shade tolerant species, is more robust than usual. The understory in these areas is typically very dense and includes shrub-sized saplings of the dominant tree species such as red maple, sugar maple, and American beech; common hardwood forest understory shrubs such as beaked hazel nut (*Corylus cornuta*), striped maple (*Acer pensylvanicum*), hobblebush (*Viburnum alnifolium*), and maple leafed viburnum (*Viburnum acerifolium*); and typical open habitat species such as red raspberry (*Rubus idaeus*) and bristly blackberry (*Rubus allegheniensis*).

Early successional habitat occurs in the project area in locations that have been previously disturbed, including along road and trail edges, meteorological measurement tower clearings, and areas that have previously been heavily logged. These areas are fairly limited on the mountain. This is because, as explained above, most of the forest harvesting that has recently occurred on the mountain has included heavy selection cutting, rather than clear-cutting. Consequently, the harvested areas, while containing habitat features typical of early successional habitats such as dense shrubs and saplings, still have an intact, though sometimes quite open, canopy of mature trees and are described in the previous section.

A few areas of complete canopy removal, however, do occur and have a characteristic plant species composition. Shrubs, saplings, and wildflowers characterize this habitat type before it matures into forest. Species common to these areas include stump sprouts and saplings of some of the canopy species, pin cherry (*Prunus pensylvanica*), red raspberry, bristly blackberry, whorled aster (*Oclemena acuminata*), and rough-stemmed goldenrod (*Solidago rugosa*).

3.2. Wetlands

Wetlands in the project area were identified and delineated in the fall of 2007 and spring of 2008. The complete report is included as Exhibit 11. A number of forested wetlands, streams, scrub-shrub/emergent wetlands, and vernal pools were documented in the area during those surveys. As previously noted, the landscape surrounding Owl and Jimmey Mountains contains an abundance of wetland habitats, including forested swamps, shrub swamps and bogs, beaver-created emergent and open water wetlands, and brooks and streams. These resources, however, occur outside of the areas that are being proposed for wind turbine development. There are no dredge or fill impacts for this project. There will be permanent 0.06 acre (2,614 square feet) wetland impact at the entrance to the Jimmey access road. A bridge that spans the wetland will be constructed in order to widen the entrance for construction traffic. There will be an additional 0.27 acre (11,581 square feet) of wetland clearing for the collector transmission line. In forested wetlands this clearing will alter the wetland type, converting them from forested wetlands to scrub/shrub wetlands. This will not have an impact on wetland values related to hydrology. Spanning existing scrub/shrub or emergent wetlands will have minimal wetland impact. Overall, the limited vegetation clearing associated with the transmission line will have a minimal impact on habitat values and wetland function but may have an impact on species using the existing habitat. See Exhibit 11.

Wetlands that do occur on the mountain are located primarily along the northern slope of Owl Mountain peak and in some areas adjacent to the existing Jimmey Road. To the maximum extent practicable buffers were maintained between new construction and wetlands, particularly Wetlands of Special Significance.

4.0 Wildlife Communities

Following are brief descriptions of the predominant wildlife species known or suspected to occur in the project area. The information presented here was derived from extensive field surveys of wetlands along the ridge.

Observations made during the course of field surveys were considered in association with the type, composition, and distribution of wildlife habitats on the mountains and the habitat requirements of Maine wildlife populations. These were used together to develop a matrix identifying those species expected to occur in the Stetson II project area, the habitats they would use, and the timing of that use (Appendix A attached hereto). This matrix should be referred to for a more complete listing of the major taxonomic groups of wildlife anticipated to occur in the project area.

4.1. Amphibians and Reptiles

Due to the predominance of upland hardwood forest in the project area, non-breeding habitat for amphibians is common. The open nature of the canopy of these forests, however, increases the amount of sunlight and the summer temperature in these areas, which likely limits the distribution of some species. Regardless, common amphibians in the project area likely includes northern redback salamander (*Plethodon cinereus*), American toad (*Bufo americanus*), gray treefrog (*Hyla versicolor*), and wood frog (*Rana sylvatica*). These species probably occur across the ridge top of the mountain, as habitat for them is evenly distributed there, and (at least for all but the redback salamander) they are known to range far from their aquatic breeding habitats.

Species that are less likely to occur in the project area or have a more limited distribution include the blue-spotted salamander (*Ambystoma laterale*), spotted salamander (*Ambystoma maculata*), red-spotted newt (*Notophthalmus viridescens*), dusky salamander (*Desmognathus fuscus*), two-lined salamander (*Eurycea bislineata*), spring peeper (*Pseudacris crucifer*), and green frog (*Rana clamitans*). These species are more closely tied to their breeding pools, permanent water bodies, or streams. Considering the relative lack of these types of aquatic resources within the area proposed for wind turbine development and on the mountain as a whole, the likelihood of these species to occur in the turbine portion of the project is lower and their distribution would be more closely tied to the distribution of their breeding habitats. However, because some of the critical habitats for these species occur in the project area, it is possible for these species to occur.

The reptile community on Owl and Jimmey Mountains is likely represented predominantly by snakes, including the northern redbelly snake (*Storeria occipitomaculata*), common garter snake (*Thamnophis sirtalis*), and northern ringneck snake (*Diadophis punctatus*), which likely occur with varying abundance across the ridge. The open canopy and dense shrub development across much of the project area probably provides suitable habitat for these species. Turtles are unlikely to occur in most of the project area due to a lack of suitable habitat. Some species, however, do travel considerable distances during nesting. It is possible that some open areas at lower elevations in the project area, such as gravel roadsides, may be used as nesting habitat by snapping turtles (*Chelydra serpentina*) and painted turtles (*Chrysemys picta*) that might inhabit the wetland resources associated with Hot Brook and Webster Brook.

4.2. Birds

Birds are among the most abundant and diverse wildlife communities in the region, and the project area is no exception. A variety of species are known or suspected to occur, and species common to northern hardwood forests and open upland shrub habitat are prevalent. Bird species that frequent upland hardwood forests include black-capped chickadee (*Parus atricapillus*), blue jay (*Cyanocitta cristata*), golden-crowned kinglet (*Regulus satrapa*), white-breasted nuthatch (*Sitta carolinensis*), hairy woodpecker (*Picoides villosus*), downy woodpecker (*Picoides pubescens*), least flycatcher (*Empidonax minimus*), ruffed grouse (*Bonasa umbellus*), winter wren (*Troglodytes troglodytes*), hermit thrush (*Catharus guttatus*), red-eyed vireo (*Vireo olivaceus*), ovenbird (*Seiurus aurocapillus*), yellow-rumped warbler (*Dendroica coronata*), black-throated blue warbler (*D. caerulescens*), and black and white warbler (*Mniotilta varia*). Raptors that inhabit upland hardwoods include great-horned owl (*Bubo virginianus*), barred owl (*Strix varia*), northern goshawk (*Accipiter gentilis*), broad-winged hawk (*Buteo platypterus*), and red-tailed hawk (*Buteo jamaicensis*).

Open areas dominated by early successional habitat provide suitable habitat for a number of ground and shrub dwelling birds. Common species include northern flicker (*Colaptes auratus*), eastern wood-pewee (*Contopus virens*), American robin (*Turdus migratorius*), chestnut-sided warbler (*Dendroica pensylvanica*), American redstart (*Setaphaga ruticilla*), common yellowthroat (*Geothlypis trichas*), chipping sparrow (*Spizella passerine*), song sparrow (*Melospiza melodia*), white-throated sparrow (*Zonotrichia albicolis*), dark-eyed junco (*Junco hyemalis*), rose-breasted grosbeak (*Pheucticus ludovicianus*), and common raven (*Corvus corax*). Red-tailed hawks regularly hunt from perches in this habitat.

Wetland habitats along the Jimmey Road and associated with Hot Brook may receive use by a subset of species that specialize in these habitats. Included could be alder flycatcher (*Empidonax alnorum*), gray catbird (*Dumetella carolinensis*), and northern waterthrush (*Seiurus noveboracensis*).

An active bald eagle (*Haliaeetus leucocephalus*) nest is located on the north end of Kittery Island in Hot Brook Lake, approximately 7,000 feet from the nearest turbine on Owl Mountain. Bald eagles were observed flying in vicinity of Stetson Mountain during the fall 2006 raptor survey.

Two species listed as endangered in Maine were also observed during the fall 2006 raptor survey at Stetson Mountain, two golden eagles (*Aquila chrysaetos*) and two peregrine falcons (*Falco peregrinus*). These raptors were observed as migrants in vicinity of Stetson Mountain, as the project area is outside the current breeding range of both species and does not have suitable nest sites within or near it.

The avian studies conducted at Stetson Mountain provide reliable information regarding migratory birds that are expected to be present during spring and fall migration periods. Daytime observations during fall 2006 documented 12 species passing by the Stetson Mountain project area during migration. These observations generally included only migrants, and few individuals were suspected of residing in the project area permanently. Songbird species present during migration would be expected to largely include forest species, as use by these species would be based on the habitats available to them. Morning bird surveys were also conducted on Stetson Mountain as part of fall 2006 field surveys. These surveys documented a total of 57 species using habitat edges and roadsides along the ridge and at the foot of the mountain. Refer to Exhibit 12D for a complete description of avian species observed during the Stetson Mountain field surveys.

4.3. Mammals

Large mammals common to the project area include white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), and black bear (*Ursus americanus*). Predators expected to occur include coyote (Canis latrans), red fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), fisher (*Martes pennanti*), long-tailed weasel (*Mustela frenata*), and raccoon (*Procyon lotor*). Common medium-sized mammals expected to occur in the area include porcupine (*Erethizon dorsatum*), snowshoe hare (*Lepus americanus*), and striped skunk (*Mephitis mephitis*).

The small mammal community is dominated by masked shrew (*Sorex cinereus*), pygmy shrew (*Sorex hoyi*), northern short-tailed shrew (*Blarina brevicauda*), eastern chipmunk (*Tamias striatus*), red squirrel (*Tamiasciurus hudsonicus*), deer mouse (*Peromyscus maniculatus*), and southern red-backed vole (*Clethrionomys gapperi*). Other less common species that could occur include smoky shrew (*Sorex fumeus*), northern flying squirrel (*Glaucomys sabrinus*), and woodland jumping mouse (*Napaeozapus insignis*). Some of the more open areas along the ridge could be used by meadow voles (*Microtus pennsylvanicus*), although their overall abundance in this predominantly forested area is likely low relative to other small mammals.

Bat detector surveys conducted during the summer and fall of 2006 on Stetson Mountain documented a variety of species. Bats of the Genus *Myotis* were the most abundant bats documented during the surveys. Identification of this group to species based on calls is difficult, though it was determined that some of the recorded call sequences were of the little brown bat (*Myotis lucifugus*). Other species that were documented included big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), and red bat (*Lasiurus borealis*). Due to the close proximity, alignment of the ridges and similar elevation the composition of bats at Owl and Jimmey Mountains is expected to be similar to Stetson Mountain, which is similar to that of other sites in the Northeast.

4.4. Significant or Sensitive Wildlife Habitats and Species

According to the MDIFW wildlife biologist, there are no Essential Habitats or Significant Wildlife Habitats located within the project area. However, there are three (P-FW) Fish and Wildlife Protection Subdistricts located adjacent to the project area. Two areas are identified as Inland Waterfowl/Wading Bird Habitat. The first area is associated with Hot Brook and is located over 2,000 feet east of the proposed project area. The second area is associated with Bog Brook, approximately 1,500 feet north of the project area. The closest the proposed development footprint falls in relation to these habitats is approximately 1,800 feet. There will be no impacts from the project to these habitats. The third P-FW area is a bald eagle (*Haliaeetus leucocephalus*) nest site located in Upper Hot Brook Lake, east of the project area. The nest is approximately 7,000 feet from the nearest turbine location. MDIFW did not express concern over the proximity of the nest site to the project. The distance between these habitats and the project will provide an adequate buffer to avoid indirect impacts to the Protection Subdistricts. Finally, there are is a documented occurrences record of yellow lampmussel (*Lampsilis cariosa*) in Upper Hot Brook Lake. Yellow lampmussel is listed as Threatened in the State of Maine.

MDIFW requested that a site visit be made to review proposed stream crossings of Webster Brook and Hot Brook in order to evaluate potential impacts to native species of fish. See Exhibit 12-B. The site visit was conducted by Stantec and MDIFW fisheries biologist Richard Dill on July 9, 2008. MDIFW asked that canopy clearing for the connector line be minimized across Webster Stream. MDIFW did not have any concerns with the proposed road development in regards to Hot Brook and Webster Brook, provided that proper sediment and erosion control measures are in place before construction begins.

During the July 9 meeting with MDIFW, Stantec conducted a preliminary aquatic habitat assessment of the Upper Hot Brook Lake shoreline between Webster Brook and Hot Brook (Exhibit 12C). The purpose of the assessment was to determine the presence and/or absence of yellow lampmussel and to identify potential white sucker (*Catostomus commersoni)* spawning habitat. Yellow lampmussel was not observed during the assessment, although it was noted that appropriate habitat conditions were present along the shoreline of Upper Hot Brook Lake between Hot Brook and Webster Brook. Suitable spawning habitat for white sucker was not observed in the surveyed areas, with the exception of upstream reaches of Webster Brook and Hot Brook in the vicinity of the Jimmey Road and Route 169 crossings.

The USFWS stated that there are no records of federally threatened or endangered species occurring within the project area. However, USFWS noted note the presence of an active bald eagle nest in Upper Hot Brook Lake. The bald eagle is protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The proposed project is not expected to impact transient bald eagles or conflict with either the Bald and Golden Eagle Protection Act or the Migratory Bird Treaty Act.

Vernal pool habitats were identified during field surveys for wetlands. The locations, representative photographs, and discussion of these pools are provided in Exhibit 11 of this application. During the typical breeding season of 2008 fifteen vernal pools were identified and surveyed. Only one was found to be significant; one additional pool was identified outside of the typical breeding season and was treated as significant for planning purposes.

5.0 Potential Project Impacts to Habitat and Wildlife

The construction and operation of wind turbines on Owl and Jimmey Mountains will result in direct and indirect impacts to local wildlife communities and their habitats. In general, the impacts could include habitat loss or conversion, disturbance effects that could result in animals avoiding the project area, habitat fragmentation, and collision-related fatalities. The following discusses the potential project impacts that could affect the natural resources and wildlife groups that are known to occur in vicinity of the project area.

5.1. Habitat Loss and Disturbance

The project was designed to avoid wetlands to the greatest extent possible and, therefore, the proposed turbines and associated access roads will largely occur in previously disturbed upland hardwood forest. The overall result of project construction will be the direct loss of forested upland and the conversion of some forested habitat areas to early-successional habitat.

The development of the wind farm will require the construction of turbine structures, the construction of new roads, and the placement of a power collection line adjacent to the road bed. Each wind turbine will be located in an opening approximately 1.26 acres in size. This opening will be graded relatively flat and, after construction, approximately 1 acre will be reseeded to allow herbaceous and shrub covers. The road system needed to construct the project requires that roads have a travel surface at least 32 feet wide on the ridges.

The Beech-Birch-Maple Forest that is the predominant habitat is the most common hardwood forest type within the State. This habitat type is ranked as secure in Maine by MNAP, and there is no land cover type considered rare or sensitive occurring in the project area. The wildlife communities occurring here, consequently, are very common. Impacts to wildlife communities due to loss of habitat on Owl and Jimmey Mountains are not expected to be adverse to those populations, particularly in light of the fact that the local wildlife populations already adapt to the occasional rapid changes in the distribution of habitats along the ridge from harvesting activities.

Both short-term and long-term disturbances to wildlife could result from project construction and operation. Short-term disturbances include avoidance of the area during construction, when vehicular traffic and the presence of construction personnel will occur. Long-term disturbances could include avoidance of or displacement from the project area during the operational period of the project, which in turn could result in decreased breeding success or increased mortality. However, as the project area is characterized by disturbed upland forest habitat and no sensitive habitat types occur on-site, these disturbances, should they occur, are not expected to adversely impact local wildlife populations. The following describes the potential disturbances to wildlife communities that are known or expected to occur within the project area.

Reptiles and Amphibians
Construction-related disturbances to amphibians include direct habitat loss and habitat modification. Clearing associated with construction could result in a dryer, warmer ground surface layer that could result in displacement of some wetland-dependent herptile species. However, there is minimal breeding habitat available for amphibians in the project area, and the open nature of the existing forest canopy likely limits the distribution of some wetland-dependent amphibians within the area. Amphibians are more diverse and abundant in low-lying, wetland habitats, which the project design layout largely avoids. Therefore, disturbances incurred from project construction are not expected to result in undue or adverse impacts to local populations.

Construction and maintenance activities could result in loss of habitat and the displacement of reptiles from the project area. The snakes likely to occur in the area frequent variable woodlands. Clearing will result in loss of habitat and cover for hunting and would influence a dryer, warmer ground surface layer. Turtles will not likely be impacted by project construction or operation. Open areas with sand or gravel substrates, occurring at lower elevations in the project area, could be used by some common species of turtles that breed in the region. Construction activities could result in temporary displacement from these areas. These species, however, take advantage of a variety of habitats and it is unlikely that local populations would be adversely impacted.

Birds
The upland hardwood forest dominating the project area provides nesting, foraging, and stop-over habitat for a number of local and migratory songbird species. Construction activities will result in some direct loss of breeding habitat of forest-interior species. The project area, however, is dominated by the most common forest type in Maine; therefore, local and regional populations of these common species will not be adversely impacted. Additionally, if construction activities are initiated prior to the beginning of most species' breeding seasons (i.e., April to May), local birds could use alternative nest sites and would not necessarily suffer from decreased breeding success. Sensitive species that use less common or rare habitat types would not be impacted, as they do not rely on habitat within the project area. Forest-edge species and species that take advantage of early-successional habitats would benefit from increased edges and re-vegetation following construction. The new growth of grasses, shrubs, and berry producing plants at forest edges would provide such species with nesting and foraging habitat.

Many species of birds, not necessarily common to the land cover types present on-site, could occur in the project area during migration. Although most migrants would occur well over the project area during nocturnal movements, some birds could use the project area as day-time stop-over habitat. Construction of permanent roads and clearings would result in some direct loss of available stop-over habitat. The occurrence of migratory birds at any stop-over habitat varies from year to year and is influenced by weather and individual habitat preference. Also, the project area is relatively small in comparison to regionally available habitat, and adverse impacts to populations are not expected to result from the project development.

Construction activities could displace raptors that may nest in the project area. The clearing of tall trees, which most raptors use for nesting, could result in direct habitat loss and decreased breeding success for those birds that annually return to nest sites. However, the species that are expected to occur in the upland hardwood habitat of the project area are regionally common. Disturbances associated with the project are not expected to result in adverse impacts to raptor populations. Additionally, the initiation of construction activities prior to the breeding season of most species (i.e., March to April) would decrease the chances of destruction of any trees being actively used for nesting. Raptors such as red-tailed hawks and kestrels that forage in open areas at forest edges would benefit from the increase of foraging habitat in cleared areas following construction.

Additional species of raptors could occur as migrants in the vicinity of Owl and Jimmey Mountains. Project construction is not expected to result in the loss of stop-over habitat for migrant raptors. These individuals use the project area for extremely short periods of time and simply pass through or over the project area. They do not actively hunt in the project area, so they are less likely to be affected by any loss or changes in habitat.

Mammals
Construction of the Stetson II project could result in the loss of habitat for those mammals expected to occur in the project area, as well as displacement from the project area of those species most sensitive to human activity. For example, the removal of mature beech trees could result in decreased foraging habitat for black bear. However, this will occur at a relatively minor scale and spread out across the mountains due to the narrow, linear layout of the project. Additional, small-scale effects could include the removal of individual roost trees used by bats. However, the regional commonness of the dominant habitat types in the project area buffers any impacts associated with the removal of canopy trees, expansion of existing roads, and creation of new roads. Undue or adverse impacts to these populations are not expected.

Significant or Sensitive Wildlife Habitat
There is only one significant or sensitive habitat or wildlife community that occurs in the project area, a significant vernal pool. One other potential vernal pool was identified outside of the breeding season and thus has been treated as a significant vernal pool. These pools have been avoided to the maximum extent practicable. The existing development within a 250 foot habitat buffer accounts for 16.7 percent of the total buffer area of the significant vernal pool. The proposed development within this area would include clearing for the collector line and account for 5.2 percent of the total area. The proposed total clearing would include 21.5 percent of the total habitat area.

The identified potential vernal pool was also evaluated. The pool itself is 0.16 acres and the 250 foot habitat buffer equals 6.7 acres. There is no existing development within its 250 foot habitat buffer. The proposed development would include clearing of 1 acre or 14.1 percent of the habitat area for the collector line.

As the region does provide significant nesting habitat for bald eagles, during the breeding season eagles may pass by the project area while undertaking daily foraging flights. The project area, however, is not characteristic of the species' breeding or foraging habitat. No nests occur or have historically occurred in the direct project area, and the nearest nest in Hot Brook Lake is more than a mile away from the nearest turbine. Therefore, project construction or operation activities are not anticipated to displace local breeding pairs or impact their foraging locations.

Peregrine falcon and golden eagle were observed in vicinity of Stetson Mountain during the fall 2006 migration survey. As neither species breeds in the area and these birds are not common migrants in the area, the project is not anticipated to adversely impact their regional populations.

Yellow lampmussels in Hot Brook Lake would not be affected by the project. The turbine locations and new access roads are more than 3,500 feet from the lake. The nearest part of the project to the lake is along the Jimmey Road, approximately 900 feet from Hot Brook Lake at its nearest point. There would be no project activity in the lake, and any activity adjacent to streams leading to the lake will include erosion and sedimentation control to minimize the possibility of sediment discharge to the lake.

5.2. Collision Risk

5.2.1. Review of known avian collision risk

Birds are known to collide with tall structures, such as buildings and communications towers. Collisions are more likely to occur in periods of low visibility, either at night or during inclement weather. Because wind turbines are large, have moving parts, and extend above the landscape, the potential exists for wildlife collisions to occur. However, at existing wind farms in the United States where mortality studies have been conducted, collision risk is generally considered low relative to other sources of bird mortality. Table 1 provides a summary of estimates of known sources of bird mortality.

Table 1. Summary of Nation-Wide Bird Mortality Estimates

Structure/Cause	Total Bird Fatalities	Reference
Building and Windows	98 - 980 million	Klem 1991
Power Lines	10,000 - 174 million	Erickson *et al.* 2001
Housecats	100 million	Coleman and Temple 1993
Vehicles	60 - 80 million	Erickson *et al.* 2001
Agricultural Pesticides	67 million	Pimentel and Acquay 1992
Communication Towers	4 - 50 million	Erickson *et al.* 2001
Wind Generation Facilities	10,000 - 40,000	Erickson *et al.* 2001

The original concern that wind farm-induced fatalities could pose biologically significant impacts to bird populations arose from a few facilities located along migratory ‘bottlenecks’ or sites where birds were seasonally very active. A large number of hawk and eagle fatalities were observed at the Altamont Pass and Solano County Wind Resource Areas in California (Orloff and Flannery 1992, Hunt 2002). Estimates of raptor and other bird fatalities at Altamont Pass are variable. However, using more recent data, it is estimated that thousands of raptors strike turbines every year at that facility (Erickson *et al.* 2002, Sterner 2002, Smallwood and Thelander 2004, GAO 2005). In 2004 raptor mortality estimates at Altamont Pass were found to be 0.24 fatalities per turbine per year (fatalities/turbine/year) (1,296 raptor fatalities) (GAO 2005). Collision fatalities induced by the Altamont Pass turbines were believed to adversely impact the local golden eagle population.

Further studies conducted at these California facilities that experienced high fatality rates found significant contributing factors to the high mortality observed: the number, density, and physical characteristics of turbines (over 5,000 present at Altamont Pass alone); high raptor wintering density; high prey densities within the wind resource areas; and the funneling of migrants through these areas by topographical features. Additionally, the turbines are predominantly older generation turbines that are smaller, lower to the ground, and with blades that spin faster as wind speed increases. The turbines at these sites are also spaced very close together in comparison to more modern facilities with larger turbines. Finally, many turbines are placed on lattice type towers, which could provide perch locations in close proximity to spinning blades.

Raptor mortality in the United States, outside of California, has been documented to be very low. For example, mortality rates found at onshore wind developments outside of Altamont Pass have documented 0 to 0.07 fatalities/turbine/year from 2000-2004 (GAO 2005). As noted by Kerlinger (2002), there were seven reported raptor fatalities which occurred in North America outside of California, and few have been reported from wind facilities since then. Since then, several other studies have documented few raptor fatalities and scarcely more than 15 fatalities have been reported at more than a dozen sites surveyed.

Similar to raptors, very few waterfowl or water birds have been found during mortality surveys at existing wind farms, despite characteristic flocking behaviors and activity during nocturnal and crepuscular periods that would seem to put these birds at a greater risk of collision. Water bird mortality at wind developments has accounted for approximately 5 percent of the reported mortality at wind facilities in the United States (Erickson *et al.* 2002). The Top of Iowa Wind Farm is an example of low mortality relative to the site’s high use by waterfowl. The facility is located in cropland between three wildlife management areas that annually receive approximately 2.5 million waterfowl-use days. Surveys of waterfowl activity in the vicinity of that project documented large numbers of ducks and geese, including 487 flocks of Canada geese (*Branta canadensis)* foraging in fields with wind turbines, yet no waterfowl were found during mortality surveys conducted from April to December in 2003 and 2004 (Koford *et al.* 2005).

Songbirds (e.g., warblers, vireos, thrushes, sparrows) account for up to 80 percent of known fatalities reported at wind facilities (Johnson *et al.* 2000, Erickson *et al.* 2002). Mortality of these species has included both daytime and nocturnal fatalities (Erickson *et al.* 2001). A wide variety of songbird species have been found during mortality surveys but, to date, no large fatality events, as have been occasionally observed at tall communications towers, have been reported. In a review of studies conducted at 15 land-based facilities in 12 different states, Erickson *et al.* (2001) concluded that, on average, 1 to 2 birds, (primarily songbirds) are killed per turbine per year outside of California.

More recent work has documented fatality rates at existing wind farms from 0 to 4.5 fatalities/turbine/year with most of the reported rates being less than 2 fatalities/turbine/year, although one site with rates as high as 7.28 fatalities/turbine/year has been investigated (Erickson *et al*. 2002, GAO 2005). It has been estimated that an average of 2.19 bird fatalities/turbine/year occur in the United States. Sites in California have significantly more fatalities than elsewhere, and it is estimated that the fatality rate is lower outside of California, at approximately 1.83 fatalities/turbine/year (corrected for searcher efficiency and scavenging). Using comparable methodologies, avian fatality monitoring in 2007 at the Mars Hill Wind Project estimated 0.44 to 1.04 bird fatalities/turbine/year.

Lighting
The lighting of tall structures may increase the risk that those structures pose to night-migrating birds. Lighting is believed to act as an attractant to birds, which have been observed circling around lit structures until they collapse from exhaustion or collide with the structures or their support systems (such as guy wires). The structure, as well as the type, location, number of lights, and pulse frequency of the lighting are important factors in the potential for a lit structure to be a risk to night migrants. Tall radio towers pose the greatest risk to night-migrants for several reasons. First, they are typically 333-671 meters m (1,000' to 2,200') tall, which extends well into the altitude zone in which most migrants fly, as documented in numerous radar surveys. Second, the FAA lighting standards for these very tall towers require a series of lights (up to 12 sets of lights along the length of the tower) that include both flashing beacons (L-864) and steady burning (L-810) lights. This requirement places the lights at the same altitude at which birds are flying. Third, the steady burning L-810 lights create a constant illumination of the tower, which further increases the potential for attraction. Finally, the dense array of guy wires surrounding each tower present a high collision risk for any birds that are drawn into the area lighted by the towers.

A new FAA Advisory Circular on Obstruction Marking and Lighting (USDOT AC 70/7460-1K, Effective 2/1/07) provides guidelines on the lighting requirements of wind turbines and wind farms. The requirements for wind turbines indicate that the lighting is unlikely to be a significant attractant to night-migrating birds. Lighting is limited to a single flashing red L-864 light placed on the turbine nacelle, which is typically located approximately 84 meters (275') above the ground and well below the height at which most migrants fly. Importantly, only one turbine is required to be lit for every linear half-mile of turbine string, and all lit turbines should flash simultaneously, when possible. The result of these greatly reduced lighting requirements is a reduction of the overall number of lights and the total time during which turbines are lit. The placement of lights well below the height at which birds prefer to migrate also indicates a very low risk for lighting to attract birds to the turbines. Mortality studies conducted in 2007 at the Mars Hill Wind Project found no relationship to avian mortality and turbine lighting.

5.2.2. Potential risk of avian collision at the Stetson II Wind Project

Different taxonomic groups of birds exhibit different habitat use and flight behaviors and, consequently, the level of risk of birds colliding with the proposed turbines is expected to vary among groups. For example, since most songbirds migrate at night, this species group is considered more at risk of collision than raptors and other birds that typically migrate during the day. Therefore, in order to assess the risk of bird collisions, it is necessary to consider these groups individually. The following describes the risk of collision of birds that could come into the vicinity of the proposed turbines.

Songbirds
Results from the Stetson Mountain radar survey suggest that the overall level of nocturnal bird migration activity documented is within the range of similar surveys that have been conducted over the past several years. Consequently, the project area is not believed to be a particularly important migration corridor or an area of concentrated migration activity. The results of these other radar studies suggest that the vast majority of nocturnal migrants fly at altitudes well above the rotor swept zone of the proposed turbines, between 300 to 600 meters (984' to 1967') (see Table 3-2 of Exhibit 12-D for a review of more than 30 seasonal radar migration surveys).

The flight behaviors of birds vary between seasons. Courtship aerial displays or territorial chases during the breeding season could put some birds at greater risk of collision with the proposed turbines. However, the majority of songbird flight behavior during the breeding season occurs under the forest canopy. Most songbird species remain within cover provided by tree canopies and shrubs while foraging, mainly to avoid detection from predators. Ground foraging and short flights from perches characterize many species' foraging activities. Additionally, local birds would be expected to habituate to the presence of turbine structures, and flight movements during the breeding season are mainly diurnal when turbine structures are visible.

Water birds and waterfowl
Although suitable habitat is not available for water birds or waterfowl on Owl or Jimmey Mountain, there may be flyovers of some species such as mallard (*Anas platyrhynchos*) and wood duck (*Aix sponsa*), as well as water birds such as great blue heron (*Ardea herodias*), because these species use lakes, wetlands, and streams in surrounding landscape. Large flocks of Canada geese were observed during the Stetson Mountain diurnal migration surveys. However, they were routinely observed flying high over the Penobscot River and Baskahegan Lake, both of which are well away from the project area. Based on the available information from other facilities and on-site habitat observations, the risk of fatalities to waterfowl and water birds to collide with the proposed wind turbines is very low.

Raptors
Raptor use of the Stetson Mountain project area was observed to be relatively low during the fall 2006 migration survey, and few raptors were observed over Owl or Jimmey Mountains during wetland work in 2007 and 2008. The risk of collision of raptors at facilities aside from those facilities at migration bottlenecks or high use areas is low. Due to most raptors' day-time habits in combination with the slow moving blades of modern industrial turbines, raptors are aware of the spinning blades and rotor structures and avoid them. The GE 1.5 sle turbines to be used at Stetson II will consist of this modern design, lacking the features believed to present a greater risk of collision. Additionally, most raptors migrate during periods of good visibility when conditions are favorable for long-distance flight. Therefore, the risk of migrant raptors colliding with the proposed turbines is anticipated to be low.

Some resident raptors engage in flight behaviors that could put them at a greater risk of collision. Owls primarily forage during nocturnal and crepuscular periods. Some raptors engage in elaborate courtship aerial displays. Despite these behaviors, mortality surveys at existing wind farms, outside of the California facilities that observed high fatalities due to local circumstances, have indicated low raptor mortality. This trend of low raptor mortality is expected at the Stetson II Wind Project.

A bald eagle and red tailed hawks were observed in the project area during fall 2007 and spring 2008 field surveys. The use of the project area by these two species is anticipated to be largely during migration (for both species) or during occasional daily flights (for bald eagles). Neither species is expected to occur in the project area routinely due to a lack of nesting and foraging habitat for both species. The nesting eagle on Kittery Island is expected to forage in the Hot Brook Lake area; there are no nearby foraging opportunities on the west side of the project that would draw the resident eagle over Owl or Jimmey Mountain. Consequently, when present, these species will be making brief, direct flights through the project area. As explained above, raptor mortality (including those of rare species) at modern wind farms is very low due to the likelihood that raptors are more aware of the slow moving blades and that raptor use is not concentrated within those facilities. The occasional, brief movements of bald eagles and red tailed hawks through the project area, therefore, do not represent a significant risk for collisions to these two species.

Summary of Avian Collision Risk at Owl and Jimmey Mountain
Fatality rates from other projects can be used to determine a possible level of impact at the proposed project. The rates observed at other facilities can be considered comparable to a proposed wind farm if those projects are representative of the site being assessed (i.e., in the same region with similar landscape and project design characteristics). As mortality rates are typically described as fatalities per turbine per year, the overall mortality expected at a given project is proportional to the size (i.e., number of turbines) of the proposed wind farm. The Stetson II Wind Project would include 17 turbines. This is small compared to most wind projects already operating in the eastern United States.

Mortality rates at existing projects have ranged from 0 to 7.28 fatalities/turbine/year. there appears to be nothing about the project area to indicate that the Stetson II Wind Project would be outside of that range Actual avian risk of collision is anticipated to be low at the Stetson II Wind Project as the area is not considered to be a migratory 'bottleneck.' Collision rates at existing facilities with similar landscape features have been relatively low.

5.2.3. Risk of Bat Collisions with Turbine Structures

5.2.3.1 Review of known bat collision risk

Wind projects have been cited as a potential threat to migrating bats for a number of years, and emerging evidence suggests that migratory bats could be at a greater risk of collision than birds. This concern arose mainly from a study at the Mountaineer Wind Energy Facility in Tucker County, West Virginia, which includes 44 operating wind turbines, where 475 dead bats were documented between April 20 and November 9, 2003 (Johnson and Strickland 2004). Subsequent fieldwork in 2004 at the Mountaineer site and nearby Meyersdale Wind Facility revealed even higher rates of bat collision mortality with operating wind turbines (Arnett *et al.* 2005).

These studies have raised concerns that bat mortality associated with wind turbine collisions could adversely impact bat populations (Williams 2003). The concerns lie primarily with wind farms on forested ridgelines in the eastern United States, where documented bat fatality rates have been considerably higher (in terms of bats/turbine/year) than at western and mid-western wind farms (Johnson *et al*. 2000, Williams 2003, Arnett *et al.* 2005). Mortality at western and mid-western facilities is much lower, with documented fatality rates ranging from only 0.07 to 2.32 fatalities/turbine/year, while those from some eastern facilities range from 30-40 fatalities/turbine/year (Erickson *et al.* 2002, GAO 2005). Emerging evidence from one facility on the prairies of Alberta, however, indicates that bat mortality even in open habitats can be comparable to that observed along the forested ridgelines of the central Appalachian mountains (unpublished data presented by Robert Barclay, University of Calgary, Alberta, at the North American Symposium on Bat Research, October 2005). Based on 2007 morality studies, bat fatalities at the Mars Hill Wind Project are estimated at between 0.43 to 2.04 bat fatalities /turbine/year, similar to the mortality rates seen at western and mid-western wind projects.

More recent work at a newly constructed facility in upstate New York found bat fatality rates that are lower than in the central Appalachian states. During an initial year of surveys, bat fatality rates were one-third to one-quarter those documented at more southern sites (pers. comm. PPM Energy personnel to Woodlot staff).

Researchers currently have a limited understanding of the actual mechanism of bat collisions, although evidence from the timing of fatalities documented at existing wind facilities and other structures suggests that migrating bats are most at risk, whereas resident bats during the summer feeding and pup-rearing period are considered low risk (Johnson and Strickland 2004, Johnson *et al*. 2003, Whitaker and Hamilton 1998). Additionally, only certain species of bats appear to be at risk. Of the 45 species of bats that occur in the United States, only approximately 6 species have been found during mortality searches (Erickson *et al.* 2002). These include hoary bat, eastern red bat, silver-haired bat, big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), and eastern pipistrelle (*Pipistrellus subflavus*). Recent evidence in upstate New York indicates that bat collisions with turbines may be timed earlier than at southern facilities and could include a larger proportion of common, resident species, particularly the little brown bat (pers. comm. PPM Energy personnel to Woodlot staff).

5.2.3.2 Potential risk of bat collision at the Stetson II Wind Project

The late-summer and fall 2006 bat surveys at Stetson Mountain indicated that some of the species of bats that are considered at risk of collision are present in the area. However, the activity of bats detected at Stetson Mountain was low (see pages 25-37 of Exhibit 12-D for a review of the bat surveys conducted in that project area). Populations at Owl and Jimmey Mountain are expected to be similar because of the physical proximity of the phased projects to each other, as well as their obvious topographic and ecological (i.e., managed forest ridgeline) similarities. Therefore, bat collision mortality at the Stetson II Wind Project is expected to be low.

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Appendix 1
Wildlife Habitat Use Matrix

Stetson Mountain Wildlife Habitat - Species Matrix				Status		Habitats					
Scientific Name	Common Name	Special Habitat Requirements	Relative Abundance in Project Area	Maine	Federal	Beech-Birch-Maple Forest	Harvested Hardwood Forests	Spruce-Northern Hardwood Forest	Forested Wetlands	Forested Streams	Vernal Pools
Amphibians											
Ambystoma laterale	Blue-spotted Salamander	Wooded swamps, ponds or vernal pools for breeding	U			Y				B	B
Ambystoma maculatum	Spotted salamander	Mesic woods, semi-permanent water for breeding	U			Y	Y			B	B
Notophthalmus viridescens	Red-spotted newt	Water with aquatic vegetation for adults	U			Y	Y	Y		B	B
Desmognathus fuscus	Northern dusky salamander	Permanent or intermittent streams or seeps in woodlands	U			Y		Y		Y	
Plethodon cinereus	Northern redback salamander	Wide variety of terrestrial habitats, mostly forested	A			Y	Y	Y			
Eurycea bislineata	Northern two-lined salamander	Wide variety of habitats, including streams, floodplains, and swamps	C			Y				Y	
Bufo a. americanus	Eastern American toad	Moist upland woods	A			Y	Y	Y		B	B
Pseudacris crucifer	Northern spring peeper	Wetlands with emergent vegetation for breeding	U			Y		Y		B	B
Hyla versicolor	Gray treefrog	Seeps, aquatic sites for breeding	C			Y	Y	Y		B	B
Rana clamitans	Green frog	Riparian habitat	U							Y	B
Rana sylvatica	Wood frog	Vernal woodland pools	A			Y		Y		B	B
Reptiles											
Chelydra serpentina	Common snapping turtle	Aquatic habitat; sandy, gravely soil	U							Y	
Chrysemys picta	Painted turtle	Aquatic habitats with open water and basking structures	U							Y	B
Storeria occipitomaculata	Northern redbelly snake	Moist woods, hillsides with surface debris	C			Y	Y	Y	Y		
Thamnophis sirtalis	Eastern garter snake	Moist areas, forest edges, stream edges, swamps	A			Y	Y	Y	Y	B	B
Diadophis punctatus	Northern ringneck snake	Mesic areas with abundant cover	U			Y	Y	Y		Y	
Birds											
Cathartes aura	Turkey vulture	Forest openings, fields, large dead tree trunks	U			B	B	B			
Accipiter striatus	Sharp-shinned hawk	Extensive, undisturbed open mixed woodlands	U					Y	Y		
Accipiter cooperii	Cooper's hawk	Undisturbed forests	R	T		B		B	B		
Accipiter gentilis	Northern goshawk	Extensive, mature mixed woods	U			B		B	B		
Buteo platypterus	Broad-winged hawk	Extensive woodlands with roads or clearings	U			B	B	B	B		
Buteo jamaicensis	Red-tailed hawk	Mature forest-field ecotone	C			Y	Y	Y	Y		
Bonasa umbellus	Ruffed grouse	Fallen logs amidst dense saplings	C			Y	Y	Y	Y	Y	
Scolopax minor	American woodcock	Moist soils, small clearings and dense swales	U			B	B	B		B	
Zenaida macroura	Mourning dove	Open land with bare ground	A			Y	Y	Y			
Coccyzus erythropthalmus	Black-billed cuckoo	Low, dense thickets	U			B	B	B			
Bubo virginianus	Great horned owl	Large abandoned hawk nests, large tree cavities	C			Y	Y	Y	Y		
Strix varia	Barred owl	Cool, damp lowlands, cavity trees >20" dbh	C			Y	Y	Y	Y		
Aegolius acadicus	Northern saw-whet owl	Cavity trees >12" dbh	C			Y		Y			
Caprimulgus vociferus	Whip-poor-will	Immature forests, woodlands, shrub areas, large clearings	U	SC		B	B	B			
Archilochus colubris	Ruby-throated hummingbird	Tubular flowers, especially red	C			B	B	B		B	
Sphyrapicus varius	Yellow-bellied sapsucker	Cavity trees with >10" dbh	C			B	B	B			
Picoides pubescens	Downy woodpecker	Trees, limbs with decay column >6" dbh	C			Y	Y	Y	Y		
Picoides villosus	Hairy woodpecker	Trees, limbs with decay column >10" dbh	C			Y	Y	Y	Y		
Colaptes auratus	Northern flicker	Open areas, trees with heart rot	C			B	B	B			
Dryocopus pileatus	Pileated woodpecker	Mature trees >20" dbh with decay	C			Y	Y	Y			
Contopus virens	Eastern wood-pewee	Open deciduous and mixed forests, forest edge	U			B	B	B			
Empidonax alnorum	Alder flycatcher	Thickets, low shrubs, clearings	U				B			B	
Empidonax minimus	Least flycatcher	Open deciduous and mixed forests, forest edge	C			B	B	B			
Sayornis phoebe	Eastern phoebe	Exposed, streamside perches, sheltered ledges for nesting	C			B	B	B			
Myiarchus crinitus	Great crested flycatcher	Mature cavity trees, deciduous forest edge	C			B	B	B			
Vireo solitarius	Blue-headed vireo	Mixed or predominantly coniferous forests	C					B	B		
Vireo olivaceus	Red-eyed vireo	Deciduous forests with continuous canopy	C			B	B	B			
Cyanocitta cristata	Blue jay	Variety of rural to urban habitats	A			Y	Y	Y	Y		
Corvus brachyrhynchos	American crow	Variety of rural to suburban habitats, open areas	A			Y	Y	Y	Y		
Corvus corax	Common raven	Cliffs and outcrops in rural areas	U			Y	Y	Y	Y		
Poecile atricapillus	Black-capped chickadee	Cavity trees >4" dbh	A			Y	Y	Y	Y		
Sitta canadensis	Red-breasted nuthatch	Cavity trees in mixed or coniferous woods	C				Y	Y	Y		
Sitta carolinensis	White-breasted nuthatch	Cavity trees in hardwoods or mixed woods	C			Y	Y	Y			
Certhia americana	Brown creeper	Woodland trees with sloughing or loose bark	C			Y	Y	Y	Y		
Troglodytes troglodytes	Winter wren	Conifer forests near water, often in ravines and swamps	U				B	B	B		
Regulus satrapa	Golden-crowned kinglet	Conifer and mixed conifer-hardwood forests	U				Y	Y	Y		

Stetson Mountain Wildlife Habitat - Species Matrix				Status		Habitats					
Scientific Name	Common Name	Special Habitat Requirements	Relative Abundance in Project Area	Maine	Federal	Beech-Birch-Maple Forest	Harvested Hardwood Forests	Spruce-Northern Hardwood Forest	Forested Wetlands	Forested Streams	Vernal Pools
Catharus fuscescens	Veery	Moist woodlands with understory	C			B		B			
Catharus guttatus	Hermit thrush	Coniferous woodlands with dense understory	C					B			
Hylocichla mustelina	Wood thrush	Cool, moist, mature deciduous or mixed forests	C			B		B			
Turdus migratorius	American robin	Lawns, fields, agricultural areas, forest openings	A			B	B	B			
Dumetella carolinensis	Gray catbird	Shrubs, thickets in open country	C			B	B				
Bombycilla cedrorum	Cedar waxwing	Early successional forests, berry producing trees, shrubs	C			Y	Y	Y	Y		
Vermivora peregrina	Tennessee warbler	Brushy, semi open habitat in coniferous or mixed forests	U					B	B		
Vermivora ruficapilla	Nashville warbler	Scattered trees interspersed with brush	C			B		B	B		
Parula americana	Northern parula	The lichen *Usnea* for nesting	C			B		B	B		
Dendroica petechia	Yellow warbler	Scattered small trees or dense brush	A			B	B			B	
Dendroica pensylvanica	Chestnut-sided warbler	Brush at wood margins, hardwood seedling stands	A			B	B	B			
Dendroica tigrina	Cape May warbler	Young conifers	U					B	B		
Dendroica caerulescens	Black-throated blue warbler	Hardwoods with well-developed understory	C					B			
Dendroica coronata	Yellow-rumped warbler	Coniferous trees, bayberry thickets	A				B	B	B		
Dendroica virens	Black-throated green warbler	Coniferous forests, mixed woodlands	C			B		B	B		
Dendroica fusca	Blackburnian warbler	Coniferous forests, mixed woodlands	U					B	B		
Mniotilta varia	Black-and-white warbler	Deciduous or mixed conifer-hardwood forests	C			B	B	B	B		
Setophaga ruticilla	American redstart	Deciduous forest and shrub habitats	A			B	B	B	B		
Seiurus aurocapillus	Ovenbird	Deciduous or mixed conifer-hardwood forests	C			B	B	B	B		
Seiurus noveboracensis	Northern waterthrush	Cool, shaded, wet ground with shallow pools	U							B	B
Oporornis philadelphia	Mourning warbler	Stands of dense saplings and shrubs, disturbed second growth	U			B	B	B			
Geothlypis trichas	Common yellowthroat	Shrublands, dense forest edges, regenerating fields	C			B	B	B		B	
Wilsonia canadensis	Canada warbler	Dense vegetation along streams and wet areas within woodlands	U			B	B	B			
Piranga olivacea	Scarlet tanager	Mature deciduous and mixed conifer-hardwood forests	C			B	B	B			
Spizella arborea	American tree sparrow	Shrublands and forest edges during winter	C				W				
Spizella passerina	Chipping sparrow	Fields and lawns in close proximity to trees (often conifers)	C				B				
Melospiza melodia	Song sparrow	Wet areas with brushy vegetation	A				B				
Zonotrichia albicollis	White-throated sparrow	Shrublands and dense forest edges	C			B	B	B	B		
Junco hyemalis	Dark-eyed junco	Mature conifer forests (often eastern hemlock)	C				Y	Y	Y		
Pheucticus ludovicianus	Rose-breasted grosbeak	Forest-field ecotones, thickets, sapling stands	C			B	B	B			
Molothrus ater	Brown-headed cowbird	Open fields, mowed grassy areas, low trees	A			B	B	B			
Icterus galbula	Baltimore oriole	Tall scattered deciduous trees	C			B	B	B			
Carduelis tristis	American goldfinch	Open, weedy fields with scattered small trees	A			Y	Y	Y	Y		
Coccothraustes vespertinus	Evening grosbeak	Spruce and fir forest	U					W	W		
Mammals											
Sorex cinereus	Masked shrew	Damp woodlands, ground cover	U			Y	Y	Y		Y	
Sorex fumeus	Smokey shrew	Loose damp leaf litter	U			Y		Y		Y	
Sorex hoyi	Pygmy shrew	Moist leaf litter, damp soils, riparian areas	U			Y		Y	Y	Y	
Blarina brevicauda	Northern short-tailed shrew	Low vegetation, damp, loose leaf litter	A			Y	Y	Y	Y	Y	
Myotis lucifugus	Little brown myotis	Dark, warm sites for maternity colonies	U			B	B	B	B	B	
Myotis septentrionalis	Northern long-eared myotis	Caves with high humidity and calm air, large cavity trees	U			B	B			B	
Lasionycteris noctivagans	Silver-haired bat	Dead trees with loose bark; streams	U	SC		B	B	B	B	B	
Pipistrellus subflavus	Eastern pipistrelle	Warm, draft-free, damp sites for hibernation, open woodlands	U	SC		B	B	B		B	
Eptesicus fuscus	Big brown bat	Cold, dry areas of caves	C			B	B	B		B	
Lasiurus borealis	Red bat	Deciduous trees on forest edges for roosting	U	SC		B	B	B		B	
Lasiurus cinereus	Hoary bat	Edges of coniferous forests	U	SC			B	B	B		
Lepus americanus	Snowshoe hare	Dense brushy or softwood cover	C			Y	Y	Y	Y	Y	
Tamias striatus	Eastern chipmunk	Open, deciduous forests and edges	C			Y	Y	Y	Y		
Sciurus carolinensis	Eastern gray squirrel	Tall trees for dens or leaf nests	C			Y	Y	Y			
Tamiasciurus hudsonicus	Red squirrel	Woodlands with mature trees	C				Y	Y	Y		
Glaucomys sabrinus	Northern flying squirrel	Mature trees with cavities, arboreal lichens	U			Y	Y	Y			
Peromyscus maniculatus	Deer mouse	Northern hardwoods or coniferous forests	C			Y	Y	Y	Y		
Clethrionomys gapperi	Southern red-backed vole	Springs, brooks, seeps, debris or slash cover	C					Y	Y	Y	
Microtis pennsylvanicus	Meadow vole	Herbaceous vegetation, loose organic soils	A				Y			Y	

Stetson Mountain Wildlife Habitat - Species Matrix

Scientific Name	Common Name	Special Habitat Requirements	Relative Abundance in Project Area	Status: Maine	Status: Federal	Habitats: Beech-Birch-Maple Forest	Habitats: Harvested Hardwood Forests	Habitats: Spruce-Northern Hardwood Forest	Habitats: Forested Wetlands	Habitats: Forested Streams	Habitats: Vernal Pools
Synaptomys cooperi	Southern bog lemming	Deciduous or mixed conifer-hardwood forests	U			Y	Y	Y		Y	
Napaeozapus insignis	Woodland jumping mouse	Moist, cool woodland, loose soils	U			Y	Y			Y	
Erethizon dorsatum	Porcupine	Rock ledges or tree dens, northern hardwoods	U			Y	Y	Y			
Canis latrans	Coyote	Forests, forest edges, agricultural land	U			Y	Y	Y	Y	Y	
Vulpes vulpes	Red fox	Forests, forest edges, agricultural land	U			Y	Y	Y		Y	
Urocyon cinereoargenteus	Gray fox	Hollow logs, tree cavities, rock crevices	U			Y	Y	Y		Y	
Ursus americanus	Black bear	Fallen trees, hollow logs, rock ledges, slash piles, northern hardwoods, mixed forests	U			Y	Y	Y	Y	Y	
Procyon lotor	Raccoon	Hollow trees	C			Y	Y			Y	
Martes pennanti	Fisher	Coniferous and mixed conifer-hardwood forests, adequate den sites	U			Y		Y	W	W	
Mustela erminea	Ermine	Dense brushy cover	U			Y	Y	Y	Y	Y	
Mustela frenata	Long-tailed weasel	Diversity of forested and partially forested habitats and edges	U			Y	Y		Y	Y	
Mephitis mephitis	Striped skunk	Agricultural areas, open habitats, often in suburban areas	C			Y	Y	Y	Y	Y	
Lynx rufus	Bobcat	Rock ledges, under windfalls, hollow logs	U	SC		Y	Y	Y		Y	
Odocoileus virginianus	White-tailed deer	Softwood yarding cover in winter	C			Y	Y	Y	Y	Y	
Alces alces	Moose	Wetlands preferred in the summer for insect relief and aquatic vegetation	C			Y	Y	Y	Y	Y	

	Beech-Birch-Maple Forest	Harvested Hardwood Forests	Spruce-Northern Hardwood Forest	Forested Wetlands	Forested Streams	Vernal Pools
Amphibians (11)	10	5	7	0	10	8
Reptiles (5)	3	3	3	2	4	2
Birds (70)	52	53	63	34	7	1
Mammals (34)	30	30	29	18	27	0
Total (120)	95	91	102	54	48	11

Relative Abundance
A - Abundant
C - Common
U - Uncommon
R - Rare

Status
E - Endangered
T - Threatened
SC- Special Concern

Season of Use
B - Breeding Season
M - Migration
W - Wintering
Y - Year round

Haider, Jessica

From: Barnes, Brooke
Sent: Tuesday, May 20, 2008 2:59 PM
To: Haider, Jessica
Subject: FW: SWH map for Danforth area
Attachments: brooke barnes request 5-20-08.jpg

This is the response from DEP to our Stetson II agency request. Please file accordingly….
Thx
B

From: Beyer, Jim R [mailto:Jim.R.Beyer@maine.gov]
Sent: Tuesday, May 20, 2008 2:55 PM
To: Barnes, Brooke
Subject: RE: SWH map for Danforth area

Sorry, the blue stripes are Inland Waterfowl Wading Bird habitats, the red dots are other IFW locations, like brook floater mussels or other RTE species. The yellow circles are bald eagles. Try this one.

Jim Beyer
Maine Department of Environmental Protection
Bureau of Land and Water Quality
Division of Land Resources Regulation
Eastern Maine Regional Office
(207) 941-4593

From: Barnes, Brooke [mailto:brooke.barnes@stantec.com]
Sent: Tuesday, May 20, 2008 2:37 PM
To: Beyer, Jim R
Subject: RE: SWH map for Danforth area

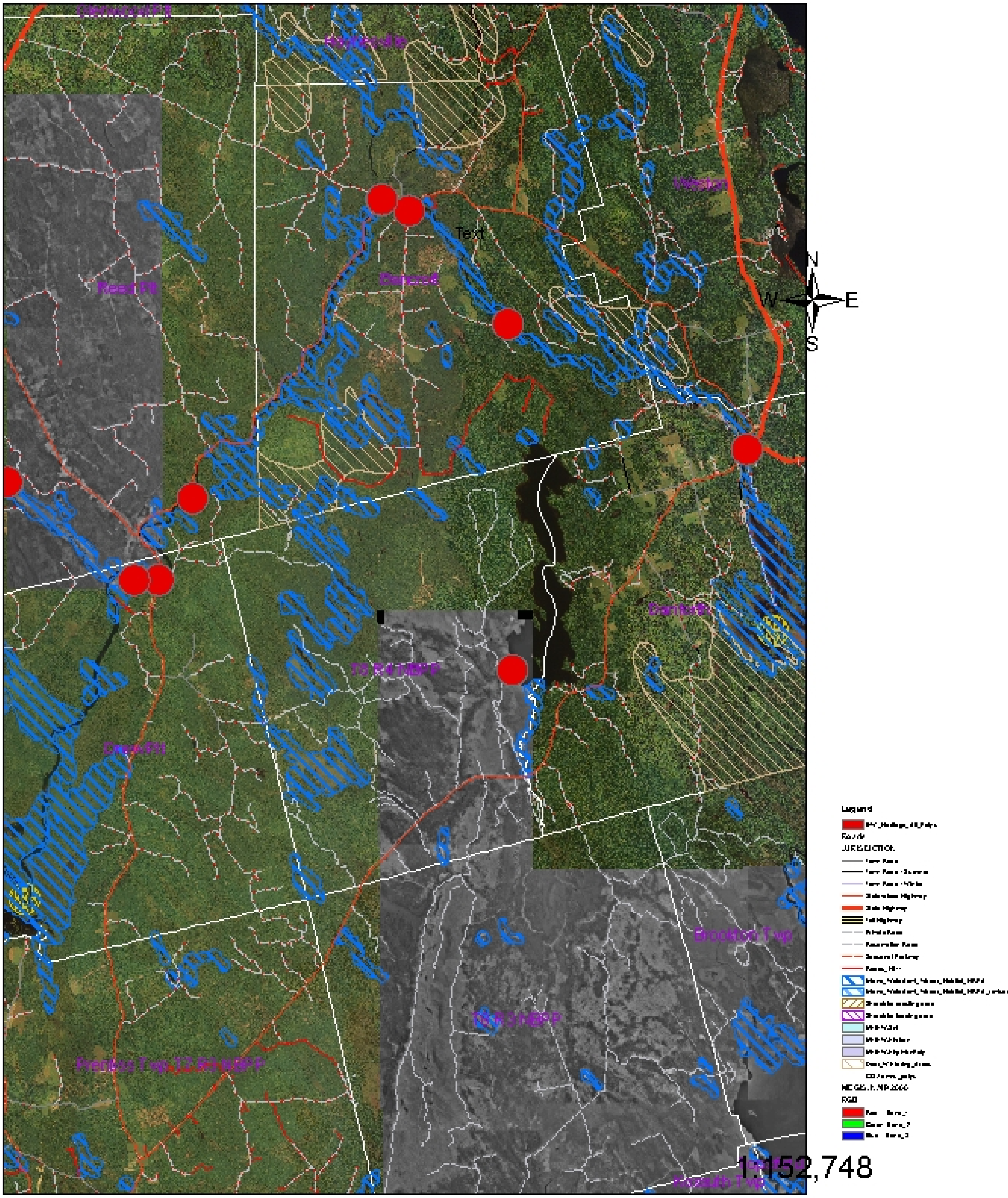
There's no legend, but I am assuming the red dots are eagles and the blue stripe is inland WWH—right?

From: Beyer, Jim R [mailto:Jim.R.Beyer@maine.gov]
Sent: Tuesday, May 20, 2008 2:21 PM
To: Barnes, Brooke
Subject: SWH map for Danforth area

Here it is. If this does not cover the area you need let me know and I can fire you off a new one.

Jim Beyer
Maine Department of Environmental Protection
Bureau of Land and Water Quality
Division of Land Resources Regulation
Eastern Maine Regional Office
(207) 941-4593

GIS Map for Brook Barnes



GOVERNOR
John E. Baldacci

COMMISSIONER
Roland D. Martin

Wildlife Division
73 Cobb Road
Enfield, ME 04493

May 21, 2008

Jessica Haider
Project Assistant
Stantec Consulting
30 Park Drive
Topsham, Maine 04086

Dear Jessica:

As requested, MDIF&W has reviewed the maps you provided for any Essential and Significant Wildlife Habitats in T8 R4 NBPP, Maine. The following is a summary of our findings:

Essential Habitats:

Essential Habitats are defined as "areas currently or historically providing physical or biological features essential to the conservation of an endangered or threatened species in Maine and which may require special management considerations". Essential Habitat protection in Maine currently applies to bald eagle, roseate and least terns, and piping plover nest sites. Additional listed species may receive attention in the future.

There are no **Essential Habitats** located within the designated project area, however, there is an active Bald eagle nest (476A) located on Kittery Island in Upper Hot Brook Lake (please refer to the enclosed map). An aerial survey was conducted on 4/22/08 and one adult was observed in incubation posture, it should be assumed that this nest will be active for the 2008 nesting season.

Significant Wildlife Habitats:

The Natural Resources Protection Act (NRPA), administered by the Maine Department of Environmental Protection (DEP), provides protection to certain natural resources including Significant Wildlife Habitats. Significant Wildlife Habitats are defined by the NRPA as:

> Habitat for state and federally listed endangered and threatened species.
>
> High and moderate value deer wintering areas (DWAs) and travel corridors.
>
> High and moderate value waterfowl and wading bird habitats (WWHs), including nesting and feeding areas.
>
> Shorebird nesting, feeding, and staging areas.

Seabird nesting islands.

There are no **Significant Wildlife Habitats** located within the designated project area (please refer to the enclosed map). There are two mapped Waterfowl and Wading Bird Habitats located in close proximity to the project area, WWH (UMO-6416) to the north and (UMO-6514) to the southeast.

There is also a documented record of Yellow Lampmussels present in Upper Hot Brook Lake. Yellow Lampmussels are currently listed as a threatened species in Maine.

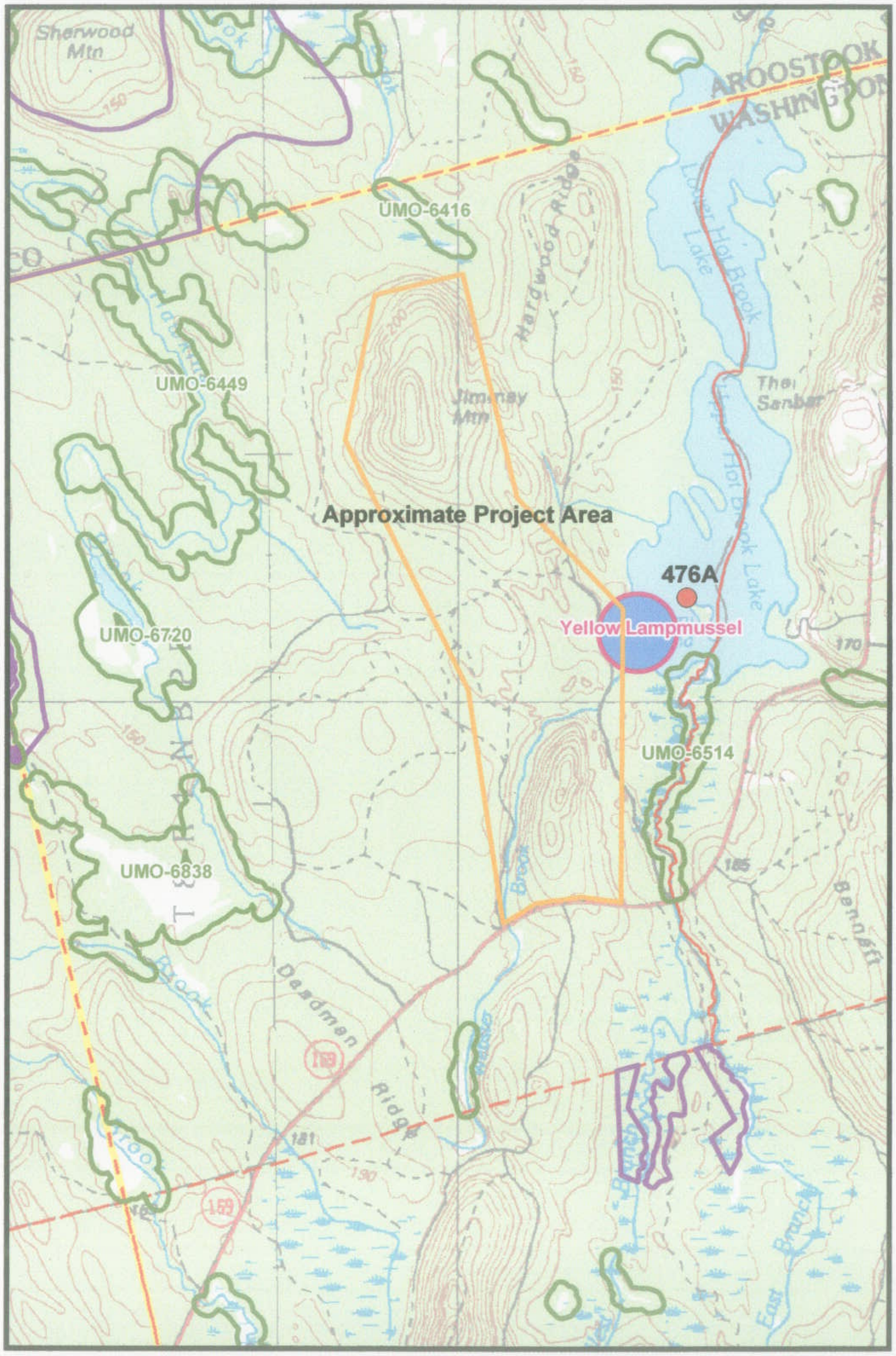
If you need any more information or clarification of the information provided please contact us at 732-4132 or at the address listed above. Thank you for your request for wildlife habitat information.

Sincerely,

Allen R. Starr

Allen R. Starr
Asst. Regional Wildlife Biologist
Phone: 207-732-4132
Fax: 207-732-4405
E-Mail: allen.starr@maine.gov

Search for Wildlife Observations & Habitat - Jimmey and Owl Mountains, T8 R4 NBPP, Maine



- Bald Eagle Nest Site
- Piping Plover / Least Tern Nesting, Feeding, & Brood-rearing Area
- Roseate Tern Nesting Area
- Deer Winter Area
- Inland Waterfowl / Wading Bird Habitat
- Tidal Waterfowl / Wading Bird Habitat
- Seabird Nesting Island
- Shorebird Area
- Biological Conservation Database Rare Species or Habitat Observation
- Township Boundary
- County

0 0.6 1.2 1.8 2.4 Miles

1:72,000

UTM Projection, Zone 19N, NAD83

N

73 Cobb Road
Enfield, ME 04493
Voice: (207) 732-4132
Fax: (207) 732-4405

May 21, 2008

Comments - Environmental Project Review Maine Department of Inland Fisheries and Wildlife	
Fisheries Division Comments – Region F	
Applicant's Name: Stantec Consulting	
Project #: 195600401	Regulatory Agency:
Project Type: Wind – Jimmey Mt. and Owl Mt. Project	Project Manager: Brook Barnes; Asst. Jessica Haider
Comments Due Date:	Date Comments Sent: June 6, 2008
Project Location	
Town: T8 R NBPP	County: Washington
Waterbody: Upper Hot Brook Lake, Webster Brook, several unnamed streams	
Fisheries Biologist: Richard Dill	

After review of the application and consideration of the proposal's probable effect on the environment, and on our agencies programs and responsibilities, we provide the following comments:

I. Project Description/Resource Affected:
Significant fish or wildlife resources in project area. Note: project type unspecified.

II. Comments/Recommended Considerations or Conditions:
Fisheries Considerations:
There are no lakes or ponds that fall within proposed project area. Upper Hot Brook Lake, which is managed for warm water fish species is in close proximity to the project area to the east. I do not anticipate any significant impacts to fish and/or fish habit in this lake related to this project.

Webster Stream falls in the project area as well as several unnamed streams (tributaries to Hot Brook Lake). In addition, Hot Brook Stream and several unnamed streams are outside but in close proximity to the project area. It is likely that all of these streams have populations of Eastern brook trout, along with other native resident species of fish. We request a site visit at any proposed stream crossings in the project area before project plans are finalized to comment on potential impacts to these streams.

Wildlife Considerations:
Will be responding separately.
[ ] Check if requesting copy of draft findings of fact and order.

STATE OF MAINE
DEPARTMENT OF
INLAND FISHERIES & WILDLIFE
284 STATE STREET
41 STATE HOUSE STATION
AUGUSTA, ME 04333-0041
TEL: 207-287-8000

JOHN ELIAS BALDACCI
GOVERNOR

ROLAND D. MARTIN
COMMISSIONER

July 10, 2008

Dana DeGraaf, Project Manager
Stantec Consulting
30 Park Drive
Topsham, Maine 04086

RE: Jimmey and Owl Mountain Wind Project (Project # 195600401) Site Visit

Dear Dana:

Following are my comments concerning our site visit on July 9, 2008 at the Jimmey and Owl Mountain Wind Project sites; specifically the Hot Brook Stream and the Webster Stream road crossings in township T8 R4 NBPP.

Hot Brook Stream: The Hot Brook Stream crossing is on Route 169 outside of the actual wind project area but is mentioned here because the entrance to the Eight Mile road (proposed project access road) is immediately south of the stream crossing. The entrance of the Eight Mile road may need to be modified to accommodate the transport of the partially constructed wind turbines to the project site; however what this will entail is still under consideration. We request the opportunity to review the final plan designs for the Eight Mile road entrance. DEP standards for erosion and sediment control (38 M.R.S.A. Section 420-C), and storm water run off (38 M.R.S.A. Section 420-D) should be adhered to during all phases of any road reconstruction.

Webster Stream: The Webster Stream crossing is approximately 1.5 miles up the Eight Mile Road north of Route 169. The stream passes under the road through a large metal (steel?) culvert, 6 feet (or slightly greater) in diameter. At the time of the site visit, roughly 50% of the culvert was blocked by a beaver dam, resulting in an impassable barrier for brook trout as well as a large impounded area upstream of the road. The surface water temperature of the impounded area was 22°C at 10:00am. The road was obviously in the process of being graded during our site visit. I noted false ditches along the road margins (both sides) not conducive for diverting water off the road into the woods. On my travel out from the site I passed by the grader operator, and it did appear that the false ditches were a result of an unfinished grading, and that the final grade was taking care of the problem. Any grading of the road in the future should be done in a manner that minimizes false ditching, especially in the area of the Webster Stream crossing.

According to the project plan, the Eight Mile road will not be widened in the area of the Webster Stream crossing; therefore I do not anticipate any issues with the current stream crossing as is that need to be addressed as part of the Jimmey and Owl Mountain Wind Project. Again, should any road reconstruction occur, then DEP standards for erosion and sediment control (38

M.R.S.A. Section 420-C), and storm water run off (38 M.R.S.A. Section 420-D) should be adhered to during all phases of the work.

Finally, as I understand it, the transmission line from the Jimmey Mountain wind turbines will travel along the Eight Mile Road and cross over Webster Stream. We recommend that minimal tree cutting occur in the immediate area of the stream to reduce the impacts to the canopy cover over the stream, thus reducing potential warming of stream water.

Please contact me at (207) 732-4131 or richard.dill@maine.gov with any questions.

Sincerely,

Richard Dill
Regional Fisheries Biologist

Jessica & Brook:
This letter is corrected & should replace the letter mailed two weeks ago.
Mark

Ur[illegible] the Interior

E

ces

9

In Reply Refer To: [illegible]
FWS/Region5/ES/M[illegible]

July 16, 2008

Jessica Haider
Stantec
30 Park Drive
Topsham, ME 04086

Dear Ms. Haider:

Thank you for your letters dated May 16, 2008 requesting information or recommendations from the U.S. Fish and Wildlife Service (Service) for three potential wind power sites in Aroostook County, Maine. One of the purposes of this letter is to advise you of applicable federal wildlife laws, including the Endangered Species Act (ESA), the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act. We do this so you can make an informed decision regarding site selection, project design, and the general requirements of these Acts. Preconstruction surveys may allow for the project to be designed in such a way to avoid or minimize the impacts to federally protected species.

Project Name/Location: land near Lincoln, Maine

Federally listed threatened and endangered species

Based on the information currently available to us, no federally threatened or endangered species under the jurisdiction of the Service are known to occur in the project area. Accordingly, no further action is required under Section 7 of the ESA, unless: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner that was not considered in this review; or (3) a new species is listed or critical habitat determined that may be affected by the identified action.

Other protected species and rare natural communities:

The state-threatened yellow-lampmussel occurs in Upper Hot Brook Lake (see attached map). Other rare mussels (particularly the tidewater mucket) could occur there also.

We recommend that you contact the Maine Department of Inland Fisheries and Wildlife for additional information on state-threatened and endangered wildlife and wildlife species of special concern. The Maine Endangered Species Act may protect some of the species in your project area.

Steve Timpano
Maine Department of Inland Fisheries and Wildlife
284 State Street
State House Station 41
Augusta, ME 04333-0041
Phone: 207 287-5258

We recommend that you contact the Maine Natural Areas Program for additional information on state-threatened and endangered plant species, plant species of special concern, and rare natural communities.

Lisa St. Hilaire
Maine Natural Areas Program
Department of Conservation
93 State House Station
Augusta, ME 04333
Phone: 207 287-8046

Bald eagles

Occasional, transient bald eagles (*Haliaeetus leucocephalus*) may occur in the area. Based on the information currently available to use, there is an active bald eagle nest on the west shore of Upper Hot Brook Lake. The bald eagle was removed from the federal threatened list on August 9, 2007 and is now protected from take under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. "Take" means to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. The term "disturb" under the Bald and Golden Eagle Protection Act was recently defined within a final rule published in the Federal Register on June 5, 2007 (72 Fed. Reg. 31332). "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

Further information on bald eagle delisting and their protection can be found at http://www.fws.gov/migratorybirds/baldeagle.htm.

Please consult with our new national bald eagle guidelines, which can found at http://www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf.

These Guidelines are voluntary and were prepared to help landowners, land managers and others meet the intent of the Eagle Act and avoid disturbing bald eagles. If you believe your project will result in taking or disturbing bald or golden eagles, please contact our office for further guidance. We encourage early and frequent consultations to avoid take of eagles.

Please contact the Maine Department of Inland Fisheries and Wildlife and Maine Natural Areas Program for an up to date account of bald eagle nests in these project areas.

Wind energy projects can affect bald eagles by direct take of resident or transient birds or by introducing new sources of disturbance (noise, significant changes to the landscape). The effect of wind power development on bald eagles has been poorly studied.

Bird and Bat Concerns

Wind energy is renewable, produces no emissions, and is considered to be generally environmentally friendly technology supported by the Department of the Interior. However, wind energy projects can adversely affect wildlife, especially birds and bats and their habitats. Operational wind turbines can adversely affect wildlife in a variety of ways. Foremost, the potential exists for bird and bat collision within the rotor-swept area of each turbine. The potential for collision with resident or migratory species of birds and bats is affected by many factors but location of the wind turbines appears to be one of the most important.
The potential harm makes careful evaluation of wind facilities essential. Each proposed development site is unique and requires individual evaluation. The Service's policy on wind energy development should be consulted as you develop this project. It can be found at http://www.fws.gov/habitatconservation/wind.pdf .

The potential collision hazard of proposed and alternative sites can be assessed by pre-construction studies of the spatial and temporal uses of the airspace by birds, bats and insects (insects are included because they are prey for birds and bats). Guidance on avoiding and minimizing wildlife impacts through proper evaluation of potential wind power sites, proper location and design of turbines and associated structures and pre- and post-construction monitoring can also be found at http://www.fws.gov/habitatconservation/wind.pdf .

Wetlands

Your project will likely require bridging, filling, or degrading certain wetlands or other waters of the United States under jurisdiction of section 404 of the Clean Water Act, which may require permits be acquired from the U.S. Army Corps of Engineers. In the event section 404 permits are necessary, the Service will make recommendations to avoid, minimize and mitigate impacts to fish and wildlife resources.

In summary, to ensure that the proposed areas for wind energy development near Lincoln, Maine are developed in the most environmentally sound manner, we recommend that you follow the guidance on avoiding and minimizing wildlife impacts as found on our website.

If you have any questions, please call Mark McCollough, endangered species biologist, at (207) 827-5938 ext.12, Wende Mahaney, federal projects and wetland biologist at (207) 827-5938, or Fred Seavey, federal energy projects biologist at (207) 827-5938.

Sincerely,

Mark McCollough for:

Lori H. Nordstrom
Project Leader
Maine Field Office

Haider, Jessica

From: Knapp, Dale
Sent: Monday, November 05, 2007 7:17 AM
To: Haider, Jessica
Subject: FW: BE476A - Upper Hot Brook Lake
Attachments: Upper Hot Brook Lake.jpg

Please file as agency correspondence for Stetson II.
Thanks

DFK

From: Todd, Charlie [mailto:Charlie.Todd@maine.gov]
Sent: Tuesday, October 30, 2007 12:56 PM
To: Knapp, Dale
Cc: Caron, Mark; Starr, Allen
Subject: BE476A - Upper Hot Brook Lake

Dale: This is an active nest (BE476A) on the NNW shore of Kittery Island in Upper Hot Brook Lake (T8 R4 NBPP, Washington Co.). It is newly eligible to be designated an Essential Habitat but we are trying to transition away from the regulatory era of eagle habitat management after federal delisting and eminent state delisting of bald eagles.

The attached graphic depicts the nest location, the outer 1/4- mile zone (= our traditional Essential Habitat designation for such nests) and an inner 1/8- mile zone. The latter is a 660-foot radius that corresponds to the sphere of concern for bald eagle nests related to new national management guidelines (see http://www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf) under the Bald Eagle – Golden Eagle Protection Act. In most consultations involving MDIFW, we would still advocate for considering impacts within 1320-feet (congruous with Essential Habitat rules, see background materials and the rule at http://www.maine.gov/ifw/wildlife/species/endangered_species/essential_habitat/index.htm) until state delisting is finalized … next year?

I'm out of the office for a week starting Oct. 31, so feel free to contact the regional wildlife biologists (Mark Caron / Allen Starr) in Enfield (732-4132) if you have a need for further input.

Thanks for your great work this past spring!

Charlie Todd

Wildlife Biologist

Maine Dept. of Inland Fisheries and Wildlife

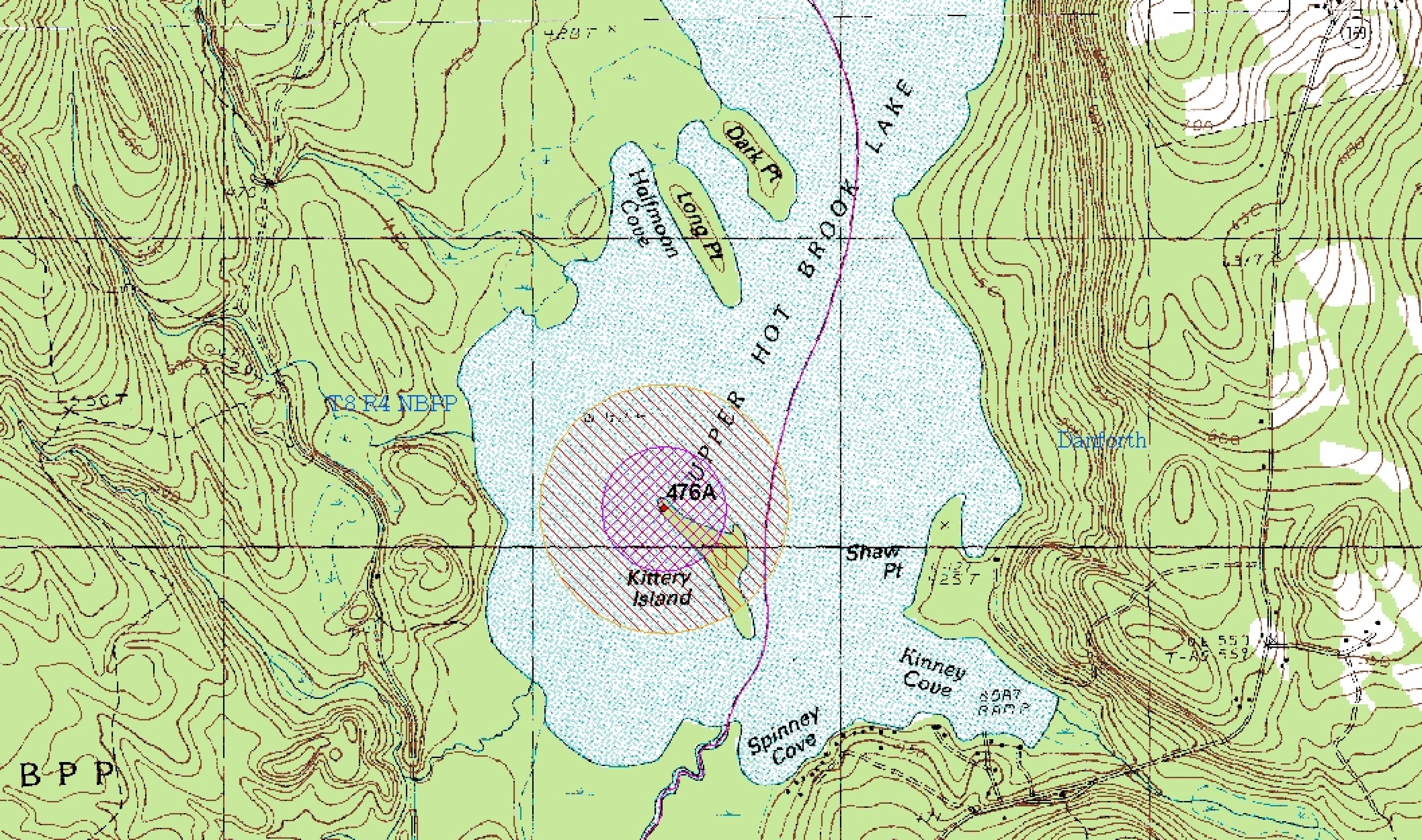
650 State Street

Bangor, ME 04401

tel. (207) 941-4468

FAX (207)941-4450

charlie.todd@maine.gov


UPPER HOT BROOK LAKE
Dark Pt
Long Pt
Halfmoon Cove
476A
Kittery Island
Shaw Pt
Kinney Cove
Spinney Cove
T8 R4 NBPP
Danforth
B P P

July 11, 2008

VIA EMAIL

Ryan Chaytors
Stetson Wind II, LLC
85 Wells Avenue, Suite 305
Newton, MA 02459

Subject: Preliminary Aquatic Habitat Assessment for Stetson II Wind Farm, Upper Hot Brook Lake, Maine

Dear Mr. Chaytors:

On July 9, 2008, Stantec Consulting (Stantec) conducted a preliminary aquatic habitat assessment for Upper Hot Brook Lake between Webster Brook and Hot Brook. The purpose of the aquatic habitat assessment were to: 1) meet with a biologist from the Maine Department of Inland Fisheries and Wildlife (MDIFW) to discuss the potential impacts of road development on crossings at Hot Brook and Webster Brook; 2) determine the presence and/or absence of yellow lampmussel (*Lampsilis cariosa*) in Upper Hot Brook Lake in the vicinity of the mouth of Webster Brook; and 3) identify potential white sucker (*Catostomus commersoni)* spawning habitat along the southwestern shore of Upper Hot Brook Lake between Webster Brook and Hot Brook that may be targeted by foraging bald eagles (Haliaeetus leucocephalus).

Site Description

Upper Hot Brook Lake shoreline aquatic habitat conditions in the surveyed areas between Webster and Hot brook outlets consist of shallow water depths (0.5 – 3.0 meters [m]) and a substrate dominated by a silt and sand mixture with submerged woody debris. Sparse aquatic vegetation is also present.

Upstream from the mouth of Webster Brook, the aquatic habitat of is mostly dominated by deep, fine sediment with coarse woody debris (e.g. downed trees and large limbs). The brook meanders through shrub habitat and has several inputs from small seasonal tributaries, which may account for some sediment input. Large 1 m deep sun-exposed pools are common. There are also many shallow, sun-exposed expanses which may increase water temperatures and potentially exclude some coldwater species (i.e. brook trout) from the lower reaches. Low flows and standing water were observed. Water was clear, however no fish were visually observed. Habitat conditions of Webster Brook 100 m immediately downstream from the Jimmey Road culvert crossing are markedly different from the furthest downstream reaches. The stream substrate is this area is dominated by cobble and larger rocks covered in silt. Water depth is shallow (≥ 0.5 m) and very shaded by approximately 85% canopy cover. High water stream channel width ranged from 1 – 3 m. Several riffle/pool complexes were observed. Presently, slow water currents exist as a result from an upstream beaver impoundment reducing flows through the culvert. This upstream impoundment consisted of warm, turbid water with submerged woody debris.

Hot Brook habitat within the vicinity of the Route 169 crossing consists of gravel and cobble substrate with approximately 75% canopy cover. Shallow water (> 0.5 m) with moderate flows were observed. Channel widths ranged from 2 – 7 m. Sedimentation in this section was minimal.

MDIFW Site Visit

Stantec met with Richard Dill (MDIFW) to discuss the project area, development plans, and department concerns over control measures necessary for stream crossings during the construction phase for the Stetson II wind farm.

At the intersection of Route 169 and Hot Brook, MDIFW did not note any concerns with the area and the proposed road widening. Sediment control barriers will need to be installed prior to construction activity. MDIFW noted that the snowmobile bridge had loose fill around it that could potentially drain immediately into Hot Brook during a rain event. This area would also require sediment barriers. MDIFW requested that development plans for the entrance expansion to Jimmey road be provided to MDIFW for review prior to construction.

At the crossing of Jimmey Road and Webster Brook, no concerns were noted other than sediment controls are needed in the area. Also noted was that the graded banks on each side of the road need to be flattened out so that rainwater may drain off the road and not be funneled to the crossing and into Webster Brook. There was upstream beaver activity at the culvert entrance that has created a significant upstream impoundment. The beaver activity and damming of the culvert are not the responsibility of the developer, however MDIFW did suggest consideration of a beaver deterrent to prevent potential future road flooding. Given installation of sediment control measures, stream conditions and brook trout habitat will not likely be affected by construction activities. MDIFW will provide comments in the form of an addendum to the original comment sheet regarding the site visit and recommendations.

Aquatic Survey and Habitat Assessment

<u>Mussel Survey</u>

Wadeable sections of water less than 1.5 m deep were surveyed for the presence and/or absence of yellow lampmussel. The survey was conducted my meandering sections of water that had suitable habitat and making visual observations of mussel presence. Polarized glasses were used for visual observations for live mussels. When live mussels could not be found, shells found on shore or in shallow water were collected for later identification.

The yellow lampmussel is listed as a threatened species in Maine. It is widely distributed in the Penobscot River Watershed and is known to occur in Upper Hot Brook Lake (Nedeau et al. 2000). The yellow lampmussel is typically found in medium to large rivers, however in Maine it is also found in ponds, lakes, and impounded rivers. Suitable habitat varies from silt, sand, gravel, and cobble (Nedeau et al. 2000).

Despite existing appropriate habitat conditions for yellow lampmussel and the known occurrence of the species in Upper Hot Brook Lake, yellow lampmussels were not identified during this preliminary survey. Eastern elliptio (*Elliptio complanata*) shells were the only indication of mussel presence in the areas surveyed. No live specimens were observed. The Eastern elliptio is the most common species in Maine, found in all types of ponds and lakes (Nedeau et al. 2000).

White Sucker Habitat Assessment

Preliminary white sucker spawning habitat assessments were made through visual observation only. Fish surveys, water quality measurements, or stream surveys were not conducted during this site visit.

The white sucker is the second most common fish species in Maine lakes; it is more common in larger systems at lower elevations (PEARL, 2008). Preferred habitat consists of shallow lakes or shallow bays in deeper lakes. White suckers are highly adaptable and have no preference of substrate type. Spawning occurs in the spring between early April and June when water temperatures reach 50 degrees Fahrenheit. Spawning typically occurs in rocky shallows of rivers with moderate currents. Lake residents will often make large spawning runs far up rivers. Eggs incubate in gravel substrates for a period of two weeks before hatching (Langdon et al. 2006).

White suckers occur in Upper Hot Brook Lake and MDIFW electrofishing data indicates white sucker presence in Webster Brook (PEARL 2008). No State data exists for Hot Brook however (PEARL, 2008). Whereas current observed habitat conditions in the lake area surveyed may support white sucker, suitable spawning habitat was not observed around the lake's shores in the area surveyed. Suitable spawning habitat was also not observed within Webster Brook upstream from the mouth of the brook to within 100 m of the Jimmey Road crossing. Potential suitable spawning habitat consisting of gravel and cobble substrates with flowing water was observed in upstream reaches of Webster and Hot brooks in the vicinity of the Jimmey Road and Route 169 crossings, respectively. Extensive sections of suitable spawning habitat were not observed.

This survey did not coincide with the timing of white sucker spring spawning and the information presented is therefore based on preliminary observations. Based on observed site conditions and a review of relative literature and state data, it is not anticipated that large aggregations of spawning white suckers occur at the mouths of Webster and Hot Brooks due to unsuitable spawning habitat. Therefore, it is not anticipated that this area is targeted by foraging bald eagles. Small numbers of suckers or individuals may utilize the existing upstream sections of suitable spawning habitat. These areas are small however, and substantial canopy cover is present. Eagle predation in these areas is therefore also not anticipated.

Please contact us if you have any questions regarding the information presented above.

Best regards,
Stantec Consulting

Dana DeGraaf

Dana DeGraaf
Project Manager/Fisheries Biologist

PN 195600401

Stantec

REFERENCES

Langdon, R. W., M.T. Ferguson, and K.M. Cox. 2006. Fishes of Vermont. Vermont Department of Fish and Wildlife, Waterbury, VT. 320 p.

Nedeau, E.J., M.A. McCollough, and B.I. Swartz. 2000. The Freshwater Mussels of Maine. Maine Department of Inland Fisheries and Wildlife, Augusta, Maine. 120 p.

PEARL. 2008. Lakes Guide. University of Maine, Orono, Maine.

Stantec

Fall 2006 Survey of Bird and Bat Migration at the Proposed Stetson Wind Power Project in Washington County, Maine

Prepared For:

Evergreen Wind V
102 Tuttle Road
Cumberland, ME 04021

Prepared By:

Woodlot Alternatives, Inc.
Topsham, ME 04086

February 2007

Executive Summary

Late-summer and fall surveys of bird and bat migration activities were initiated by Evergreen Wind Power V, LLC at the proposed Stetson Mountain Wind Project, east of Lincoln, Maine, in Penobscot and Washington Counties. The surveys included daytime surveys of raptor migration activity, nocturnal radar surveys, analysis of weather radar data, morning surveys of bird activity during the migration season, and bat detector surveys.

Raptor Surveys

Raptor surveys were conducted on seven days between September 14 and October 26, 2006. A total of 86 raptors of 11 species were observed during the surveys. Broad-winged hawks (*Buteo platypterus*) were the most abundant species observed, followed by red-tailed hawks (*Buteo jamaicensis*), turkey vultures (*Cathartes aura*), and osprey (*Pandion haliaetus*). The observation rate of hawks was 2.05 birds per observation hour, which was low compared to the nearest reported fall hawk watch site (12.36 birds per observation hour at Cadillac Mountain, Maine), and extremely low compared to regionally significant sites further to the southwest.

Marine Radar Surveys

Radar surveys were conducted on 12 nights between September 2 and October 6, 2006, from the ridge top of Stetson Mountain. Surveys were conducted using X-band radar, sampling during the first six hours of the night. Each hour of sampling included the recording of radar video files during horizontal and vertical operation. The radar site provided excellent visibility of the surrounding airspace, and targets flying below the ridge top were visible to the radar in both horizontal and vertical operation.

The mean seasonal passage rate at Stetson Mountain was 476 ± 86 targets/kilometer/hour (t/km/hr), with a range in nightly passage rates of 131 ± 54 t/km/hr (September 3) to 1,192 ± 72 t/km/hr (October 5). The seasonal flight direction over the mountain was 227° ± 56°, at an approximately 45° angle to the alignment of the ridgeline. The mean flight height of night migrants over the radar station was 378 ± 32 meters (m) (1,240’ ± 105’) and the nightly mean flight height ranged from 219 ± 13 m (718’ ± 43’) to 506 ± 32 m (1,660’ ± 105’). The average flight height of migrants on all nights sampled was well above the proposed turbine height of 125 m (410’). Over the course of the season, 13 percent of migrants were documented flying below the mean turbine height.

The radar surveys conducted in the project area fall within the range of other surveys conducted in the Northeast that used the same equipment, sampling methods, and data analysis procedures. The overall high nighttime flight altitude and low percentage of migrants flying below turbine height suggests that a very small proportion of night migrants have the potential to encounter wind turbines on Stetson Mountain.

NEXRAD Weather Radar Analysis

NEXRAD weather radar data from the Caribou, Maine station were collected for 44 nights from September 1 to October 15, 2006. Migration activity for each night was classified as 1) no activity, 2) light activity, and 3) heavy activity. Analysis of the NEXRAD data indicated that approximately 70 percent of the migration season included nights with light migration and 27 percent included heavy migration. Of the nights sampled with on-site radar, nights of light and heavy migration were generally sampled in proportion to their occurrence within the migration season (67 % on nights with light migration and 33% on nights with heavy migration). This similarity between sample night allocation and

migration activity indicates that the seasonal mean passage rate documented at the project is likely to be representative of the true seasonal mean activity level in the area.

Morning Bird Activity Surveys

Morning stopover transect surveys were conducted on the mornings following nights of radar data collection. All birds seen or heard each morning along up to four 0.8-km (2,640’) transects were recorded. During the survey periods, a total of 632 individuals of 40 species were observed. No real trends between morning bird abundance and migration activity documented with radar were observed. In general, the most abundant birds included yellow-rumped warblers (*Dendroica coronata*), black-capped chickadees (*Poecile atricapillus*), common yellowthroats (*Geothlypis trichas*), dark-eyed juncos (*Junco hyemalis*), and American robins (*Turdus migratorius*). There were no obvious trends in the timing of abundance for most species groups, as several pulses in increased abundance were observed among species and distributed across the migration period. The only exception to this was the vireos, which were most abundant before September 13 and were hardly documented after then.

Bat Detector Surveys

Bat detector surveys included documentation of late-summer and fall bat activity through passive (i.e., detectors deployed and left in place for long durations) and active (i.e., hand-held detectors) surveys. Passive surveys included acoustic detectors deployed for a total of 361 detector-nights (4,332 hours of operation) of effort from June 28 to October 16, 2006. Four detectors were deployed in two meteorological measurement towers on the Stetson Mountain ridgeline. A total of 937 bat call sequences were recorded during the passive sampling. The mean detection rate of all detectors was 2.6 sequences per detector-night (or 0.2 call sequences/hour). This detection rate was generally lower than other sites studied similarly, especially some of the existing facilities at which unexpectedly high bat fatality rates have been documented.

Active surveys were conducted during the first four hours of four separate nights, totaling 16 survey hours. Active sampling was conducted largely along roads surrounding the base of Stetson Mountain. The active surveys documented 182 call sequences, with an overall detection rate of 11.4 detections/hour. Comparisons of the two surveys indicate that, as expected, bat activity was much more common at lower elevations where productive bat foraging habitats occur.

Bat call sequences were identified to the lowest possible taxonomic level. These were then grouped into four guilds based on similarity in call characteristics between some species and uncertainty in the ability of the detectors to adequately provide information for this differentiation. The majority of calls (34%) were identified as within the big brown guild, which includes the big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*). Call sequences of the Genus Myotis accounted for 24 percent of all recorded sequences, and less than 1 percent were that of either the eastern red bat (*Lasiurus borealis*) or eastern pipistrelle (*Pipistrellus subflavus*). The remaining call sequences were identified as unknown (44%) due to poor quality, a lack of distinguishing characteristics, or too few call pulses within the recorded call sequence. A total of 36 percent of calls recorded during active surveys were identified as *Myotis* spp., 27 percent were red bat/eastern pipistrelle, and 4 percent were from the big brown guild. The remaining call sequences recorded during the active surveys were identified as unknown (33%). In general, the species composition and relative abundance of call sequences recorded during passive and active sampling was what would be expected, similar to other studies conducted in the region, and include variation attributable to the habitats sampled and method of sampling.

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1.0 Introduction

1.1 Project Context

Evergreen Wind Power V, LLC (Evergreen) has proposed the construction of a 57 megawatt (MW) wind project, located in Penobscot County and Washington Counties, Maine. The project, called the Stetson Wind Project, would include the construction of 38 General Electric (GE) 1.5 MW wind turbines, located along the ridge top of Stetson Mountain (Figures 1-1 and 1-2). The GE turbines have a maximum height of approximately 120 meters (m) (394').

In advance of permitting activities for the project, Evergreen initiated a series of ecological field surveys to characterize bird and bat use of the project area. The surveys will provide data to help assess the potential for the proposed project to impact birds and bats. The scope of the surveys was based on a combination of standard methods that are developing within the wind power industry for pre-construction surveys and guidelines outlined by the Maine Wind Power Advisory Group, and are consistent with several other studies conducted recently in the state and the Northeast.

1.2 Project Area Description

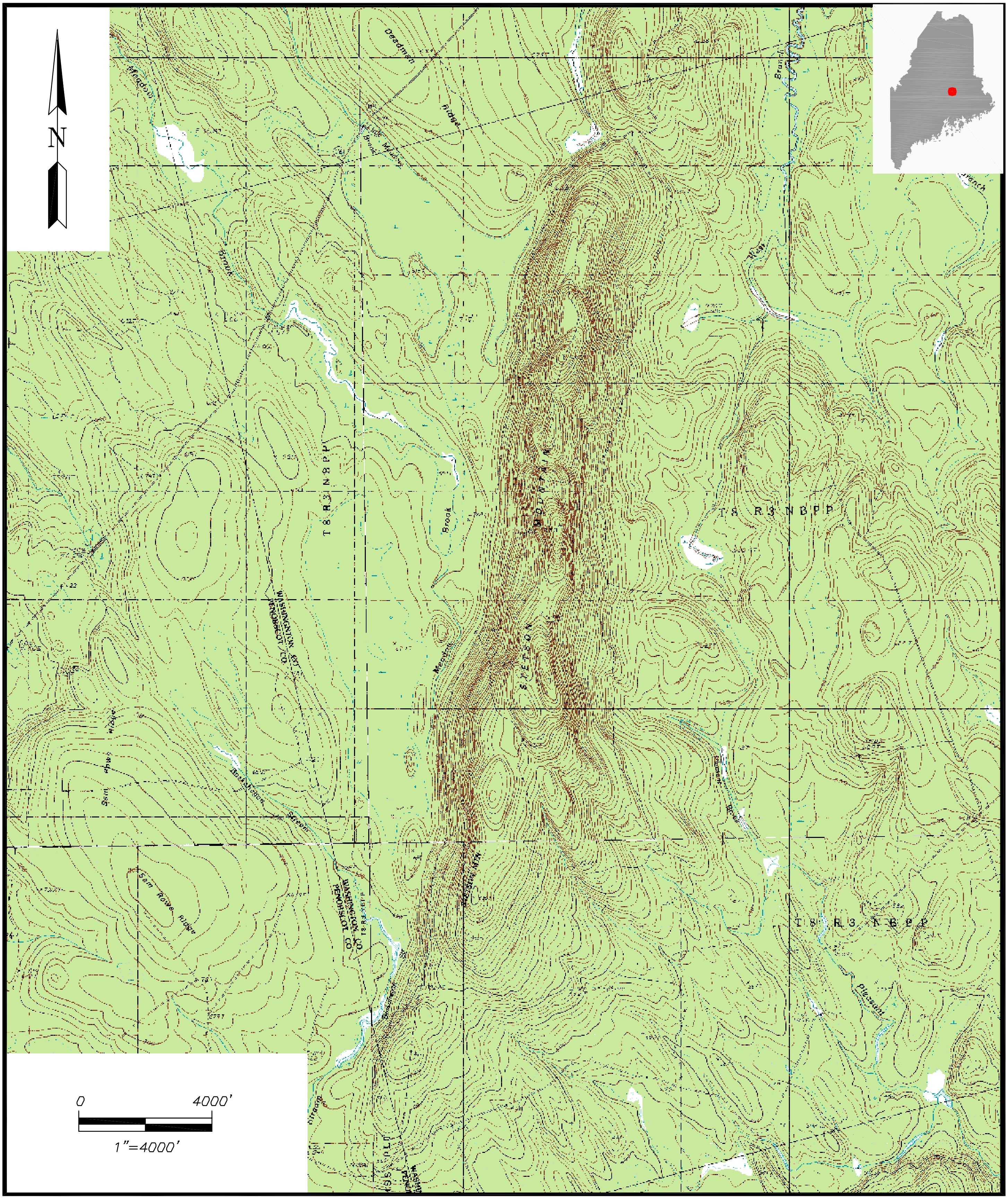
The project area for the surveys included Stetson Mountain in T8 R3 NBPP Township, Maine (Figure 1-1). The project area occurs in the Maine-New Brunswick Lowlands Biophysical Region in the east region of the State, bordering New Brunswick, Canada. The Maine-New Brunswick Lowlands Biophysical Region ranges in elevation from about 122 m (400') to 182 m (600'), with the exception of a few mountains over 182 m (600') above sea level, including Stetson Mountain at 330 m (1,085'). The region includes some of the most extensive peatlands, marshes, and swamps in Maine and is the southern limit of the ribbed fen and other northern wetland systems. The climate is relatively uniform throughout the region, with the highest average temperature in July of 79 ºFahrenheit (F) and an average low temperature in January of 3ºF. The mean annual precipitation is approximately 117 centimeters (cm) (46").

Stetson Mountain consists of a nearly 9.7-kilometer (6 mile) long ridgeline oriented largely north to south. The ridge itself consists predominantly of well to excessively well-drained soils. Timber harvesting operations are common and areas surveyed during the fall 2006 period exhibited various signs of recent forest harvesting. Northern Hardwoods and mixed conifers are the dominant forests in the region (McMahon 1990) and the forest cover on Stetson Mountain is largely mixed northern hardwoods.

1.3 Survey Overview

Woodlot Alternatives, Inc. (Woodlot) conducted field investigations for bird and bat migration during the fall of 2006. The overall goals of the investigations were to:

- document the occurrence and flight patterns of diurnally migrating raptors (hawks, falcons, harriers, and eagles) in the project area, including number and species, general flight direction, and approximate flight altitude;
- document the overall passage rates for nocturnal migration in the vicinity of the project area, including the number of migrants, their flight direction, their flight altitude, and their utilization of stopover habitat; and
- document the presence of bats in the area, including the rate of occurrence and, when possible, species present during the summer and the fall migration period.



PREPARED BY:

WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

106154–FD01–Loc.dwg

SHEET TITLE:

Stetson – Project Location Map

PROJECT:

Stetson Wind Project

DATE: December 2006

SCALE: 1"=4000'

PROJ. NO.: 106154

FIGURE:

1-1

Surveys were conducted from June 28 to October 26, 2006, although effort for the different aspects of the work varied within this time period. A total of 7 days of raptor survey were collected, 12 nights of radar survey data were recorded, 12 mornings of morning bird migration data were collected, and four bat detectors were deployed over a 110-night period.

This report is divided into primary sections that discuss the methods and results for each field survey. Each section includes summary graphs of the survey results. In addition, supporting data tables are provided in a separate appendix for each chapter.

2.0 Diurnal Raptor Surveys

2.1 Introduction

The project area is located in the eastern portion of the Eastern Continental Hawk Flyway. Geography and topography are major factors in shaping migration dynamics in this flyway. The northeast to southwest orientation of the northern North American coast and the inland mountain ranges influences hawks migrating in eastern Canada and New England to fly southwestward to their wintering grounds in fall and northeastward in the spring (Kerlinger 1989, Kellogg 2004). The juxtaposition of the Appalachian mountain ranges and large bodies of water further influence raptor migration. Away from features such as the Atlantic shoreline, the Kitatinny and Appalachian ridges, with their updrafts, provide "leading lines" for hawks to follow and large numbers of raptors use those areas (Kellogg 2004).

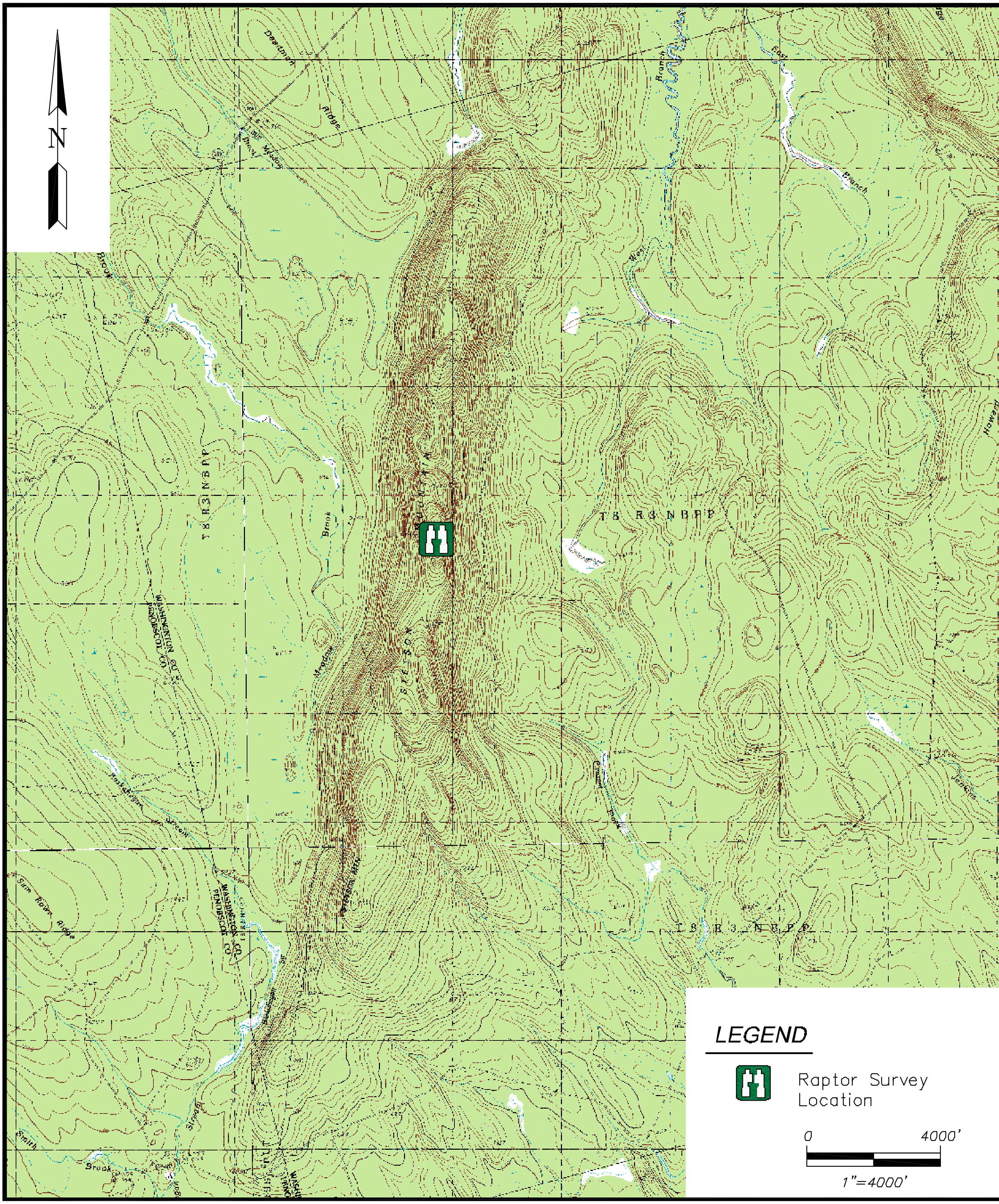
Because Maine lies at the northern end of many species’ breeding ranges, there are fewer birds passing through Maine compared to other more southern locations in the North American hawk flyways. Raptor migration through Maine is not as concentrated as in other flyways because long, continuous ridges found to be important to hawk migration in other regions of the Eastern Continental Hawk Flyway are not present. Rather, fall-migrating hawks following the short, fractured ridges that are more common to Maine could be expected to travel from ridge to ridge or travel in broad front types of movements between localized concentration points. In this way, raptors are able to use the northern ends of ridges or mountains to gain altitude via thermal development or ridge-generated updrafts before gliding as far as possible to another suitable lift site (Kerlinger 1989).

Woodlot conducted a raptor migration survey to determine if significant raptor migration occurred in the vicinity of the proposed project location. The survey was conducted on seven days during the months of September and October. The goal of the survey was to document the occurrence of raptors in the vicinity of the project area, including the number and species, approximate flight height, general direction, and flight path, as well as other notable flight behavior.

2.2 Methods

Field Surveys

Raptor surveys were conducted from the meteorological measurement tower (met tower) clearing atop the summit of Stetson Mountain (Figure 2-1). The view from this location offered clear views over the tree tops to the north, west, and east. As the leaves fell from the trees, the ability to view the surrounding lower elevation areas improved. On the clearest days, Mount Katahdin could be seen to the northwest and Baskahegan Lake could be observed to the east.



PREPARED BY:

WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

106154–F201–RaptorSurv.dwg

SHEET TITLE:

Stetson – Raptor Survey Location Map

PROJECT:

Stetson Wind Project
Lincoln, Maine

DATE: December 2006
SCALE: 1"=4000'
PROJ. NO.: 106154
FIGURE:
2-1

Raptor surveys occurred on seven days from September 12 to October 26, 2006, and were generally conducted from 9:00 am to 3:00 pm in order to include the time of day when the strongest thermal lift is produced and the majority of raptor migration activity typically occurs. Days with favorable flight conditions produced by low-pressure systems bringing northerly winds and days following the passage of a weather front were targeted as survey days.

Surveys were based on methods developed by the Hawk Migration Association of North America (HMANA). Observers scanned the sky and surrounding landscape for raptors flying into the survey areas. Observations were recorded onto HMANA data sheets, which summarize the data by hour. Detailed notes on each observation, including location and flight path, flight height, and activity of the bird, were recorded. Height of flight was categorized as less than or greater than 125 m (410’) above ground, which is the approximate height of the larger of the two types of wind turbines that could be used at the site (the Clipper Liberty turbine). Nearby objects with known heights, such as the met towers and surrounding trees, were used to gauge flight height. Information regarding the raptors’ behavior and whether a raptor was observed in the same locations throughout the study period was used to differentiate between migrants and resident birds. When possible, general flight paths and flight heights of individuals observed were plotted on topographic maps of the project area.

Hourly weather observations, including wind speed, direction from which the wind was coming, temperature, percent cloud cover, and precipitation, were recorded on HMANA data sheets. Birds that flew too rapidly or were too far to accurately identify were recorded as unidentified to their genus or, if the identification of genus was not possible, unidentified raptor.

Data Analysis

Field observations were summarized by species for each survey day and for the whole survey period. This included a tally of the total number of individuals observed for each species, the observation rate (birds/hour), and an estimate of how many of those observations were suspected to be resident birds. The total number of birds, by species and by hour, was also calculated, as was the species composition of birds observed flying below and above 125 m (410’). Finally, the mapped flight locations of individuals were reviewed to identify any overall patterns for migrating raptors.

Observations from the project area were compared to data from local or regional HMANA hawk watch sites available on the HMANA web site or from HMANA yearly reports. Sites used included Cadillac Mountain in Maine, Pack Monadnock Raptor Observatory in New Hampshire, Putney Mountain in Vermont, Barre Falls and Blueberry Hill in Massachusetts, Franklin Mountain in New York, Waggoner’s Gap and Hawk Mountain in Pennsylvania, and Kittatinny Mountain in New Jersey. Only hawk watch counts from September and October were used in this report.

2.3 Results

Surveys were conducted on mostly clear to partly cloudy days with no precipitation, allowing for optimal visibility. During the surveys in September, the temperatures ranged from 8 ºCelsius (C) to 21 ºC. The temperatures in October ranged from -1 ºC to 18 ºC. The development of thermals on some of these days was evident as temperatures increased and cumulus clouds developed. Although days with predominantly north winds were targeted, winds were quite variable throughout the survey period. Two of the nine days had a northerly wind component. The remainder of survey days experienced predominantly south, east, or west winds [0 – 25 km/hour (km/hr)] or a mix of everything. Some survey effort did occur on days when the weather and wind were suboptimal for raptor migration due to inaccurate weather forecasting or relatively weak cold fronts. One day in October was highlighted by passing rain, sleet, and snow showers.

Surveys were conducted for a total of 42 hours during the 7 survey days. A total of 86 raptors, representing 11 species, were observed during that time, yielding an overall observation rate of 2.05 birds/hour (Appendix A Table 1; Figure 2-2). Throughout the 7 survey days, the range of passage rates varied from 0.00 to 6.83 birds/hour. Daily count totals ranged from 0 to 41 raptors. The highest count of 41 raptors occurred on September 21 when winds were moderate to heavy (20 – 38 km/hr) and predominantly west to west-northwest. Temperatures during this survey ranged from 8 ºC to 11 ºC.

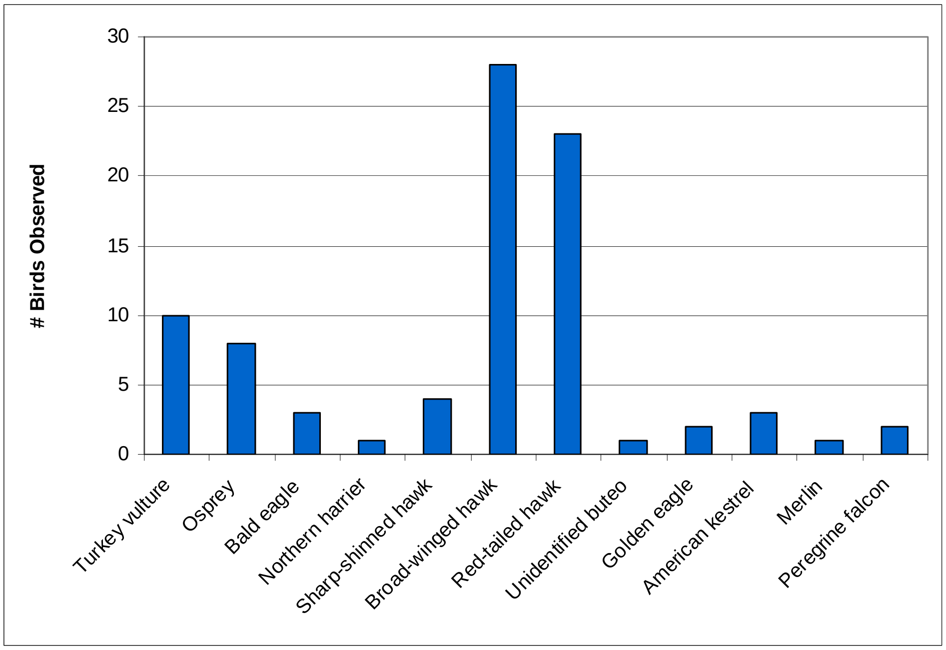


Figure 2-2. Species composition of raptors observed during fall 2006 surveys at Stetson Mountain.

Broad-winged hawks (*Buteo platypterus*) were the most commonly observed species, accounting for approximately 33 percent of the total observations (*N* = 28). Red-tailed hawks (*Buteo jamaicensis*) were the next most abundant species and comprised nearly 27 percent of the observations (*N* = 23), followed by turkey vultures (*Cathartes aura)* comprising almost 12 percent of observations (*N* = 10)[1] and osprey (*Pandion haliaetus)* comprising 10 percent (*N* = 8). There were two golden eagles (*Aquila chrysaetos*) and two peregrine falcons (*Falco peregrinus*) observed. Both of these species are listed as endangered in Maine. Three bald eagles (*Haliaeetus leucocephalus*), listed as state and federally threatened, were also observed.

Seven percent of all observations reported were of birds believed to be resident to the project area. Included was a pair of red-tailed hawks, a pair of bald eagles, and a pair of sharp-shinned hawks (*Accipiter striatus*). Most residents were repeatedly observed foraging and perching at consistent locations throughout the survey period. In these cases, a particular individual may have been observed flying back and forth across a section of hillside or perching in an area repeatedly during the same day or on more than one survey day. However, for the most part, raptors that were observed were believed to be actively migrating.

[1] While turkey vultures are not true raptors, they are diurnal migrants that exhibit flight characteristics similar to hawks and other raptors and are typically included during hawk watch surveys.

Flight heights were categorized as below or above 125 m (410'), the approximate height of the larger of the two types of turbines that could be used at the site. Overall, approximately 63 percent of the raptors observed were flying less than 125 m above the ground. Differences in flight altitudes between species were observed (Figure 2-3; Appendix A Table 2). Most of the falcon observations were flying below this height. Sharp-shinned hawks were also consistently flying low. Most red-tailed hawks and all turkey vultures also flew below 125 m. Both golden eagles and bald eagles flew above and below 125 m for an equal amount of time. Broad-winged hawks and osprey were the only two species that flew predominantly above turbine height.

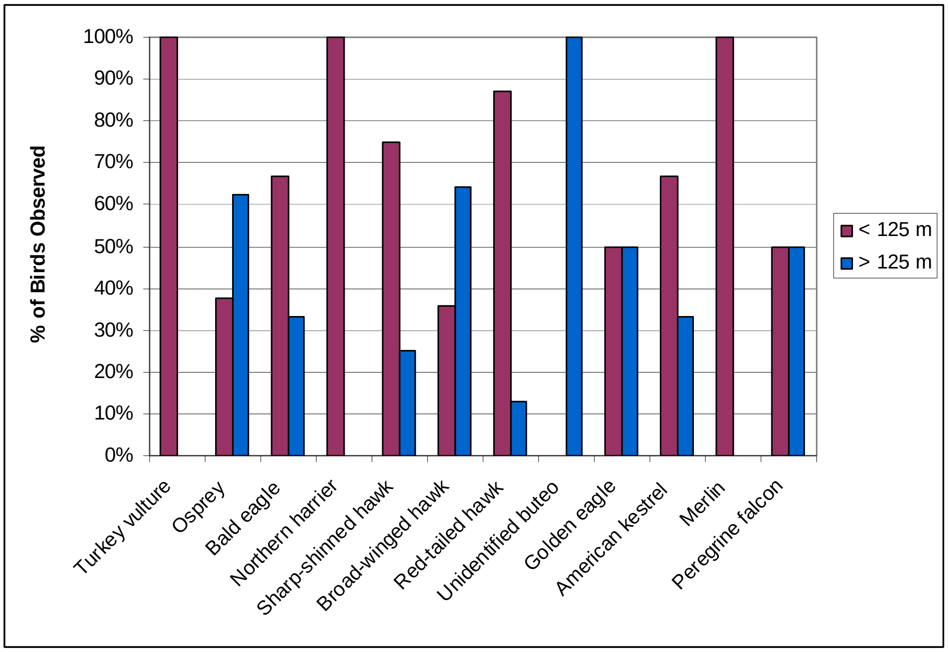


Figure 2-3. Raptor flight height distribution at Stetson Mountain during fall 2006 surveys.

The flight habits of raptors in the project area were variable, though the locations of those observations often occurred in similar locations. Most of the raptors observed were using the side slopes of Stetson Mountain to gain updrafts and continue southward. Some birds, particularly red-tailed hawks flew in different directions over the observation site and were typically observed kiting (using updrafts to hover in-place) and hunting. Individuals believed to be undertaking long-distance migratory movements (particularly broad-winged hawks) had much more direct flight paths past or over the project area.

Migrating raptors were consistently observed flying to the west and east of the survey site on Stetson Mountain. Flight direction was generally to the south. However, birds were frequently observed flying southwestward crossing the ridge near the summit and gaining updrafts from the side slopes. The largest concentrations of raptors (a kettle of broad-winged hawks composed of 5 individuals) were observed flying directly down the spine of Stetson Mountain ridge at 500 m (1,640') height.

2.4 Discussion

A total of 86 individuals from 11 different species of raptors were observed during 7 days and 49 hours of observation. Broad-winged hawks, accounting for 33 percent of all raptor observations, were the most commonly observed species on site. This species is considered common in the Northeast and often migrates in large numbers (Wheeler 2003). Hawk watch sites seasonally report high numbers of broad-winged hawks, as they are regionally abundant and their movements are concentrated over a short span of time. Red-tailed hawks accounted for 27 percent of the observations and are also considered one of the most common raptor species and regular breeders in the East (Wheeler 2003). Three state/federally threatened bald eagles, two state endangered golden eagles, and two state endangered peregrine falcons were observed during the survey period. At least one pair of bald eagles is nesting in the vicinity of the project area (near or on Baskahegan Lake), approximately 8 km (5miles) east. Some of the bald eagles observed during the survey could have been those local birds.

Observation rates during fall 2006 (from September 1 to October 31) at other sites in the region ranged from approximately 9.5 to 37.38 birds/hour (Appendix A Table 3). The two most active sites were Hawk Mountain, with a total of 21,920 raptors counted during 598.5 survey hours (36.6 birds/hour) and Waggoner's Gap, with a total of 20,539 raptors counted during 551 survey hours (37.3 birds/hour). The closest hawk watch to the study area was Cadillac Mountain in Acadia National Park. Cadillac Mountain observed a total of 2,431 raptors during 197 hours of observation and a passage rate of 12.4 birds/hour. The proposed Stetson Wind Project had a total of 86 raptors counted during 42 survey hours, yielding a passage rate of 2.05 birds/hour. This passage rate was one of the lowest reported in the northeast.

There are several reasons for the observed differences in passage rates observed among hawk watch sites in fall 2006, although location is probably the most significant. Geographic location can affect the magnitude of raptor migration at a particular site. Other sites that are located at prominent topographic points such as Waggoner's Gap and Hawk Mountain, Pennsylvania, are along ridgelines known to receive concentrated use; therefore, organized hawk count locations target those areas. The low passage rate documented at the proposed Stetson Wind Project is likely due to a lack of large landscape features that could concentrate raptor migration activity at the project area. Rather, the surrounding landscape consists of a series of widely dispersed interrupted ridges and individual peaks that migrating raptors use as stepping stones as they pass through the area. While Stetson Mountain may be one of the longest, continuous ridges in the area, it is not very prominent, extending less than 200 m (656') above the surrounding landscape. Consequently, it does not appear to represent a significant regional feature that attracts migrant raptors.

The flight heights of raptors in the project area indicate that raptor migration does occur below the maximum blade tip height of the proposed turbines. Differences between species were observed and could be due to typical flight height preferences, species behavior, or on limitations in the distance that different species are visible. Broad-winged hawks were observed in thermals of up to 5 individuals migrating directly over the site at an elevation above 125 m (410'). Despite this, the greater occurrence of migrants at low altitudes increases the potential for migrating raptors to encounter the proposed wind power development. Resident birds flew at lower heights than migrants, as they are typically undertaking small-scale movements while foraging. In fact, several birds believed to be resident to the survey sites were observed flying exclusively below the blade-swept area of the proposed turbines.

Different species of raptors may have greater or lesser risk of collision with wind turbines, dependent upon various factors. Some species of raptors [i.e., golden eagles, rough-legged hawk (*Buteo lagopus*), northern goshawk (*Accipiter gentilis*), red-shouldered hawk (*Buteo lineatus*), and red-tailed hawk] migrate during time periods when thermal production is generally low and must rely on topographical features such as side slopes and narrow ridge-tops to produce updrafts; consequently, they do not attain excessively high altitudes (Brandes 2005). Species of raptor that use thermals, such as broad-winged hawks, often rise with thermals to very high altitudes and may have a lower risk of encountering turbines during migration. Coincidently, on-site observations documented those former species at lower heights than the latter species.

While survey effort can play a role in the observation rate and total number of individuals documented at a site, the overall low numbers of raptors documented during the fall 2006 survey may indicate a low risk of raptor collision with wind turbines. It is also still largely unknown what avoidance behavior migrating raptors exhibit when flying near wind turbines. Unpublished observations of hawk migration activity at an existing facility in New England (Woodlot, unpublished data) indicate that the passage of small raptors, such as sharp-shinned hawks, often occurs below the blade-swept area of turbines, and the passage of larger raptors occurs well above the turbines. Birds have also been observed rising above operating turbines and then decreasing altitude between turbines.

2.5 Conclusions

The results of the field surveys indicate that fall raptor migration at the proposed Stetson Wind Project is low relative to other sites in the region. Regional passage rates varied from 9.5 to 37.3 birds/hour, with passage rates in the project area (2.05 birds/hour) among the lowest reported in the Northeast. The low passage rate is likely due to the fact that the project area does not lie in an area where raptors concentrate in large numbers. However, raptors do use the project area's prominent topographical features such as ridges, side slopes, and valleys to gain updraft and thermals during migration. In addition, there are nesting raptors such as bald eagle, sharp-shinned hawk, red-tailed hawk, and turkey vulture in the vicinity of the project area.

Migrants observed passing near or through the project area flew higher than resident birds. These birds were taking advantage of thermals and updrafts flowing up hillsides. Consequently, they were consistently observed gaining altitude in these areas before following straight flight paths south and southwest. Based on the flight paths of migrants observed, it is likely that the central pats of the plateaus, where most wind turbines are being proposed, receive low use by migrating raptors, as the majority of birds follow valleys and side slopes that develop stronger thermals and crosswinds for migration.

3.0 Nocturnal Radar Survey

3.1 Introduction

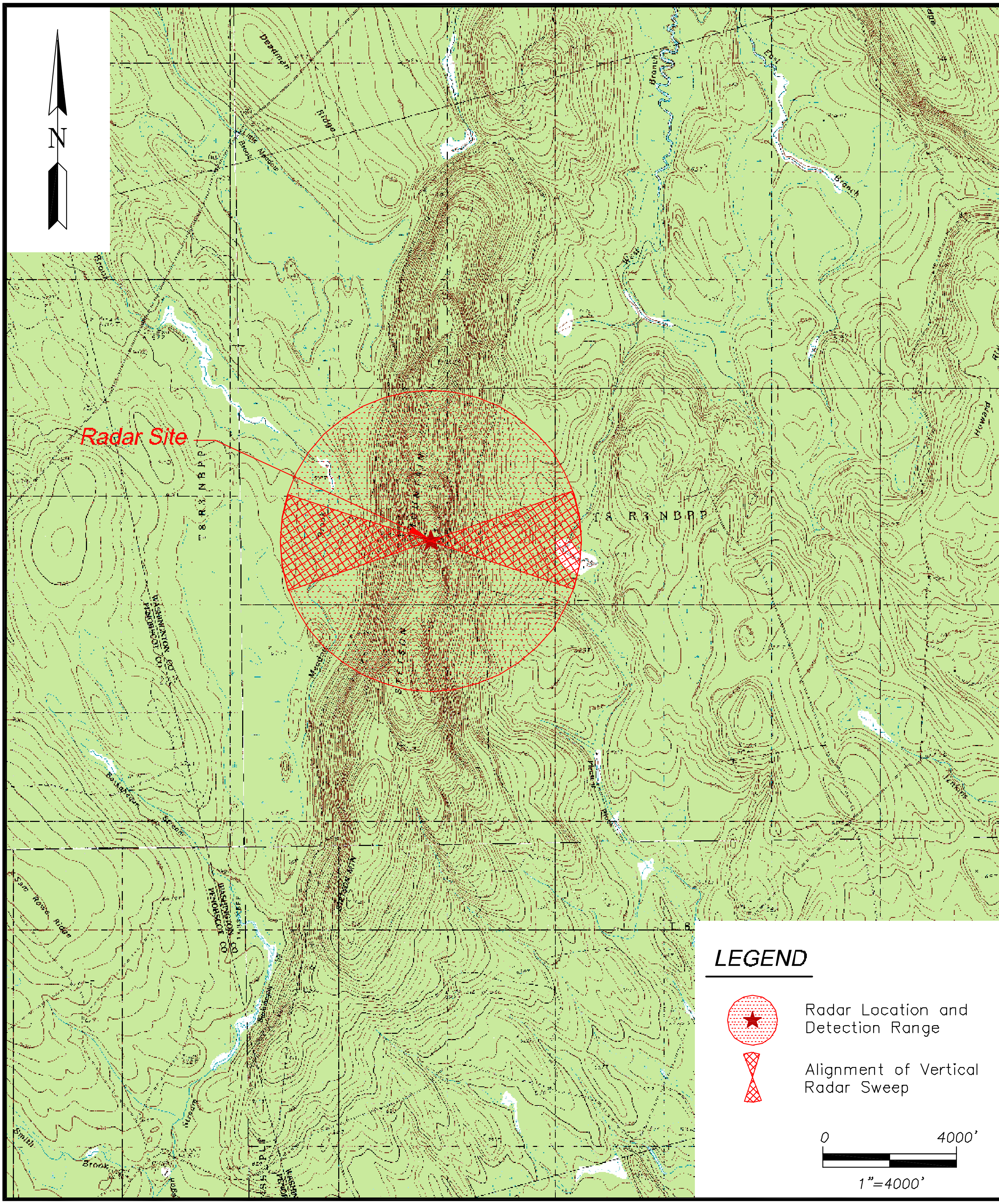
The majority of North American landbirds migrate at night. The strategy to migrate at night may be to take advantage of more stable atmospheric conditions for flapping flight (Kerlinger 1995). Conversely, species using soaring flight, such as raptors, migrate during the day to take advantage of warm rising air in thermals and laminar flow of air over the landscape, which can create updrafts along hillsides and ridgelines. Additionally, night migration may provide a more efficient medium to regulate body temperature during active, flapping flight and could reduce the potential for predation while in flight (Alerstam 1990, Kerlinger 1995).

Radar surveys were conducted to characterize fall nocturnal migration patterns in the area. The goal of the surveys was to document the overall passage rates for nocturnal migration in the vicinity of the project area, the flight direction of night migrants, and the flight height of night migrants.

3.2 Methods

Field Methods

The radar study was conducted from near the northern end of the Stetson Mountain ridgeline, below the northern met tower (Figure 3-1). This site, at an elevation of 360 m (1,180'), provided a view in all directions. Marine surveillance radar similar to that described by Cooper *et al.* (1991) was used during



PREPARED BY:

WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

106154-F301-Radar.dwg

SHEET TITLE:

Stetson – Radar Location Map

PROJECT:

Stetson Wind Project

DATE: December 2006

SCALE: 1"=4000'

PROJ. NO.: 106154

FIGURE:

3-1

field data collection. The radar has a peak power output of 12 kilowatts and has the ability to track small animals, including birds, bats, and even insects, based on settings selected for the radar functions. It cannot, however, readily distinguish between different types of animals being detected. Consequently, all animals observed on the radar screen are called targets. The radar has an echo trail function that maintains past echoes of trails. During all operations, the radar's echo trail was set to 30 seconds.

The radar was equipped with a 2-m (6.5') waveguide antenna. The antenna has a vertical beam height of 20º (10º above and below horizontal), and the front end of the antenna was inclined approximately 5º to increase the proportion of the beam directed into the sky.

Objects on the ground detected by the radar cause returns on the radar screen (echoes) that appear as blotches called ground clutter. Large amounts of ground clutter reduce the ability of the radar to track birds and bats flying over those areas. However, vegetation and hilltops near the radar can be used to reduce or eliminate ground clutter by 'hiding' clutter-causing objects from the radar. These nearby features also cause ground clutter, but their proximity to the radar antenna generally limits the ground clutter to the center of the radar screen (Figure 3-2). The presence of ground clutter and other objects that could reduce clutter were important factors considered during the survey site selection process and configuration of the radar stations.

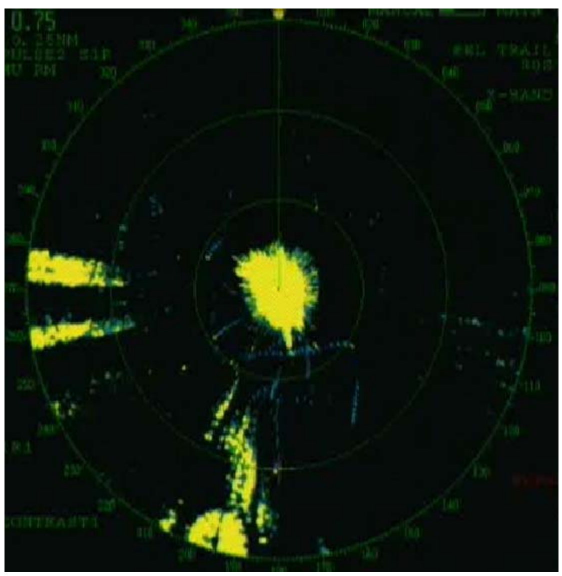


Figure 3-2. Ground clutter in project area.

Radar surveys were targeted for the first six hours of each survey night, although this varied. Twelve nights of survey data were collected between September 2 and October 7, 2006. Because the anti-rain function of the radar must be turned down to detect small songbirds and bats, surveys could not be conducted during periods of inclement weather. Therefore, surveys were targeted largely for nights without rain. However, in order to characterize migration patterns during nights without optimal conditions, some nights with weather forecasts that included occasional showers were sampled.

The radar was operated in two modes during each hour of operation. In the first mode, surveillance, the antenna spins horizontally to survey the airspace around the radar and detects targets moving through the area. By analyzing the echo trail, the flight direction of targets can be determined. In the second mode of operation, vertical, the antenna is rotated 90º to vertically survey the airspace above the radar (Harmata *et al.* 1999). In vertical mode, target echoes do not provide directional data but do provide information on the altitude of targets passing through the vertical, 20º radar beam. Both modes of operation were used during each hour of sampling.

The radar was operated at a range of 1.4 km (0.75 nautical miles). At this range, the echoes of small birds can be easily detected, observed, and tracked. At greater ranges, larger birds can be detected, but the echoes of small birds are reduced in size and restricted to a smaller portion of the radar screen, reducing the ability to observe the movement pattern of individual targets.

Data Collection

The radar display was connected to video recording software of a computer. Based on a random sequence for each night, approximately 25 minutes of video samples were recorded during each hour of operation. These included 15 one-minute horizontal samples and 10 one-minute vertical samples.

During each hour, additional information was also recorded, including weather conditions and ceilometer observations. Ceilometer observations involved directing a one-million candlepower spotlight vertically into the sky in a manner similar to that described by Gauthreaux (1969). The ceilometer beam was observed by eye for 5 minutes to document and characterize low-flying [below 125 m (410')] targets. The ceilometer was held in-hand so that any birds, bats, or insects passing through it could be tracked for several seconds, if needed. Observations from each ceilometer observation period were recorded, including the number of birds, bats, and insects observed. This information was used during data analysis to help characterize activity of insects, birds, and bats.

Data Analysis

Video samples were analyzed using a digital analysis software tool developed by Woodlot. For horizontal samples, targets were identified as birds and bats rather than insects based on their speed. The speed of targets was corrected for wind speed and direction; targets traveling faster than approximately 6 m (20') per second were identified as a bird or bat target (Larkin 1991, Bruderer and Boldt 2001). The software tool recorded the time, location, and flight vector for each target traveling fast enough to be a bird or bat. The results for each sample were output to a spreadsheet. For vertical samples, the software tool recorded the entry point of targets passing through the vertical radar beam, the time, and flight altitude above the radar location. The results for each sample were output to a spreadsheet. These data sets were then used to calculate passage rate (reported as targets per km of migratory front per hour), flight direction, and flight altitude of targets.

Mean target flight directions (± 1 circular standard deviation) were summarized using software designed specifically to analyze directional data (Oriana2© Kovach Computing Services). The statistics used for this are based on Batschelet (1965), which take into account the circular nature of the data. Nightly wind direction was also summarized using similar methods and data collected from the nearest met tower to the radar.

Flight altitude data were summarized using linear statistics. Mean flight altitudes (± 1 standard error) were calculated by hour, night, and the overall season. The percent of targets flying below 125 m (410'), the approximate maximum height of the larger of the two types of wind turbines that could be used at the site, was also calculated hourly, for each night, and for the entire survey period.

NEXRAD Radar Data Analysis

NEXRAD weather radar images from the National Weather Service station in Houlton, Maine, were compiled for the full migration period (approximately September 1 to October 15). These radar images were used to determine the proportion of the fall 2006 migration season that was sampled at Stetson Mountain with the on-site radar.

NEXRAD radar provides a different type of data than the marine surveillance radar used at the Stetson Project area. This long range Doppler radar produces reflectivity data on objects (and precipitation) in the sky, as well as velocity of those objects. It does not individually track birds but can be used to interpret large-scale bird migration patterns (Gauthreaux and Belser 1998).

Nightly samples of reflectivity and velocity images were obtained from the National Oceanic and Atmospheric Administration website at http://www.nws.noaa.gov, and visually assessed to determine the overall intensity of nightly migration. Each night was qualitatively categorized as: 1) no migration (very low activity or rainy nights); 2) light migration; or 3) heavy migration (Figure 3-3). These determinations were made based on the color-coded strength of the radar reflectance data, velocity and direction, and winds aloft data. The images selected for this assessment were generally timed to be from two to four hours after sunset. For data interpretation purposes, bird migration is discernable from most precipitation. Bird activity was detected on some nights when rain occurred periodically. On those nights, radar reflectivity patterns indicative of migrating birds were observed forming and then dissolving during those periods between rain events. Nights exhibiting these conditions were given a classification of light migration activity.

Once the NEXRAD images were analyzed, the nights of on-site surveys at Stetson Mountain were compared with those same nights of NEXRAD data. Additionally, the remainder of the nightly NEXRAD data was summarized to identify the proportion of nights with light and heavy migration from the entire season that were sampled at Stetson Mountain.

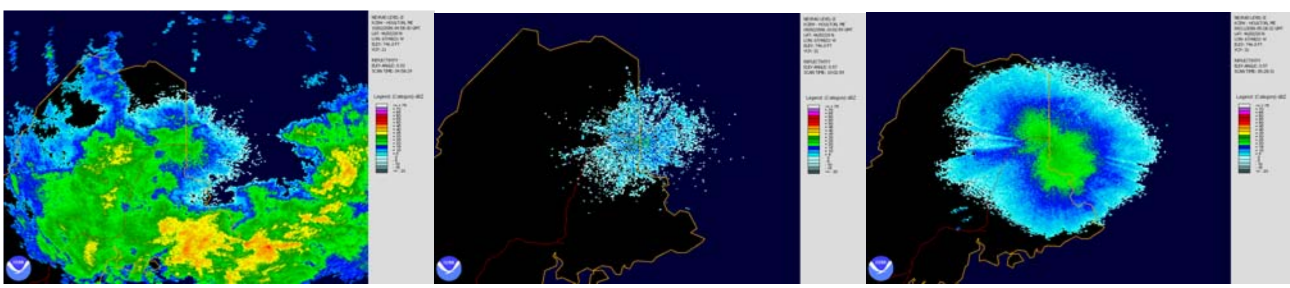


Figure 3-3. Examples of NEXRAD radar images depicting (from left to right) rain, light migration, and heavy migration activity.

3.3 Results

The radar site provided exceptional visibility of the surrounding airspace, and targets were observed in all areas of the radar display unit. The location of the radar at the crest of the ridgeline and within a clearing for an existing met tower resulted in most of the surrounding tree canopy being level with or slightly below the antenna of the radar. This resulted in a better than average view by the radar to sample upwards 15° in all directions and downwards 5° to the east and to the west. The result of this was an overall increased volume of airspace sampled by the radar relative to most other available radar studies. Additionally, during vertical operation, the low tree canopy to the east and west provided the radar with a view downward, into the adjacent lowlands, and the radar was able to document targets located below the elevation of the radar and the ridgeline. The potential effects of this exceptional view on the results of this survey are discussed in Section 3.4.

Passage Rates

Nightly passage rates varied from 131 ± 54 targets per km per hour (t/km/hr) on September 3 to 1,192 ± 72 t/km/hr on October 5. The mean passage rate for the twelve nights surveyed at Stetson was 476 ± 86 t/km/hr. (Figure 3-4, Appendix B Table 1). Individual hourly passage rates varied throughout the entire season from 55 to 1,444 t/km/hr (Appendix B Table 1). Hourly passage rates varied throughout each night and for the season overall (Figure 3-5).

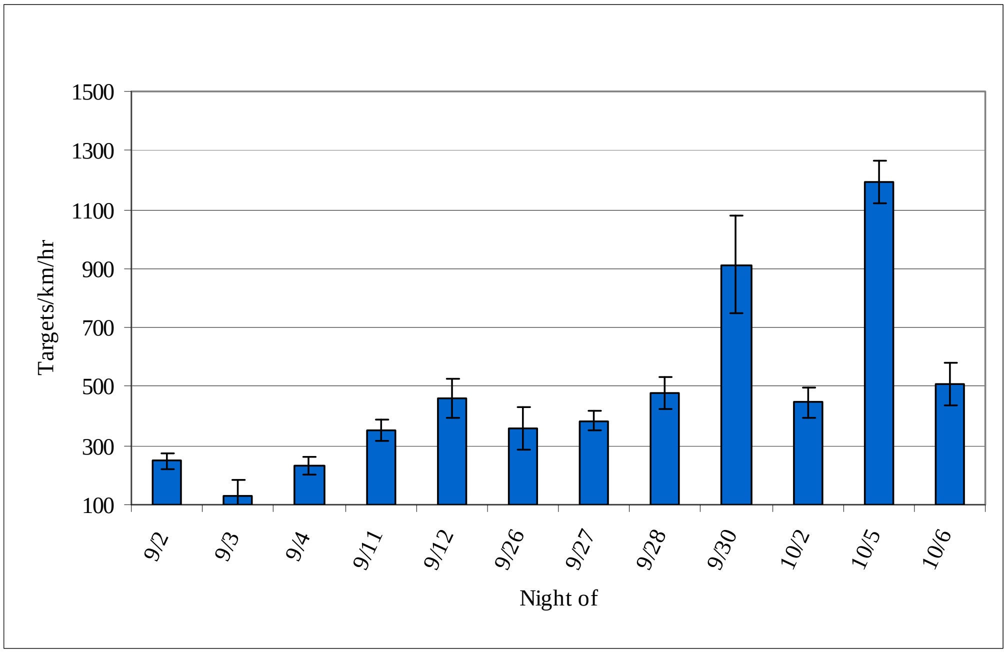


Figure 3-4. Nightly passage rates (error bars = ±1 SE) observed at Stetson Wind Project, fall 2006

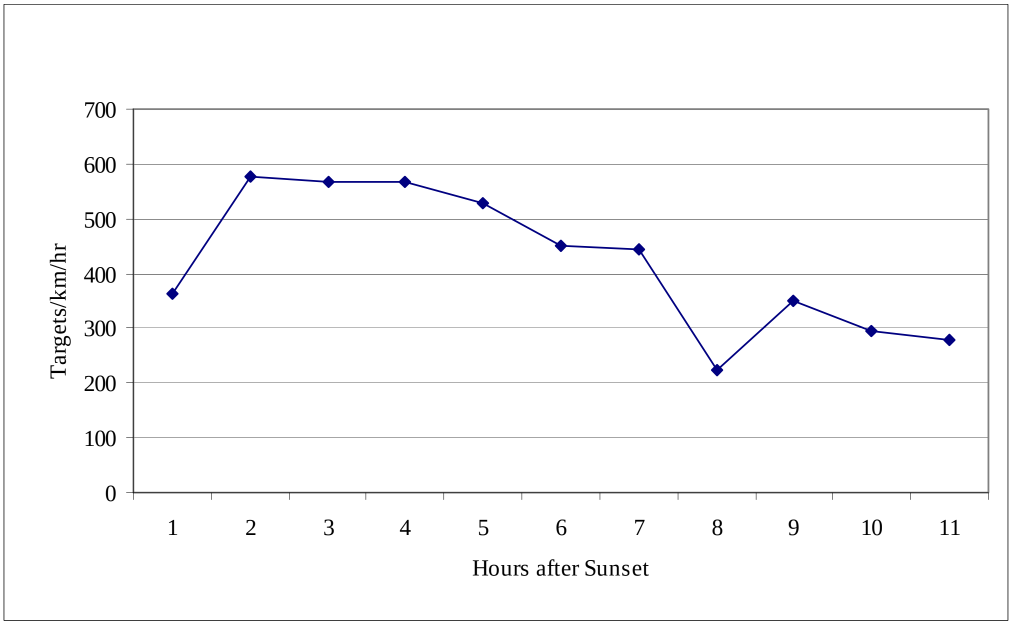


Figure 3-5. Hourly passage rates for entire season

Flight Direction

The mean flight direction over Stetson Mountain was 227º ± 56º (Figure 3-6). There was considerable night-to-night variation in mean direction, although most nights included flight directions generally to the south and southwest (Appendix A Table 2)

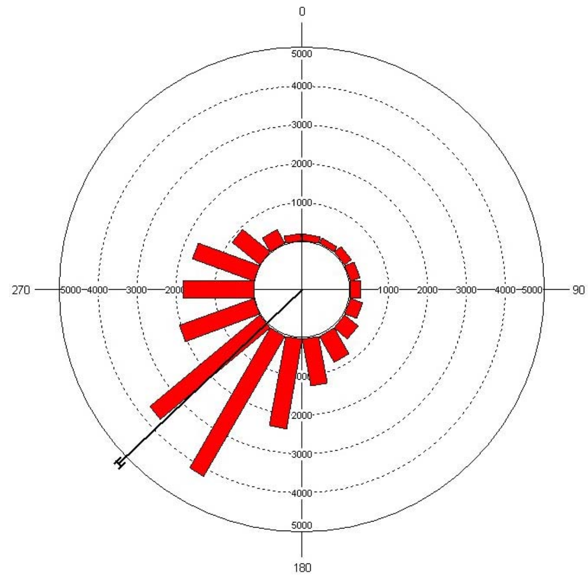


Figure 3-6. Mean flight direction for the entire season
(the bracket along the margin of the histogram is the 95% confidence interval)

Flight Altitude

The flight height of all targets was 378 m ± 32 m (1,2409' ± 105') above the radar site, and the average nightly flight height ranged from 219 m ± 13 m (718' ± 43') to 506 m ± 32 m (1,660' ± 105') (Figure 3-7, Appendix B Table 3). The percent of targets observed flying below 125 m (410') also varied by night, from 6 percent to 34 percent. On nights with the greatest percent of targets below 125 m, lower passage rates were observed (Figure 3-8) and were typically less than the seasonal average. The seasonal average of targets flying below 125 m (410') was 13 percent. The observed peak of hourly flight height occurred six to seven hours after sunset

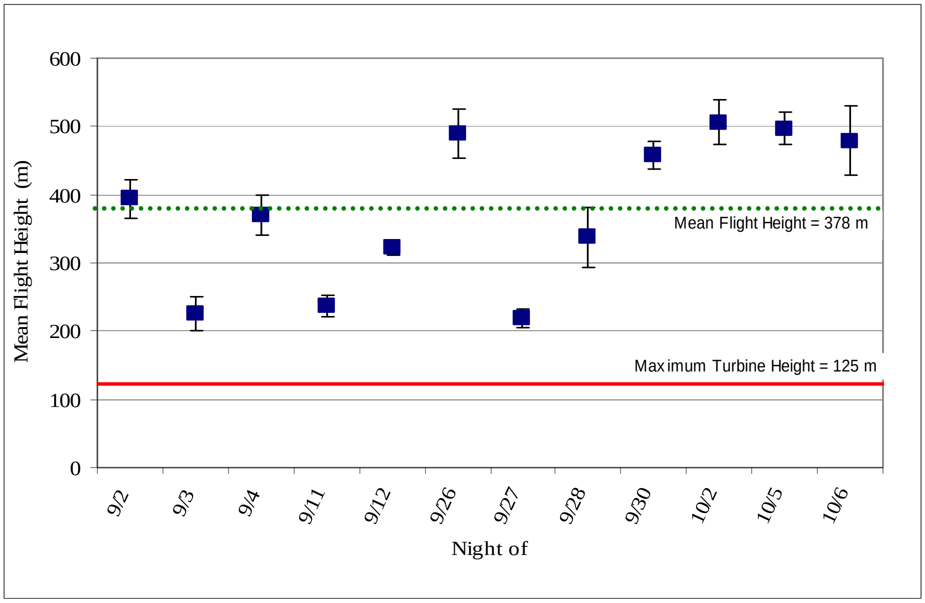


Figure 3-7. Mean nightly flight height of targets (error bars = ±1 SE)

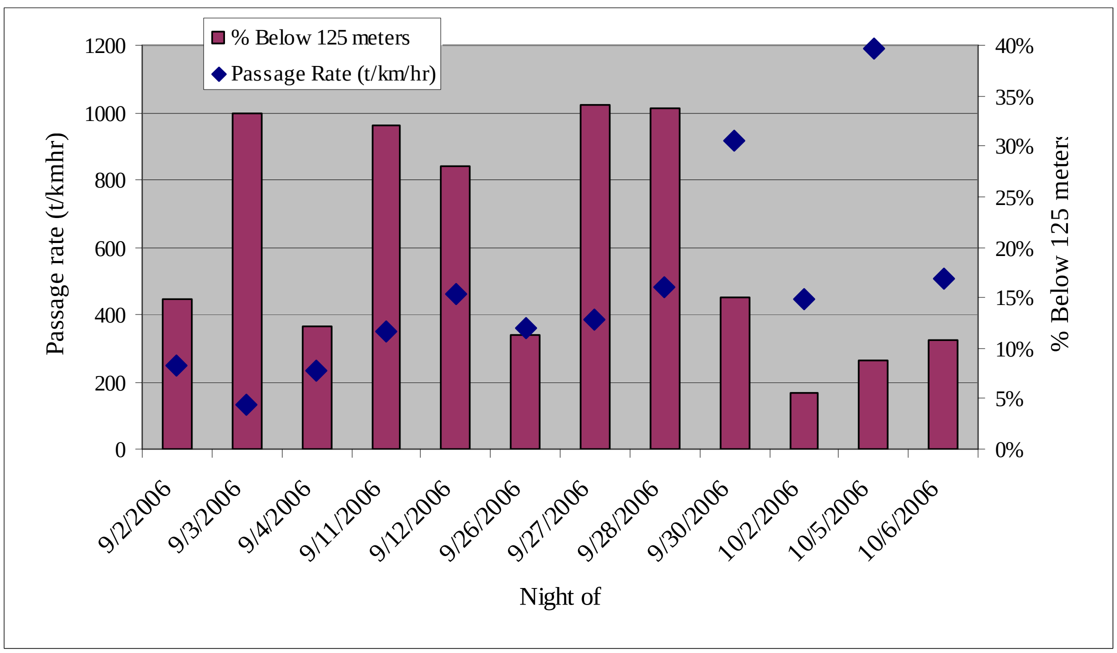


Figure 3-8. Nightly percent of targets flying below turbine height

Ceilometer and Moonwatching Observations

Ceilometer data collected during the radar survey yielded a total of 71 five-minute observations. Sixty birds and no bats were observed in the ceilometer beam.

NEXRAD Weather Radar Analysis

A total of 44 nights of NEXRAD weather data were analyzed from the fall migration period. Migration activity occurred on 43 of those nights, with 1 night of no migration due to prolonged intense rain. There were 12 nights of heavy migration and 31 nights of light migration. In general, the nights of sampling with on-site radar occurred on nights with light and heavy migration in proportion to how those nights occurred over the entire migration season (Table 3-1).

Table 3-1. Summary of NEXRAD and on-site radar data collection

Migration Activity Category	Number of nights (NEXRAD)	Percent of Migration Nights	Number of nights with on-site radar	Percent of on-site radar data set
No Migration	1	2%	0	0%
Light Migration	31	70%	8	67%
Heavy Migration	12	27%	4	33%

3.4 Discussion

Fall 2006 radar surveys documented migration activity and patterns in the vicinity of the proposed Stetson Wind Project area. In general, migration activity and flight patterns varied between and within nights, which is very typical of nighttime migration. Nightly variation in the magnitude and flight characteristics of nocturnally-migrating songbirds is not uncommon and is often attributed to weather patterns, such as cold fronts and winds aloft (Hassler *et al.* 1963, Gauthreaux and Able 1970, Richardson 1972, Able 1973, Bingman *et al.* 1982, and Gauthreaux 1991).

Radar surveys using similar methods and equipment conducted within the last several years are rapidly becoming available. These other studies provide an opportunity to reference the results from the proposed Stetson Wind Project to other areas of Maine, the Northeast, and the central Appalachian states. However, there are limitations in comparing data from previous years with data from 2006, as year-to-year variation in continental bird populations and weather patterns may effect how many birds migrate through an area or region. Additionally, differences in site characteristics at each radar survey location, particularly the landscape and vegetation surrounding a radar site, can play a significant role in any radar's ability to detect targets in all directions around it and the subsequent calculation of passage rate.

This last factor must be recognized as one of the factors, if not the most significant limiting factor, in making direct site-to-site comparisons in passage rates. As mentioned previously, the radar station at Stetson Mountain had exceptional visibility of the airspace around it. This is not the case with many radar studies, which have hillsides and trees that block the radar beam in certain directions around the radar and hide low-flying night migrants. Additionally, the placement of the radar at the top of the ridge with excellent visibility to the east and west (the alignment of the radar beam while in vertical mode) resulted in the radar being able to 'see' down into the adjacent lowlands and actually document night migrants flying below the radar. The vast majority of radar studies have not had similarly clear views low to or below horizontal. Interestingly, this consideration is not as important for the calculation of flight height, as the main portion of the radar beam is directed skyward, rather than in a 360° horizontal plane around the radar, and the potential effects of surrounding vegetation on the radar's view can generally be more easily controlled to be more similar across sites.

Regardless of any potential differences between site conditions at radar survey locations, the nightly mean passage rates observed at the proposed Stetson Wind Farm (476 t/km/hr) was high but within the range of other available studies (Table 3-2). Currently, in the wind power industry, there is no direct correlation between passage rates and risk of collisions with wind turbines, and it is not known precisely how passage rate calculated with this method translates to overall fatalities. While conventional wisdom might be to assume that increased passage rate may translate to measurable increases in fatalities, overall documented bird mortality at wind facilities has been low, so there may instead be a critical threshold at which the likelihood of collisions increases more significantly. These potential relationships are not yet understood.

Seasonal variation in migration activity also occurs. Of the available radar studies, no clear trend in migration activity between spring and fall at any one site occurs. In general, there seems to be no consistent trend in passage rate, such as an increase in passage rate from spring to fall (presumably when recruitment into the population should equate to a greater number of migrants documented at a site). In fact, there is a slight trend for passage rates in spring to be greater than fall, regardless of the timing at which the seasons are sampled. A review of the seasonal mean flight height data for the thirteen sites identified in Table 3-2 studied in both spring and fall shows a consistent trend for lower flight heights in the spring than in the fall (12 out of 13 sites had lower mean flight altitudes in the spring than in the fall). This overall lower flight height is likely the principal factor causing spring traffic rates to be greater than fall. That is to say, migrants flying lower over the ground in the spring keep proportionally more migrants within the detection zone of the radar beam than when migrants are flying higher in the fall.

Some research suggests that bird migration may be affected by landscape features, such as coastlines, large river valleys, and mountain ranges. This has been documented for diurnally-migrating birds, such as raptors, but is not as well established for nocturnally migrating birds (Sielman *et al*. 1981; Bingman 1980; Bingman *et al*. 1982; Bruderer and Jenni 1990; Richardson 1998; Fortin *et al*. 1999; Williams *et al.* 2001; Diehl *et al*. 2003; Woodlot, unpublished data).

Evidence suggesting topographic effects to night-migrating birds has typically included areas of varied topography, such as the most rugged areas of the northern Appalachians and the Alps. The landscape around the Stetson Wind Project consists of lowlands with some low elevation hills and ridgelines. The area has gentle gradients with elevation differentials of less than 91 m to 360 m (300’ to 1,180’). This differential is considerably less than in those other areas where potential topographic effects on flight direction have been observed. The mean flight direction of 227º at Stetson takes migrants over the top of the mountain at an angle and suggests that migrants use a broad front migratory path across the project area, and that areas of concentrated night-migrant density are not likely to occur in the project area.

The emerging body of studies characterizing nighttime bird movements shows a relatively consistent trend in regards to the altitude at which night migrants fly (Table 3-2). In general, nighttime migration typically occurs several hundred meters or more above the ground. The range in mean flight heights is approximately 300 m (1,000’) to 600 m (2,000’) above the ground. The percentage of targets documented at heights below that of typical modern wind turbines is variable, but is usually 10 to 20 percent. The flight height documented in the project area is within the range of other studies in the region, as is the observed percentage of targets flying below the height of the turbines. The similarity in flight height between sites is likely due to consistent ways in which migrants respond to nightly atmospheric conditions and, as mentioned previously, the relatively uniform way that radars view the airspace over them while in vertical operation mode across survey sites.

Table 3-2. Summary of Available Radar Survey Results†

Project Site	Landscape	Season and Year	Average Passage Rate (t/km/hr)	Range in Nightly Passage Rates	Average Flight Direction	Average Flight Height (m)	Percent Targets Below Turbine Height	Citation
Franklin, WV	Forested ridge	Fall 2004	229	18-643	175	583	(125 m) 8%	Woodlot 2004
Franklin, WV	Forested ridge	Spring 2005	457	34-240	53	492	(125 m) 11%	Woodlot 2005a
Fairfield, NY	Agric. plateau/ADK foothills	Spring 2005	509	80-1175	44	419	(125 m) 20%	Woodlot 2005b
Fairfield, NY	Agric. plateau/ADK foothills	Fall 2005	691	116-1351	198	516	(125 m) 4%	Woodlot 2005c
An eastern Maine mountain	Forested ridge	Fall 2006	631	237 - 1308	220	369	(125 m) 13%	Woodlot unpubl. data
Stetson Mountain, ME	Forested ridge	Fall 2006	476	131 - 1192	227	376	(125 m) 13%	this report
Mars Hill, ME	Forested ridge	Fall 2005	512	60-1092	228	424	(120 m) 8%	Woodlot 2005d
Mars Hill, ME	Forested ridge	Spring 2006	338	76-374	58	384	(120 m) 16%	Woodlot 2006a
Jordanville, NY	Agricultural plateau	Spring 2005	409	26-1410	40	371	(125 m) 21%	Woodlot 2005e
Jordanville, NY	Agricultural plateau	Fall 2005	380	26-1019	208	440	(125 m) 6%	Woodlot 2005f
Deerfield, VT	Forested ridge	Fall 2004	178	7-1121	212	611	(100 m) 3%	Woodlot 2005g
Deerfield, VT	Forested ridge	Spring 2005	404	74-973	69	523	(125 m) 4%	Woodlot 2005h
Mt. Storm, WV	Forested ridge	Fall 2003	241	8-852	184	410	N/A	Cooper *et al.* 2004a
Chautauqua, NY	Great Lakes shore	Spring 2003	395	15-1702	29	528	(125 m) 4%	Cooper *et al.* 2004b
Chautauqua, NY	Great Lakes shore	Fall 2003	238	10-905	199	532	(125 m) 4 %	Cooper *et al.* 2004c
Prattsburgh, NY	Agricultural plateau	Fall 2004	193	12-474	188	516	(125 m) 3%	Woodlot 2005i
Prattsburgh, NY	Agricultural plateau	Spring 2005	277	70-621	22	370	(125 m) 16%	Woodlot 2005j
Prattsburgh, NY	Agricultural plateau	Fall 2004	200	18-863	177	365	(125 m) 9%	Mabee *et al.* 2005a
Prattsburgh, NY	Agricultural plateau	Spring 2005	170	3-844	18	319	(125 m) 18%	Mabee *et al.* 2005b
Cohocton, NY	Agricultural plateau	Spring 2005	371	133-773	28	609	(125 m) 12%	Woodlot 2006b
Churubusco, NY	Grt Lks plain/ADK foothills	Spring 2005	254	3-728	40	422	(120 m) 11%	Woodlot 2005k
Churubusco, NY	Grt Lks plain/ADK foothills	Fall 2005	152	9-429	193	438	(120 m) 5%	Woodlot 2005l
Clinton County, NY	Grt Lks plain/ADK foothills	Spring 2005	110	n/a	30	338	(n/a) 20%	Mabee *et al.* 2006
Clinton County, NY	Grt Lks plain/ADK foothills	Fall 2005	197	n/a	162	333	(n/a) 12%	Mabee *et al.* 2006
Dairy Hills, NY	Great Lakes shore	Spring 2005	117	n/a	14	397	(n/a) 15%	Young 2006
Dairy Hills, NY	Agricultural plateau	Fall 2005	94	n/a	180	466	(n/a) 10%	Young 2006
Wethersfield, NY	Agricultural plateau	Fall 1998	168	N/A	179	N/A	N/A	Cooper and Mabee 1999
Harrisburg, NY	Grt Lks plain/ADK foothills	Fall 1998	122	N/A	181	N/A	N/A	Cooper and Mabee 1999
Sheldon, NY	Great Lakes shore	Spring 2005	112	6-558	25	371	(125 m) 21%	Woodlot 2006c
Sheldon, NY	Agricultural plateau	Fall 2005	197	43-529	213	422	(120 m) 3%	Woodlot 2006d
Sheffield, VT	Forested ridge	Fall 2004	114	19-320	200	566	(125 m) 1%	Woodlot 2005m
Sheffield, VT	Forested ridge	Spring 2005	208	11-439	40	522	(125 m) 6%	Woodlot 2006e

† Studies are listed in seasonal order, by site, and from known or suspected visibility around the radar; starting with the most visibility and ending with the least.

The mean flight altitude of targets documented during this study likely further supports the presumption that topographic features are not affecting migration patterns, particularly flight direction. The mean flight altitude being high above the radar sites, which were located along a ridgetop and at the peak of a mountain, indicates that most birds are flying so high that their flight is unimpeded by topographic features, such as the hilltops of the project area.

3.5 Conclusions

Radar surveys during the fall 2006 migration period have provided important information on nocturnal bird migration patterns in the vicinity of the Stetson project area. The results of the surveys indicate that bird migration patterns are generally similar to patterns observed at other sites in the region, especially other sites in Maine.

Migration activity varied throughout the season, which is probably largely attributable to weather patterns. The mean passage rate is generally within the range of passage rates observed at other sites studied with similar methods and equipment, even though the radar view far surpassed that of most other available studies. The combination of the flight height and flight direction data indicates that the majority of the migrants are flying at altitudes well above Stetson Mountain and are unimpeded by topography. The flight height data also suggest that the majority of migration during the fall survey period took place well above the height of the proposed turbines. The percent of targets flying below turbine height was comparable to percentages observed at other sites.

4.0 Morning Avian Stopover Survey

4.1 Introduction

Because most birds migrate at night, their identification is nearly impossible. Marine radars are not capable of identifying species that migrate at night; therefore, morning bird stopover surveys were conducted to supplement the radar data by identifying species that ‘fall out’ after each night of migration. This survey technique does not identify the full complement of migrants documented by radar, but it can document seasonal changes in the species composition of migrant birds using the project area during stopover events.

Stopover areas are places where birds halt migration and forage to replenish energy reserves spent during the previous night(s) of migration (Alerstam and Hedenström 1998). Consequently, habitats used as stopover areas may be of critical importance to the survival or health of migratory birds (Hutto 2000). Historically, these areas have been thought to be concentrated along landscape features that might provide an abundance of energy rich food resources such as fruit-bearing shrubs and late-season insects. Low-lying areas and coastal shorelines often provide both of these potential food sources in expansive scrub-shrub wetlands and surface waters that provide mild conditions and aquatic insect prey sources. Recent research has indicated that some species that use higher elevations during the nesting season may also select higher elevations as stopover habitat (DeLong *et al.* 2005). The mechanisms causing this segregation of altitudinal habitats during migration are not well known, although it’s likely that birds are simply selecting habitats with which they are familiar.

To investigate the seasonal species composition of the migrant population in the vicinity of the project area, morning stopover surveys were conducted. The goals of the survey were to document species present and their relative abundance. Surveys consisted of transect counts along the ridge line adjacent to the radar survey locations. Surveys were conducted on mornings following nighttime radar sampling.

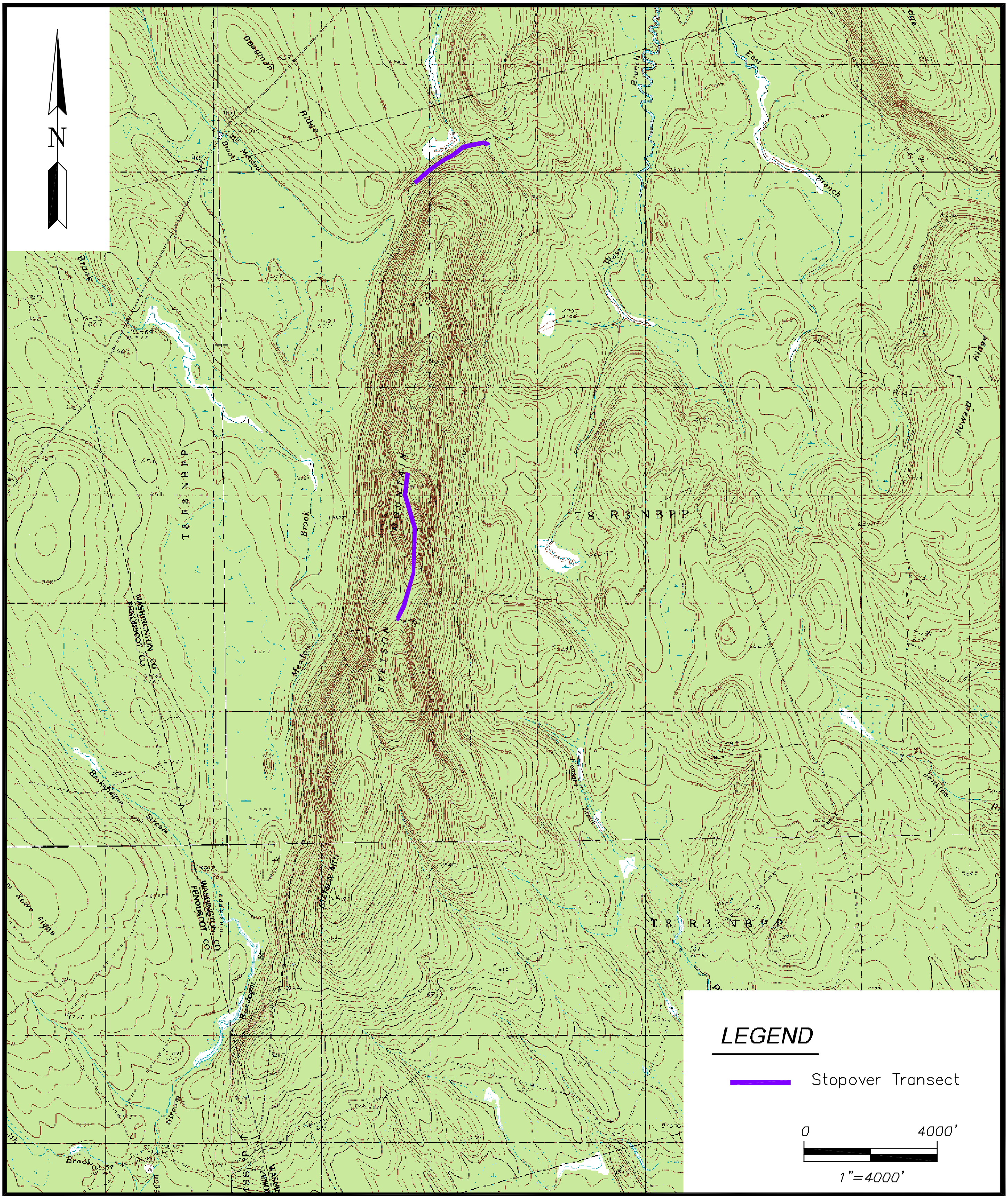
A total of 12 surveys were conducted on the ridges and an additional five surveys were conducted along the base of Stetson Mountain.

4.2 Methods

Field Surveys

Stopover surveys were conducted from two locations; one along the ridge top of Stetson Mountain, and one at the base of Stetson Mountain (Figure 4-1). The upper transect followed the access road from the radar/met tower location south and north for approximately 0.4 km (1,325') in either direction. The lower elevation transect started at the base of the northern end of the ridge at the gate to Stetson Mountain Road, and continued along the western base of the ridge for approximately 0.4 km (1,325'). Habitats along the upper and lower transects were primarily mixed northern hardwoods with a significant American beech (*Fagus grandifolia*) component. The forest was of mixed age and has been harvested to varying degrees, providing diverse vertical strata, some interior forest and some edge. There were some clearings that supported thickets of raspberries (*Rubus* spp.).

Stopover surveys occurred on mornings following the 12 radar survey nights. Surveys were generally conducted from 6:30 am to 10:00 am. Each transect was walked and all birds observed were identified and counted. Notes on each observation, including species, location, behavior, and multi-species foraging groups were recorded. Weather observations were also recorded at the start of the survey.



PREPARED BY:

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106154–FD401–MorningBird.dwg

SHEET TITLE:

Stetson – Morning Bird Survey Location Map

PROJECT:

Stetson Wind Project

DATE: December 2006

SCALE: 1"=4000'

PROJ. NO.: 106154

FIGURE:

4-1

4.3 Results

A total of 632 individual birds representing 40 species were documented during the morning bird stopover surveys (Appendix C Table 1). Yellow-rumped warblers (*Dendroica coronata*) were the most abundant birds, followed by black-capped chickadees (*Poecile atricapilla*), common yellowthroats (*Geothlypis trichas*), dark-eyed juncos (*Junco hyemalis*), and American robins (*Turdus migratorius*). Of the individuals observed, 36 percent (*N* = 227) were wood warblers and 28 percent (*N* = 176) were species grouped as 'other' (Figure 4-2; Appendix C Table 2).

Of the most commonly observed species, many of the black-capped chickadees, dark-eyed juncos, golden-crowned kinglet (*Regulus satrapa*), and blue jays (*Cyanocitta cristata*) were probably residents or near-migrants rather than long-distance migrants. Some observations may have included resident birds, but variability in the number of individuals indicates that pulses of migrants periodically occurred in the project area (Figure 4-3). The vireos were abundant during early September and were notably less abundant during the later part of the survey period. Corvids, a group of species likely to be resident birds, were consistently abundant through out the survey period, as would be expected.

Finches were least abundant during the early weeks of the survey period and increased in abundance during early October. The abundance of thrushes was consistent throughout the survey period. All species had peaks of abundance during mid- and late-September. The grouping identified as 'others' included both near and far migrants, such as woodpeckers, kinglets, wrens, waxwings, and blackbirds. The abundance of the "other" species stayed relatively constant, though the relative abundance of the individual species varied.

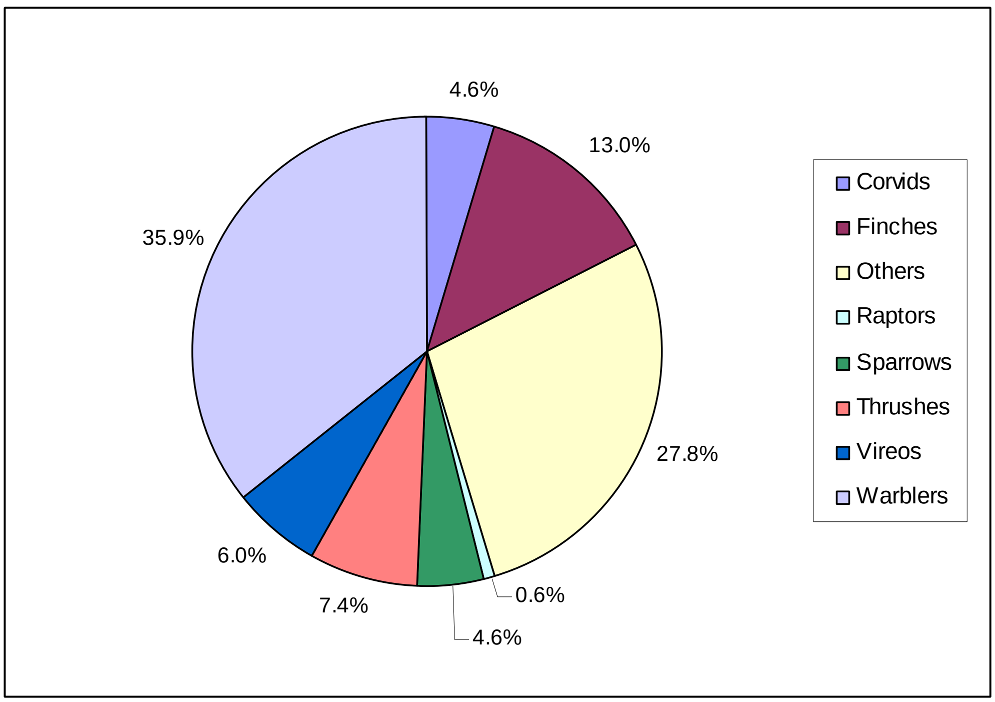


Figure 4-2. Species composition by taxonomic grouping observed during morning bird stopover surveys at Stetson Mountain in fall 2006

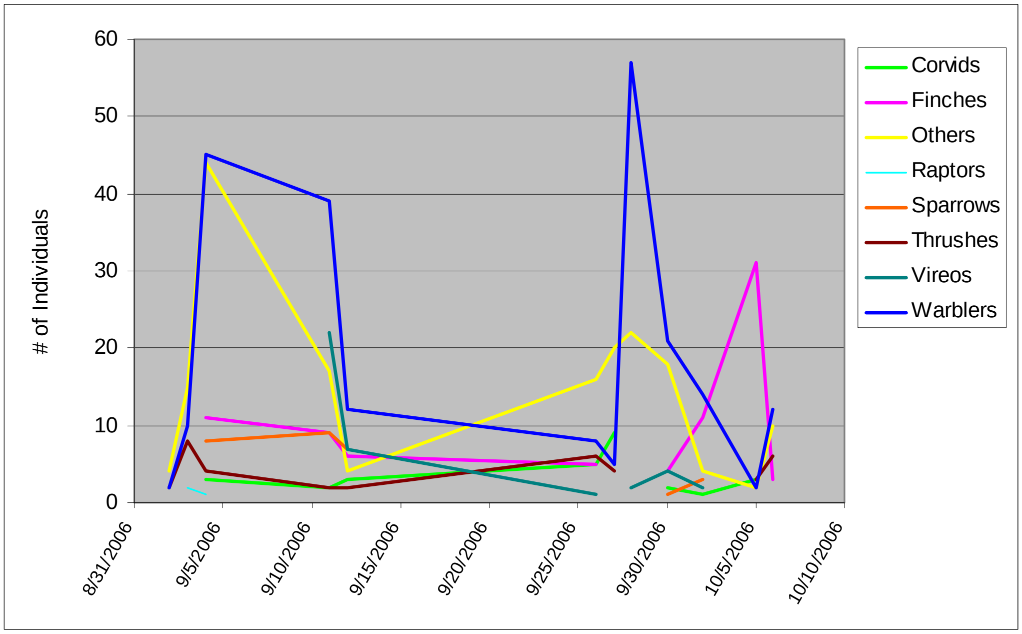


Figure 4-3. Seasonal occurrence of species groups during morning bird stopover surveys at Stetson Mountain in fall 2006.

The total number of individuals observed during morning surveys was plotted against the previous nights' passage rates, as documented with the on-site marine radar (Figure 4-4). While some of the highest observed levels of morning bird abundance occurred after nights with passage rates greater than the seasonal mean, no obvious or consistent trend between these variables was observed.

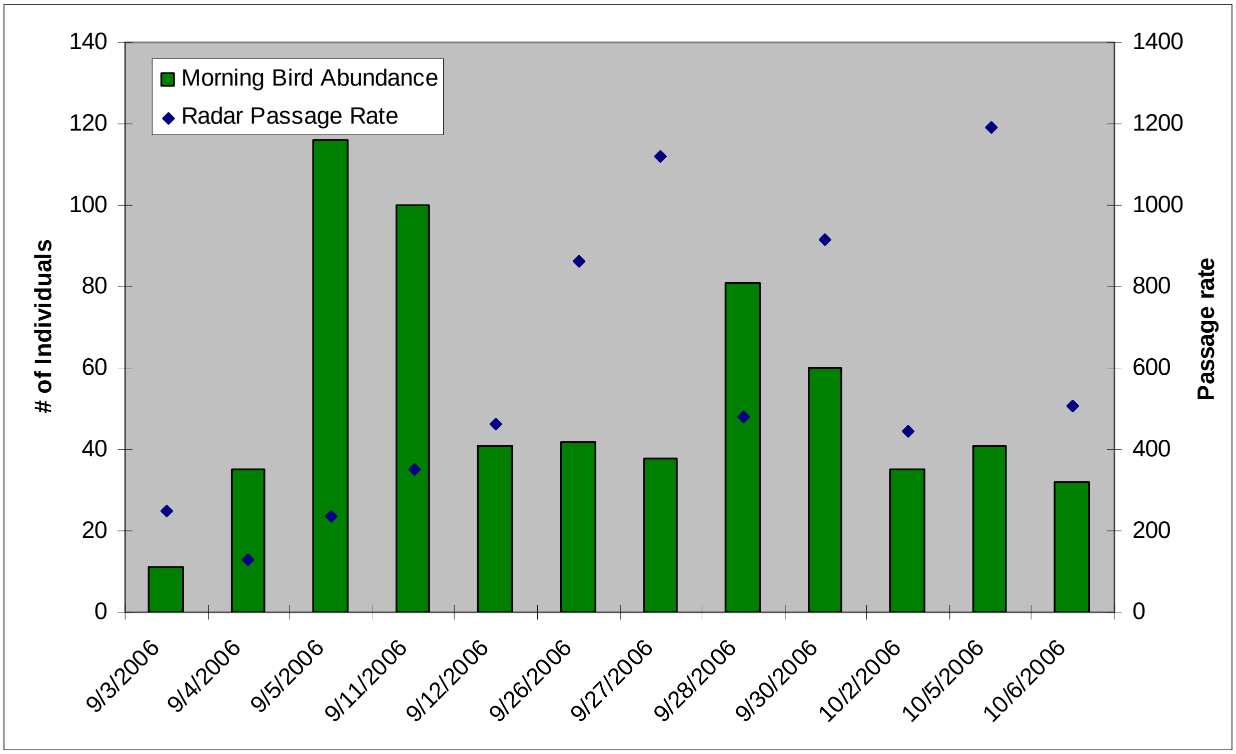


Figure 4-4. Transect survey bird abundance and radar passage rate at Stetson Mountain in fall 2006.

4.4 Discussion

Fall 2006 morning bird stopover surveys were conducted to supplement radar surveys. The goal of these surveys was to document the species present, species composition, and relative abundance of nocturnal migrants using the project area for stopover habitat. Some of the birds included in the surveys were species that could be year-round residents in the project area. Many of these species, however, also undertake short distance migrations or may be irregular migratory species in northern New England.

Nights with greater radar passage rates generally had fewer birds detected the following morning during the morning stop over survey. Hence, there may be no positive correlation between radar passage rates and abundance of morning stopover birds. This may indicate that after nights of heavy migration activity, the majority of birds kept moving south, taking advantage of good migration conditions or that the site may not provide optimal stopover habitat.

Warblers were observed throughout the season with peeks in abundance around mid and late September. Fewer warblers were observed in October. Vireos were most common earlier in the season while sparrows were less abundant early in the season and increased rapidly during the mid point of the survey period. Finches were seen infrequently early in the survey period and become more common in early October. These patterns in occurrence are expected. It is likely that since the majority of wood-warbler and vireos are neo-tropical migrants that they leave their nesting territories earlier in the migration period. This may be due to a reduction in prey density and the necessities of traveling the greater distances to their wintering grounds relative to near-migrants, such as sparrows and finches.

Total numbers of individuals within each stopover transect varied from morning to morning as did the nightly passage rates documented with the radar. When the total numbers of individuals within each morning stopover transect werecompared to the previous night's passage rates, no trends were observed. That is, nights with high passage rates did not necessarily result in increased morning stopover activity.

4.5 Conclusions

The results of the field surveys indicate that bird migration patterns found in the Stetson project area are similar to those observed at other sites. Variation in the number of birds observed along the stopover survey transects are probably due to weather, individual habitat preference, site selection, and level of effort. Patterns in the seasonal abundance of species were as would be expected, with most long-distance migrants, such as vireos and wood-warblers, present through the middle of the survey season and short-distance migrants and potential wintering species present late into the survey season.

5.0 Acoustic Bat Survey

5.1 Introduction

Seven species of bats occur in Washington County, based upon their normal geographical range. These are the little brown bat (*Myotis lucifugus*), northern myotis (*M. septentrionalis*), silver-haired bat (*Lasionycteris noctivagans*), eastern pipistrelle (*Pipistrellus subflavus*), big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), and hoary bat (*L. cinereus*) (Whitaker and Hamilton 1998).

To document bat activity in the proposed Stetson Wind Project area, monitoring surveys were conducted during summer and fall 2006. Anabat II detectors were used for the duration of the survey. The survey was designed largely to document bat activity near the rotor zone of the proposed turbines and near the ground throughout the project area. These surveys were conducted at two met towers on Stetson Mountain. Occasional active, "roving" surveys with a hand held bat detector were also conducted throughout the project area and surrounding habitats. Within the surrounding region, forest openings, clear cuts, road corridors, and wetlands likely serve as important feeding habitats but are not common in the areas proposed for wind turbines. Hence, the roving surveys targeted these areas.

5.2 Methods

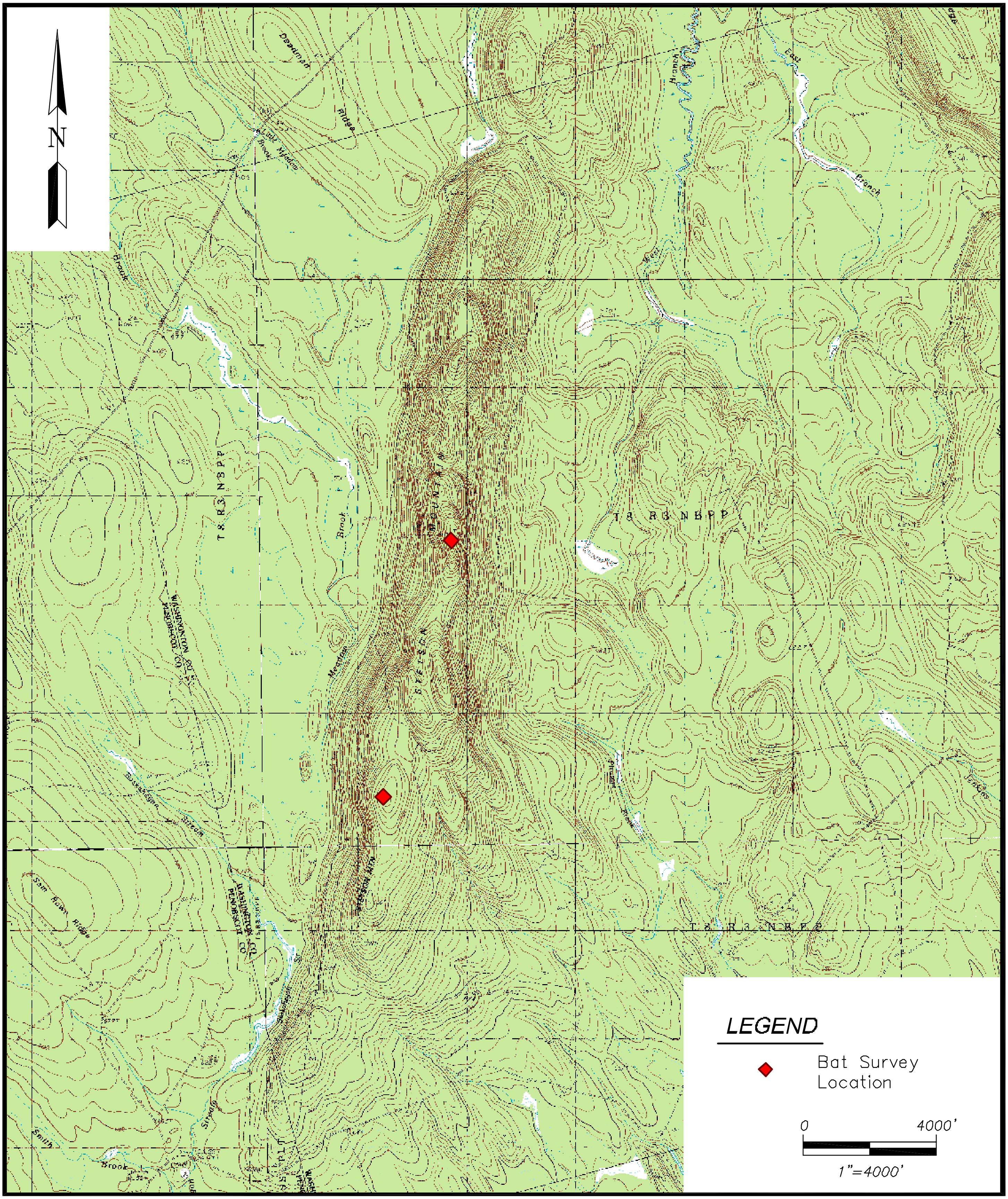
Field Surveys

Anabat detectors are frequency division detectors that divide the frequency of ultrasonic calls made by bats by a division factor so that they are audible to humans. A factor of 16 was used in this study. Frequency division detectors were selected based upon their widespread use for this type of survey, their ability to be deployed for long periods of time, and their ability to detect a broad frequency range, which allows detection of all species of bats that could occur in Maine. Data from the Anabat detectors were logged onto compact flash media using a CF ZCAIM (Titley Electronics Pty Ltd.) and downloaded to a computer for analysis.

Passive surveys involved suspending bat detectors from the guy wires of met towers on Stetson Mountain (Figure 5-1). Detectors were suspended at heights of approximately 30 m (66') and 15 m (33') in each of the met towers. Detectors were deployed from June 29 to October 16, 2006.

Bat detector surveys included active sampling, as well. Active sampling was conducted throughout the project area, in a variety of habitat types and landscape settings surrounding the mountain (Figure 5-2).

The active surveys involved manually carrying a detector slowly throughout the site and surrounding area, pausing in different habitats to document bat activity. Notes were recorded on numbers of bats seen, habitat characteristics, and the amount of time spent in each habitat. These surveys were generally conducted between 7:00 pm and 11:00 pm, at which point the detector was left in a stationary location and programmed to record data until 2:00 am.



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106154-F512-Bat.dwg

SHEET TITLE:

Stetson – Bat Survey Location Map

PROJECT:

Stetson Wind Project

DATE: December 2006

SCALE: 1"=4000'

PROJ. NO.: 106154

FIGURE:

5-1

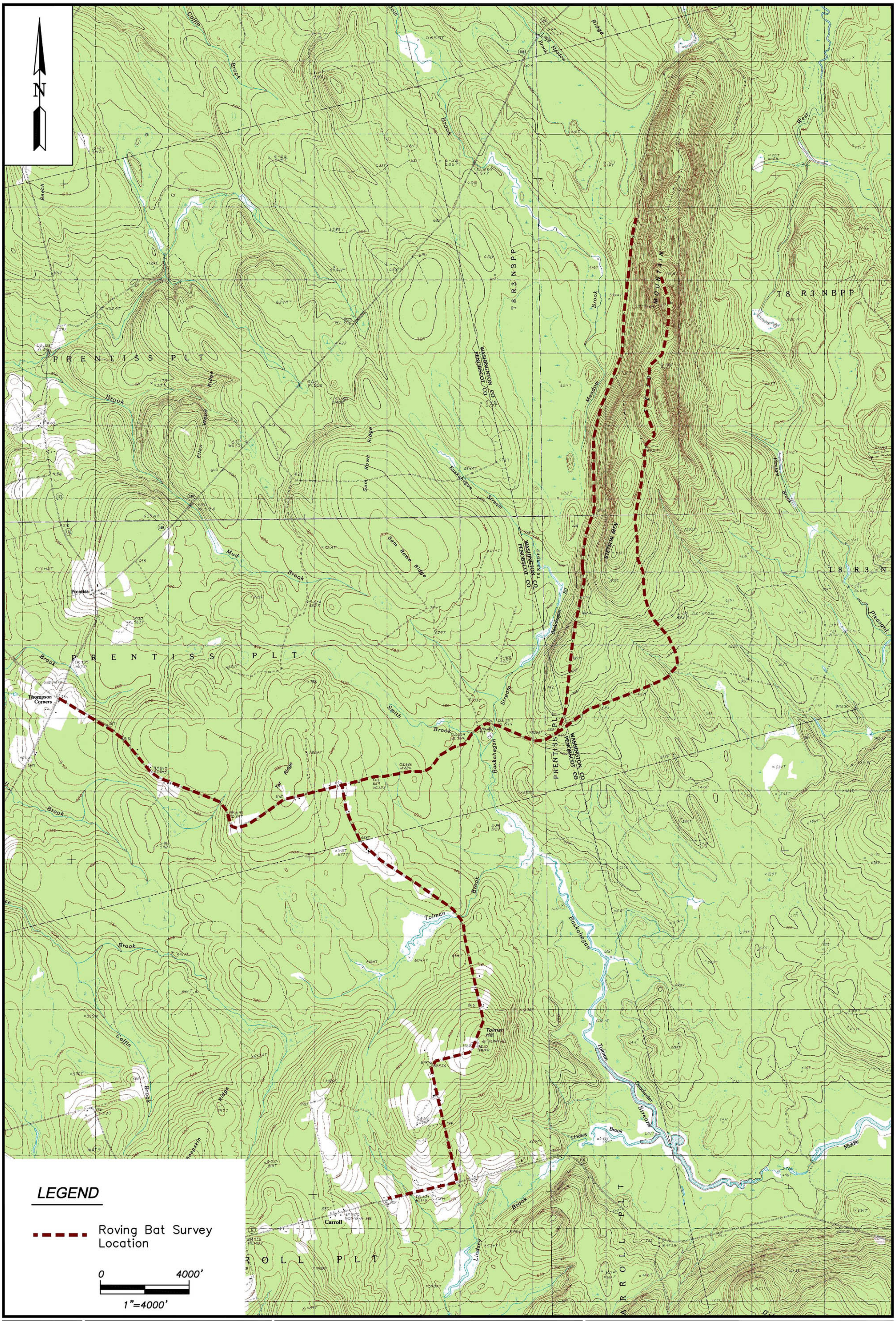

FIGURE: 5-2

DATE: December 2006

SCALE: 1"=4000'

PROJ. NO. 106154

PREPARED BY:

WOODLOT ALTERNATIVES, INC.
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106154-F534-Bat_Roving.dwg

PROJECT:

Stetson Wind Project

SHEET TITLE:

Stetson – Roving Bat Survey Location Map

Data Analysis

Potential call files were extracted from data files using CFCread© software. The default settings for CFCread© were used during this file extraction process, as these settings are recommended for the calls that are characteristic of northeastern bats. This software screens all data recorded by the bat detector and extracts call files using a filter. The filter simply removes files created by noises other than bat calls based on the characteristics of the call file and the established characteristics of northeastern bat calls. Using the default settings for this initial screen also ensures comparability between data sets. Settings used by the filter include a max TBC (time between calls) of 5 seconds, a minimum line length of 5 milliseconds, and a smoothing factor of 50. The smoothing factor refers to whether or not adjacent pixels on the call spectrogram can be connected with a smooth line. The higher the smoothing factor, the less restrictive the filter is and the more noise files and poor quality call sequences are retained within the data set. A call is a single pulse of sound produced by a bat. A call sequence is a combination of two or more pulses recorded in a call file.

Following the initial screening, the spectrogram of each file was visually inspected to ensure that files created by static or some other form of interference that were still within the frequency range of northeastern bats were not included in the data set. Call sequences were identified based on visual comparison of call sequences with reference libraries, including known calls recorded by Woodlot during mist netting surveys in 2006 in New York and Pennsylvania, and reference calls from 2002 to 2005 provided by nationally-recognized bat experts Lynn Robbins and Chris Corben, who is also the developer of the Anabat software. Bat calls typically include a series of pulses characteristic of normal flight or prey location and capture periods (feeding 'buzzes') and visually look very different than static, which typically forms a solid line at either a constant frequency or with great frequency variation. Using these characteristics, bat call files are easily distinguished from non-bat files.

Qualitative visual comparison of recorded call sequences of sufficient length to reference libraries of bat calls allows for relatively accurate identification of bat species (O'Farrell *et al*. 1999, O'Farrell and Gannon 1999). A call sequence was considered of suitable quality and duration if the individual call pulses were 'clean' (i.e., consisting of sharp, distinct lines), and at least seven pulses were included within the sequence if it was thought to be a myotid and at least five pulses for non-myotids [all pulses less than 35-40 kilohertz (kHz)]. Call sequences were classified to species whenever possible, using the reference calls described above. However, due to similarity of call signatures between several species, all classified calls have been categorized into four guilds for presentation in this report. This classification scheme follows that of Gannon *et al.* (2003) and is as follows:

- Unknown (UNKN) – all call sequences with too few pulses (less than five) or of poor quality (such as indistinct pulse characteristics or background static);
- Myotid (MYSP) – All bats of the genus *Myotis*. While there are some general characteristics believed to be distinctive for several of the species in this genus, these characteristics do not occur consistently enough for any one species to be relied upon at all times when using Anabat recordings;
- Red bat/pipistrelle (RBEP) – Eastern red bats and eastern pipistrelles. Like many of the other northeastern bats, these two species can produce calls distinctive only to each species. However, significant overlap in the call pulse shape, frequency range, and slope can also occur; and
- Big brown/silver-haired/hoary bat (BBSHHB) – This guild will be referred to as the big brown guild. These species' call signatures commonly overlap and have therefore been included as one guild in this report.

This guild grouping represents a conservative approach to bat call identification. Since some species do sometimes produce calls unique only to that species, all calls were identified to the lowest possible taxonomic level before being grouped into the listed guilds. Tables and figures in the body of this report will reflect those guilds. However, since species-specific identification did occur in some cases, each guild will also be briefly discussed with respect to potential species composition of recorded call sequences.

Once all of the call files were identified and placed into the appropriate guilds, nightly tallies of detected calls were compiled. Mean detection rates (number of calls/detector-night) for the entire sampling period were calculated for each detector and for all detectors combined. It is important to note that detection rates indicate only the number of calls detected and do not necessarily reflect the number of individual bats in an area. For example, a single individual can produce one or many call files recorded by the bat detector, but the bat detector cannot differentiate between individuals of the same species producing those calls. Consequently, detections recorded by the bat detector system likely over-estimates the actual number of animals that produced the recorded calls.

Ceilometer and Radar Data

Nocturnal radar surveys and hourly ceilometer surveys were also conducted concurrently with the acoustic bat monitoring on 12 nights. While conclusive differentiation between bats and birds is not possible using radar, past observations made by Woodlot staff using radar and thermal imaging cameras indicates that nocturnal targets that move erratically or in curving paths are typically bats, while those with straight flight paths are birds. Additionally, while bats can create radar flight paths more similar to birds (i.e., straight flight path), no birds were observed creating the erratic radar flight paths observed to be created by some bats (Woodlot, unpublished observations).

Targets with erratic flight paths, similar to those previously observed to be created by bats, were noted during the analysis of the radar video data. Nightly tallies of these targets were then made. Additionally, the ceilometer observations made during the radar survey were an opportunity to document birds and bats flying at low altitude over the radar site. Any bats observed during the ceilometer surveys were recorded.

Weather Data

Wind speed and temperature data recorded at 10-minute intervals were obtained from the on-site met tower between June 29 and October 15. The mean, maximum, and minimum wind speeds and temperatures between 7:00 pm and 7:00 am were calculated for each night. Weather data from June 28 and October 16 was taken from weatherunderground.com.

5.3 Results

Passive Survey

Two detectors were deployed in each met tower on Stetson Mountain from the night of June 29 to the night of October 15, for a total of 109 nights. Occasionally, the detectors powered down for a few nights and data were not collected (Table 5-1). Overall, a total of 361 detector-nights (or 4,332 hours) of survey effort occurred during the passive sampling.

A total of 937 call sequences were recorded during passive surveys at the met tower locations. A large portion (44%) of the call sequences were identified simply as ‘unknown’ due to poor file quality or too few call pulses on which to base identification (Table 5-2). Approximately 34 percent of the recorded call sequences were identified as from within the guild of bat calls that includes the big brown bat, silver-haired bat, and hoary bat, while 22 percent were identified as myotid in origin. Less than 2 percent of call sequences were that of the eastern red bat or eastern pipistrelle.

Within each guild, some individual call sequences were identified to species (Appendix D Tables 1–4). Call sequences within the guild of unknown bat calls were identified as such primarily due to too few pulses being included within the recorded call sequence. Approximately one-third, however, had pulses that were steep and above 35 to 40 kHz. Most of these calls were probably those of the myotids. However, the upper portion of feeding buzzes for several other species extends above this frequency and precludes making definitive identification of these sequences.

<table>
<tr><th colspan="7">Table 5-1. Summary of bat detector field survey effort and results at all passive detectors</th></tr>
<tr><th>Location</th><th>Dates</th><th># Nights</th><th># Detector Nights *</th><th># Recorded sequences</th><th>Detection Rate **</th><th>Maximum # calls recorded ***</th></tr>
<tr><td>Stetson Mtn South Low</td><td>6/29-6/30, 7/5-10/15</td><td>105</td><td rowspan="2">178</td><td>108</td><td>1.0</td><td>18</td></tr>
<tr><td>Stetson Mtn South High</td><td>7/18-10/15</td><td>73</td><td>8</td><td>0.1</td><td>2</td></tr>
<tr><td>Stetson Mtn North Low</td><td>7/1-10/15</td><td>107</td><td rowspan="2">183</td><td>651</td><td>6.1</td><td>80</td></tr>
<tr><td>Stetson Mtn North High</td><td>6/29-7/26, 7/28-8/1, 8/22-8/26, 8/29-9/2, 9/13-10/15</td><td>76</td><td>170</td><td>2.2</td><td>27</td></tr>
<tr><td>Overall Results</td><td>June 28 to October 16</td><td>361</td><td>361</td><td>937</td><td>2.6</td><td>80</td></tr>
<tr><td colspan="7">* Detector-night is a sampling unit during which a single detector is deployed overnight. On nights when two detectors are deployed, the sampling effort equals two detector-nights, etc.</td></tr>
<tr><td colspan="7">** Number of bat passes recorded per detector-night.</td></tr>
<tr><td colspan="7">*** Maximum number of bat passes recorded from any single detector for a 12-hour sampling period.</td></tr>
</table>

Table 5-2. Species composition of calls recording at all passive detectors

Detector	**Guild**				**Total**
	Big brown guild	**Red bat/ E. pipistrelle**	***Myotis* spp.**	**Unknown**	
Stetson Mtn South Low	23	5	26	54	*108*
Stetson Mtn South High	1	2	3	2	*8*
Stetson Mtn North Low	178	2	161	310	*651*
Stetson Mtn North High	113	1	13	43	*170*
Total	***315***	***10***	***203***	***409***	***937***

The distribution of bat calls varied hourly and nightly throughout the survey period. Bat call sequences peaked in abundance during the early evening, and then peaked again in the few hours before dawn. The greatest numbers of calls were recorded between 8:00 and 9:00 pm.

Appendix D provides a series of tables with more specific information on the nightly number and suspected species composition of recorded bat call sequences at each of the eight detectors deployed during the passive sampling. Specifically, Appendix D Tables 1 through 4 provide information on the number of call sequences, by guild and suspected species, recorded at each detector and the weather conditions for that night. Appendix D Table 5 provides a summary of the results of active surveys.

Stetson Mountain North

During the 109-night deployment period, the Stetson Mountain North met tower high detector (30 m) operated for 76 nights and the low detector (15 m) operated for 107 nights (combined, 183 detector-nights of effort). A total of 821 bat call sequences were recorded during the sampling period at Stetson Mountain North (Table 5-1, 5-2). The number of call sequences recorded by each detector ranged from 170 (by the high detector) to 651 (by the low detector). The mean detection rate for both detectors was 4.5 call sequences/detector-night, with the rate at the low detector nearly three times that of the high detector (6.1 versus 2.2 sequences/detector-night). Of the 821 call sequences recorded; 43 percent were classified as unknown, 35 percent were grouped as the big brown guild, 21 percent were classified as the genus *Myotis*, and less than 1 percent were red bat/eastern pipistrelle. Overall, during the survey period at Stetson Mountain North, the majority of calls were recorded between 3:00 and 4:00 am (Figure 5-3).

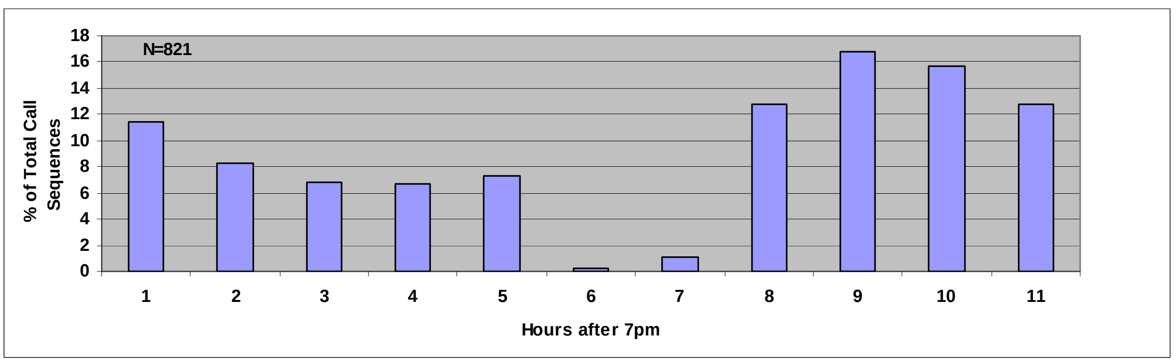

Figure 5-3. Hourly distribution of bat calls at Stetson Mountain North

Stetson Mountain South

During the 109-night deployment period, the Stetson Mountain South met tower high detector (30 m) operated for 73 nights and the low detector (15 m) operated for 105 nights (combined, 178 detector-nights of effort). A total of 116 bat call sequences were recorded during the sampling period at Stetson Mountain South (Table 5-1, 5-2). The number of call sequences recorded by each detector ranged from 8 (by the high detector) to 108 (by the low detector). The mean detection rate for both detectors was 0.7 call sequences/detector night, with the rate at the low detector ten times that of the high detector (1.0 versus 0.1 sequences/detector-night). Of the 116 call sequences recorded, 48 percent were classified as unknown, 25 percent were classified as the genus *Myotis*, 21 percent were grouped as the big brown guild, and 6 percent were red bat/eastern pipistrelle. Overall, during the survey period at Stetson Mountain South, the majority of calls were recorded between 4:00 and 5:00 am (Figure 5-4).

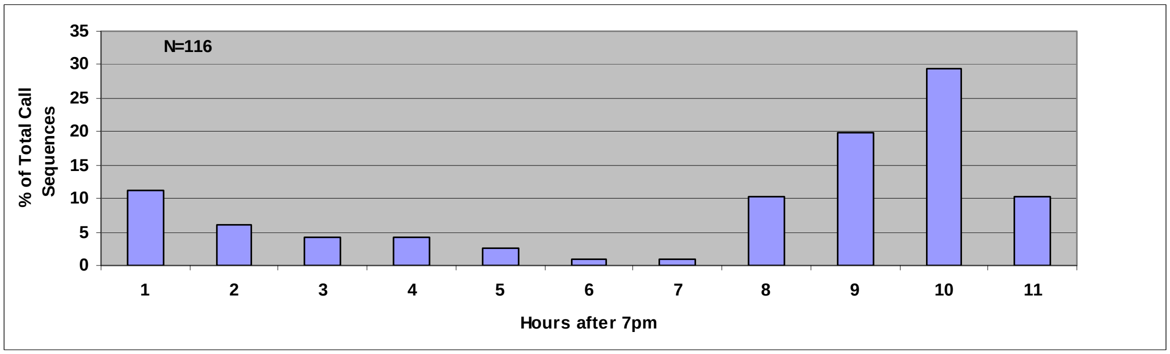

Figure 5-4. Hourly distribution of bat calls at Stetson Mountain South

Active Survey

Active surveys took place on the nights of August 21, September 12, September 13, and September 27, totaling 16 hours of sampling time (Table 5-3). During this time, 182 bat call sequences were recorded (11.4 call sequences/hour) (Appendix D Table 5). The majority of species detected during the roving surveys were myotids, which accounted for 66 of the 182 calls, or 36 percent (Figure 5-5). The red bat/eastern pipistrelle guild accounted for 49 (27%) of all calls, and the big brown guild accounted for 7 calls (4%). Additionally, 60 (33%) call sequences were classified as unknown calls. The majority of calls were recorded between the third and fifth hours post sunset (Figure 5-6). Generally, in most of the sites at which bats were detected, only one to two bats were seen, although multiple call sequences were recorded.

Table 5-3. Summary of bat detector roving survey effort and results

Location	Dates	# Nights	# Detector-Nights*	# Recorded sequences	Detection Rate **	Maximum # calls recorded ***
Roving Survey	8/21, 9/12-9/13, 9/27	4	4	182	45.5	45
Overall Results		***4***	***4***	***182***	***45.5***	--

* Detector-night is a sampling unit during which a single detector is deployed overnight. On nights when two detectors are deployed, the sampling effort equals two detector-nights, etc.

** Number of bat passes recorded per detector-night.

*** Maximum number of bat passes recorded from any **single** detector for a 12-hour sampling period.

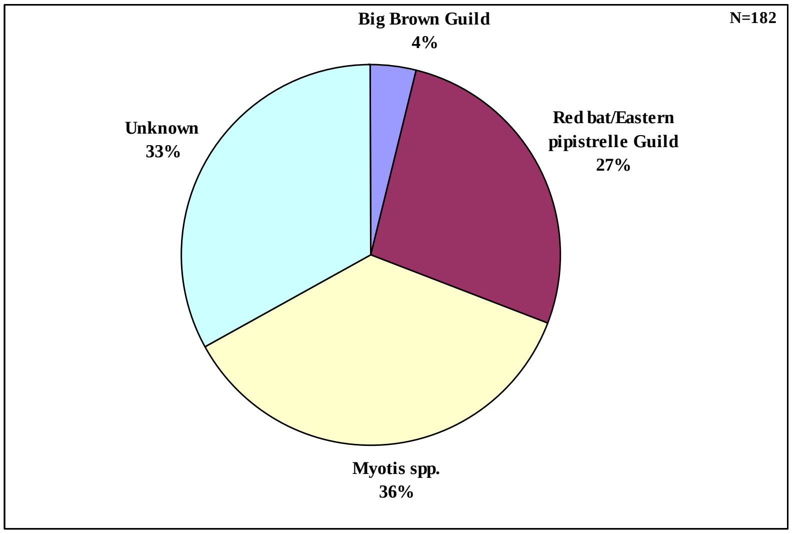

Figure 5-5. Species composition of calls recorded during roving surveys

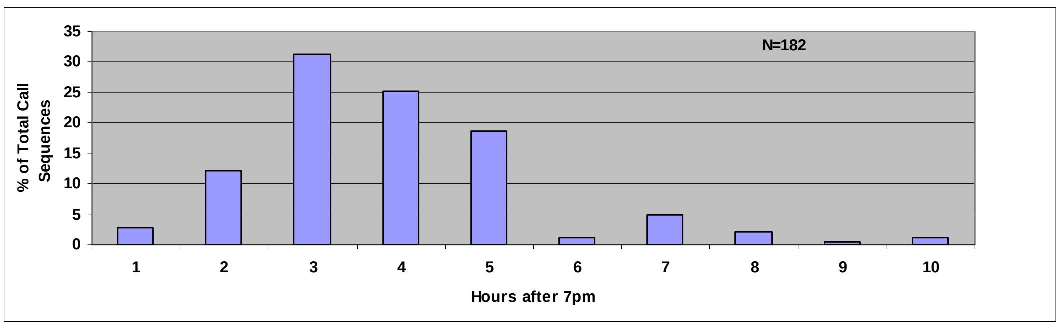

Figure 5-6. Timing of bat call detections during roving surveys

Ceilometer and Radar Surveys-Stetson Mountain

No bats were observed during the 71 five-minute ceilometer observation periods conducted during radar surveys. During analysis of the radar survey video data, 0.6 percent of target trails were identified as potential bats. These observations were generally distributed throughout the sampling period.

Weather Data- Stetson Mountain North and Stetson Mountain South

Mean nightly wind speeds at the Stetson Mountain area, from June 29 to October 16, varied between 1.9 and 11.7 meters per second (m/s), with an overall mean of 6.7 m/s (Figure 5-7). Mean nightly temperatures varied between 1.7 ºC and 21.5 ºC, with an overall mean of 12.2 ºC (Figure 5-8). No statistical relationships between these nightly data, or hourly data within each night, were observed. However, some general trends included slightly greater bat activity during periods of warmer, calmer weather.

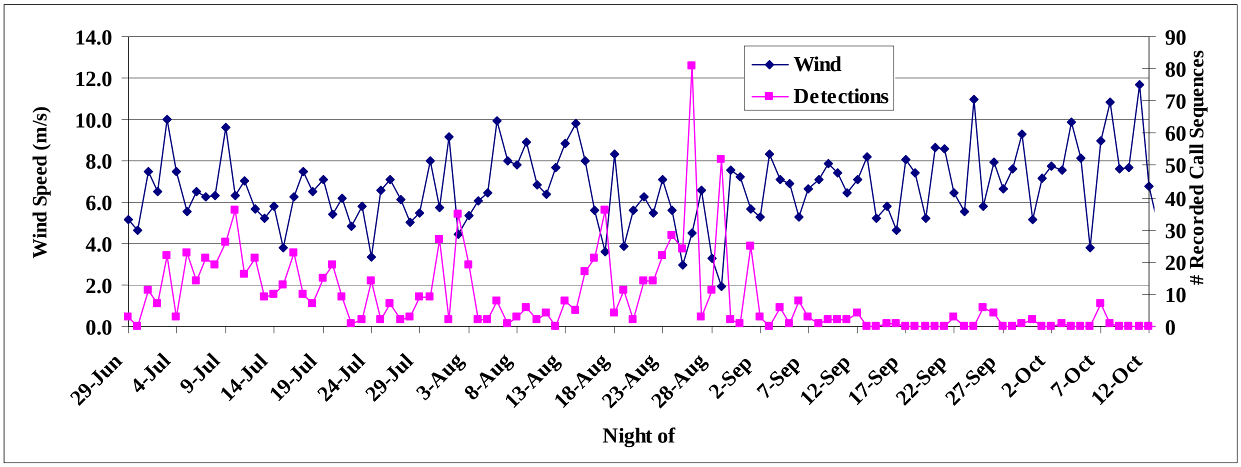

Figure 5-7. Nightly mean wind speed (m/s) and bat call detections (red line) at Stetson Mountain.

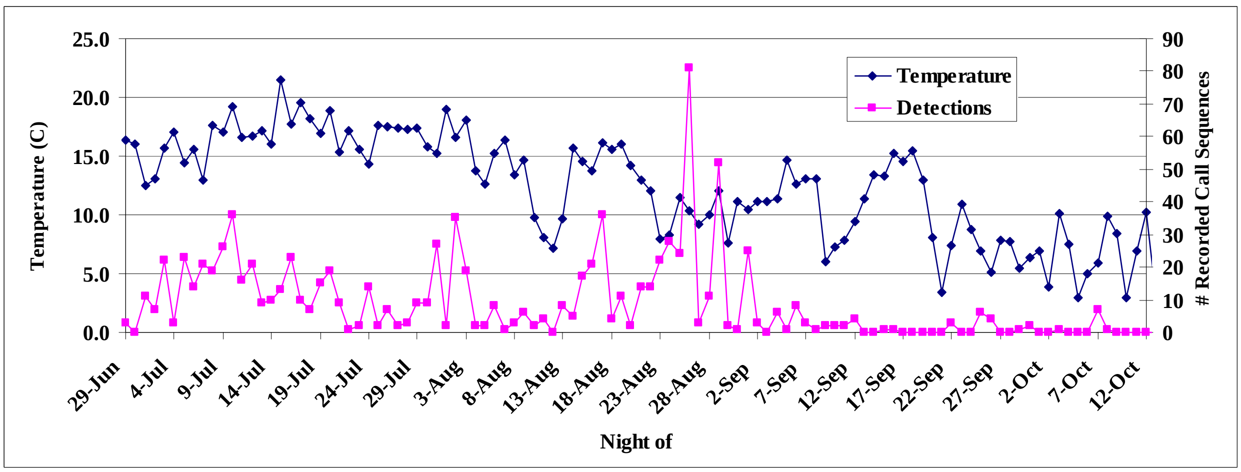

Figure 5-8. Nightly mean temperature (Celsius) and bat detections (red line) at Stetson Mountain.

5.4 Discussion

Bat echolocation surveys in 2006 at the proposed Stetson Wind Project provide some insight into activity patterns, possible species composition, and timing of movements of bats in the project area. The bimodal nighttime distribution of bat activity documented at both met towers seems to be a consistent behavioral trend in a number of species (Hayes 1997). Anthony *et al*. (1981) documented that bats appear to leave roosting sites at dusk to forage for a given period, return to their roosts during the middle portion of the night, then forage again later in the evening, closer to dawn.

Bat activity has been shown to correlate negatively to low nightly mean temperatures (Hayes 1997). For example, low temperatures may encourage species of the genus *Myotis* to remain in nocturnal roosts, as indicated by observations of roosts occupied for longer periods of time when temperatures are low (Anthony *et* al. 1981). While no obvious or strong correlation between bat activity and nighttime temperature appeared to occur in the project area, this overall demonstrated trend may provide an explanation for the relatively low number of calls recorded at Stetson Mountain, particularly near the end of the season.

The overall mean passive detection rate at the proposed Stetson Wind Project during the fall 2006 survey period was 2.6 call sequences/detector-night. This rate is generally similar to other fall bat detector surveys conducted recently (Table 5-4).

Of those calls that were identifiable to species or guild, calls of the species within the big brown guild were most abundant, followed by those of the *Myotis* spp. This pattern in guild abundance is generally consistent with most of the studies listed in Table 5-4. Fall 2006 passive surveys resulted in 921 bat call sequences, of which 315 were of the big brown bat guild, 203 were myotid, few were of the red bat/eastern pipistrelle group, and the remaining call sequences were unknown. Fall 2006 active surveys resulted in 182 bat call sequences, of which 66 were myotid, 49 were red bat/eastern pipistrelle, 7 were of the big brown bat guild, and the remaining calls were unknown.

Table 5-4. Summary of other available bat detector survey results

Location	Landscape	Season	Calls per detector night	Reference
Cohocton, NY	Agric. plateau	Fall 2004	2	Woodlot 2006a
Franklin, WV	Forested ridge	Fall 2004	9.24	Woodlot 2004
Prattsburgh, NY	Agric. plateau	Fall 2004	2.22	Woodlot 2005d
Sheffield, VT	Forested ridge	Fall 2004	1.76	Woodlot 2005e
Redington, ME	Forested ridge	Fall 2005	4.2	Woodlot 2005f
Cohocton, NY	Agric. plateau	Fall 2005	1.57	Woodlot 2006a
Fairfield, NY	Agric. plateau / ADK foothills	Fall 2005	1.7	Woodlot 2005a
Jordanville, NY	Agric. plateau / ADK foothills	Fall 2005	4.79	Woodlot 2005c
Mars Hill, ME	Forested ridge / Agric. plateau	Fall 2005	0.83	Woodlot 2005b
Sheffield, VT	Forested ridge	Fall 2005	1.18	Woodlot 2006b
Sheldon, NY	Agric. plateau	Fall 2005	34.92	Woodlot 2006c
Stetson Mountain	Forested ridge	Fall 2006	2.6	this report

The results of the roving surveys yielded a higher number of red bat/eastern pipistrelle utilizing habitat away from the met tower locations. Slightly more than one percent of calls recorded during the passive portion of the survey were those of red bat/eastern pipistrelle. In contrast, calls recorded during active sampling, at ground level, of a variety of habitat types showed that 27 percent of calls were of either red bat or eastern pipistrelle. Additionally, while far fewer call sequences were recorded during active sampling, far less effort was expended. On a per-hour basis, call sequence detections occurred nearly sixty times as frequently during active sampling than during passive sampling (11.4 versus 0.2 sequences/hour), indicating that bat activity in general is far more common at productive habitats, such as wetlands, out-buildings, and low elevation habitat edges, than at the tops of ridges and mountains in the area.

Results of acoustic surveys must be interpreted with caution. Considerable room for error exists in identification of bats based upon acoustic calls alone, especially if a site or regionally specific library of recorded reference calls is not available. Also, detection rates are not necessarily correlated with the actual numbers of bats in an area because it is not possible to differentiate between individual bats.

5.5 Conclusions

Detector surveys conducted during the fall migration period have provided information on bat activity in the vicinity of the proposed Stetson Wind Project. The surveys documented the species that would be expected in the area based on the species' range and abundance, as well as the habitats present in the project area. The overall detection rate of call sequences provides a good representation of the bat activity during the fall migration period throughout the Stetson project area.

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Appendix A

Raptor Survey Data Tables

Appendix A Table 1. Summary of Daily Raptor Migration Observations at Stetson Mountain

Species	9/14/2006	9/21/2006	9/22/2006	10/11/2006	10/16/2006	10/17/2006	10/26/2006	Grand Total
Turkey vulture	2	4	4					**10**
Osprey	2	3	2		1			**8**
Bald eagle				1	1		1	**3**
Northern harrier			1					**1**
Sharp-shinned hawk		2	1	1				**4**
Broad-winged hawk	1	25	2					**28**
Red-tailed hawk		5	6	9	2		1	**23**
Unidentified buteo				1				**1**
Golden eagle					1		1	**2**
American kestrel		1	1	1				**3**
Merlin				1				**1**
Peregrine falcon		1		1				**2**
Daily total	**5**	**41**	**17**	**15**	**5**	**0**	**3**	**86**
Number of obs. hours	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**42**
Daily passage rate	**0.8**	**6.8**	**2.8**	**2.5**	**0.8**	**0.0**	**0.5**	**2.0**

Appendix A Table 2. Raptor species distribution below or above maximum turbine height at Stetson Mountain in fall 2006.

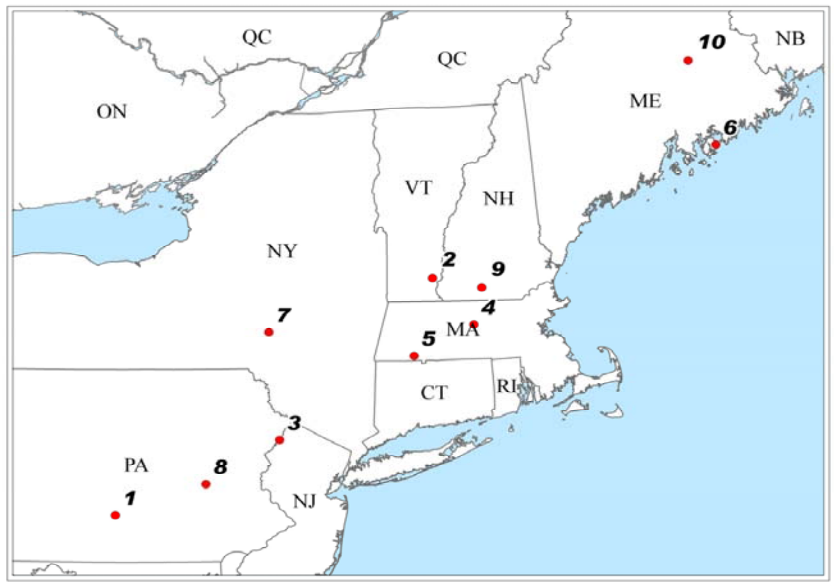
Species	< 125 m	> 125 m	Grand Total
Turkey vulture	10	0	10
Osprey	3	5	8
Bald eagle	2	1	3
Northern harrier	1	0	1
Sharp-shinned hawk	3	1	4
Broad-winged hawk	10	18	28
Red-tailed hawk	20	3	23
Unidentified buteo	0	1	1
Golden eagle	1	1	2
American kestrel	2	1	3
Merlin	1	0	1
Peregrine falcon	1	1	2
Grand Total	**54**	**32**	**86**

Appendix A Table 3. Summary of Regional Fall 2006 (September 1 - October 31) Migration Surveys*

Site Number**	Location	Observation Hours	BV	TV	OS	BE	NH	SS	CH	NG	RS	BW	RT	RL	GE	AK	ML	PG	SW	UR	UB	TOTAL	BIRDS/ HOUR
1	**Waggoner's Gap, PA**	551	46	1,061	657	257	278	7,525	872	16	92	7,279	1,763	0	73	310	79	79	0	152	0	20,539	37.3
2	**Putney Mountain, VT**	281	0	94	151	21	54	828	64	11	25	1,760	256	2	5	114	19	21	0	0	0	3,425	12.2
3	**Kittatinny Mountain, NJ**	176.25	0	0	78	13	11	424	58	3	3	894	278	0	0	56	6	6	0	51	0	1,881	10.7
4	**Barre Falls, MA**	243	0	314	274	47	31	1,036	120	7	17	5,561	148	0	3	158	42	10	0	52	0	7,820	32.2
5	**Blueberry Hill, MA**	260.83	0	112	169	35	56	700	97	2	28	1,534	118	0	4	350	9	29	0	37	0	3,280	12.6
6	**Cadillac Mountain, ME**	196.75	0	50	141	14	102	875	11	6	0	476	44	0	0	531	59	24	0	98	0	2,431	12.4
7	**Franklin Mountain, NY**	428.25	0	389	108	58	56	552	103	5	50	743	1,796	0	37	83	35	13	0	41	0	4,069	9.5
8	**Hawk Mountain, PA**	598.5	36	302	638	147	208	5,149	847	2	108	11,754	1,857	0	61	395	188	61	0	167	0	21,920	36.6
9	**Pack Monadnock, NH**	379.25	0	95	257	55	76	1,242	206	54	42	7,595	247	0	6	201	47	29	0	74	0	10,226	27.0
10	**Stetson Wind Project, ME**	42	0	10	8	3	1	4	0	0	0	28	23	0	2	3	1	2	0	0	1	86	2.0

* Data obtained from HMANA website.
** See map to right for site location.

Abbreviation Key:
BV - Black Vulture
TV - Turkey Vulture
OS - Osprey
BE - Bald Eagle
NH - Northern Harrier
SS - Sharp-shinned Hawk
CH - Cooper's Hawk
NG - Northern Goshawk
RS - Red-shouldered Hawk
BW - Broad-winged Hawk
RT - Red-tailed Hawk
RL - Rough-legged Hawk
GE - Golden Eagle
AK - American Kestrel
ML - Merlin
PG - Peregrine Falcon
SW - Swainson's Hawk
UR - unidentified Raptor
UB - unidentified Buteo
UA - unidentified Accipiter
UF - unidentified Falcon
UE - unidentified Eagle



Appendix B

Radar Survey Data Tables

Appendix B Table 1. Summary of passage rates by hour, night, and for entire season.

Night of	Passage Rate (targets/km/hr) by hour after sunset											Entire Night		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Mean**	**Stdev**	**SE**
9/2/2006	178	367	321	243	210	189	236	--	--	--	--	249	70	27
9/3/2006	102	291	55	77	--	--	--	--	--	--	--	131	108	54
9/4/2006	77	228	310	220	257	243	300	--	--	--	--	234	77	29
9/11/2006	--	--	--	--	441	470	402	225	351	295	279	352	90	34
9/12/2006	142	486	466	500	589	580	--	--	--	--	--	460	164	67
9/26/2006	--	626	211	379	311	264	--	--	--	--	--	358	162	72
9/27/2006	255	532	452	407	362	328	357	--	--	--	--	385	89	34
9/28/2006	188	392	551	570	603	545	514	--	--	--	--	480	145	55
9/30/2006	1063	1229	1367	1306	780	314	340	--	--	--	--	914	445	168
10/2/2006	273	406	573	579	479	370	--	--	--	--	--	446	120	49
10/5/2006	1170	1444	1377	1287	1130	1027	909	--	--	--	--	1192	191	72
10/6/2006	171	338	563	684	669	635	500	--	--	--	--	509	191	72
Entire Season	**361.8**	**576**	**568**	**568**	**530**	**451**	**445**	**225**	**351**	**295**	**279**	**476**	**298**	**86**

Appendix B Table 2. Mean Nightly Flight Direction

Night of	Mean Flight Direction	Circular Stdev
9/2/2006	329°	79°
9/3/2006	311°	42°
9/4/2006	154°	48°
9/11/2006	237°	32°
9/12/2006	187°	40°
9/26/2006	183°	56°
9/27/2006	297°	31°
9/28/2006	281°	27°
9/30/2006	220°	37°
10/2/2006	167°	31°
10/5/2006	212°	18°
10/6/2006	254°	38°
Entire Season	**227°**	**56°**

Appendix B Table 3. Summary of mean flight heights by hour, night, and for entire season.

Night of	Mean Flight Height (m) by hour after sunset										Entire Night			% of targets below 125 meters
	1	2	3	4	5	6	7	8	9	10	Mean	STDV	SE	
9/2/2006	266	373	411	422	461	433	--	--	--	--	394	69	28	15%
9/3/2006	230	179	--	266	--	--	--	--	--	--	225	44	25	33%
9/4/2006	275	311	356	477	392	405	--	--	--	--	369	72	29	12%
9/11/2006	--	--	--	--	282	254	--	232	188	230	237	35	15	32%
9/12/2006	303	355	298	344	333	302	--	--	--	--	322	25	10	28%
9/26/2006	--	656	397	511	451	466	453	--	--	--	489	90	37	11%
9/27/2006	178	193	222	212	237	269	--	--	--	--	219	32	13	34%
9/28/2006	235	468	411	409	296	208	--	--	--	--	338	106	43	34%
9/30/2006	472	450	386	434	465	534	530	--	--	--	457	49	20	15%
10/2/2006	353	445	493	553	595	581	521	--	--	--	506	85	32	6%
10/5/2006	360	502	517	518	559	514	506	--	--	--	497	63	24	9%
10/6/2006	206	418	482	555	610	551	530	--	--	--	479	135	51	11%
Entire Season	**294**	**388**	**396**	**429**	**438**	**440**	**508**	**232**	**188**	**230**	**378**	**110**	**32**	**13%**

-- indicates no data for that hour

Appendix C

Morning Bird Survey Data Tables

Appendix C Table 1. Morning bird survey results from both transects at Stetson Mountain during fall 2006

Species	9/2/2006	9/3/2006	9/4/2006	9/11/2006	9/12/2006	9/26/2006	9/27/2006	9/28/2006	9/30/2006	10/2/2006	10/5/2006	10/6/2006	Grand Total
American crow							5						**5**
American goldfinch				2		1							**3**
American redstart				1									**1**
American robin	2	8	4			2	2		10		1	5	**34**
Black and white warbler			8	2				2					**12**
Black capped chickadee	3	8	17	13	2	8	10	5	1	2		5	**74**
Blackburnian warbler				1				1					**2**
Blackpoll warbler				1				1				3	**5**
Black-throated blue warbler			4	4				5	4				**17**
Black-throated green warbler			3	7				2					**12**
Blue jay				1	3	3	2		1		2		**12**
Blue-headed vireo				8	4			1	4	1			**18**
Broad-winged hawk			1										**1**
Brown creeper												1	**1**
Chestnut-sided warbler		4	10	4									**18**
Common raven	1		3	1		2	2		1	1	1		**12**
Common yellowthroat	2	6	18	7	3	6	1	2	2	1			**48**
Dark-eyed junco	2		11	7	6	4			3	5	6	2	**46**
Downy woodpecker		1	3										**4**
Golden-crowned kinglet					2	3	6	10	10		2	3	**36**
Hairy woodpecker						1	1		1				**3**
Hermit thrush				2	2	4	2					1	**11**
Magnolia warbler			2	1				2					**5**
Nashville warbler				2					1				**3**
Northern flicker	1	6	14			3	3		1				**28**
Northern parula				1		1			1				**3**
Pileated woodpecker													**0**
Pine siskin											16		**16**
Purple finch									1	6	9	1	**17**
Red-eyed vireo				14	3	1		1		1			**20**
Red-tailed hawk		2				1							**3**
Ruby-crowned kinglet			6	1				6		1			**14**
Ruffed grouse						1		1	2				**4**
Unidentified Thrush											2		**2**
Unidentified Warbler				7	9		3						**19**
White-breasted nuthatch				3					1				**4**
White-throated sparrow			8	9	7				1	3		1	**29**
Winter wren			2							1		1	**4**
Yellow-bellied sapsucker			2						2				**4**
Yellow-rumped warbler				1		1	1	42	13	13	2	9	**82**
Grand Total	**11**	**35**	**116**	**100**	**41**	**42**	**38**	**81**	**60**	**35**	**41**	**32**	**632**

Dates listed indicate the previous night's date.

Appendix C Table 2. Morning bird surveys results by family group at Stetson Mountain during fall 2006.

Family Groups	9/2/2006	9/3/2006	9/4/2006	9/11/2006	9/12/2006	9/26/2006	9/27/2006	9/28/2006	9/30/2006	10/2/2006	10/5/2006	10/6/2006	Grand Total
Corvids	1		3	2	3	5	9		2	1	3		**29**
Finches	2		11	9	6	5			4	11	31	3	**82**
Others	4	15	44	17	4	16	20	22	18	4	2	10	**176**
Raptors		2	1			1							**4**
Sparrows			8	9	7				1	3		1	**29**
Thrushes	2	8	4	2	2	6	4		10		3	6	**47**
Vireos				22	7	1		2	4	2			**38**
Warblers	2	10	45	39	12	8	5	57	21	14	2	12	**227**
Grand Total	**11**	**35**	**116**	**100**	**41**	**42**	**38**	**81**	**60**	**35**	**41**	**32**	**632**

Appendix D

Bat Detector Survey Data Tables

Appendix D Table 1. Summary of species and weather during each survey night at the Stetson North high detector (30m) – Fall 2006

Night of	Detector Nights	GUILD											Total	Nightly Means 7pm-7am		
		BIG BROWN GUILD				RBEP		MYSP				UNKN		Wind Speed	Wind Direction	Temperature
		big brown bat	hoary bat	silver-haired bat	silver-haired/big brown	eastern pipistrelle	eastern red bat	little brown bat	*Myotis* spp.	northern myotis	small-footed myotis	unknown		(m/s)	(degrees from true north)	(C)
29-Jun	**1**											3	**3**	5.2	216.5	16.3
30-Jun	**1**												**0**	4.6	178.8	16.1
1-Jul	**1**			1	1							4	**6**	7.5	254.9	12.5
2-Jul	**1**		1									2	**3**	6.5	220.6	13.1
3-Jul	**1**				5			1				2	**8**	10.0	271.6	15.7
4-Jul	**1**											1	**1**	7.5	226.3	17.1
5-Jul	**1**			1	2				2			3	**8**	5.6	187.7	14.5
6-Jul	**1**				3				1				**4**	6.5	285.5	15.6
7-Jul	**1**			1	4							1	**6**	6.3	296.1	13.0
8-Jul	**1**	1	2		6								**9**	6.3	275.4	17.6
9-Jul	**1**		1		8				1				**10**	9.6	226.2	17.0
10-Jul	**1**	1	1	3	8				1			2	**16**	6.3	230.0	19.2
11-Jul	**1**			1	4							1	**6**	7.0	215.6	16.6
12-Jul	**1**			1	2				1				**4**	5.6	253.9	16.7
13-Jul	**1**								1				**1**	5.2	119.8	17.1
14-Jul	**1**			1	2								**3**	5.8	167.5	16.0
15-Jul	**1**				3							2	**5**	3.8	162.5	21.5
16-Jul	**1**				7								**7**	6.2	173.5	17.7
17-Jul	**1**				4								**4**	7.5	203.6	19.6
18-Jul	**1**								1				**1**	6.5	183.5	18.1
19-Jul	**1**				2							2	**4**	7.1	214.1	17.0
20-Jul	**1**												**0**	5.5	215.3	18.9
21-Jul	**1**												**0**	6.2	159.8	15.3
22-Jul	**1**												**0**	4.9	201.8	17.2
23-Jul	**1**												**0**	5.8	123.8	15.6
24-Jul	**1**			1	3								**4**	3.4	292.6	14.3
25-Jul	**1**												**0**	6.6	192.0	17.6
26-Jul	**1**												**0**	7.1	226.3	17.5
27-Jul	**0**												**n/o**	6.1	170.2	17.4
28-Jul	**1**				1								**1**	5.0	179.1	17.3
29-Jul	**1**						1						**1**	5.5	278.0	17.4
30-Jul	**1**											3	**3**	8.0	323.5	15.8
31-Jul	**1**			13	7				1			6	**27**	5.7	313.8	15.2
1-Aug	**1**												**0**	9.2	252.4	19.0
2-Aug	**0**												**n/o**	4.4	170.7	16.6
3-Aug	**0**												**n/o**	5.3	222.9	18.0
4-Aug	**0**												**n/o**	6.0	250.8	13.8
5-Aug	**0**												**n/o**	6.4	283.6	12.6
6-Aug	**0**												**n/o**	9.9	208.1	15.2
7-Aug	**0**												**n/o**	8.0	257.9	16.3
8-Aug	**0**												**n/o**	7.8	287.6	13.5
9-Aug	**0**												**n/o**	8.9	234.5	14.6
10-Aug	**0**												**n/o**	6.9	313.8	9.8
11-Aug	**0**												**n/o**	6.4	304.2	8.0
12-Aug	**0**												**n/o**	7.7	290.1	7.2
13-Aug	**0**												**n/o**	8.8	257.2	9.7
14-Aug	**0**												**n/o**	9.8	201.5	15.7
15-Aug	**0**												**n/o**	8.0	275.5	14.6
16-Aug	**0**												**n/o**	5.6	324.5	13.8
17-Aug	**0**												**n/o**	3.6	135.2	16.1
18-Aug	**0**												**n/o**	8.3	225.1	15.6
19-Aug	**0**												**n/o**	3.9	190.2	16.1
20-Aug	**0**												**n/o**	5.6	75.7	14.2
21-Aug	**0**												**n/o**	6.3	281.5	12.9
22-Aug	**1**												**0**	5.5	289.7	12.0
23-Aug	**1**												**0**	7.1	272.6	7.9
24-Aug	**1**											2	**2**	5.6	313.1	8.3
25-Aug	**1**			2	1				1			1	**5**	3.0	48.2	11.5
26-Aug	**1**												**0**	4.5	100.7	10.3
27-Aug	**0**												**n/o**	6.6	169.7	9.2
28-Aug	**0**												**n/o**	3.3	93.4	10.0
29-Aug	**1**			7	1				2			7	**17**	1.9	240.2	12.1
30-Aug	**1**												**0**	7.5	325.2	7.6
31-Aug	**1**												**0**	7.3	313.5	11.1
1-Sep	**1**												**0**	5.7	89.2	10.4
2-Sep	**1**												**0**	5.3	189.3	11.1
3-Sep	**0**												**n/o**	8.3	115.6	11.1
4-Sep	**0**												**n/o**	7.1	309.5	11.3
5-Sep	**0**												**n/o**	6.9	239.7	14.7
6-Sep	**0**												**n/o**	5.3	86.2	12.6
7-Sep	**0**												**n/o**	6.6	227.2	13.1
8-Sep	**0**												**n/o**	7.1	216.0	13.1
9-Sep	**0**												**n/o**	7.9	344.1	6.0
10-Sep	**0**												**n/o**	7.4	13.2	7.3
11-Sep	**0**												**n/o**	6.5	25.4	7.9
12-Sep	**0**												**n/o**	7.1	334.0	9.4
13-Sep	**1**												**0**	8.2	225.2	11.4
14-Sep	**1**												**0**	5.2	240.9	13.4
15-Sep	**1**												**0**	5.8	271.3	13.3
16-Sep	**1**												**0**	4.6	316.8	15.2
17-Sep	**1**												**0**	8.0	253.9	14.5
18-Sep	**1**												**0**	7.4	189.5	15.5
19-Sep	**1**												**0**	5.2	236.8	12.9
20-Sep	**1**												**0**	8.6	272.5	8.0
21-Sep	**1**												**0**	8.6	267.8	3.5
22-Sep	**1**											1	**1**	6.5	231.4	7.3
23-Sep	**1**												**0**	5.6	218.6	10.9
24-Sep	**1**												**0**	11.0	283.5	8.8
25-Sep	**1**												**0**	5.8	243.4	6.9
26-Sep	**1**												**0**	7.9	260.4	5.1
27-Sep	**1**												**0**	6.6	168.6	7.9
28-Sep	**1**												**0**	7.6	126.9	7.7
29-Sep	**1**												**0**	9.3	264.9	5.4
30-Sep	**1**												**0**	5.2	177.8	6.3
1-Oct	**1**												**0**	7.2	106.0	6.9
2-Oct	**1**												**0**	7.8	288.3	3.8
3-Oct	**1**												**0**	7.5	288.4	10.2
4-Oct	**1**												**0**	9.9	294.7	7.5
5-Oct	**1**												**0**	8.1	12.5	3.0
6-Oct	**1**												**0**	3.8	198.3	5.0
7-Oct	**1**												**0**	9.0	269.6	5.9
8-Oct	**1**												**0**	10.8	243.0	9.9
9-Oct	**1**												**0**	7.6	184.1	8.4
10-Oct	**1**												**0**	7.7	60.7	3.0
11-Oct	**1**												**0**	11.7	103.3	7.0
12-Oct	**1**												**0**	6.7	230.6	10.3
13-Oct	**1**												**0**	4.8	182.8	3.3
14-Oct	**1**												**0**	7.8	269.2	2.0
15-Oct	**1**												**0**	6.9	287.6	1.7
By Species		**2**	**5**	**32**	**74**	**0**	**1**	**1**	**12**	**0**	**0**	**43**	**170**			
By Guild		**113**				**1**		**13**				**43**				
		BIG BROWN GUILD				**RBFP**		**MYSP**				**UNKN**	**Total**			

n/o - indicates that detector was not operating on that night

Appendix D Table 2. Summary of species and weather during each survey night at the Stetson North low detector (15m) – Fall 2006

Night of	Detector Nights	GUILD: BIG BROWN GUILD				RBEP		MYSP				UNKN	Total	Nightly Means 7pm-7am: Wind Speed (m/s)	Wind Direction (degrees from true north)	Temperature (C)
		big brown bat	hoary bat	silver-haired bat	silver-haired/big brown	eastern pipistrelle	eastern red bat	little brown bat	*Myotis* spp.	northern myotis	small-footed myotis	unknown				
29-Jun	**0**												**n/o**	5.2	216.5	16.3
30-Jun	**0**												**n/o**	4.6	178.8	16.1
1-Jul	**1**				1				2			2	**5**	7.5	254.9	12.5
2-Jul	**1**											4	**4**	6.5	220.6	13.1
3-Jul	**1**		1		6				7				**14**	10.0	271.6	15.7
4-Jul	**1**							1				1	**2**	7.5	226.3	17.1
5-Jul	**1**				1				7			3	**11**	5.6	187.7	14.5
6-Jul	**1**				5				4				**9**	6.5	285.5	15.6
7-Jul	**1**			3	2				4			6	**15**	6.3	296.1	13.0
8-Jul	**1**		1		2				2			3	**8**	6.3	275.4	17.6
9-Jul	**1**				7				2			5	**14**	9.6	226.2	17.0
10-Jul	**1**	2			12				3			3	**20**	6.3	230.0	19.2
11-Jul	**1**				5				2			1	**8**	7.0	215.6	16.6
12-Jul	**1**			1	6				5			1	**13**	5.6	253.9	16.7
13-Jul	**1**				5				1			1	**7**	5.2	119.8	17.1
14-Jul	**1**			1	2							3	**6**	5.8	167.5	16.0
15-Jul	**1**				3				2				**5**	3.8	162.5	21.5
16-Jul	**1**		3		6				2			3	**14**	6.2	173.5	17.7
17-Jul	**1**				3				3				**6**	7.5	203.6	19.6
18-Jul	**1**								2				**2**	6.5	183.5	18.1
19-Jul	**1**			2					1			5	**8**	7.1	214.1	17.0
20-Jul	**1**											1	**1**	5.5	215.3	18.9
21-Jul	**1**		1	3	1							3	**8**	6.2	159.8	15.3
22-Jul	**1**												**0**	4.9	201.8	17.2
23-Jul	**1**								1				**1**	5.8	123.8	15.6
24-Jul	**1**			1	2							4	**7**	3.4	292.6	14.3
25-Jul	**1**			1								1	**2**	6.6	192.0	17.6
26-Jul	**1**				1				1			3	**5**	7.1	226.3	17.5
27-Jul	**1**		1									1	**2**	6.1	170.2	17.4
28-Jul	**1**			1									**1**	5.0	179.1	17.3
29-Jul	**1**								1			5	**6**	5.5	278.0	17.4
30-Jul	**1**								1			3	**4**	8.0	323.5	15.8
31-Jul	**1**												**0**	5.7	313.8	15.2
1-Aug	**1**			1								1	**2**	9.2	252.4	19.0
2-Aug	**1**			8	11				1			12	**32**	4.4	170.7	16.6
3-Aug	**1**			3	8				1			6	**18**	5.3	222.9	18.0
4-Aug	**1**			1								1	**2**	6.0	250.8	13.8
5-Aug	**1**								1				**1**	6.4	283.6	12.6
6-Aug	**1**			1	1				1			1	**4**	9.9	208.1	15.2
7-Aug	**1**												**0**	8.0	257.9	16.3
8-Aug	**1**												**0**	7.8	287.6	13.5
9-Aug	**1**								1			2	**3**	8.9	234.5	14.6
10-Aug	**1**			1								1	**2**	6.9	313.8	9.8
11-Aug	**1**												**0**	6.4	304.2	8.0
12-Aug	**1**												**0**	7.7	290.1	7.2
13-Aug	**1**						1		2			5	**8**	8.8	257.2	9.7
14-Aug	**1**											3	**3**	9.8	201.5	15.7
15-Aug	**1**		1						5			8	**14**	8.0	275.5	14.6
16-Aug	**1**			4	3				1			11	**19**	5.6	324.5	13.8
17-Aug	**1**			12	4				4			13	**33**	3.6	135.2	16.1
18-Aug	**1**				1				1				**2**	8.3	225.1	15.6
19-Aug	**1**			4	2							3	**9**	3.9	190.2	16.1
20-Aug	**1**											2	**2**	5.6	75.7	14.2
21-Aug	**1**								3			7	**10**	6.3	281.5	12.9
22-Aug	**1**								5			8	**13**	5.5	289.7	12.0
23-Aug	**1**								9			12	**21**	7.1	272.6	7.9
24-Aug	**1**								6			20	**26**	5.6	313.1	8.3
25-Aug	**1**			2	2				4			9	**17**	3.0	48.2	11.5
26-Aug	**1**								32			48	**80**	4.5	100.7	10.3
27-Aug	**1**						1		1			1	**3**	6.6	169.7	9.2
28-Aug	**1**								5			6	**11**	3.3	93.4	10.0
29-Aug	**1**			12	3				2			17	**34**	1.9	240.2	12.1
30-Aug	**1**								1				**1**	7.5	325.2	7.6
31-Aug	**1**												**0**	7.3	313.5	11.1
1-Sep	**1**				1				8			14	**23**	5.7	89.2	10.4
2-Sep	**1**											3	**3**	5.3	189.3	11.1
3-Sep	**1**												**0**	8.3	115.6	11.1
4-Sep	**1**								3			2	**5**	7.1	309.5	11.3
5-Sep	**1**												**0**	6.9	239.7	14.7
6-Sep	**1**								2			5	**7**	5.3	86.2	12.6
7-Sep	**1**								1			2	**3**	6.6	227.2	13.1
8-Sep	**1**								1				**1**	7.1	216.0	13.1
9-Sep	**1**								1			1	**2**	7.9	344.1	6.0
10-Sep	**1**								1				**1**	7.4	13.2	7.3
11-Sep	**1**											1	**1**	6.5	25.4	7.9
12-Sep	**1**								1			2	**3**	7.1	334.0	9.4
13-Sep	**1**												**0**	8.2	225.2	11.4
14-Sep	**1**												**0**	5.2	240.9	13.4
15-Sep	**1**											1	**1**	5.8	271.3	13.3
16-Sep	**1**												**0**	4.6	316.8	15.2
17-Sep	**1**												**0**	8.0	253.9	14.5
18-Sep	**1**												**0**	7.4	189.5	15.5
19-Sep	**1**												**0**	5.2	236.8	12.9
20-Sep	**1**												**0**	8.6	272.5	8.0
21-Sep	**1**												**0**	8.6	267.8	3.5
22-Sep	**1**											2	**2**	6.5	231.4	7.3
23-Sep	**1**												**0**	5.6	218.6	10.9
24-Sep	**1**												**0**	11.0	283.5	8.8
25-Sep	**1**											6	**6**	5.8	243.4	6.9
26-Sep	**1**											4	**4**	7.9	260.4	5.1
27-Sep	**1**												**0**	6.6	168.6	7.9
28-Sep	**1**												**0**	7.6	126.9	7.7
29-Sep	**1**								1				**1**	9.3	264.9	5.4
30-Sep	**1**								1			1	**2**	5.2	177.8	6.3
1-Oct	**1**												**0**	7.2	106.0	6.9
2-Oct	**1**												**0**	7.8	288.3	3.8
3-Oct	**1**												**0**	7.5	288.4	10.2
4-Oct	**1**												**0**	9.9	294.7	7.5
5-Oct	**1**												**0**	8.1	12.5	3.0
6-Oct	**1**												**0**	3.8	198.3	5.0
7-Oct	**1**											7	**7**	9.0	269.6	5.9
8-Oct	**1**								1				**1**	10.8	243.0	9.9
9-Oct	**1**												**0**	7.6	184.1	8.4
10-Oct	**1**												**0**	7.7	60.7	3.0
11-Oct	**1**												**0**	11.7	103.3	7.0
12-Oct	**1**												**0**	6.7	230.6	10.3
13-Oct	**1**												**0**	4.8	182.8	3.3
14-Oct	**1**												**0**	7.8	269.2	2.0
15-Oct	**1**												**0**	6.9	287.6	1.7
By Species		**2**	**8**	**62**	**106**	**0**	**2**	**1**	**160**	**0**	**0**	**310**	**651**			
By Guild		**178**				**2**		**161**				**310**				
		BIG BROWN GUILD				**RBFP**		**MYSP**				**UNKN**	**Total**			

n/o - indicates that detector was not operating on that night

Appendix D Table 3. Summary of species and weather during each survey night at the Stetson South high detector (30m) – Fall 2006

		GUILD												Nightly Means 7pm-7am		
		BIG BROWN GUILD				RBEP		MYSP				UNKN		Wind Speed	Wind Direction	Temperature
Night of	Detector Nights	big brown bat	hoary bat	silver-haired bat	silver-haired/big brown	eastern pipistrelle	eastern red bat	little brown bat	*Myotis* spp.	northern myotis	small-footed myotis	unknown	Total	(m/s)	(degrees from true north)	(C)
29-Jun	0												n/o	5.2	216.5	16.3
30-Jun	0												n/o	4.6	178.8	16.1
1-Jul	0												n/o	7.5	254.9	12.5
2-Jul	0												n/o	6.5	220.6	13.1
3-Jul	0												n/o	10.0	271.6	15.7
4-Jul	0												n/o	7.5	226.3	17.1
5-Jul	0												n/o	5.6	187.7	14.5
6-Jul	0												n/o	6.5	285.5	15.6
7-Jul	0												n/o	6.3	296.1	13.0
8-Jul	0												n/o	6.3	275.4	17.6
9-Jul	0												n/o	9.6	226.2	17.0
10-Jul	0												n/o	6.3	230.0	19.2
11-Jul	0												n/o	7.0	215.6	16.6
12-Jul	0												n/o	5.6	253.9	16.7
13-Jul	0												n/o	5.2	119.8	17.1
14-Jul	0												n/o	5.8	167.5	16.0
15-Jul	0												n/o	3.8	162.5	21.5
16-Jul	0												n/o	6.2	173.5	17.7
17-Jul	0												n/o	7.5	203.6	19.6
18-Jul	1												0	6.5	183.5	18.1
19-Jul	1												0	7.1	214.1	17.0
20-Jul	1												0	5.5	215.3	18.9
21-Jul	1												0	6.2	159.8	15.3
22-Jul	1												0	4.9	201.8	17.2
23-Jul	1												0	5.8	123.8	15.6
24-Jul	1												0	3.4	292.6	14.3
25-Jul	1												0	6.6	192.0	17.6
26-Jul	1												0	7.1	226.3	17.5
27-Jul	1												0	6.1	170.2	17.4
28-Jul	1												0	5.0	179.1	17.3
29-Jul	1												0	5.5	278.0	17.4
30-Jul	1												0	8.0	323.5	15.8
31-Jul	1												0	5.7	313.8	15.2
1-Aug	1												0	9.2	252.4	19.0
2-Aug	1												0	4.4	170.7	16.6
3-Aug	1												0	5.3	222.9	18.0
4-Aug	1												0	6.0	250.8	13.8
5-Aug	1												0	6.4	283.6	12.6
6-Aug	1												0	9.9	208.1	15.2
7-Aug	1												0	8.0	257.9	16.3
8-Aug	1												0	7.8	287.6	13.5
9-Aug	1												0	8.9	234.5	14.6
10-Aug	1												0	6.9	313.8	9.8
11-Aug	1												0	6.4	304.2	8.0
12-Aug	0												n/o	7.7	290.1	7.2
13-Aug	0												n/o	8.8	257.2	9.7
14-Aug	0												n/o	9.8	201.5	15.7
15-Aug	0												n/o	8.0	275.5	14.6
16-Aug	0												n/o	5.6	324.5	13.8
17-Aug	0												n/o	3.6	135.2	16.1
18-Aug	0												n/o	8.3	225.1	15.6
19-Aug	0												n/o	3.9	190.2	16.1
20-Aug	0												n/o	5.6	75.7	14.2
21-Aug	0												n/o	6.3	281.5	12.9
22-Aug	0												n/o	5.5	289.7	12.0
23-Aug	0												n/o	7.1	272.6	7.9
24-Aug	0												n/o	5.6	313.1	8.3
25-Aug	0												n/o	3.0	48.2	11.5
26-Aug	0												n/o	4.5	100.7	10.3
27-Aug	0												n/o	6.6	169.7	9.2
28-Aug	0												n/o	3.3	93.4	10.0
29-Aug	1												0	1.9	240.2	12.1
30-Aug	1												0	7.5	325.2	7.6
31-Aug	1												0	7.3	313.5	11.1
1-Sep	1						1					1	2	5.7	89.2	10.4
2-Sep	1												0	5.3	189.3	11.1
3-Sep	1												0	8.3	115.6	11.1
4-Sep	1								1				1	7.1	309.5	11.3
5-Sep	1											1	1	6.9	239.7	14.7
6-Sep	1						1						1	5.3	86.2	12.6
7-Sep	1												0	6.6	227.2	13.1
8-Sep	1												0	7.1	216.0	13.1
9-Sep	1												0	7.9	344.1	6.0
10-Sep	1				1								1	7.4	13.2	7.3
11-Sep	1								1				1	6.5	25.4	7.9
12-Sep	1								1				1	7.1	334.0	9.4
13-Sep	1												0	8.2	225.2	11.4
14-Sep	1												0	5.2	240.9	13.4
15-Sep	1												0	5.8	271.3	13.3
16-Sep	1												0	4.6	316.8	15.2
17-Sep	1												0	8.0	253.9	14.5
18-Sep	1												0	7.4	189.5	15.5
19-Sep	1												0	5.2	236.8	12.9
20-Sep	1												0	8.6	272.5	8.0
21-Sep	1												0	8.6	267.8	3.5
22-Sep	1												0	6.5	231.4	7.3
23-Sep	1												0	5.6	218.6	10.9
24-Sep	1												0	11.0	283.5	8.8
25-Sep	1												0	5.8	243.4	6.9
26-Sep	1												0	7.9	260.4	5.1
27-Sep	1												0	6.6	168.6	7.9
28-Sep	1												0	7.6	126.9	7.7
29-Sep	1												0	9.3	264.9	5.4
30-Sep	1												0	5.2	177.8	6.3
1-Oct	1												0	7.2	106.0	6.9
2-Oct	1												0	7.8	288.3	3.8
3-Oct	1												0	7.5	288.4	10.2
4-Oct	1												0	9.9	294.7	7.5
5-Oct	1												0	8.1	12.5	3.0
6-Oct	1												0	3.8	198.3	5.0
7-Oct	1												0	9.0	269.6	5.9
8-Oct	1												0	10.8	243.0	9.9
9-Oct	1												0	7.6	184.1	8.4
10-Oct	1												0	7.7	60.7	3.0
11-Oct	1												0	11.7	103.3	7.0
12-Oct	1												0	6.7	230.6	10.3
13-Oct	1												0	4.8	182.8	3.3
14-Oct	1												0	7.8	269.2	2.0
15-Oct	1												0	6.9	287.6	1.7
By Species		0	0	0	1	0	2	0	3	0	0	2	8			
By Guild		1				2		3				2				
		BIG BROWN GUILD				RBEP		MYSP				UNKN	Total			

n/o - indicates that detector was not operating on that night

Appendix D Table 4. Summary of species and weather during each survey night at the Stetson South low detector (15m) – Fall 2006

		GUILD												Nightly Means 7pm-7am		
		BIG BROWN GUILD				RBEP		MYSP				UNKN		Wind Speed	Wind Direction	Temperature
Night of	Detector Nights	big brown bat	hoary bat	silver-haired bat	silver-haired/big brown	eastern pipistrelle	eastern red bat	little brown bat	*Myotis* spp.	northern myotis	small-footed myotis	unknown	Total	(m/s)	(degrees from true north)	(C)
29-Jun	1												0	5.2	216.5	16.3
30-Jun	1												0	4.6	178.8	16.1
1-Jul	0												n/o	7.5	254.9	12.5
2-Jul	0												n/o	6.5	220.6	13.1
3-Jul	0												n/o	10.0	271.6	15.7
4-Jul	0												n/o	7.5	226.3	17.1
5-Jul	1				1				3				4	5.6	187.7	14.5
6-Jul	1											1	1	6.5	285.5	15.6
7-Jul	1												0	6.3	296.1	13.0
8-Jul	1											2	2	6.3	275.4	17.6
9-Jul	1								2				2	9.6	226.2	17.0
10-Jul	1												0	6.3	230.0	19.2
11-Jul	1								1			1	2	7.0	215.6	16.6
12-Jul	1								1			3	4	5.6	253.9	16.7
13-Jul	1								1				1	5.2	119.8	17.1
14-Jul	1								1				1	5.8	167.5	16.0
15-Jul	1				2				1				3	3.8	162.5	21.5
16-Jul	1				1		1						2	6.2	173.5	17.7
17-Jul	1												0	7.5	203.6	19.6
18-Jul	1				1				2			1	4	6.5	183.5	18.1
19-Jul	1		2		1								3	7.1	214.1	17.0
20-Jul	1		6						1			11	18	5.5	215.3	18.9
21-Jul	1								1				1	6.2	159.8	15.3
22-Jul	1						1						1	4.9	201.8	17.2
23-Jul	1											1	1	5.8	123.8	15.6
24-Jul	1								1			2	3	3.4	292.6	14.3
25-Jul	1												0	6.6	192.0	17.6
26-Jul	1						1					1	2	7.1	226.3	17.5
27-Jul	1												0	6.1	170.2	17.4
28-Jul	1											1	1	5.0	179.1	17.3
29-Jul	1											2	2	5.5	278.0	17.4
30-Jul	1								1			1	2	8.0	323.5	15.8
31-Jul	1												0	5.7	313.8	15.2
1-Aug	1												0	9.2	252.4	19.0
2-Aug	1								1			2	3	4.4	170.7	16.6
3-Aug	1											1	1	5.3	222.9	18.0
4-Aug	1												0	6.0	250.8	13.8
5-Aug	1											1	1	6.4	283.6	12.6
6-Aug	1								3			1	4	9.9	208.1	15.2
7-Aug	1								1				1	8.0	257.9	16.3
8-Aug	1				1							2	3	7.8	287.6	13.5
9-Aug	1						1		1			1	3	8.9	234.5	14.6
10-Aug	1												0	6.9	313.8	9.8
11-Aug	1								1			3	4	6.4	304.2	8.0
12-Aug	1												0	7.7	290.1	7.2
13-Aug	1												0	8.8	257.2	9.7
14-Aug	1											2	2	9.8	201.5	15.7
15-Aug	1				1				1			1	3	8.0	275.5	14.6
16-Aug	1											2	2	5.6	324.5	13.8
17-Aug	1						1					2	3	3.6	135.2	16.1
18-Aug	1				1							1	2	8.3	225.1	15.6
19-Aug	1											2	2	3.9	190.2	16.1
20-Aug	1												0	5.6	75.7	14.2
21-Aug	1											4	4	6.3	281.5	12.9
22-Aug	1								1				1	5.5	289.7	12.0
23-Aug	1				1								1	7.1	272.6	7.9
24-Aug	1												0	5.6	313.1	8.3
25-Aug	1			2									2	3.0	48.2	11.5
26-Aug	1											1	1	4.5	100.7	10.3
27-Aug	1												0	6.6	169.7	9.2
28-Aug	1												0	3.3	93.4	10.0
29-Aug	1			1									1	1.9	240.2	12.1
30-Aug	1								1				1	7.5	325.2	7.6
31-Aug	1				1								1	7.3	313.5	11.1
1-Sep	1												0	5.7	89.2	10.4
2-Sep	1												0	5.3	189.3	11.1
3-Sep	1												0	8.3	115.6	11.1
4-Sep	1												0	7.1	309.5	11.3
5-Sep	1												0	6.9	239.7	14.7
6-Sep	1												0	5.3	86.2	12.6
7-Sep	1												0	6.6	227.2	13.1
8-Sep	1												0	7.1	216.0	13.1
9-Sep	1												0	7.9	344.1	6.0
10-Sep	1												0	7.4	13.2	7.3
11-Sep	1												0	6.5	25.4	7.9
12-Sep	1												0	7.1	334.0	9.4
13-Sep	1												0	8.2	225.2	11.4
14-Sep	1												0	5.2	240.9	13.4
15-Sep	1												0	5.8	271.3	13.3
16-Sep	1											1	1	4.6	316.8	15.2
17-Sep	1												0	8.0	253.9	14.5
18-Sep	1												0	7.4	189.5	15.5
19-Sep	1												0	5.2	236.8	12.9
20-Sep	1												0	8.6	272.5	8.0
21-Sep	1												0	8.6	267.8	3.5
22-Sep	1												0	6.5	231.4	7.3
23-Sep	1												0	5.6	218.6	10.9
24-Sep	1												0	11.0	283.5	8.8
25-Sep	1												0	5.8	243.4	6.9
26-Sep	1												0	7.9	260.4	5.1
27-Sep	1												0	6.6	168.6	7.9
28-Sep	1												0	7.6	126.9	7.7
29-Sep	1												0	9.3	264.9	5.4
30-Sep	1												0	5.2	177.8	6.3
1-Oct	1												0	7.2	106.0	6.9
2-Oct	1												0	7.8	288.3	3.8
3-Oct	1				1								1	7.5	288.4	10.2
4-Oct	1												0	9.9	294.7	7.5
5-Oct	1												0	8.1	12.5	3.0
6-Oct	1												0	3.8	198.3	5.0
7-Oct	1												0	9.0	269.6	5.9
8-Oct	1												0	10.8	243.0	9.9
9-Oct	1												0	7.6	184.1	8.4
10-Oct	1												0	7.7	60.7	3.0
11-Oct	1												0	11.7	103.3	7.0
12-Oct	1												0	6.7	230.6	10.3
13-Oct	1												0	4.8	182.8	3.3
14-Oct	1												0	7.8	269.2	2.0
15-Oct	1												0	6.9	287.6	1.7
By Species		0	8	3	12	0	5	0	26	0	0	54	108			
By Guild		23				5		26				54				
		BIG BROWN GUILD				RBEP		MYSP				UNKN	Total			

n/o - indicates that detector was not operating on that night

Appendix D Table 5. Summary of species and weather during each of the active survey nights, fall 2006

Night of	GUILD												Total	Nightly Means 7pm-7am		
	BIG BROWN GUILD				RBEP			MYSP				UNKN		Wind Speed	Wind Direction	Temperature
	big brown bat	hoary bat	silver-haired bat	silver-haired/big brown	eastern pipistrelle	eastern red bat	red bat/ eastern pipistrelle	little brown bat	*Myotis* spp.	northern myotis	small-footed myotis	unknown		(mph)	(degrees)	(C)
21-Aug							45		36			26	**107**	6.6	18.7	16.6
12-Sep				1		2	1		15			15	**34**	8.5	22.9	8.1
13-Sep									12			4	**16**	7.9	14.3	9.4
27-Sep			3	3		1			3			15	**25**	6.9	202.3	9.7
By Species	0	0	3	4	0	3	46	0	66	0	0	60	**182**			
By Guild	**7**				**49**			**66**				**60**				
	BIG BROWN GUILD				**RBFP**			**MYSP**				**UNKN**	**Total**			

1.0 AGENCY CONTACTS

Stantec Consulting contacted the Maine Natural Areas Program (MNAP) requesting information regarding rare and significant natural communities and botanical features within the proposed project area. MNAP maintains a database of the rare plants and natural communities that have been documented in Maine. A response from MNAP indicated that no known significant or exemplary natural communities or rare plant populations have been documented along the Owl or Jimmey Mountain ridgelines within the project area. MNAP included a list of species that have been documented within a four-mile radius of the project area that could potentially be present within its limits.

MNAP identified that an Eccentric Bog Ecosystem, Unpatterned Fen Ecosystem, and Beech–Birch–Maple Forest have been documented within the past 20 years near the project site. While second growth Beech–Birch–Maple forest exists within the project boundaries, this natural community type is classified as S4, which is not of particular interest to MNAP unless it is an outstanding example (e.g., large, old growth stands). Unpatterned Fen Ecosystems are listed as S4 and are not located near the project site. Eccentric Bog Ecosystems are listed as S3[1] in Maine. MNAP's response is included in Appendix 13-1.

2.0 FIELD SURVEY

Rare plant species were not identified during the Stantec field survey. The majority of the Jimmey and Owl Mountain ridgelines are characterized as second-growth Beech-Birch-Maple and Spruce-Northern Hardwood ecosystems with portions of Spruce-Fir-Northern Hardwood Forest included within this matrix forest ecosystem. These upland forests have been disturbed through multiple timber harvests in the past with numerous bisecting skidder trails. Based on this high degree of past disturbance, the probability of rare plant populations occurring within these upland forests is very low.

The wetland communities present along the ridgelines of Owl and Jimmey Mountains are also unexceptional and contain evidence of past disturbance in most locations. The larger forested wetland communities include Spruce-Fir-Cinnamon Fern Forests. Additional wetlands include small, isolated depressions within the upland forests, stream-associated wetlands, and wetlands associated with old logging trails. The majority of the forested wetlands along the ridgeline have been harvested for timber in past years, resulting in an altered canopy composition and hydrology. As a result of this disturbance, the probability of rare plants occurring within these wetlands is generally very low. However, it is important to note that the west-central portion of the Owl Mountain ridgeline contained several mature, residual trees and saplings of basswood (*Tilia americana*); which typically indicate nutrient-enriched soil conditions and are often associated with rare plant species such as ginseng (*Panax quinquefolius*), squirrel corn (*Dicentra canadensis*), and Goldie's fern (*Dryopteris goldiana*). With the exception of squirrel corn, it is presumed that several of the potential rare species would still have been identifiable during this time; however, rare plants were not identified during the field inventory. Within the majority of the two ridgelines, the high level of past disturbance from selective timber harvests has resulted in altered hydrology and partially open forest canopies, suggesting that the likelihood for rare plants to occur within the potentially enriched area is very low. It is unknown if rare species were historically present within this area prior to timber harvesting activities.

Aerial photographs indicate that an open peatland is located approximately 0.2 mile west of Atlas Road, south of Route 169 from the project area. Secondary pools and patterning are evident on the aerial photographs. These patterning features are characteristic of a rare Eccentric Bog Ecosystem or a rare Patterned Fen Ecosystem, ranked S3 in Maine. Impacts as a result of the proposed project will not occur within or adjacent to this significant wetland ecosystem.

3.0 CONCLUSION

There will be no undue adverse effects on rare plant populations or rare, exemplary, or otherwise unusual natural communities as a result of the proposed development along the Owl or Jimmey Mountain ridgelines.

[1] A state rarity rank of S3 indicates that the element is rare in Maine (on the order of 20-100 occurrences statewide).

Appendix 13-1

STATE OF MAINE
DEPARTMENT OF CONSERVATION
93 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0093

JOHN ELIAS BALDACCI
GOVERNOR

PATRICK K. MCGOWAN
COMMISSIONER

May 29, 2008

Jessica Haider
Stantec Consulting
30 Park Drive
Topsham, ME 04086

Re: Rare and exemplary botanical features, Proposed Project, PN195600401, T8 R4 NBPP, Maine.

Dear Ms. Haider:

I have searched the Natural Areas Program's digital, manual and map files in response to your request of May 16, 2008 for information on the presence of rare or unique botanical features documented from the vicinity of the project site in the Town of T8 R4 NBPP, Maine. Rare and unique botanical features include the habitat of rare, threatened, or endangered plant species and unique or exemplary natural communities. Our review involves examining maps, manual and computerized records, other sources of information such as scientific articles or published references, and the personal knowledge of staff or cooperating experts.

Our official response covers only botanical features. For authoritative information and official response for zoological features you must make a similar request to Steve Timpano, Environmental Coordinator, Maine Department of Inland Fisheries and Wildlife, 284 State Street, Augusta, Maine 04333.

According to the information currently in our Biological and Conservation Data System files, there are no rare botanical features documented specifically within the project areas. This lack of data may indicate minimal survey efforts rather than confirm the absence of rare botanical features. You may want to have the site inventoried by a qualified field biologist to ensure that no undocumented rare features are inadvertently harmed.

If a field survey of the project area is conducted, please refer to the enclosed supplemental information regarding rare and exemplary botanical features documented to occur in the vicinity of the project sites. The list may include information on features that have been known to occur historically in the area as well as recently field-verified information. While historic records have not been documented in several years, they may persist in the area if suitable habitat exists. The enclosed list identifies features with potential to occur in the area, and it should be considered if you choose to conduct field surveys.

MAINE NATURAL AREAS PROGRAM
MOLLY DOCHERTY, DIRECTOR

PHONE: (207) 287-8044
FAX: (207) 287-8040
TTY: (207) 287-2213

This finding is available and appropriate for preparation and review of environmental assessments, but it is not a substitute for on-site surveys. Comprehensive field surveys do not exist for all areas in Maine, and in the absence of a specific field investigation, the Maine Natural Areas Program cannot provide a definitive statement on the presence or absence of unusual natural features at this site.

The Natural Areas Program is continuously working to achieve a more comprehensive database of exemplary natural features in Maine. We would appreciate the contribution of any information obtained should you decide to do field work. The Natural Areas Program welcomes coordination with individuals or organizations proposing environmental alteration, or conducting environmental assessments. If, however, data provided by the Natural Areas Program are to be published in any form, the Program should be informed at the outset and credited as the source.

The Natural Areas Program has instituted a fee structure of $75.00 an hour to recover the actual cost of processing your request for information. You will receive an invoice for $75.00 for our services.

Thank you for using the Natural Areas Program in the environmental review process. Please do not hesitate to contact me if you have further questions about the Natural Areas Program or about rare or unique botanical features on this site.

Sincerely,

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Maine Natural Areas Program
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Enclosures

Rare and Exemplary Botanical Features in the Project Vicinity

5/28/2008

Documented within a Four-Mile Radius of the Proposed Project, PN195600401, T8 R4 NBPP, Maine.

Scientific Name / Common Name	Last Seen	Global Rarity Rank	State Rarity Rank	State Protection Status	Habitat Description
Eccentric bog ecosystem Eccentric Bog Ecosystem	1987-06-30	GNR	S3		Sloping raised bogs along shallow valleys. Patterned perpendicular to the slope with ridges of dwarf shrub bog and troughs containing bog pools and/or moss lawns.
Unpatterned fen ecosystem Unpatterned Fen Ecosystem	2004-06-17	GNR	S4		Peatlands fed by water carrying nutrients from adjacent uplands. Vegetation (with a large component of sedges, grasses, low shrubs, and sphagnum) is different and often more
Unpatterned fen ecosystem Unpatterned Fen Ecosystem	2004-06-17	GNR	S4		Peatlands fed by water carrying nutrients from adjacent uplands. Vegetation (with a large component of sedges, grasses, low shrubs, and sphagnum) is different and often more
Beech - birch - maple forest Northern Hardwoods Forest	2006-09-06	G3G5	S4		Northern hardwood forests found on cool, mid-elevation ridges and slopes, often blanketing large areas. Forests on richer soils may have a more diverse herbaceous flora.