STATE OF NEW HAMPSHIRE SITE EVALUATION COMMITTEE

DOCKET NO. 2015-06

JOINT APPLICATION OF NORTHERN PASS TRANSMISSION, LLC AND PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE D/B/A EVERSOURCE ENERGY FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF

MICHAEL LEW-SMITH, JEFF PARSONS, MICHAL AMARAL AND SCOTT REYNOLDS

ON BEHALF OF COUNSEL FOR THE PUBLIC

December 30, 2016

1		Michael Lew-Smith
2	Q.	Please state your name, position and your employer.
3	A.	My name is Michael Lew-Smith. I am a Senior Botanist, Ecologist, and Partner with
4		Arrowwood Environmental, LLC ("AE"), with a business address of 950 Bert White
5		Road, Huntington, Vermont.
6	Q.	Please summarize your education background and employment experience.
7	А.	I hold a Masters in Plant Biology from the University of Minnesota and a B.S. in Natural
8		Resource Management from University of Michigan. I have conducted wetland
9		delineations, ecological restorations and inventories for rare, threatened and endangered
10		plants. Much of my work involves the mapping and assessment of natural
11		communities-often for public and private land managers and conservation groups. I am
12		one of the founders of the Vermont Vernal Pool Mapping Project, which mapped and
13		assessed vernal pools across Vermont. See my resume attached as Exhibit A.
14	Q.	Have you testified previously before the New Hampshire Site Evaluation Committee
15		or other regulatory bodies?
16	A.	I have not previously testified before the New Hampshire Site Evaluation Committee. I
17		have testified on numerous occasions before the Vermont Public Service Board for a
18		variety of energy development and electrical transmission projects. I have also provided
19		testimony as an expert witness in Vermont Act 250 Proceedings and in Federal Court.
20		Jeff Parsons
21	Q.	Please state your name, position and your employer.
22	A.	My name is Jeff Parsons. I am a Senior Wildlife Biologist, Wetland Ecologist, and
23		Partner with AE, with a business address of 950 Bert White Road, Huntington, Vermont.
24	Q.	Please summarize your education background and employment experience.
25	A.	I hold a Master of Science in Natural Resource Planning from the University of Vermont
26		and a B.S. in Zoological-Anthropology from the University of Michigan. I have
27		conducted wildlife habitat assessments, wetland delineations and functional assessments,
28		and ecological restorations. Much of my work involves the mapping and assessment of

wildlife and wildlife habitat, for both public and private entities. See my resume attached
 as Exhibit B.

Q. Have you testified previously before the New Hampshire Site Evaluation Committee
or other regulatory bodies?

A. I have not previously testified before the New Hampshire Site Evaluation Committee. I
have testified on numerous occasions before the Vermont Public Service Board for a
variety of energy development and electrical transmission projects. I have also provided
testimony as an expert witness in Vermont Act 250 Proceedings and in Vermont Superior
Court.

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Michael Amaral

11 Q. Please state your name, position and your employer.

A. My name is Michael J. Amaral. I am currently employed as an Adjunct Professor in the
 Environmental Science Department at the American Public University where I teach
 courses on Conservation Biology, Environmental Land Use Planning and Introduction to
 Wildlife Management.

16 Q. Please summarize your education background and employment experience.

17 A. I have a Master of Science degree in Wildlife Science from the University of 18 Washington in Seattle (1977) and a Bachelor of Science degree in Natural Resources 19 from the University of Rhode Island (1974). I have worked for the U.S. Environmental 20 Protection Agency as a general biologist at the Narragansett, RI, National Water Quality 21 Lab. I was then employed as a Wildlife Biologist and Endangered Species Specialist with 22 the U.S. Fish and Wildlife Service (USFWS) for the period 1978-2011 (33 years). As a 23 USFWS Supervisory Wildlife Biologist, I coordinated the Endangered Species program 24 in five New England states and was involved in the implementation of the Endangered 25 Species Act (ESA) with regard to listing, recovery and protection of threatened and 26 endangered species, including the Karner Blue Butterfly (1990-2011). I have served on 27 and been the team leader of several endangered species recovery teams, and assisted in 28 the development of the national recovery plan for the Karner Blue Butterfly. See my 29 resume attached as Exhibit C.

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- 2 3 Q. Have you testified previously before the New Hampshire Site Evaluation Committee 4 or other regulatory bodies? 5 A. No, I have not. 6 **Scott Reynolds** 7 Q. Please state your name, position and your employer. 8 A. My name is Dr. D. Scott Reynolds. I am on the Science Faculty at St. Paul's School in 9 Concord, New Hampshire. In addition to teaching at St. Paul's School, I am the 10 Managing Partner for North East Ecological Services ("NEES"), an ecological consulting 11 firm. 12 Please summarize your education background and employment experience. Q. 13 A. I am a population biologist and physiological ecologist with a Ph.D. from Boston 14 University. I am a biologist who has been conducting research on bats since 1993, I am 15 currently a Certified Senior Ecologist with the Ecological Society of America. I am also 16 the past-President of the North East Bat Working Group, a research organization focusing 17 on the ecology and conservation biology of bats in the northeastern United States, as well 18 as an Executive Committee Member of the North American Bat Conservation Alliance, a 19 group of bat biologists developing conservation, research, and educational strategies for 20 bat conservation across North America. See my resume attached as Exhibit D. Have you testified previously before the New Hampshire Site Evaluation Committee 21 Q. 22 or other regulatory bodies?
- 23 A. I have not previously testified before the New Hampshire Site Evaluation Committee. I have previously provided testimony and testified as an expert witness for regulatory 24 25 bodies in Connecticut (Connecticut Siting Council), Maryland (Maryland Public Service 26 Commission), and the province of Ontario (Environmental Review Tribunal).
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Panel Testimony

2 Q. What is the purpose of your testimony?

A. The purpose of our testimony is to introduce the witnesses testifying on this panel, to
describe the work we performed on behalf of Counsel for the Public and to summarize
our conclusions regarding the proposed project. Additionally, our testimony introduces
our natural resources reports, which contain the full details of the analysis we performed
and the conclusions that we reached.

8 Q. Please describe the work that you were asked to perform.

9 A. Counsel for the Public asked AE to conduct an independent and objective analysis of the 10 materials submitted by NPT related to impacts on natural resources and to review other 11 materials that were available to us to determine if the Project would have an unreasonable 12 adverse effect on those resources. Our assessment focused on two resource areas: rare, 13 threatened and endangered ("RTE") species and associated habitats, and significant 14 wildlife habitat. AE conducted this review in an objective manner based on our 15 professional expertise and the current scientific literature in these fields. The standards 16 used to assess proposed impacts are based on the Site Evaluation Committee ("SEC") 17 rules.

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19 The initial step in the assessment process was to review all of the applicable documents 20 relating to RTE species and significant wildlife habitats. In addition, we conducted an 21 outreach effort in order to collect information about the resource areas. Outreach was 22 limited to individuals and groups that have information about the two resource areas. AE 23 attended a public meeting about the Project on August 9, 2016, to hear concerns from 24 local conservation commissions and environmental organizations. AE also participated 25 in Technical Sessions of the Applicants' natural resource witnesses on September 20, 22 26 and October 18, 2016. AE also conducted field assessments at selected sites. Field 27 assessments were conducted to familiarize AE with specific areas of the Project and, in 28 some cases, to obtain detailed information about the site conditions and specific 29 resources. AE contracted sub-contractors for the assessment of the Karner Blue butterfly 30 and bats.

1 Q. Is the work you performed contained in reports?

A. Yes. Reports detailing the work we performed and our conclusions are attached hereto as
Exhibit E.

4 Q. What are your conclusions about the Project's effects on deer wintering areas?

5 A. Deer wintering areas ("DWA") have not been adequately mapped within or adjacent to 6 the Project area. Therefore, there is insufficient information to adequately assess the 7 nature, extent and duration of the potential effects of the proposed Project on deer 8 overwintering habitat. In addition, due to lack of information on avoidance from 9 alternate routes, NPT failed to demonstrate that sufficient efforts to avoid and minimize 10 adverse impacts to DWAs were undertaken. AE concludes that there is insufficient 11 information to fully determine the impacts to DWAs and without a commitment to 12 adequate BMPs which include seasonal construction restrictions and restrictions on 13 winter-time recreation use, the Project would have an unreasonable adverse impact on 14 this significant wildlife habitat.

15 Q. What are your conclusions about the Project's effect on moose concentration areas?

A. Moose concentration area ("MCA") habitat within the Project ROW is adequately
mapped, and 47 acres will be directly impacted by the Project. MCA habitat adjacent to
the Project area has not been mapped. NPT fails to provide a mitigation plan to offset
permanent loss of MCAs and fails to provide adequate seasonal construction limitations
in areas adjacent to MCAs and in areas where MCAs are to be removed. The Project
does not, therefore represent the best practical measures available to avoid, minimize, or
mitigate the adverse direct and indirect impacts on MCAs.

23 Q. What are your conclusions about the Project's effect on mast stands?

A. The nature and extent of hard mast stand resources (both oak and beech), a significant
habitat for black bear, have not been adequately identified within the Project area. It is
therefore not possible to evaluate the nature, extent and duration of potential effects of
the Project. Mitigation measures have not been fully developed or committed to by NPT,
therefore the Project does not represent the best practical and most effective measures
available to avoid, minimize, or mitigate the adverse direct and indirect impacts on mast
stands.

1 Q. What are your conclusions about the Project's effect on vernal pools?

2 A. The data collection methodology used for identification of vernal pools is sufficient, but 3 the ranking protocol used was inappropriate and inconsistently applied. NPT has not 4 specified the nature of primary impacts and failed to conduct an analysis of the secondary 5 impacts to vernal pools. Given this, the nature, extent and duration of potential effects on vernal pools cannot be fully determined. Avoidance and minimization of adverse 6 7 impacts has been proposed in some cases, but in other instances avoidance and 8 minimization appears possible but has not been proposed. For this reason, the Project 9 does not represent the best practical and most effective measures available to avoid, 10 minimize, or mitigate the adverse direct and indirect impacts vernal pools.

11 Q. What are your conclusions about the Project's effect on Canada lynx?

A. The habitat of the Canada lynx has been adequately mapped. NPT has not provided a sound methodology for implementing proposed mitigation measures and has failed to provide measures to mitigate potential long-term impacts of the Project by restricting post-construction use of the ROW by motorized vehicles. For these reasons, the Project does not provide the best practical and most effective measures available to avoid, minimize, or mitigate the adverse direct and indirect impacts on Canada lynx.

18 Q. What are your conclusions about the Project's effect on America marten?

- 19 A. The habitat of the American marten has been adequately mapped within the Project area. 20 The Project will result in the direct loss of potentially high quality marten habitat. Issues 21 raised by New Hampshire Fish and Game ("NHFG") have not been addressed and NPT 22 has failed to provide an alternative route analysis. No details of any minimization 23 measures have been developed or committed to by NPT. Without incorporating 24 restrictions on winter-time motorized recreation within the new ROW and access roads, 25 and confirming that the proposed mitigation parcel provides accessible high quality 26 marten habitat, AE concludes that the Project will likely have an unreasonable adverse 27 effect on this species.
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Q. What are your conclusions about the Project's effect on bird species not addressed in the NPT wildlife report?

A. Impacts to certain RTE bird species such as shorebirds are unlikely, while for others such
as the upland sandpiper and three-toed woodpecker, the possibility of impacts exists.
However, lacking documentation of an analysis by NPT, it is not possible to determine
the nature, extent and duration of potential effects of the Project on these species.

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Q. What are your conclusions about the Project's effect on grassland birds?

8 The NPT grassland bird habitat assessment may have excluded appropriate habitats for A. 9 the northern harrier, so it is not possible to evaluate the nature, extent and duration of the 10 potential effects on all grassland birds. Measures undertaken or planned to avoid, 11 minimize or mitigate potential adverse effects on northern harriers present in the Project 12 area are insufficient, may be ineffective and do not represent best practical measures 13 available. AE concludes that there is insufficient information to fully determine the 14 impacts to grassland bird species, notably Northern harrier, and without a commitment to 15 appropriate pre-construction surveys and/or seasonal restrictions on construction, the 16 Project would likely have an unreasonable adverse impact on RTE bird species.

17 Q. What are your conclusions about the Project's effect on wetland-dependent birds?

A. Construction within the existing ROW portions of the Project will result in temporary
displacement of wetland-dependent birds, but bird species will likely return and utilize
the habitat again in subsequent breeding seasons. General construction methods
described for open water wetlands may to be inappropriate, and without accurate
construction details, the nature, extent and duration of potential adverse effects on
wetland-dependent bird species is not possible.

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Habitat investigations and presence/absence surveys for Rusty blackbird, pied-billed grebe and sedge wren were not conducted by NPT. Since no habitat suitability analysis or field surveys were conducted, despite records of their presence, the nature, extent and duration of adverse impacts from the construction of the Project to wetland dependent RTE and special concern bird species is impossible to evaluate. AE concludes that there is insufficient information to fully determine the impacts to wetland-dependent bird species, and without appropriate habitat assessments and avoidance measures, the Project
 may have an unreasonable adverse impact on RTE bird species.

3 Q. What are your conclusions about the Project's effect on nightjars?

A. Available habitat for nesting common nighthawk and eastern whip-poor-will will not be
significantly impacted following construction of the Project. Details and commitments
are lacking for efforts at avoidance, minimization and mitigation of direct impacts of
construction activities to nesting common nighthawks and eastern whip-poor-wills.
Lacking these commitments, the Project does not represent best practical measures
available to avoid or mitigate direct adverse impacts to common nighthawk and eastern
whip-poor-will.

11 Q. What are your conclusions about the Project's effect on high elevation birds?

12 A. Since monitoring for Bicknell's thrush was conducted only once several years ago, 13 additional surveys should be conducted in the nesting season immediately prior to 14 construction to confirm that no Bicknell's thrush are present in areas of appropriate 15 habitat. If Bicknell's thrush are not found, it is unnecessary for the Project to avoid, 16 minimize or mitigate direct impacts or habitat loss to Bicknell's thrush. If Bicknell's 17 thrush are found prior to construction, Project impacts above 2700' in elevation should be 18 prohibited until a complete evaluation of habitat impacts is conducted. If no Bicknell's 19 thrush are found in the nesting season immediately preceding construction, it is unlikely 20 that the Project poses an unreasonable adverse impact to Bicknell's thrush or their 21 habitat.

22 Q. What are your conclusions about the Project's effect on nesting raptors and heron?

A. The Project does not provide a methodology or a formal commitment for appropriate preconstruction surveys, nest removal and construction restrictions for nesting raptors. The Project has failed to provide measures to mitigate potential impacts to nesting raptors, so the Project does not provide the best practical and most effective measures available to avoid, minimize, or mitigate the adverse direct and indirect impacts on these species. AE concludes that there is insufficient information to fully determine the impacts to nesting raptor species, including bald eagle, and without appropriate habitat assessments and avoidance measures, the Project may have an unreasonable adverse impact on RTE bird
 species.

Q. Please describe the Project's effects related to avian electrocution and collision with Project components?

- A. NPT fails to provide a formal commitment to implement the suggested practices for both
 new and relocated distribution and transmission structures as described in APLIC.
 Lacking such a commitment, the Project does not avoid, minimize or mitigate adverse
 impacts to avian species from electrocution.
- 9

10 Since a route-siting analysis was apparently not conducted per the APLIC 2012 11 recommendations, it is not possible to conclude any avoidance or minimization measures 12 have been undertaken with regards to Project route selection. A bird-collision risk 13 assessment that was conducted may underestimate or misrepresent potential collision risk 14 areas, therefore the nature, extent and duration of impacts to avian species through 15 collision is not possible to evaluate. Since no methodology or parameters for post-16 construction bird mortality surveys or commitments to line marking devices are provided, 17 measures undertaken or planned to minimize and mitigate potential adverse effects from 18 avian collision are either insufficient or appear unlikely to be effective and do not 19 represent best practical measures available. AE concludes that there is insufficient 20 information to fully determine the impacts to RTE bird species due to electrocution or 21 collision with the proposed aerial power lines and without appropriate best management 22 practices ("BMP") and installation of line marking devices, the Project is likely to have 23 an unreasonable adverse impact on RTE bird species.

24 Q. What are your conclusions about the Project's effect on RTE mussels?

A. The potential effects to the RTE mussel species have been identified by NPT. BMP
measures have been suggested that would address potential impacts from construction,
but no BMPs have been made available for review. Without these documents, there is
not enough information to determine that the Project will not have an unreasonable
adverse impact on these rare mussels.

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1 Q. What are your conclusions about the Project's effect on RTE insects?

A. The habitat of the RTE insect species has been identified; however, surveys have not
been conducted to determine population numbers within the Project area. The nature,
duration and extent of the Project's direct impacts on these individual species have not
been determined. No obvious avoidance or minimization measures have been undertaken
or committed to by NPT. Failing to provide species specific information on the Persius
duskywing skipper, the pine pinion moth and the frosted elfin, NPT has not demonstrated
that the proposed mitigation measures for the Karner Blue butterfly will be effective.

9 Q. What are your conclusions about the Project's effect on RTE snakes?

10 A. The habitat of these snakes may be negatively impacted during construction, but long-11 term impacts are not likely to be adverse. Impacts to individuals, nests and hibernacula 12 during construction could be avoided or minimized by the development of BMPs and 13 seasonal restrictions, but no details about these plans have been made available or 14 committed to by NPT.

15 Q. What are your conclusions about the Project's effect on RTE turtles?

A. NPT has failed to provide consistent information on avoidance, minimization and
 mitigation measures for impacts to RTE turtle species. In addition, no details about
 specific construction BMPs, seasonal restrictions and mitigation measures have been
 presented or formally committed to by NPT. An assessment of the overall adverse
 impacts on RTE turtles is therefore impossible to conduct.

21 Q. What are your conclusions about the Project's effect on butterfly milkweed?

- A. One population of this endangered species has been identified within the Project area and
 would be eliminated by construction disturbance. NPT has failed to provide materials
 showing that any steps were taken to avoid or minimize adverse impacts to this species.
- 25

Q. What are your conclusions about the Project's effect on blunt-leaved milkweed?

- A. Two populations of this species were found directly adjacent to the Project area and have
 been avoided. Employing effective constructions BMPs, as well as use of an
 environmental compliance monitor, will likely minimize the potential for adverse impacts
 to this species.
- 30

1 Q. What are your conclusions about the Project's effect on spiked needle grass?

A. Three populations of this species were found that will be impacted by the Project,
including the largest in the state. NPT has not provided an alternatives analysis within
the application materials showing that any steps were taken to avoid or minimize impacts
to this species. In addition, NPT fails to provide adequate measures to mitigate adverse
impacts to this endangered species. Without these measures, the Project will likely have
an unreasonable adverse impact on this species.

8 Q. What are your conclusions about the Project's effect on licorice goldenrod?

9 A. A population of licorice goldenrod was identified in Pembroke and is likely one of the 10 larger populations of this species in the state. The Project will have direct adverse 11 impacts on this population. NPT has not provided an alternatives analysis within the 12 application materials showing that any steps were taken to avoid or minimize adverse 13 impacts to this species. In addition, NPT fails to provide adequate measures to mitigate 14 impacts to this rare species, specifically, development of construction BMPs and/or a 15 transplantation plan for individuals to be taken. Without these measures, the Project will 16 likely have an unreasonable adverse impact on this species.

17 Q. What are your conclusions about the Project's effect on wild lupine?

A. AE's analysis of the plant population boundaries and layout of the proposed development has concluded that no obvious avoidance or minimization measures have been undertaken by NPT. NPT fails to provide an alternatives analysis within the application materials showing that the best practical measures have been employed to avoid or minimize adverse impacts to this rare species. The degree of impacts combined with the apparent lack of avoidance and minimization lead AE to conclude that the Project would have an unreasonable adverse impact on this significant resource.

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Q. What are your conclusions about the Project's effect on small whorled Pogonia?

A. Based on the known range of this species, NPT failed to conduct an adequate inventory to
 confirm its presence or absence in the Project area. Lacking a sufficient inventory, it is
 impossible to conclude that the Project would not have an unreasonable adverse impact
 on this species.

1Q.What are your conclusions about the Project's effect on State Watch and2Indeterminate plant species?

A. NPT documented thirteen State Watch and Indeterminate species that would be impacted
by the Project. The Project will have both direct and indirect impacts to the local
populations of these species. However, given their relative lack of rarity, it is unlikely
that these local impacts would rise to the level of being unreasonable.

7 Q. What are your conclusions about the Project's effect on the Karner Blue butterfly?

8 A. NPT demonstrates adequate field assessments for occurrence of Karner Blue butterflies 9 ("KBB") and wild lupine plants in the Concord Pine Barren's reach of the Project ROW. 10 There was adequate communication and coordination between NPT's representatives and 11 state and federal natural resource agencies. There is documentation among the parties 12 that adverse effects from the construction of the Project can be offset through 13 compensatory mitigation, particularly conservation parcel acquisition and implementation 14 of a NPT ROW management agreement. While we concur with that position, 15 compensatory mitigation should follow in sequence after efforts to avoid and minimize 16 effects. As there is little evidence that NPT made a concerted effort to avoid and 17 minimize impacts to the KBB and wild lupine at the Main Site, and the compensatory 18 mitigation plan and ROW management agreement has not been completed, these impacts 19 are therefore unreasonable adverse effects.

20 Q. What are your conclusions about the Project's effect on bats?

21 A. Based on information that has been submitted by NPT to date, in our opinion they have 22 not met the criteria necessary to state that the Project will not have an unreasonable 23 adverse effect on the northern myotis and the eastern small-footed myotis. Α 24 Programmatic Agreement should be developed to ensure that any construction activities 25 that occur in forested habitat will be designed and implemented in a manner that will 26 minimize any direct or indirect impact on the northern myotis. Furthermore, the 27 Programmatic Agreement should ensure that any construction and blasting activities that 28 occur near exposed rocky outcrops will be designed and implemented in a manner that 29 will minimize any direct or indirect impact on the eastern small-footed myotis. It is our 30 opinion that this Programmatic Agreement should be approved by the U.S. Fish and

- 1 Wildlife Service and NHFG, preferably in consultation with disinterested bat biologists
- 2 and biostatisticians. Furthermore, it is our opinion that this Programmatic Agreement
- 3 should be developed and approved prior to this issuance of any certificate by the SEC.
- 4 Q. Does this conclude your testimony?
- 5 A. Yes.

Northern Pass Transmission Line SEC Docket No. 2015-06

EXHIBITS

- A. Resume of Michael Lew-Smith
- B. Resume of Jeff Parsons
- C. Resume of Michael Amaral
- D. Resume of Scott Reynolds
- E. Independent Review of Significant Wildlife Habitats and Rare, Threatened & Endangered Species



MICHAEL LEW-SMITH

PRINCIPAL ECOLOGIST/BOTANIST

Education

M.S., University of Minnesota Department of Plant Biology, Major: Plant Biology. June, 1997

B.S., University of Michigan School of Natural Resources. Natural Resource Management. May, 1991

Recent Collaborations

Vernal Pool Mapping. Co-founder of the Vermont Vernal Pool Mapping Project. In collaboration with Vermont Center for Ecostudies, created a statewide Vernal Pool map and database.

Aquatic Invasive Species Mapping. In collaboration with Lake Champlain Committee, developed a methodology for mapping and tracking aquatic invasive plants and an aquatic natural community classification.

Relevant Experience

Arrowwood Environmental Mr. Lew-Smith is a founding partner and principal ecologist for Arrowwood Environmental. Working closely with Natural Heritage Programs, The Nature Conservancy, towns, companies, private individuals and organizations, Mr. Lew-Smith has conducted botanical inventories, wetland delineations, wildlife habitat assessments, and ecological restorations. He also has extensive experience mapping and assessing natural communities for private organizations and public land managers of towns, state forests and National Parks. He is one of the founders of the Vermont Vernal Pool Mapping project, which mapped and assessed vernal pools statewide. His recent focus has been on mapping and assessing native aquatic species in Lake Champlain.

Vermont Department of Fish and Wildlife, Contract Ecologist/Botanist. Non-Game & Natural Heritage Program, Waterbury Vermont, May 2000 to May 2003. Field ecologist and botanist for a project to catalogue and survey significant examples of hardwood dominated swamp communities throughout Vermont. Responsible for identifying potential sites, visiting sites and determining statewide significance, conducting vegetation plots, and surveying for rare plants.

Vermont Department of Fish and Wildlife Contract Ecologist, Non-Game & Natural Heritage Program, Waterbury Vermont, May 1999 to March 2001. Primary ecologist on program to map the natural communities of Mount Mansfield State Forest. Developed and implemented a sampling strategy for the survey of natural communities. Conducted vegetation plots in all community types throughout the State Forest.

Vermont Department of Fish and Wildlife Contract Botanist, Non-Game & Natural Heritage Program, Waterbury Vermont, March 1999 to September 1999. Conducted a rare plant and significant natural community survey for U.S. Army Corps of Engineers Union Village Dam site in Thetford, Vermont.

The Nature Conservancy Midwest Regional Office Contract Botanist/Plant Ecologist, Voyageurs National Park, MN, August 1996 to March 1999. Field team leader on a project to classify and map the vegetation of Voyageurs National Park. Conducted releves and ground truthing plots and assisted in the development of the vegetation classification system for the park. Experience with plant community analysis including ordination, cluster analysis and indicator species analysis. Wrote descriptions of and developed a dichotomous key for the plant communities of the Park.

Keewaydin Environmental Education Center, Naturalist, Salisbury, VT, January to June 1994. Responsible for leading groups of students through a 2-5 day residential environmental education program. Developed lesson plans and taught short courses natural history and environmental issues to school groups.

Project SOAR, Naturalist/Trip Leader, Balsam, NC, June to August 1992. Worked with troubled youth in both a residential and wilderness setting. Planned and led low and high ropes course, backpacking, white-water rafting and rock climbing trips.

North Woods Resource Center, Naturalist, Ely, MN, January to May 1992. Responsible for leading groups of students through a 5-day residential environmental education program. Planned and taught naturalist activities including plant identification and map/compass use. Also responsible for conducting weekend naturalist programs for adult groups.

Michigan Department of Natural Resources, Forest Pest Specialist, Roscommon, MI, May to August 1991. Responsible for detecting and monitoring insect and fungal pest populations. Conducted tree survival surveys, risk rating and damage assessments, map and aerial photograph reading, aerial sketch mapping, and timber sampling.

Museum of Natural Science, Docent/Planetarium Operator, Ann Arbor, MI, January 1989 to May 1991. Designed and led tours on wildlife, geology, Native American cultures, and prehistoric life for school groups. Conducted planetarium shows and wrote the astronomy section of the docent training manual.

National Park Service and US Forest Service Volunteer. West Glacier, MT, September to November 1989. Assisted in research on population estimates of the timber wolf and grizzly bear. Studied the ecology and management of these species and conducted back-country population surveys. Gained experience in track identification, track casting, sign identification, and radio telemetry.

Publications and Presentations

Faccio, S.D. ., **M. Lew-Smith** and A. Worthley. 2013. Vermont Vernal Pool Mapping Project. 2009-2012. Final Report to the Natural Heritage Information Project of the Vermont Department of Fish and Wildlife.

Sorenson, E., **M. Lew-Smith** and R. Popp. 2011. Bogs and Fens of Vermont: Distribution, Ecology, Classification and Some Sites of Ecological Significance. Nongame and Natural Heritage Program, Vermont Fish and Wildlife Department, Agency of Natural Resources, Waterbury Vermont. In Press

Faber-Langendoen, D., N. Aaseng, K. Hop, **M. Lew-Smith**, J. Drake. 2007. Vegetation classification, mapping, and monitoring at Voyageurs National Park, Minnesota: An application of the U.S. National Vegetation Classification. Applied Vegetation Science 10:361-374.

Sorenson, E., R. Popp, **M. Lew-Smith**, B. Engstrom, M. Lapin and M. Ferguson. 2004. Hardwood Swamps of Vermont: Distribution, Ecology, Classification and Some Sites of Ecological Significance. Nongame and Natural Heritage Program, Vermont Fish and Wildlife Department, Agency of Natural Resources, Waterbury Vermont.

Lew-Smith, Michael. 2003. *Cyperus houghtonii* Torrey (Houghton's Flat Sedge) Conservation and Research Plan for New England. New England Wildflower Society, Framingham, Massachusetts, USA.

Hop, K., D. Faber-Langendoen, **M. Lew-Smith**, N. Aaseng and S. Lubinski. 2001. USGS-NPS Vegetation Mapping Program, Voyageurs National Park, Minnesota. Project Report.

Smith, M.S., I.D. Charvat, and R. Jacobsen. 1998. The significance of arbuscular mycorrhizal fungi in an early successional tallgrass prairie reclamation. Canadian Journal of Botany. 76:1947-1956.

Charvat, I.D., **M. Smith**, J. White, H. Agwa, J. Tallaksen, and L. Gould. 1998. Roadside prairie and wetland restoration: mycorrhizal and plant factors. Minnesota Department of Transportation Report MN/RC-1998/15.

E. Gould, **M. Smith** and I. Charvat. 1997. Wetland succession: a comparison of a disturbed and undisturbed site. Poster presentation a at Botanical Society of America Meetings, 1997, Montreal, Quebec.



JEFFREY W. PARSONS

PRINCIPAL WETLAND ECOLOGIST / WILDLIFE BIOLOGIST

Education

- M.S., University of Vermont, Natural Resources Planning (Wetland Ecology), 1986-1992
- B.S., University of Michigan, Zoological-Anthropology, 1983-1985
- Michigan State University, Wildlife Biology, 1978-1982

Work Experience

- 2001-Present: Arrowwood Environmental, Partner and Consulting Ecologist
- 1987-2001: Jeffrey W. Parsons, Consulting Ecologist

Mr. Parsons has been a consulting ecologist for over 25 years, working with various local, regional, and statewide private and public organizations. He has extensive work experience in the following areas: wetland delineation, functional assessment, restoration and mitigation, wetland educational programs, environmental impact assessment, wildlife habitat assessments, lake and pond management, natural areas identification and protection, trail development, community natural resources planning, environmental policy, recreation planning, and environmental permitting.

Teaching Experience

- 1992-Present: Adjunct, Sterling College, Craftsbury Common, Vermont. Teach Field Ecology, Conservation Biology, James Bay Hydroelectricty and Resource
- Management, Wetlands Ecology, Wildlands Stewardship 1997- 2003: Adjunct, Vermont Law School, S. Royalton, Vermont. "Ecology and Environmental Science".
- 1987-2012: Guest lecturer in the following University of Vermont courses: "Natural Areas Management, Senior Recreation Management" (Topic: pesticides and golf courses), "Environmental Impact Assessment, Wetland Biology" (Topic: wetland function and value), "Environmental Conflict Resolution" (Topic: Act 250), "Introduction to Soils" (Topic: wetland soils field and classroom (1989-1997)), "Environmental Restoration" (Topics: wetland mitigation, and wetland/stream restoration (1993-2012)), and "Natural History of New England" (Topic: peatlands and boreal forests).
- 1998: Guest Lecturer, Dartmouth College, "Wetlands and Hydric Soils".
- 1993-1998: Adjunct, University of Vermont, Burlington, Vermont. "Natural History of Vermont's Natural Communities" (A Lake Champlain Basin class team-taught with R. Paradis).
- 1994-2014: Adjunct, Johnson State College. "Introduction to Environmental Problems, and Natural History of Vermont, National Park & Wilderness Management"; Landuse Planning.

Selected Presentations:

- 2000: Guest Speaker, Vermont Bird and Botanical Club Annual Meeting. Topic: Vermont's Boreal Communities.
- 2000: Lecture "Conservation Biology and the James Bay Hydroelectric Development". UVM
- 1998: Guest Speaker, White River Partnership. Topic: Wetlands in a Watershed.

- 1997: Workshop organizer and presenter, South Burlington City Officials. Topic: Wetland Identification, Function and Value, and Regulation.
- 1996: Field Trip Leader, Vermont Life magazine. Topic: Yellow Bogs, Essex County.
 Field Trip Leader, American Review. Topic: Silviculture and Herbicide Spraying.
 Guest Lecturer and Field Trip Leader, Consulting Foresters of Vermont. Topic: Wetlands and
 Silviculture. Guest Lecturer and Field Trip Leader, L.E.A.P. (Vermont Logger Certification
 Program). Topic: Wetlands.
- 1994: Guest Lecturer and Field Trip Leader. Vermont Law School. Topic: Wetland Ecology for the U.S. Federal District Court Judges.
- 1993: Co-organized and presented (with Richard Paradis), Winooski Valley Park District. Topic: Ecology of Greenways Implementation.
- 1992: Field Trip Leader, Northern Vermont Conservation Districts. Topic: Review of Wetlands and Water Quality. Field Trip Leader, Lamoille County Regional Solid Waste District. Topic: Landfill Impacts on Wetlands. Guest Speaker, UVM Extension/Educational Curriculum Development Program.Topic: The Natural History of Vermont's Forests.
- 1991: Guest Speaker, Vermont Extension Service Conference. Topic: Logging in and Around Wetlands.
- 1990-1992: Guest Lecturer. UVM Extension Service "Coverts" program, St. Johnsbury, VT, and Lake Dunmore, VT. Topics: Wetlands, Wildlife Management, and Forestry.
- 1990-1991: Organized and presented at the Soil and Water Conservation Society's conferences entitled "Wetland Delineation". Topic: Wetland hydrology as it pertains to the Federal Manual for Identification and Delineation of Jurisdictional Wetlands.
- 1990: Co-organized and presented conferences for the Vermont Association of Realtors, Stowe, VT, and Dorset, VT. Topic: Wetland Regulation, Takings and the Law.Guest Speaker, Lamoille County Regional Solid Waste District. Topic: Landfills and wetlands. Audubon Field - Family Camp: Topics: Bogs and Other Wetlands (field trips).

Reports and Publications: (prior to Arrowwood Environmental)

- <u>Ecological Assessment of the Black Falls Tract in Montgomery, Westfield, and Richford, Vermont</u>. Prepared for the Green Mountain Club by Jeff Parsons, Deborah Benjamin, 2000.
- <u>Middlebury Gap Scenic Highway Management Plan</u>, 1996, Vermont Agency of Transportation, 1996 (Authors: White, Parsons, Rajala, De Leuw & Cather).
- <u>Recommendations for the Enhancement of Streamside, Wetland, and Wildlife/Fisheries Habitat</u> <u>on the Robillard Farm, Irasburg, Vermont, Sweet Water Trust, Vermont Land Trust, 1994.</u>
- <u>Proposed Trail Network: Properties of Equinox Resort Associates</u>, with E. Thompson, 1992.
- <u>Ecological Values and Management Implications, Mount Equinox, Properties of Equinox Resort</u> <u>Associates, Manchester, Vermont</u>, with Elizabeth Thompson, 1991. 27 pages.
- <u>Smugglers' Notch Nature Trails</u>, with Elizabeth Thompson, Peter Adams, Steven Young, 1991. Prepared for Smugglers' Notch, Inc., 36 pages.
- <u>A Clean Lake For Tomorrow: Action Plan</u>. J. Parsons, F. Lowenstein, and L. Fisher. 1991. Lake Champlain Committee, 17 pages.
- <u>Woodbury Lakes and Ponds Study</u>. 1991. Jeff Parsons, Don Meals, Deb Lester, 164 pages.
- <u>Environmental Survey, Vicinity of Smugglers' Notch Village, Cambridge, Vermont, with Dr. Steven</u> Young. Prepared for Smugglers' Notch Ski Area, Inc., 1990, 30 pages.
- <u>Vermont Recreation Plan</u>, Summary Chapters, Vermont Department of Forests, Parks, and Recreation, Waterbury, Vermont, 26 pages.
- <u>The Identification and Characterization of Burlington, Vermont's Wetlands and Significant Natural</u> <u>Areas, With Recommendations for Management</u>. 1998 J. Parsons, E. Thompson, Dr. T. Hudspeth. Community and Economic Development Office, Burlington, Vermont, 89 pages.
- <u>A Characterization of Vermont's More Important Wetlands</u>. Vermont Department of Forests, Parks & Recreation, Waterbury, Vermont, 28 pages.
- <u>Wetlands Component, 1988-1993 Vermont Recreation Plan</u>. Vermont Department of Forests, Parks & Recreation, Waterbury, Vermont, 43 pages.
- <u>A use decision tree for Natural Area managers and users to mitigate wetland degradation</u>. Jeffrey Parsons, Dr. Ian Worley, and Rick Paradis, authors. *In* Wetlands/Peatlands 1987.
- <u>Wetland Buffer Zone Delineation</u>. 1987. Adirondack Park Agency, Ray Brook, New York.

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Education: Mr. Amaral received a Master of Science degree in Wildlife Science from the University of Washington in Seattle and a Bachelor of Science degree in Natural Resources from the University of Rhode Island.

Past Employment: Mr. Amaral worked one year for the U.S. Environmental Protection Agency as a general biologist at the Narragansett, RI National Water Quality Lab. He was then employed as a Wildlife Biologist and Endangered Species Specialist with the U.S. Fish and Wildlife Service (USFWS) for the period 1978-2011 (33 years). As a USFWS Supervisory Wildlife Biologist, Michael coordinated the Endangered Species program in five New England states and was involved in the implementation of the Endangered Species Act (ESA) with regard to listing, recovery and protection of threatened and endangered species, including the Karner Blue Butterfly – a species for which Mr. Amaral was lead recovery biologist from 1990-2011. He has served on and been the team leader of several endangered species recovery teams, and assisted in the development of the national recovery plan for the Karner Blue Butterfly, completed by the USFWS in 2003.

In addition to the ESA, Michael has experience reviewing and commenting on activities pursuant to the National Environmental Policy Act (NEPA) and the Migratory Bird Treaty Act. In this regard, Mr. Amaral was the USFWS's lead biologist for the review of the Cape Wind project, the nation's first large-scale offshore wind energy facility (130 turbines) proposed for Nantucket Sound, Massachusetts. While at the USFWS's New England Field Office, Michael held a master station bird banding permit and coordinated a multi-state effort to band nestling peregrine falcons and bald eagles. He is co-author of a manuscript on the dispersal and survival of peregrine falcons in the Northeast (Faccio et al., Jour. of Raptor Research 2013). He is also coauthor of a monograph on the Taxonomy of North American Wolves from Morphological and Genetic Analyses, published on line in the USDOI, North American Fauna series. He is the recipient of several performance-based Special Achievement awards from the USFWS and a Secretary Commendation from the Department of the Interior for his work in the Arctic National Wildlife Refuge, Alaska. In addition to the two manuscripts above, he is the author or co-author of several scientific articles on species such as the Aleutian Canada goose, American burying beetle and Karner blue butterfly. In his career with the USFWS, Mr. Amaral worked in California, Alaska, as well as the Northeast.

From 2011 to present, Mr. Amaral has been an adjunct professor of Environmental Science at American Public University, an on-line university based in Charles Town, WV, where he teaches Introduction to Wildlife Management, Ecosystem Management/Environmental Planning, and Conservation Biology.

From June 2016 to present, Mr. Amaral has also been employed by Arrowwood Environmental, as a subcontractor in the review of the Northern Pass Transportation Project.

Memberships/Professional Associations:

Mr. Amaral is member of The Wildlife Society, the Warner Conservation Commission, the Basil Woods Chapter of Trout Unlimited, The Nature Conservancy of Block Island and vice chair of the Board of Trustees of the New Hampshire Audubon Society.

D. Scott Reynolds, Ph.D. March 2016

North East Ecological Services, LLC	AREAS OF SPECIALIZATION	
P.O. Box 3596	Population Biology	
Concord, New Hampshire 03302	Conservation Biology	
(603) 545-7012	 Project Risk Assessment Analysis 	
www.neesbats.org	Wind Power Bat Impact Surveys	

EDUCATION and CERTIFICATIONS

Ph.D., 1999. Physiological Ecology of Temperate Bats, Boston University; Boston, Massachusetts B.Sc., 1991. Biology with Environmental Science minor, McGill University: Montréal, Quebec Canada. Certified Senior Ecologist. Board of Professional Certification of the Ecological Society of America

EMPLOYMENT

North East Ecological Services:Managing Partner: 1998 - presentSt. Paul's School:Faculty in the Science Division: 2000 - presentBoston UniversityResearch Fellow, Department of Biology: 2009 - 2014Allegro MicroSystems, Inc.Facilities Systems Consultant: 1993 – 1999Occupational Health and Safety Coordinator: 1991-1993Environmental Compliance Coordinator: 1991-1992

PROFESSIONAL MEMBERSHIPS

American Society of Mammalogists: 1992 – present North East Bat Working Group: 1996 – present Sigma Xi: 1997 – present National Science Teachers Association: 2001 – present Ecological Society of America: 2004 – present Wildlife Society: 2006 - present

PROFESSIONAL ACTIVITIES

North American Bat Conservation Alliance, Executive Board: 2014 - present North East Bat Working Group, President: 2013 – 2015 Northern Long-Eared Bat Endangered Species Listing Committee: 2013 - 2015

RESEARCH EXPERIENCE (since 2007)

Project Risk Assessment for Bats: (completed date) Broken Ground Substation Expansion Project (Merrimack County, NH): Unitil Energy, LLC: 2015 Verizon Cell Tower Retrofit Project (Carroll County, NH): McLane Law Firm, LLC: 2015 Greeley Wind Farm (Greeley County, NE): Bluestem Energy Solutions, 2015 Heritage Garden Wind Project (Delta County, MI): Heritage Sustainable Energy, 2014 Four Mile Wind Project (Garrett County, MD): Synergics Energy: 2013 Grande Prairie Wind Project (Knox County, NE): Midwest Energy, LLC: 2012 Port Jersey Wind Project (Hudson County, NJ): Port Authority NYNJ: 2011 Fisherman's Atlantic City Wind Project (Atlantic County, NJ): Fisherman's Energy: 2010 Cape May Wind Project (County, PA): STK Renewable Energy, Inc.: 2007 Chestnut Flats Wind Project (Blair County, PA): Gamesa Energy, USA: 2007 Grandview Wind Project (Platte County, WY): community Energy, Inc: 2007 Tarkio Wind Energy Project: Atchinson County, MO): Community Energy, Inc: 2007



RESEARCH EXPERIENCE (since 2006)

Pre- and Post-Construction Bat Inventories and Migratory Surveys: (completed date)
Greeley Wind Farm (Greeley County, NE): Bluestem Energy Solutions, 2015
Garden Peninsula Wind Project (Delta County, MI): Heritage Wind Energy, 2013
Atlantic City Wind Project (Atlantic County, NJ): Fisherman's Energy, 2012
Maple Ridge Wind Project (Lewis County, NY): Iberdrola Renewables, 2010
Wethersfield Wind Project (Luzerne County, NY): Noble Environmental Power: (2010)
Bear Creek Wind Project (Luzerne County, NY): Babcock & Brown Renewable Holdings, 2009
Hounsfield Wind Project (Potter County, PA): Babcock & Brown, 2009
Sweden Wind Project (Potter County, PA): STK Renewable Energy, Inc., 2009
Chestnut Flats Wind Project (Ilair County, PA): Gamesa Energy, USA: 2007
Laurel Hill Wind Project (Lycoming County, PA): Catamount Energy, LLC: 2007
Highland New Wind Development (Highland County, VA): 2006

Endangered Species Inventory Surveys

Jackson Ski Trail Expansion Project (Carroll County, NH): Jackson Ski Touring Foundation: 2015 VTrans US Route 4 Improvement Project (Rutland County, VT): 2015 New Hampshire National Guard Training Institute (Merrimack County, NH): 2014 Mt. Storm Wind Project (Grant County, WV): 2014 New Boston Air Force Station (Merrimack County, NH): 2002, 2006, 2007, 2010, 2011, 2012, 2013) Dan's Mountain Wind Project (Allegany County, MD): 2013 Four Mile Wind Project (Garrett County, MD): Synergics Renewables, LLC: 2010, 2012 Chestnut Flats Wind Project (Blair County, PA): Gamesa Energy, USA: 2008 Green Brook Flood Damage Reduction Project (Somerset County, NJ): NEA, Inc., 2007 West Point Military Reservation (Westchester County, NY): United States Marine Corp: 2002 Green Mountain National Forest (VT): US Forest Service: 2000 Finger Lakes National Forest (NY): US Forest Service: 2000

Conservation Biology and Habitat Mitigation

Critical Maternity Colony Relocation in Cornish (Sullivan County, NH): NH Fish & Game: 2005 Vermont Electric Company Northwest Reliability Project: VELCO: 2004 Population Survey of Hibernating Bats in New Hampshire: NH Fish & Game: 1999

EXPERT WITNESS TESTIMONY

Fairview Wind Project: Ontario Environmental Review Tribunal, Dale & Lessmann, LLP: 2016
Amherst Island Wind Facility: Ontario Environmental Review Tribunal, Torys, LLP: 2015
Bow Lake Wind Facility: Ontario Environmental Review Tribunal, Torys, LLP: 2014
Ostrander Point Wind Project: Ontario Environmental Review Tribunal, McCarthy Tetrault LLP: 2013
Dufferin Wind Power Project: Ontario Environmental Review Tribunal, Torys, LLP: 2013
Prospect Wind Energy Project: Connecticut Siting Council on behalf of Friends of Prospect., 2011
Liberty Gap Wind Project: West Virginia Public Service Commission, US Wind Force, LLC: 2008
Highland New Wind Project: Maryland State Corporation Commission, Synergics Energy, LLC: 2005
East Haven Wind Project: Vermont Public Service Board, EMDC, LLC: 2004

RESEARCH GRANTS

Conserving Northern Long-Eared Bat Habitat in Working Forestlands (NRCS-CIG Grant), 2015 Connecting Disparate Datasets to Generate Population Models (US Fish and Wildlife Service), 2014 Population Survey of the bats of New Boston Air Force Station (US Fish and Wildlife Service), 2012 Transect-based Acoustic Monitoring of a Bat Community (US Fish and Wildlife Service), 2011 New Hampshire Winter Bat Population Surveys (NHFG): 2000, 2005, 2008, 2009, 2010 Maple Ridge Post-Construction Monitoring Project (NYSERDA and NJ Audubon): 2007-2009 New Hampshire Comprehensive Plan for Bats (New Hampshire Department of Fish and Game): 2004 North American Bat Conservation Partnership (Bat Conservation International): 1999, 1998



PROFESSIONAL PRESENTATIONS

- Live longer by living alone and staying active: lower mortality of eastern small-footed myotis from White-nose Syndrome. Northeastern Natural History Conference, Springfield, MA: 2016.
- Variables that affect acoustic monitoring. North East Bat Working Group, Baltimore, MD: 2016.
- The influence of environmental variables on the demography of *Myotis lucifugus*. North American Symposium on Bat Research, Costa Rica: 2013
- The use of mobile platforms to conduct pre-construction acoustic monitoring at off-shore wind project sites. North East Bat Working Group, Albany, New York: 2013
- Temporal and spatial patterns of bat activity at a large-scale wind energy facility. North American Symposium on Bat Research, San Juan, Puerto Rico: 2012.
- The value of long-term banding for White-Nose Syndrome surveillance and research. White-Nose Syndrome Symposium, Little Rock, Arkansas, 2011.
- Re-evaluating the role for banding in the population biology of bats. North American Symposium on Bat Research, Denver, Colorado: 2010.
- The hibernating bats of New Hampshire: Are we climbing to the edge of a cliff? North American Symposium on Bat Research, Portland, Oregon: 2009.
- The Impact of White-Nose Syndrome on the bats of New Hampshire. White-Nose Syndrome Symposium, Pittsburgh, Pennsylvania: 2009.
- The value of long-term mark-recapture data for determining the population dynamics of the little brown myotis *Myotis lucifugus*: North American Symposium on Bat Research, Scranton, Pennsylvania: 2008.
- The potential value of pre-construction surveys for predicting bat fatality at wind facilities: North American Symposium on Bat Research, Merida, Mexico: 2007
- Monitoring the potential impact of wind development for bats in the Northeast: North East Bat Working Group, East Stroudsburg, Pennsylvania: 2006.
- The use of passive acoustic monitoring as a biological assessment tool for surveying migratory patterns of bats in relation to wind power development: Annual Meeting of the International Ecology Society and the Ecological Society of America, Montréal, Quebec Canada: 2005.
- Pre-Construction Assessment of Habitat Use by Bats at the Flat Rock Wind Power Facility, New York: North American Symposium on Bat Research, Salt Lake City, Utah: 2004.
- Long-Term Life History Analysis in Myotis lucifugus: North American Symposium on Bat Research, Burlington, Vermont: 2002.
- Data Management in the Study of Temperate Bats: North East Working Group on Bats, Burlington, Vermont: 2002.
- Changes in Body Composition During Reproduction and Postnatal Growth in the Little Brown Bat *Myotis lucifugus*, Using Direct and Indirect Analytical Techniques: North American Symposium on Bat Research, Hot Springs, Arkansas: 1998.
- The Validation of Total Body Electrical Conductivity Analysis (TOBEC) to Assess Body Composition in *Myotis lucifugus*. North American Symposium on Bat Research, Bloomington, Illinois: 1998.
- The Use of Modular Artificial Roosts in the Conservation and Management of a *Myotis lucifugus* Colony in Central Massachusetts. North American Symposium on Bat Research, Gainesville, Florida: 1996.

OTHER PRESENTATIONS

The Natural History and Conservation of the northern long-eared myotis (*Myotis septentrionalis*). Northeastern Regional Meeting of the American Society of Foresters; Bartlett, NH: January, 2015

Why Bats Hit Wind Turbines? New Hampshire Audubon Environmental Lecture Series: 26 July, 2007 Studying Bats in New Hampshire: *Front Porch* interview series, New Hampshire Public Radio: 08 August, 2002 House-Roosting Bat Research and Issues in New Hampshire: New Hampshire Public Television: 2001



PUBLICATIONS

- **Reynolds, D.S.**, K. Shoemaker, S. von Oettingen, S. Nager, J.P. Veilleux, and P. Moosman. 2016. Characterizing the impact of White-nose Syndrome on a New England bat community using long-term monitoring data. Journal of Mammalogy, *in prep*.
- **Reynolds, D.S.**, K. Shoemaker, S. von Oettingen, and S. Nager. 2016. Reducing the impact of White-nose Syndrome by staying close to home and active through the winter. Northeastern Naturalist, *in press*.
- Reichard, J.D., N.W. Fuller, A.B. Bennett, S.R. Darling, M.S. Moore, K.E. Langwig, E.D. Preston, S. von Oettingen, C. Richardson, and **D.S. Reynolds.** 2014. Interannual survival of *Myotis lucifugus* (Chiroptera: Vespertilionidae) near the epicenter of White-Nose Syndrome. Northeastern Naturalist, *in press*.
- **Reynolds, D.S.** 2012. Multi-year acoustic monitoring of bats at the Maple Ridge Wind Project. Report submitted to New York State Energy Research and Development Authority NYSERDA Grant 10498
- Hein, C., E. Arnett, M. Schirmacher, M.M.P. Huso, and D. S. Reynolds. 2011. Patterns of pre-construction bat activity at the proposed Hoosac wind facility, Massachusetts, 2006-2007. A final project report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International, Austin, Texas.
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- **Reynolds, D.S.** and C. Korine, 2009. Body Composition Analysis. In. T.H. Kunz and S. Parsons (eds). Ecological and Behavioral Methods for the Study of Bats. Johns Hopkins University Press, in press.
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- Kunz, T.H. and D.S. Reynolds, 2004. Bat colonies in buildings. In: Monitoring Trends in Bat Populations of the U.S. and Territories: Problems and Prospects (T.J. O'Shea & M.A. Bogen, eds.) U.S. Geological Survey, Biological Resources Division, Information and Technology Report, Washington D.C.
- **Reynolds, D.S.** and T.H. Kunz, 2001. Standard Methods For Destructive Body Composition Analysis. Body Composition Analysis of Animals (J. Speakman, ed.). Cambridge University Press.
- Reynolds, D.S. and T.H. Kunz, 2000. Changes in Body Composition During Postnatal Growth and Reproduction in the Little Brown Bat, *Myotis lucifugus. Ecoscience*: 7: 10-17.



Northern Pass Transmission Project

Independent Review of Significant Wildlife Habitats and Rare, Threatened & Endangered Species



on behalf of: NH Attorney General, Counsel for the Public

December 30, 2016

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Commonly Used Acronyms and Abbreviations

AE	Arrowwood Environmental, LLC
ASL	Above sea level
DEIS	Draft Environmental Impact Statement
DWA	Deer Winter Area
GIS	Geographic Information Systems
MCA	Moose Concentration Areas
NHB	New Hampshire Natural Heritage Bureau
NHDES	New Hampshire Dept. of Environmental Services
NHFG	New Hampshire Fish and Game Department
NPT	Northern Pass Transmission Company
Project	Northern Pass Transmission Project
ROW	Right-of-Way
RTE	Rare, Threatened and Endangered
SEC	Site Evaluation Committee
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
VTFW	Vermont Fish and Wildlife
WMNF	White Mountain National Forest
Application	Joint Application Of Northern Pass Transmission LLC And Public Service Company Of New Hampshire D/B/A Eversource Energy For A Certificate Of Site And Facility To Construct A New High Voltage Transmission Line And Related Facilities In New Hampshire
Aquatic Report	Normandeau Assoc. Inc. Application Vol XXIX Appendix 33 Fisheries and Aquatic Invertebrates Resource Report and Impact Analysis
Mitigation Plan	Normandeau Assoc. Inc. Application Vol XXIX Appendix 32 Natural Resource Mitigation Plan
RTE Report	Normandeau Assoc. Inc. Application Vol XXX Appendix 35 Rare, Threatened, and Endangered Plants and Exemplary Natural Communities
Wetland Application	Normandeau Assoc. Inc. Application Vol V Appendix 2. Application for State of NHDES Wetland Permit for Major Dredge and Fill Project for the Northern Pass Transmission Project
Wetland Report	Normandeau Assoc. Inc. Application Vol XXIX Appendix 31 Wetlands, Rivers, Streams and Vernal Pools Resource Report and Impact Analysis
Wildlife Report	Normandeau Assoc. Inc. Application Vol XXXI Appendix 31 Wildlife Report and Impact Assessment
Wildlife Technical Report	Ecology and Environment Inc. Wildlife Technical Report for the Draft



Executive Summary

Arrowwood Environmental (AE) conducted an independent assessment of the NPT environmental review of the Project. This assessment focused on rare, threatened and endangered species and significant wildlife habitat and evaluated both the methods and conclusions of the environmental review. In a few cases, AE has determined that the methodology employed to map and evaluate the impacts of the Project on the resource are sufficient to conclude no unreasonable adverse impacts. In many cases, however, conclusions regarding the nature, extent and duration of the Project impacts could not be drawn because of inadequate methodology or incomplete information. In these circumstances, inadequate methodologies may have resulted in incomplete mapping of the resource within the Project area. In addition, information on Best Management Practices, seasonal restrictions, and minimization techniques have been mentioned in the application materials, but no details about these plans or commitments to employ these techniques have been presented. Lacking commitments to adequate minimization measures, AE has concluded in some instances that the Project would result in unreasonable adverse impacts to RTE species or significant wildlife habitat.

A brief summary of our conclusion for each resource is presented below.

Significant Wildlife Habitats

Deer Winter Areas (DWA)

DWAs have not been adequately mapped within or adjacent to the Project area. Therefore there is insufficient information to adequately assess the nature, extent and duration of the potential effects of the proposed Project on deer overwintering habitat. In addition, due to lack of information on avoidance from alternate routes, NPT failed to demonstrate that sufficient efforts to avoid and minimize adverse impacts to DWAs were undertaken. AE concludes that there is insufficient information to fully determine the impacts to DWAs and without a commitment to adequate BMPs which include seasonal restrictions and restrictions on winter-time recreation use, the Project would have an unreasonable adverse impact on this significant wildlife habitat.



Moose Concentration Areas (MCA)

MCA habitat within the Project ROW is adequately mapped, and will be directly impacted by the Project. MCA habitat adjacent to the Project area has not been mapped. NPT fails to provide a mitigation plan to offset permanent loss of MCAs and fails to provide adequate seasonal construction limitations in the area where MCAs are to be removed. The Project does not represent the best practical measures available to avoid, minimize, or mitigate the adverse direct and indirect impacts on MCAs.

Mast Stands

The nature and extent of hard mast stand resources (both oak and beech), a significant habitat for black bear, have not been adequately identified within the Project area. It is therefore not possible to evaluate the nature, extent and duration of potential effects of the Project. Mitigation measures have not been fully developed or committed to by NPT, therefore the Project does not represent the best practical and most effective measures available to avoid, minimize, or mitigate the adverse direct and indirect impacts on mast stands.

Vernal Pools

The data collection methodology used for identification of vernal pools is sufficient, but the ranking protocol used was inappropriate and inconsistently applied. NPT has not specified the nature of primary impacts and failed to conduct an analysis of the secondary impacts to vernal pools. Given this, the nature, extent and duration of potential effects on vernal pools cannot be fully determined. Avoidance and minimization of adverse impacts has been proposed in some cases, but in other instances avoidance and minimization appears possible but has not been proposed. For this reason, the Project does not represent the best practical and most effective measures available to avoid, minimize, or mitigate the adverse direct and indirect impacts vernal pools.

Rare, Threatened and Endangered Species

RTE Animals

Canada Lynx

The habitat of the Canada lynx has been adequately mapped. NPT has not provided a sound methodology for implementing proposed mitigation measures and has failed to provide measures



to mitigate potential longterm impacts of the Project by restricting post-construction use of the ROW by motorized vehicles. For these reasons, the Project does not provide the best practical and most effective measures available to avoid, minimize, or mitigate the adverse direct and indirect impacts on Canada lynx.

American Marten

The habitat of the American marten has been adequately mapped within the Project area. The Project will result in the direct loss of potentially high quality marten habitat. Issues raised by NHFG have not been addressed and NPT has failed to provide an alternative route analysis. No details of any minimization measure have been developed or committed to by NPT. Without incorporating restrictions on winter-time motorized recreation within the new ROW and access roads, and confirming that the proposed mitigation parcel provides accessible high quality marten habitat, AE concludes that the project will likely have an unreasonable adverse impact on this species.

Birds Species not addressed in NPT Wildlife Report

Impacts to certain RTE bird species such as shorebirds are unlikely, while for others such as the upland sandpiper and three-toed woodpecker, the possibility of impacts exists. However, lacking documentation of an analysis by NPT, it is not possible to determine the nature, extent and duration of potential effects of the Project on these species.

Grassland Birds

The grassland bird habitat assessment may have excluded appropriate habitats so it is not possible to evaluate the nature, extent and duration of the potential effects on all grassland birds. Measures undertaken or planned to avoid, minimize or mitigate potential adverse effects on northern harriers present in the Project area are insufficient, may be ineffective and do not represent best practical measures available. AE concludes that there is insufficient information to fully determine the impacts to grassland bird species, notably Northern harrier, and without a commitment to appropriate pre-construction surveys and/or seasonal restrictions on construction, the Project would likely have an unreasonable adverse impact on RTE bird species.



Wetland-dependent Birds

Construction within the existing ROW portions of the Project will result in temporary displacement of wetland-dependent birds, but bird species will likely return and utilize the habitat again in subsequent breeding seasons. General construction methods described for open water wetlands may to be inappropriate, and without accurate construction details, the nature, extent and duration of potential adverse effects on wetland-dependent bird species is not possible.

Habitat investigations and presence/absence surveys for Rusty blackbird, pied-billed grebe and sedge wren were not conducted by NPT. Since no habitat suitability analysis or field surveys were conducted, despite records of their presence, the nature, extent and duration of adverse impacts from the construction of the Project to wetland dependent RTE and special concern bird species is impossible to evaluate. AE concludes that there is insufficient information to fully determine the impacts to wetland-dependent bird species, including pied-billed grebe, and without appropriate habitat assessments and avoidance measures, the Project may have an unreasonable adverse impact on RTE bird species.

<u>Nightjars</u>

Available habitat for nesting common nighthawk and eastern whip-poor-will will not be significantly impacted following construction of the Project. Details and commitments are lacking for efforts at avoidance, minimization and mitigation of direct impacts to these species during construction. Lacking these commitments, the Project does not represent best practical measures available to avoid or mitigate direct adverse impacts to common nighthawk and eastern whip-poor-will.

<u>High Elevation Birds</u>

Since monitoring for Bicknell's thrush was conducted only once several years ago, additional surveys should be conducted in the nesting season immediately prior to construction to confirm that no Bicknell's thrush are present in areas of appropriate habitat. If Bicknell's thrush are not found, it is unnecessary for the Project to avoid, minimize or mitigate direct impacts or habitat loss to Bicknell's thrush. If Bicknell's thrush are found prior to construction, Project impacts above 2700' in elevation should be prohibited until a complete evaluation of habitat impacts is conducted. If no Bicknell's thrush are found in the nesting season immediately preceding



construction, it is unlikely that the Project poses an unreasonable adverse impact to Bicknell's thrush or their habitat.

Nesting Raptors and Herons

The Project does not provide a methodology or a formal commitment for appropriate preconstruction surveys, nest removal and construction restrictions for nesting raptors. The Project has failed to provide measures to mitigate potential impacts to nesting raptors, so the Project does not provide the best practical and most effective measures available to avoid, minimize, or mitigate the adverse direct and indirect impacts on these species. AE concludes that there is insufficient information to fully determine the impacts to nesting raptor species, including bald eagle, and without appropriate habitat assessments and avoidance measures, the Project may have an unreasonable adverse impact on RTE bird species.

Avian Electrocution and Collision

NPT fails to provide a formal commitment to implement the suggested practices for both new and relocated distribution and transmission structures as described in APLIC. Lacking such a commitment, the Project does not avoid, minimize or mitigate adverse impacts to avian species from electrocution.

Since a route-siting analysis was apparently not conducted per the APLIC 2012 recommendations, it is not possible to conclude any avoidance or minimization measures have been undertaken with regards to Project route selection. A bird-collision risk assessment that was conducted may underestimate or misrepresent potential collision risk areas, therefore the nature, extent and duration of impacts to avian species through collision is not possible to evaluate. Since no methodology or parameters for post-construction bird mortality surveys or commitments to line marking devices are provided, measures undertaken or planned to mitigate potential adverse effects from avian collision are either insufficient or appear unlikely to be effective and do not represent best practical measures available. AE concludes that there is insufficient information to fully determine the impacts to RTE bird species due to electrocution or collision with the proposed aerial power lines and without appropriate BMPs and installation of line marking devices, the Project is likely to have an unreasonable adverse impact on RTE bird species.



Mussels

The potential impacts to the RTE mussel species have been identified by NPT. BMP measures have been suggested that would address potential impacts from construction, but no BMPs have been made available for review. Without these documents, there is not enough information to determine that the Project will not have an unreasonable adverse impact on these rare mussels.

Insects

The habitat of the RTE insect species has been identified; however, surveys have not been conducted to determine population numbers within the Project area. The nature, duration and extent of the Project's direct impacts on these individual species have not been determined. No obvious avoidance or minimization measures have been undertaken or committed to by NPT. Concerns expressed by NHFG have not been addressed. Failing to provide species specific information on the Persius duskywing skipper, the pinion moth and the frosted elfin, the Applicant has not demonstrated that the proposed mitigation measures for the Karner Blue butterfly will be effective.

<u>Snakes</u>

The habitat of these snakes may be negatively impacted during construction, but long-term impacts are not likely to be adverse. Impacts to individuals, nests and hibernacula during construction could be avoided or minimized by the development of BMPs and seasonal restrictions, but no details about these plans have been made available or committed to by NPT.

Turtles

NPT has failed to provide consistent information on avoidance, minimization and mitigation measures for impacts to RTE turtle species. In addition, no details about specific construction BMPs, seasonal restrictions and mitigation measures have been presented or formally committed to by NPT. An assessment of the overall adverse impacts on RTE turtles is therefore impossible to conduct.

RTE Plants

Overall, the RTE plant survey methodology employed by NPT is insufficient to fully assess the Project's impacts on RTE species. Without a complete RTE inventory of the entire route, there is



not enough information to conclude that the Project will have no unreasonable adverse impact on rare plants.

Butterfly Milkweed

One population of this endangered species has been identified within the Project area and would be eliminated by construction disturbance. NPT has failed to provide materials showing that any steps were taken to avoid or minimize adverse impacts to this species.

Blunt-leaved milkweed

Two populations of this species were found directly adjacent to the Project area and have been avoided. Employing effective constructions BMPs, as well as use of an environmental compliance monitor, will likely minimize the potential for adverse impacts to this species.

Spiked Needle Grass

Three populations of this species were found that will be impacted by the Project, including the largest in the state. NPT has not provided an alternatives analysis within the application materials showing that any steps were taken to avoid or minimize impacts to this species. In addition, the NPT fails to provide adequate measures to mitigate adverse impacts to this endangered species. Without these measures, the Project will likely have an unreasonable adverse impact on this species.

Licorice Goldenrod

A population of licorice goldenrod was identified in Pembroke and is likely one of the larger populations of this species in the state. The Project will have direct adverse impacts on this population. NPT has not provided an alternatives analysis within the application materials showing that any steps were taken to avoid or minimize adverse impacts to this species. In addition, NPT fails to provide adequate measures to mitigate impacts to this rare species, specifically, development of construction BMPs and/or a transplantation plan for individuals to be taken. Without these measures, the Project will likely have an unreasonable adverse impact on this species.


Wild Lupine

AE's analysis of the plant population boundaries and layout of the proposed development has concluded that no obvious avoidance or minimization measures have been undertaken by NPT. NPT fails to provide an alternatives analysis within the application materials showing that the best practical measures have been employed to avoid or minimize adverse impacts to this rare species. The degree of impacts combined with the apparent lack of avoidance and minimization lead AE to conclude that the Project would have an unreasonable adverse impact on this significant resource.

Small whorled Pogonia

Based on the known range of this species, NPT failed to conduct an adequate inventory to confirm its presence or absence in the Project area. Lacking a sufficient inventory, it is impossible to conclude that the Project would not have an unreasonable adverse impact on this species.

State Watch and Indeterminate Species

NPT documented 13 State Watch and Indeterminate species that would be impacted by the Project. The Project will have both direct and indirect impacts to the local populations of these species. However, given their relative lack of rarity, it is unlikely that these local impacts would rise to the level of being unreasonable.



1 Introduction

Pursuant to RSA 162-H:9, the Attorney General of the State of New Hampshire shall appoint an Assistant Attorney General as counsel for the public in seeking to protect the quality of the environment and in seeking to assure an adequate supply of energy. Arrowwood Environmental, LLC (AE) was retained for the purposes of providing the counsel for the public an impartial, third party review of the proposed Northern Pass Transmission Project (Project) impacts. AE focused on rare, threatened and endangered (RTE) species, and significant wildlife habitat.

2 Project Summary

Northern Pass Transmission, LLC (NPT) proposes the construction or expansion of a 192-mile (309 km) electrical transmission corridor from Pittsburg in northern New Hampshire down to Deerfield in southern New Hampshire. The Project follows existing transmission line ROW or public road ROW for over 80% of its length with approximately 32 miles of the Project in northern New Hampshire requiring the clearing of a new ROW.

3 Methodology (AE)

AE conducted an assessment of the NPT environmental review of the Project. This assessment focused on two resource areas: RTE species and associated habitats, and significant wildlife habitat. AE conducted this review in an objective manner based on our professional expertise and the current scientific literature in these fields. The standards used to assess proposed impacts are based on the Site Evaluation Committee (SEC) rules and other state regulatory requirements.

The initial step in the assessment process is to review all of the applicable documents relating to RTE species and significant wildlife habitats. The following documents were reviewed during this process:

- SEC Permit Application
- Testimony of Expert Witnesses
- Public Information Sessions
- Wetland Permit Application
- Other Relevant Environmental Permits
- Various Agency Comments from Phone Logs and Meeting Minutes



- Agency Comments to the Draft Environmental Impact Statement
- Other Relevant Environmental Permits

An outreach effort was undertaken by AE in order to collect information about the resource areas. Outreach was limited to individuals and groups that have information about the two resource areas. These groups included:

- New Hampshire Department of Environmental Services (NHDES)
- New Hampshire Fish and Game (NHFG)
- NH Municipal Conservation Commissions
- Appalachian Mountain Club
- Society for the Protection of NH Forests
- Conservation Law Foundation

AE attended a public meeting about the Project on August 9, 2016, to hear concerns from local conservation commissions and environmental organizations. AE also participated in Technical Hearings for the Project on September 20, 22 and October 18, 2016.

AE conducted field assessments at selected sites. Field assessments were conducted to familiarize AE with specific areas of the Project and, in some cases, to obtain detailed information about the site conditions and specific resources.

AE contracted outside experts for the assessment of the Karner Blue butterfly and bats.

4 Regulatory Framework (SEC Criteria for Review Overview)

AE used the SEC review criteria to assess whether the Applicant provided in their application adequate information regarding the effects of, and plans for avoiding, minimizing, or mitigating the potential adverse effects of, the proposed energy facility on the natural environment. Specifically, AE looked for the following in the application materials:

Site 301.07 (c)

1) Description of how the applicant identified significant wildlife species, rare plants, rare natural communities, and other exemplary natural communities potentially affected by construction and operation of the proposed facility, including communications with and



documentation received from the New Hampshire department of fish and game, the New Hampshire natural heritage bureau, the United States Fish and Wildlife Service, and any other federal or state agencies having permitting or other regulatory authority over fish, wildlife, and other natural resources;

- Identification of significant wildlife species, rare plants, rare natural communities, and other exemplary natural communities potentially affected by construction and operation of the proposed facility;
- 3) Identification of critical wildlife habitat and significant habitat resources potentially affected by construction and operation of the proposed facility;
- Assessment of potential impacts of construction and operation of the proposed facility on significant wildlife species, rare plants, rare natural communities, and other exemplary natural communities, and on critical wildlife habitat and significant habitat resources, including fragmentation or other alteration of terrestrial or aquatic significant habitat resources;
- 5) Description of the measures planned to avoid, minimize, or mitigate potential adverse impacts of construction and operation of the proposed facility on wildlife species, rare plants, rare natural communities, and other exemplary natural communities, and on critical wildlife habitat and significant habitat resources, and the alternative measures considered but rejected by the applicant; and
- 6) Description of the status of the applicant's discussions with the New Hampshire department of fish and game, the New Hampshire natural heritage bureau, the United States Fish and Wildlife Service, and any other federal or state agencies having permitting or other regulatory authority over fish, wildlife, and other natural resources.

5 Significant Wildlife Habitat Resources

This section addresses the proposed impacts of the Project on significant wildlife habitat resources. Significant habitat resource is defined by the SEC as habitat used by a wildlife species for critical life cycle function. AE reviewed the methodologies the Applicant used to identify these resources. AE next evaluated the Applicant's assessment of Project impacts on these resources. Finally, AE reviewed the effectiveness of the measures planned to avoid, minimize, or mitigate potential adverse impacts of construction and operation of these resources.



5.1 Habitats

AE assessed the Project's review of three distinct terrestrial habitat types considered by general consensus among biologists and regulating authorities to be Significant Habitat Resources: Deer Wintering Areas, Moose Concentration Areas and Mast Stands. AE reviewed Vernal Pool Habitat as an aquatic resource. Each of these assessments is presented below.

5.1.1 Deer Wintering Areas

White-tailed deer are a prominent component of New Hampshire's wildlife community occurring throughout the state. White-tailed deer (hereafter referred to as "deer") inhabit forest edges and areas interspersed with fields and woodland openings. Deer wintering areas (DWA) are a distinct forest resource utilized by deer during the cold, snowy winter months. DWAs typically consist of stands of mature and mixed age evergreen forest or mixed evergreen and hardwood forests. Eastern hemlock, northern white cedar, spruce and fir trees are dominant woody species within many of New Hampshire's DWAs. Forested DWAs with south-facing, west-facing, and flat topography are generally those receiving the highest use by deer but all topographic aspects can be important in some years.

Deer are near their northern range limit in northern New England and benefit from reduced snow depths and the reduced exposure to the cold in DWAs. In New Hampshire, and northern New England as a whole, the energy savings that deer receive from these habitats can mean the difference between surviving the winter and dying of starvation. In New Hampshire, DWAs may contain 100 or more deer during periods of cold temperatures and deep snow. During the winter months, deer generally move to these habitats when snow depths exceed about 12" and depend on them heavily when snow depths exceed 18" (http://www.wildlife.state.nh.us/wildlife/profiles/deer.html).

In northern Maine (where published data is available) deer can spend over 110 days within DWAs (Wiley and Hulsey 2010) while 60 days is more common in southern Maine. On hill slopes throughout the Project area, and in the north in particular, deep snow can remain until April 1 or later in any given year. A review of snow depths for the last 4 years showed over 18" of snow remaining on the ground in all but a small section of the northern portion of the Project on April 1 in 3 of the last 4 years (National Snow Analysis Center, 2016). Snow depths were



often deep enough by the middle of December to prompt deer to move into their DWAs. The New Hampshire Extension Service Website (<u>https://extension.unh.edu/goodforestry/html/6-9.htm</u>) states that deer will spend their entire winters in DWAs, as long as deep snow stays on the ground.

Deer are negatively impacted by human activities occurring both within and adjacent to DWAs during the winter months. Deer move to avoid humans, loud and sharp noises, and light associated with human activities. This added stress and avoidance behavior creates an additional depletion of energy beyond that just brought by cold temperatures and deep snow. The Vermont Fish and Wildlife Department provides a 300 foot protective buffer around its DWAs to protect and buffer deer from the negative impacts of humans and their activities (Argentine 2008). This loss of energy associated with the climate-related demands of winter and human-based disturbances is cumulative throughout the winter and begins when plants go into winter dormancy and snow cover coats the forest floor and continues until the first flush of green vegetation in the spring.

5.1.1.a Project Impact Summary

As reported by Normandeau, the Project will directly intersect seventeen NHFG-mapped DWAs and one previously unmapped DWA (Wildlife Report, Table 11). The Wildlife Report goes on to state the Project will directly impact 28.3 acres or about 0.25 percent of the over 10,000 acres of NHFG mapped DWAs that the Project intersects. Normandeau suggests (Wildlife Report, Section 13.5.2) that the impact to deer in DWAs directly adjacent to the proposed ROW may also be negative and that deer could suffer reduced overwinter survival if the Project construction occurs during harsh winter conditions.

5.1.1.b Agency Issues

In written comments on the Draft Environmental Impact Statement (NHFG, April 4, 2016), NHFG lists a number of concerns regarding the Project and DWAs. NHFG states that the Project route goes through two large DWAs in the northern section of new ROW, the State Line and West Road North DWAs which were not mapped by NHFG. NHFG does not believe that the current Project alignment adequately considered options that would minimize impacts to these two large DWAs.



Regarding a DWA in Dummer, NHFG states that the total impacted areas that Normandeau has presented (Wildlife Report, p 13-8) does not reflect the total impact that a Project road will have on overwintering deer in this area.

NHFG also asserts that the Project route bisects and "interrupts connectivity" of important mapped DWAs and that this impact has not been included in Normandeau's total impact area. In addition, NHFG requested that the actual boundaries of the NHFG mapped DWAs be ground-truthed in the field (Carol Henderson letter to Sarah Barnum 12-12-2010). Normandeau has stated that no field data points adjusting NHFG mapped DWA boundaries were taken during their field investigation because the DWA boundaries were accurate and had not changed since they were originally mapped by NHFG (Sarah Barnum, personal communication, 10-18-2016).

5.1.1.c AE Assessment

5.1.1.c.i Methodology Review

AE has identified three problems with the DWA assessment methodology: 1) DWAs have not been identified and mapped throughout the Project area; 2) the methods used to identify DWA boundaries were inappropriate, and 3) the assessment of DWA acres impacted by the Project does not include indirect impacts. These issues are discussed below.

1. DWAS have not been identified and assessed throughout the Project area: Normandeau failed to adequately identify the extent of DWA resources within and directly adjacent to the Project by relying upon NHFG DWA maps and limiting their review to only the ROW boundaries. In order to determine if Normandeau's assessment was insufficient, AE conducted a targeted DWA mapping exercise of three forested areas in the towns of Dummer and Stark. Two of the assessed sites consisted of conifer forests adjacent to an existing ROW and one site where the proposed ROW cut through existing forest. AE chose to investigate potential unmapped DWA in the north because the region's forest management activities (i.e. logging) have created a very dynamic forest.

Through the use of GIS software and aerial photography, AE identified the presence of mid to late successional coniferous or mixed coniferous-hardwood forest in the targeted review area. From this desktop process, three potential DWAs (un-mapped by Normandeau) on the Project



route were identified. Three of these forest areas were subsequently field reviewed by an AE wildlife biologist and determined to meet the definition of a DWA. The additional DWAs are shown in Figure 5.1.1-1.







The results of the field investigation revealed that, at all three sites, habitat meeting the definition of a DWA was present: 50-75 % coniferous canopy closure, bark stripping, and sign of moderate to high amounts of winter woody browse by deer. Moose had also browsed woody vegetation at one site. Another common feature at all three sites was the presence of canopy trees that were only 20-35 feet tall. These trees are young enough that when NHFG biologists mapped the State's DWAs 10-25 years ago or more these forest stands did not meet the definition of a DWA and hence were not mapped. These trees have since grown tall enough to function in the capacity as deer winter habitat. The results of this DWA habitat review conducted by AE strongly support the conclusion that unmapped DWAs exist along the proposed Project route.

Reliance on the NHFG DWA maps has been discouraged by New Hampshire agencies. On its website (<u>https://extension.unh.edu/goodforestry/html/6-9.htm</u>) the New Hampshire Extension Service states the "N.H. Fish and Game (NHFG) provides maps of known DWAs. Because locations of wintering areas change over time, a field evaluation of the current habitat conditions is recommended before conducting any work within a known or potential DWA."

The mapping of DWAs in New Hampshire began in the 1970s and was largely field checked and completed by the 1990s. Some evaluation of the yearly utilization of DWAs by NHFG continues to the present, but DWA boundary adjustments are generally not part of this process (Dan Bergeron, NHFG Deer Program Chief, personal communication, 11-1-2016). In addition, DWAs have not been mapped in all towns within New Hampshire by NHFG (for example, the towns of Pittsburg and Dixville have not been mapped). The NHFG maps can best be looked at as advisory, and need to be accompanied by rigorous field evaluation of existing habitat features.

2. Inappropriate Methods to Identify DWAs: Normandeau failed to identify DWA resources directly adjacent to the Project ROW due to inappropriate field survey methods. Normandeau failed to consider forest structure in their determination of DWA resources. Ms. Barnum concluded that the NHFG considers the sign of winter deer browse as sufficient evidence to conclude winter DWA use (Sarah Barnum phone conversation with Kent Gustafson, NHFG former Deer Project Leader, 2-13-2012). In speaking with the current NHFG Deer Project Leader Dan Bergeron (Dan Bergeron, personal communication, 11-17-2016), he stated that while browse is indeed adequate to show deer utilization, the edge of the coniferous forest habitat should be used to show boundaries of the DWA. The NHFG publication titled "More Harm Than Good"



explains the importance of the forest cover to deer during New Hampshire winters. In the publication they state "During winter, cover - not forage becomes the key to survival …" By failing to consider forest structure, Normandeau omitted significant areas of likely DWA along the existing ROW and proposed expansion of the existing ROW. Within the northern section where a new ROW will be cut, it appears that most areas with adequate coniferous forest canopy cover were recorded, but only within the actual ROW. Mature coniferous forests and mixed coniferous - broad-leaved forest adjacent to the actual footprint of the Project within the Northern Section have not been delineated.

3. Failure to Account for Indirect Impacts: Normandeau's assessment of Project impacts on DWAs does not include indirect impacts. Indirect impacts take the form of both temporary (construction related) and permanent (ongoing activity such as winter recreation). Temporary impacts include noise from chainsaws, possible use of dynamite, machines used for trenching underground sections of the line, or machines used in constructing access roads and transmission lines (i.e. bulldozers and cranes). Permanent impacts include noise from snowmobiles, ATVs, dogs and humans associated with winter recreation.

5.1.1.c.ii Impact Assessment

The Project impacts include both direct and indirect impacts on DWA resources; the fragmentation of currently contiguous coniferous forest cover; and, the lack of effective measures to avoid, minimize, or mitigate for potential adverse effects on DWA resources.

Normandeau found that the direct adverse effects of the Project include the removal of 28.3 acres of DWA habitat. Given the inadequacies in Normandeau's field methodology, this figure may well under-represent the actual acreage present. The majority of DWAs that were likely missed during Normandeau's field assessment are within areas of existing ROW and ROW expansion, where Normandeau relied solely upon the mapped NHFG DWA boundaries. However, in the areas of proposed ROW expansion, the removal of actual evergreen forest consisting of trees tall enough to function as deer winter habitat is probably quite limited.

The direct loss of 28.3 acres of DWA habitat from the Project is adverse and may negatively affect the winter survivability of the local population of deer. If this winter habitat is currently saturated with deer (in relation to its carrying capacity), displaced deer may not be able to



immediately shift habitat ranges to take advantage of other nearby winter habitats. This direct effect is local, but represents a permanent loss of habitat.

The indirect impacts of the proposed Project route on deer, as proposed, are considerable in extent. Construction of the Project during winter months in and adjacent to DWAs will temporarily impact the deer overwintering in these locations. Deer would be displaced and/or expend additional energy due to the stress associated with the presence of humans and human-associated disturbances such as noise and light.

Permanent indirect impacts will likely result if winter recreation is introduced adjacent to DWAs along the Project route, specifically in the northern section of new ROW where these activities are not already occurring. The testimony of Mr. John Kayser suggests that access roads may well be graveled. If access roads are improved and access unrestricted, there is the potential for the long-term continued recreational use of these roads and further disturbance of wildlife, including overwintering deer within DWAs.

In addition, line maintenance work can also result in the displacement of deer from DWAs depending on the time of year and the degree of noise associated with the work.

Using Vermont policy as a guide, one can expect a negative impact within 300' of DWA resources. This renders the actual impact to overwintering deer from the Project well beyond the physical limits of construction. This greater total impact area would include both the actual area in the DWA intersected by the Project, and also the area of the DWA (also inhabited by deer) within 300' of the final ROW. While Normandeau also commented on this indirect effect in the Wildlife Report, it is not carried over to the tallied impact analysis.

The fragmentation of DWAs in the northern section of new ROW where the Project will cut through existing forest is a permanent impact. The deeper snow that will accumulate in the new ROW will deter some deer from crossing and increase the expenditure of energy of other deer which do venture across the ROW. We concur with NHFG that deer will expend greater energy crossing the new ROW in these areas (W. Staats, Notes regarding my comments on the Northern Pass Project. 3-29-2016). Conversely, deer might cease accessing these disjunct areas of the



DWAs periodically or altogether. This is a permanent, although relatively minor adverse impact upon deer, in that it may only impact a few deer.

The Applicant fails to provide in the application materials a clear evaluation of alternative routes, particularly in the northern section of new ROW that may have resulted in fewer impacts to DWAs. It is not clear from the application materials that the Project proponents considered any alternative routes in the northern section of new ROW in relation to DWA impacts. The choice of a route that followed existing paved roads and/or ROWs would likely have substantially less impact upon DWAs. At this time, it is impossible to adequately assess the relative impacts on DWAs of the Project route proposal versus other potential routes.

Normandeau proposes measures to mitigate the identified DWA impacts. The Mitigation Plan includes the protection of Parcel C which contains a NHFG mapped DWA approximately 3 times the size of the 28.3 acres of DWA that Normandeau calculated was impacted by the Project. This habitat protection effort will certainly help preserve the benefits of DWA utilization long-term for deer in the area where the parcel is protected. This protected parcel may help offset Project impacts to deer that currently utilize the West Road North DWA which will be impacted by the Project. However, this protection effort will do nothing to benefit deer experiencing winter conditions in areas distant to the conserved land that is negatively impacted by the Project.

Normandeau has also suggested seasonal restrictions on construction in the areas identified as DWAs, specifically curtailing construction activity in areas with deep, crusted, snow conditions, primarily during the months of January and February (Mitigation Report, Appendix B). The outlined restrictions are not adequate, because they do not account for the total area of DWA present in the Project area and they do not cover the appropriate time period for overwintering which can extend from mid-December to mid-April.

Normandeau fails to address permanent impacts on DWAs that would result from the introduction of winter recreation activities and on-going line maintenance, particularly in the northern section of new ROW where these activities are not currently happening.



5.1.1.c.iii Conclusions

AE concludes that Deer Winter Areas and their boundaries have not been adequately identified and mapped within or directly adjacent to the Project. Normandeau failed to update previously mapped NHFG wildlife habitat data with current field conditions. Normandeau fails to identify the nature, extent and duration of the indirect impacts on DWAs that will result from the Project. In addition, Normandeau failed to demonstrate that sufficient efforts to avoid and minimize impacts to DWAs, by alternate route evaluation in the northern section of new ROW were made. The mitigation plan fails to provide effective measures to address the adverse impacts from the Project on DWAs. AE concludes that there is insufficient information to fully determine the impacts to DWAs and without a commitment to adequate BMPs which include seasonal restrictions and restrictions on winter-time recreation use, the Project would have an unreasonable adverse impact on this significant wildlife habitat.

5.1.2 Moose Concentration Areas

Moose are an iconic animal found throughout New Hampshire but are commonly associated with northern parts of the state. Moose are the largest living member of the deer family. In recent years, moose have declined significantly in New Hampshire, most likely due to the stresses brought on by global warming and direct mortality from the ravages of ticks.

Moose Concentration Areas (MCAs) are forested areas with evergreen trees tall enough to promote the occupation of concentrations of moose during the winter months when snow depths exceed approximately 27". Typically these areas will also contain heavy woody plant browse and may contain significant concentrations of winter moose scat. They are often found in relatively higher elevations than DWAs.

In the eastern United States and Canada, there is substantial scientific agreement that moose utilize closed canopy evergreen forests during the winter when deep snow and extreme cold set in (Balsom et al. 1996). There is, however, less of a scientific nexus between use of these habitats by moose, the energy reserves of the moose utilizing MCAs, and winter survival of moose.



5.1.2.a Project Impact Summary

Normandeau states that the Project will directly impact 47 acres of MCAs, all of which occur in the northern section of new ROW. Normandeau concludes that if harsh winter conditions are present during winter construction, activities could have negative impacts on moose in areas adjacent to the Project (Wildlife Report, Section 13.5.3). Normandeau posits that moose in areas adjacent to the Project during construction could experience reduced overwintering survival due to the added stress and potential displacement of moose as a result of the human activity.

5.1.2.b Agency Issues

NHFG have no stated issues with Normandeau's assessment of MCA's.

5.1.2.c AE Assessment

5.1.2.c.i Methodology Review

Normandeau utilized a snow depth model to determine areas where snow depths on the ground were likely to exceed 36" for at least a month. Based on Normandeau's Wildlife Report, it appears that areas within this snow depth range with conifer forests (Normandeau does not give a range of tree heights) were then field investigated for moose winter scat and/or the presence of moose woody plant browse. Normandeau states that biologists doing field surveys collected information when MCA sign was encountered. Numerous MCAs were identified in the northern section of the new ROW through the use of these methodologies.

Within the footprint of the proposed ROW (both new and existing) this methodology appears to be sufficient to identify MCA's. MCAs outside of the proposed ROW were not identified or investigated.

5.1.2.c.ii Impact Assessment

The Project impacts include both direct and indirect impacts on MCA resources. The direct loss of MCA habitat in the northern section of new ROW amounts to 47 acres. Within the Town of Dixville, there are 3 MCAs that will be directly impacted by construction of the Project. It is possible that in this area the effects on moose utilizing these MCAs will be more substantial, in



particular if Project construction occurs in the winter months. The Mitigation Plan does not include mitigation for direct loss of MCA habitat resulting from the Project.

Moose are also susceptible to indirect impacts from construction and increased recreation use of the area. These indirect impacts are not accounted for in the impact summary for MCAs. Indirect impacts of the Project are primarily temporary in nature and associated with winter construction activity in the area of MCAs. Moose which experience the indirect negative effects of disturbance from humans and the activities associated with the Project construction during the winter will expend greater amounts of energy fleeing these activities. If nearby MCAs are already at carrying capacity, moose may not be able to readily move to other nearby winter habitats.

Winter construction restrictions in the area of MCAs could address the adverse indirect impacts, but have not been put forth in the application materials. The Mitigation Plan does suggest possibly limiting construction work during January and February if crusted snow conditions exist. This restriction is insufficient in its duration as these conditions can exist throughout the winter months.

The Project does not represent more than a minor fragmenting feature for moose in MCAs as they generally can travel short distances (i.e. the width of a ROW) through deep snow relatively unabated (Geist 1999).

A comprehensive alternatives analysis that assessed the relative impacts on MCAs of various alternative routes was not conducted. So the relative impacts of the northern section of new ROW versus that of other possible routes is not possible. The choice of a route that followed existing paved roads and/or ROWs would likely have substantially less direct and indirect impact upon MCA resources.

Normandeau stated that at least one MCA was avoided by rerouting the Project route. However, as stated above, there is no evidence in the application materials that other alternative routes that potentially had less direct and indirect impacts upon MCAs were considered.



5.1.2.c.iii Conclusions

AE concludes that MCA habitat within the actual Project footprint is adequately mapped. Direct impacts of the Project consist of the removal of 47 acres of MCA habitat. The removal of this habitat is a long-term and likely permanent adverse, although minor, impact upon the local moose population. This negative impact is more pronounced in the northern section of new ROW where forest habitat will be cleared within a number of MCAs.

Normandeau has failed to assess or map MCAs outside of the proposed ROW. The potential for indirect impacts from construction on moose within MCAs remains.

Normandeau fails to provide effective measures to avoid, minimize or mitigate the adverse direct and indirect effects of the Project on MCAs. Specifically, the failing to provide a mitigation plan to offset permanent loss of MCAs and failing to provide adequate seasonal construction limitations in the area where MCAs are to be removed. Lacking this material, AE does not have enough information to conclude that the Project will not have an unreasonable adverse impact on moose concentration areas.

5.1.3 Bear Habitat: Mast Stands

Bear inhabit ten counties in New Hampshire, preferring forest and wetland habitats and shying away from areas in the state with a large human footprint. Bear are large, herbivorous animals that spend much of the winter months inactive and sleeping.

Mast stands are groups of trees such as oak and beech that produce fruits. American beech trees produce beechnuts, a fat-rich food source for black bear and other wildlife. During the fall months, bear climb the trees to access these beechnuts, leaving scars from their climbing activities, in years when beechnut productivity is sufficient. They often return in spring and scavenge beechnuts from the ground under the beech trees.

Studies in Maine have demonstrated the vital importance of beechnuts to bear health and reproductive success. In geographic locations where alternative food sources (acorns, apple reserves, croplands) are largely absent, researchers found the reproductive success of bears was strongly tied to the productivity of beechnuts (Jacobas et al. 2005). This correlation speaks to the importance of the mast resource in the energy cycle of black bear.



5.1.3.a Project Impact Summary

The Wildlife Report (p 13-10) states that direct impact to bear-scarred beech (BSB) trees will occur at three locations. Two locations (Structures 214 - 230 and Structures 286 - 288) in the northern section of new ROW were identified as having beech trees scarred by bear and meeting the definition of a beech stand. The third direct impact area is located in New Hampton (Structures 1178-1185) and had an undetermined number of BSB trees which would be removed to widen the ROW. No count of BSB impacted by the Project was conducted.

In addition to these impacts, NHFG states that the proposed ROW would also directly impact a beech stand at Fish Brook Ridge (NHFG, Comments on DEIS, 4-4-2016). According to Normandeau, the BSB in this area (Structures 286-288) did not meet their definition of a beech stand.

Normandeau also states that there were other areas within or adjacent to the proposed ROW with beech trees constituting up to 10% of the species composition, but none that met their definition of a beech stand. These bear-scarred beech trees were not recorded and their numbers and aerial extent were not mapped.

5.1.3.b Agency Issues

The NHFG did not have any issues with Normandeau's beech or mast stand review except that the Project goes through the Fish Brook Ridge beech stand.

NHFG did request that Normandeau map the oak and beech resources (Carol Henderson letter to Normandeau, 12-7-2010), but the oak tree mapping was never conducted.

5.1.3.c AE Assessment

5.1.3.c.i Methodology Review

Normandeau defines beech stands as forest areas with a cluster of 15-25 or more bear-scarred beech trees and where beech comprise at least 80% of the forest area. The first part of this definition comes from Vermont Fish and Wildlife which states that a stand must contain 15-25 bear-scarred beech within an area (Vermont Fish and Wildlife Department 2004). The second part of this definition is adapted from a forester's guide to managing beech stands in Vermont forests



(Hamlin 2011) which is utilized by the Vermont Department of Forests, Parks and Recreation. Hamlin's report on optimizing beech stand productivity is intended for the forester attempting to promote beech within a forest management plan, not wildlife habitat protection. Within Hamlin's document he defines a stand as being comprised of at least 80% beech. By combining these different definitions, it appears that Normandeau misapplied a forestry criterion in identifying and mapping these mast stands.

While Normandeau's methodology involved mapping beech stands that met their definition, they did not, with a few exceptions, map bear-scarred beech trees which occurred outside of these stands. In the few cases where this did occur, beech trees were not formally mapped -- but rather they were said to occur between Project structures. There is no count of bear-scarred beech, or estimate of the acreage potentially impacted by the Project.

Normandeau did not attempt to map the oak resources along the Project, although it is stated that in areas (i.e. south of Ashland) oaks are ubiquitous and commonly dominant in the forest community (Wildlife Report, p 13-10). Direct impacts to bear-scarred oak trees would likely only occur in the southern Project area. While the line in this area follows an existing road and ROW and the oak resource may already be compromised by human activities, AE agrees with NHFG (Carol Henderson letter to S. Barnum 12-7-10) that important mast (both oak and beech) areas should have been identified and ground truthed during Normandeau's environmental survey of the route in order that both direct and indirect Project impacts to these significant wildlife resources could be fully evaluated.

5.1.3.c.ii Impact Assessment

Project impacts include both direct and indirect impacts to mast stands in the form of habitat loss and temporary habitat disturbance during construction. Each of these is considered separately below.

Direct Impacts

Normandeau has identified that within the Town of New Hampton widening of the existing ROW will result in the direct removal of BSB trees. Normandeau fails to provide the evaluation needed of the total stand size compared to the amount of trees to be removed in order to be able to assess the full impact on the resource. The Project will have negative impacts on black bear in New



Hampton by direct loss of habitat, the full extent of which is unknown at this time due to incomplete data collection.

Because of the failure to map all of the beech stand resources, the direct loss of beech stands is not necessarily limited to the areas indicated in Normandeau's Wildlife Report. Both Fish Brook Ridge and the area between Structures 1178-1185 in New Hampton are known to have concentrated BSB. In addition, AE is particularly concerned about the likely failure of Normandeau to have identified BSB in the northern section of new ROW which is located in a densely forested environment where beechnuts are likely to be of great importance to the black bear as other food resources are limited (i.e. oak trees, orchards, and croplands).

Indirect Impacts

It is important to address the potential indirect impacts of human activities, such as the construction of the Project, outside of the actual ROW footprint. Black bear are a wildlife species wary of human beings and human activities (Hammond 2002). Bear benefit from solitude while climbing mast trees and a study in Vermont found that beech stands distant from human impacts were utilized by bear to a greater degree than those stands impacted by human development (Wolfson 1992). Normandeau has adopted Vermont's approach to defining important bear habitat. The State of Vermont protects important bear habitat (stands with at least fifteen BSB trees) with protective buffers of over 1000 feet.

Normandeau only addressed direct impacts of the ROW construction and operation of the Project on bear and the beech resources. Indirect impacts to beech stands and BSB were not identified or evaluated.

The temporary indirect impacts of construction on bears of the Project result from the people, vehicles, and loud equipment associated with the human activity necessary to construct the transmission lines and the clearing of new ROW. Bear access beechnuts during the fall months and construction activity that occurs at that time of the year can result in the displacement of bear away from BSB resources in the construction area. This displacement of bear away from oak and beech trees will only occur if construction takes place in the fall months.



Based on the application materials submitted, there is no evidence to suggest that mast stands were part of any consideration of possible route alternatives, or that the presence of beech stands with BSB were responsible for any alterations in the proposed route or Project structural changes. In addition, the Mitigation Plan contains no measures to compensate for direct impacts to the mast crop that will be negatively impacted by the Project.

5.1.3.c.iii Conclusions

The nature and extent of mast stand resources (both oak and beech) have not been identified within the Project area. Of particular concern is the failure of the Applicant to identify the Fish Brook Ridge beech stand, and other beech stands that did not meet Normandeau's narrow definition, and to accurately delineate the resources boundaries.

Because the Applicant fails to identify the extent of the resource, it is not possible to evaluate the nature, extent and duration of potential effects of the Project. Without knowing the full extent of oak and beech stands in the vicinity of the proposed Project, it is currently impossible to determine the number and percentage of mast trees (of the total available) to be cut in the construction of ROW.

Mitigation measures, in the form of offsite conservation and seasonal restrictions on constructions activities, could potentially address the adverse direct (loss of habitat) and indirect (construction disturbance) impacts of the Project. However, there have been no beech or oak stands conserved as potential bear feeding habitat identified in the mitigation parcels. Without knowledge of the extent of the resource present and the relative impacts on the overall resources from the Project, it is not possible to determine what mitigation measures are appropriate (area of conservation land to be conserved) and where or when those measures should be employed (location of seasonal construction restrictions). Given this lack of data, AE does not have enough information to conclude that the Project will not have an unreasonable adverse impact on this resource.

5.1.4 Vernal Pool Habitat

Vernal Pools are a special type of wetland that provide critical habitat to a wide variety of invertebrate and vertebrate species. They are typically defined as a temporary body of water that does not support fish and provides essential breeding habitat for certain amphibians and



invertebrates (including indicator species) (Marchand 2016). Invertebrate indicator species include fingernail clams and fairy shrimp. Although the amphibians found in these pools are the most obvious wildlife to rely on these sites, the diversity of invertebrates in vernal pools can be stunning, with over 300 different species found in a single pool (Vermont DEC 2003). The amphibian indicator species include the spotted salamander (*Ambystoma maculata*), the blue-spotted salamander (*A. laterale*), the Jefferson salamander (*A. jeffersonianum*) and the wood frog (*Rana sylvatica*). These species rely on vernal pools as breeding habitat. In addition, species such as the spotted turtle (*Clemmys guttata*) and Blanding's turtle (*Emydoidea blandingii*) use pools as feeding or hibernating habitat.

While the amphibian indicator species rely on vernal pools for breeding, these animals spend most of their lives in the forests that surround the pools. In the spring, they migrate to the pools to breed, reside for a period of one to two weeks, then return to their upland habitat. The uplands around the pools are therefore critical to the wildlife habitat that the pools provide. The zone around the vernal pool out to 100' is referred to as the "Vernal Pool Envelope" and from 100' to 750' as "Critical Terrestrial Habitat" (Calhoun and Klemens 2002).

5.1.4.a Project Impact Summary

Project impacts to vernal pools presented in the Wetlands Report include impacts associated with the development of the Scobie Pond line and substation. Under the current Project proposal, no impacts are proposed south of the Deerfield substation; vernal pool impacts were therefore recalculated to reflect these changes. Normandeau has calculated direct permanent impacts to vernal pools at 20 square feet and direct temporary impacts to vernal pools at 10,204 square feet or 0.23 acres. However, in his pre-filed testimony, John Kayser states that for construction in wetlands, either timber mats or large rock fill will be used (Kayser, Pre-filed Direct Testimony p.22). AE believes that it is highly likely that rock fill, placed and subsequently dug out of vernal pools will result in long-term impacts to these sensitive habitats. These impacts could include a significant change in hydrology and subsequent degradation of the pool. Since no specifics are offered as to where the different techniques described by Kayser will be employed, there is little way to distinguish between permanent and temporary impacts.



As mentioned above the uplands surrounding vernal pools are often linked to the functioning of the vernal pool ecosystem, so impacts to the surrounding uplands within 100' of the pools are considered secondary impacts. Normandeau calculated the proposed secondary impacts to vernal pools from the Project total 403,841 square feet (9.27 acres).

5.1.4.b Agency Issues

There appear to be no outstanding agency issues regarding vernal pools.

5.1.4.c AE Assessment

5.1.4.c.i Methodology Review

Because of the ephemeral nature of vernal pools, data collection on the biological and physical characteristics of pools must be collected during the spring. This data should include physical parameters such as size of the pool, depth, connection to surface waters, and predicted hydroperiod and origin. Biological data should include evidence of vertebrates breeding (egg masses/larvae), presence of different invertebrates and condition of the upland buffer and overall pool condition. The data collection methods used by Normandeau appear to have been sufficient to assess the functions of the various vernal pools found in the Project area.

In order to rank the pools in the Project area, Normandeau identified "High Quality" pools based on Calhoun and Klemens (2002). This evaluation considered factors such as diversity of breeding species, number of egg masses and condition of the surrounding upland. The methodology in the source document (Calhoun and Klemens 2002), however, explicitly states that this is designed as a "planning tool, not as an official assessment tool." Normandeau's use of this method likely under-represents the number of "High Quality" pools in the Project area. Furthermore, it appears that the assessment was applied inconsistently. One pool identified as "High Quality" (Pool DF-VP1) does not meet their criteria while others (e.g. Pool WFVP22) appeared to meet the criteria but did not get included at all. From AE's analysis of Normandeau's data, at least seven impacted vernal pools should have been ranked as "High Quality".



5.1.4.c.ii Impact Assessment

As mentioned in Section 5.1.4, the upland surrounding vernal pools is essential to the functioning of the pool as wildlife habitat. For this reason, impacts to the vernal pool wetland itself are considered primary impacts and impacts to the 100' of the pool (Vernal Pool Envelope) are considered secondary impacts. Each of these impact types is addressed below.

Primary Impacts

AE conducted an analysis of the impacted vernal pools in order to assess if impacts were properly reported and if avoidance measures were undertaken. The 37 pools that are proposed to be impacted were assessed in relation to the ROW, structure location, road layout and construction pad configuration. Location of other resources (mainly wetlands) that could impact construction design was also taken into consideration.

In order to assess the amount of temporary and permanent impacts from the project, AE's analysis utilized the data provided by Normandeau. This analysis used the vernal pool delineation data and compared it to the proposed development to determine total impacts. This analysis has determined that the amount of impacts reported by Normandeau in their filing report is accurate.

AE also conducted an analysis of the avoidance and minimization measures for vernal pool habitats. This analysis examined options within the proposed ROW only. Since a detailed wetland assessment was not conducted for an alternate route, no real comparison with regards to vernal pool impacts on an alternate route could be made.

According to AE's analysis, the impacts to pools can be broken up into three different categories: 1) Pools where impacts appear to be unavoidable; 2) Pools where impacts appear to be unavoidable but were minimized and; 3) Pools where steps could be taken to avoid or minimize but were not. Each of these situations is described in detail below.

1) Pools where impacts appear to be unavoidable. According to AE's analysis, 19 pools within the Project area appear to have impacts that are unavoidable. Two examples of these are shown in Figure 5.1.4-1.





Figure 5.1.4-1. Likely unavoidable impacts to vernal pools

In these pools, no evidence of minimization was apparent from the data. Seven of these pools occur near corner or end structures or in areas where the prevalence of wetlands in the area prevent any significant shifting of the impact areas. Twelve of the pools in this category occur along existing off-ROW access roads (ORAR). In these situations, it appears that the existing roads have already impacted the pools. In addition, in most cases the proposed road is not wider than the existing road and only minimal impacts are therefore being proposed to these pools. AE concurs with Normandeau that the use of existing ORAR is preferable to building new access roads.



2) Pools where impacts appear to be unavoidable but were minimized.

Like the category above, the impacts to these pools appear to be unavoidable given their location on the line and the presence of other wetland resource in the area. Unlike the category above, the four pools in this category include those where impact minimization was evident. Minimization typically consisted of shifting the construction pad or access road to reduce the impact on vernal pools. In Figure 5.1.4-2, for example, impacts to vernal pool WFVP22 were minimized by shifting the construction pad to the southwest and the access road out of the pool.







3) Pools where steps could be taken to avoid or minimize but were not.

According to AE's analysis, the evidence suggests that in at least nine circumstances, proposed impacts to vernal pools could have been avoided or minimized, but were not. Many of these situations occur where construction pads could be shifted or access roads re-routed to avoid or minimize direct impacts to vernal pools. In Figure 5.1.4-3, for example, the access road could be shifted to the west to avoid or minimize impacts to Pool DUVP9. In Figure 5.1.4-3, the construction pad could be shifted to the west to avoid or minimize impacts to DFVP2.







In some cases, shifting of the construction pad by a few feet would avoid impacts to vernal pools. Given the flexibility in construction pad layout illustrated in other parts of the Project, it is unclear why impacts were not avoided in many of these cases.

In addition, there are a few cases where avoidance of a vernal pool would result in impacts to a different wetland. In Figure 5.1.4-4, moving the road south to avoid the vernal pool SKVP4 would result in impacts to a different (drier) part of the wetland. However, because of its importance as wildlife habitat, vernal pools should have a priority for minimization over lower functioning wetland types.







The situations described above include moving access roads and construction pads to avoid or minimize impacts. However, in many of the cases of proposed impacts, complete avoidance from moving the tower locations appears to be a possibility. Throughout the Project layout, tower spanning distances vary widely, ranging from 285' to 1,125' (for lattice type structures) and 266' to 845' (for tubular structures).





The ramifications of relocating towers are ultimately an engineering issue. The above analysis did not, therefore, include pools where impacts could have been avoided by moving the tower



structures. Figure 5.1.4-5, illustrates a situation where tower relocation could minimize or avoid some of the largest impacts to a single vernal pool in the Project area.

Secondary Impacts

In addition to the direct impacts, the secondary impacts to vernal pools occur when there is clearing or disturbance to the Vernal Pool Envelope. The majority (84%) of the clearing proposed to occur around vernal pools is north of Dummer where a new ROW is being proposed. According to Normandeau, these impacts would not "have a significant detrimental impact" on these vernal pools (Wetland Application, p83). Normandeau claims that the resulting powerline would still provide "suitable terrestrial habitat for vernal pool-dependent species." Assuming that the species they are referring to are wood frog (*Rana sylvatica*) and spotted salamander (*Ambystoma maculata*), that statement is not supported by the scientific literature on habitat requirements for these species.

Wood frogs are known to use many different types of forested uplands and wetlands including hardwood forests, mixed conifer/hardwood forests and forested swamps (Colburn 2004; Knox 1992; Heatwole 1961). Likewise, the spotted salamander is known to inhabit a wide variety of upland forests but prefer dry, well-drained soils with moderate slopes in deciduous forests (Petranka 1998). Areas without canopy cover are often avoided by these species (Colburn 2004). Furthermore, the negative effect of loss of forested habitat on both of these species has been well documented in the literature (Homan et al. 2004; Kolozvary and Swinhart 1999; Porej et al 2004). Since vegetation maintenance in the ROW will largely prevent the development of a forest canopy, it is unclear how Normandeau concludes that these secondary impacts would not have a detrimental impact on these vernal pools.

In order to reach their conclusion, Normandeau would have had to assess the effect of new clearing on individual pools. AE performed a cursory version of this analysis by examining the amount of forested cover of the 100' Vernal Pool buffer pre- and post-construction. Eleven out of the 17 pool buffers affected were in the existing ROW with only minor additional clearing. In these cases it is unlikely that this additional clearing would have a significant detrimental effect on these pools. The clearing associated with 6 pools in the northern section of new ROW, however, consisted of a significant change in cover type (forested to open/shrub type) due to new ROW clearing. Calhoun and deMaynadier (2004) recommend that 75% forest cover be



maintained within the 100' buffer zone. Cover in the buffers for each of these 6 pools would drop below that threshold. The effect on these pools from loss of surrounding upland habitat is therefore likely to be detrimental. The degree to which these impacts affect the functioning of the vernal pool as wildlife habitat will vary, however, depending upon local factors. Determining whether or not these pools continue to provide some habitat function is beyond the scope of AE's analysis, nor was it conducted by Normandeau.

5.1.4.c.iii Conclusions

The data collection methodology used for vernal pools appears to be sufficient in terms of type of data collected, amount of data and time of year. However, the ranking protocol for determining quality of the pools was an inappropriate methodology and was inconsistently applied. This has resulted in a lack of reliable data on the quality of the pools present in the Project area. The overall assessment of vernal pool impacts is therefore incomplete.

The primary impacts to vernal pools include both permanent and temporary impacts to the vernal pool wetlands, although that distinction is not adequately defined. Minimization measures may have been implemented for some pools, while impacts to other pools were not minimized even though it appeared possible to do so. In many cases, tower relocation could have avoided or minimized pool impacts. The amount of apparently avoidable impacts suggests that vernal pool avoidance was not a high priority when designing the layout.

In addition to primary impacts, secondary impacts consisting of clearing in the vernal pool envelope are proposed. Normandeau did not conduct an analysis of the secondary impacts to vernal pools and therefore did not determine the full nature and extent of the Project's impacts to this significant wildlife habitat. Given these issues, there is not enough information to conclude that the Project will not have an unreasonable adverse impact on this significant wildlife habitat.



6 Rare, Threatened and Endangered Species

This section addresses the proposed impacts of the Project on rare, threatened or endangered (RTE) species. This section includes species of animals and plants that are listed federally by the United States Fish and Wildlife Service or in the state of New Hampshire by NHDES. This section is broken up into subsections on Mammals, Birds, Invertebrates, Reptiles/Amphibians, and Plants. Impacts on Karner Blue Butterfly are included in Appendix A and impacts on bats are included in Appendix B.

6.1 RTE Mammals

6.1.1 Canada Lynx

The Canada lynx (*Lynx canadensis*) is a feline predator inhabiting the spruce-fir forests of the northern and mountainous areas of New Hampshire. New Hampshire is located at or near the southern limit of lynx distribution in eastern North America. Breeding populations of the Canada lynx were long absent from New Hampshire but are becoming re-established in the state. Breeding habitat of the lynx is characterized by dense low-growing conifers with limited visibility.

The Canada lynx is morphologically well-adapted to deep snow and the success of most lynx populations is closely tied to that of its main prey, the snowshoe hare. The Canada lynx is listed as Threatened under the federal Endangered Species Act (ESA) and as Endangered by the State of New Hampshire.

6.1.1.a Project Impact Summary

Normandeau identified the presence of five potential lynx denning areas based on vegetative conditions. Two structures were subsequently moved in the Project design, with the result that three potential denning sites remain impacted by the Project.

The proposed Project would result in the direct removal of forest and foraging habitat for the lynx. Some of that forest area likely consists of early successional spruce-fir habitat, which is high-quality snowshoe hare habitat.



New access roads will be constructed into Canada lynx habitat as part of the Project. Normandeau concludes that these access points will not be maintained post-construction and this should greatly limit or eliminate increased human traffic in the area.

Construction of the Project could result in the temporary disturbance or displacement of Canada lynx in the vicinity of the construction activities. Normandeau concludes that this potential impact is only temporary and that the lynx will likely return to the area post-construction.

6.1.1.b Agency Issues

Both the USFWS and NHFG were consulted on the methodologies for identifying Canada lynx and for documenting lynx habitat in the Project area. Both agencies signed-off on the Normandeau survey methodologies.

The DEIS concluded that as a result of the Project there will be an overall loss of foraging habitat. Both the NHFG and USFWS agree with the overall conclusions of Normandeau regarding the Project's potential impact on the Canada lynx.

6.1.1.c AE Assessment

6.1.1.c.i Methodology Review

Normandeau conducted a desktop GIS review of potential Canada lynx habitat based on forest cover types, distance from roads, and a relative measure of human habitation near the proposed ROW. Based on this desktop review Normandeau targeted certain locations for winter tracking exercises along the Project route. The tracking survey conducted by Normandeau recorded one individual lynx track crossing an existing Eversource ROW in Whitefield. This methodology is sufficient to adequately document presence/absence of lynx in the Project area.

6.1.1.c.ii Impact Assessment

The desktop GIS modeling and field evaluation of the proposed ROW revealed the presence of five potential Canada lynx denning areas (i.e. areas with appropriate habitat) within the Project area. Two structures were subsequently moved in the Project design, with the result that three potential lynx denning sites remain directly impacted by the Project.



Normandeau states that if a Canada lynx is found to be present in a construction area (including the three identified den sites), that area will be avoided until occupation by lynx ceases (Mitigation Plan, Appendix B). No specifics of this plan are provided in the application materials. It is unclear, for example, what frequency tracking exercises will be conducted, how the presence or absence of lynx outside of the winter tracking season will be determined, or how it will be determined that lynx occupancy has ceased. Since lynx breed in the spring and raise kittens in the early-mid summer, it is unclear how denning lynx will be detected.

The proposed Project would result in the direct removal of forest and foraging habitat for the lynx. Some of that forest area likely consists of early successional spruce-fir habitat, which is high-quality snowshoe hare habitat. However, the Project may also create some early successional spruce-fir forest depending on the vegetation management plan employed. Since both of these habitats are common in northern New Hampshire, the effect of the Project clearing on lynx is likely to be minor.

The potential displacement of non-breeding Canada lynx during construction of the Project exists. This potential impact is short-term if post-construction access to the Project route is limited. If, however, these areas are opened to motorized recreational use, this impact could be long-term and detrimental.

6.1.1.c.iii Conclusions

AE concludes that the habitat of the Canada lynx has been adequately mapped. The direct impacts of the Project have also been identified, and three sites with appropriate denning habitat will be avoided within the Project area. NPT has not provided a sound methodology for identifying the presence of actual individuals prior to construction. NPT fails to provide measures to mitigate potential long term impacts of the Project, specifically restrictions on post-construction use of the ROW by motorized vehicles. Given these issues, there is not enough information to conclude that the Project will not have an unreasonable adverse impact on this species.

6.1.2 American Marten

The American marten (*Martes americana*) is a mink-sized member of the weasel family which lives primarily in coniferous and mixed hardwood-coniferous forests in northern North America.



Its range in New Hampshire extends from the southern edge of the White Mountains northward into Maine and Canada. The American marten ("marten") is listed as Threatened under New Hampshire law.





American marten in New Hampshire have a restricted range, low population numbers, and are susceptible to the impacts of forest fragmentation (NHFG 2015 and Ecology and Environment 2015). Marten populations have only become re-established in New Hampshire since the late 1970s and early 1980s. Along with the protected high-elevation lands of the WMNF, central Coos County has been identified as crucial to the persistence and possible expansion of the marten population in New Hampshire (NHFG 2015). High-elevation spruce-fir forest with deep snow and complex forest structure (with significant woody debris) in this region are particularly important. NHFG also suggests that these high-elevation spruce-fir forests are subject to less logging pressure as opposed to the low-elevation spruce-fir forests and represent more expansive and contiguous habitat for the marten (NHFG 2015).



The continued persistence of the American marten in New Hampshire is threatened by the changing nature of the snowpack in the state (Krohn 2012). Fisher prey upon marten (Hodgeman et al. 1997) and during periods of deep snow marten utilize more mature conifer forests (NHFG 2015). The segregation in use of high elevation, deep snow habitats between the marten and the fisher is supported by the scientific literature (Harrison et al. 2004; Kelly 2005; Krohn et al. 1997).

In the northeast, and New Hampshire specifically, areas of deeper snow generally occur in areas of higher elevation (Sarin 2005). These higher elevation coniferous forests (above 2700') in the northern section of new ROW are in a region of intensively harvested forests and often provide the largest area of contiguous American marten habitat. NHFG has been working with large landowners to voluntarily limit forest management and tree cutting in higher elevations in northern New Hampshire (Will Staats, personal communication, 10-11-2016). Mid to late successional spruce - fir forests in New Hampshire are becoming increasingly scarce (NHFG Habitat Stewardship Series). Unfortunately, this is the preferred habitat for the American marten (NHFG 2015).

6.1.2.a Project Impact Summary

The American marten is found within the northern Project area especially at the higher elevations from Whitefield to Dixville. Winter tracking exercises conducted by Normandeau confirmed the presence of marten in 12 locations throughout the northern section of new ROW.

In Table 4-62 of the DEIS, it states that the Project threats to marten amount to localized, longterm adverse effects resulting from the construction and maintenance of the new transmission line in the northern section of new ROW. They also state the concern that the Eastern coyote travels linear pathways (including transmission lines) and that this species could compete with sensitive wildlife such as the marten.

Within the Wildlife Report, the authors compare the loss of forest types associated with each alternative. In the northern section of new ROW, the loss of mixed forest and conifer forest amounts to 238 acres.



6.1.2.b Agency Issues

NHFG present a number of issues regarding the American marten and the proposed Project (NHFG, Comments on DEIS, 4-4-2016). Within the northern section of new ROW, the NHFG lists the following concerns regarding American marten: the fragmentation of marten habitat; the loss of marten habitat; the introduction of competing predators such as Eastern coyote and red fox into high elevation deep snow habitats; the loss of riparian habitat; the potential use of Project access roads by recreationists, especially those utilizing vehicles that create packed surfaces on the snow; and, the cumulative effects of potential development in the vicinity of the Project.

NHFG states that the northern section of new ROW (approximately 32 miles) will pass through two blocks of remote undeveloped forest land in Coos County currently bisected by only one major paved road, Route 26. NHFG is concerned that the Project and new access roads will fragment this forest region. NHFG biologists are concerned that this area of the American marten's distribution is a vital link to the animal's persistence in New Hampshire and that the Project threatens that link. They have further concerns that forest clearing in high elevation (above 2700') regions threatens to remove older, mature spruce-fir forests which are preferred by marten particularly during the winter months. According to NHFG, these forest stands represent prime marten habitat within an otherwise intensively managed (i.e. logged) forested matrix.

NHFG is concerned that the Project will allow species such as red fox and Eastern coyote to compete and in some cases directly kill marten. NHFG provided evidence that marten currently live in deep snow, high elevation habitats (especially in winter) largely free from competition with red fox and Eastern coyotes. The development of the new ROW, associated access roads and likely recreational use of the ROW and access roads will allow the winter-time passage of these competing predators into formerly remote areas and have prolonged impact on marten (Siren 2013).

In addition to high elevation forest habitat, NHFG note that Siren (2013) found marten favor the use of riparian habitat for travel. NHFG expressed a concern about the loss of this habitat in locations where the Project line crosses streams and rivers.


Figure 6.1.2-2. Location of Proposed NPT Route, Wind Measurement Towers, and High Occurrence Probability of Marten.



Biologists with NHFG state that much of the northern section of new ROW passes through an area that Kelly (2005) has identified as the highest value marten habitat because of its relative paucity of fisher and its greater winter snow depths. Figure 6.1.2-2 illustrates this common occurrence. In effect, NHFG feels that all of the potential negative impacts on American marten are amplified because of the importance of this high value habitat to the marten.

Finally, NHFG expressed concern about the overall cumulative impacts on high elevation high quality marten habitat in Northern New Hampshire resulting from existing and proposed



development. In addition to the existing Granite Reliable Power project and the proposed Project, meteorological towers are currently operating on at least four nearby ridgelines, indicating the possibility of further high elevation development.

6.1.2.c AE Assessment

6.1.2.c.i Methodology Review

Winter tracking was conducted by Normandeau to determine the presence and extent of the American marten during the winters of 2011-2013 in the towns of Whitefield, Dalton, Lancaster, Northumberland, Stark, Dummer, Millsfield, and Dixville. Results indicated that the marten was located throughout the area sampled. The field methodology by Normandeau was sufficient to document the species' presence along the Project route.

6.1.2.c.ii Impact Assessment

AE shares the same concerns about Project impacts expressed by NHFG including: 1. the fragmentation of marten habitat; 2. the direct loss of marten habitat; 3. the potential introduction of competing predators such as Eastern coyote and red fox into high elevation deep snow habitats; 4. the loss of riparian habitat; and, 5. the cumulative effects of potential development in the vicinity of the Project.

Within the northern section of new ROW, 238 acres of conifer and mixed conifer-deciduous forest would be converted to scrub-shrub and herbaceous natural communities. The 238 acres has been identified as potentially high quality marten habitat. This represents a large area of marten habitat in an area of New Hampshire with the greatest potential for the re-establishment of stable marten populations (along with areas in the Connecticut Lakes region).

As mentioned by NHFG, the Project could introduce a greater number of both predators and competitors of American marten, including fisher, red fox, and Eastern coyotes into high elevation forests. Eastern coyotes are known to hunt along linear pathways including transmission lines (Way and Eatough 2006). The presence of the new ROW, access roads and potential recreational use can also result in a dense snowpack which can open up areas to marten competitors and predators (Sarin 2013). The cumulative effects of high elevation developments such as the Project and existing and potential development would result in the conversion and



loss of additional mid and high elevation coniferous forest area -- some of which would be mature forest habitat currently suitable for occupation by the marten.

An alternative routes assessment which weighs the relative and specific impacts of different routes (including routes which would bypass the remote forested northern section of new ROW) upon the marten has not been provided in the application materials. Such an alternatives analysis would include an assessment of the relative impacts each route would have on the marten, including ROW elevations, snow depths and the presence of competitors, such as fisher and Eastern coyote.

As part of the Mitigation Plan, there is a parcel (Parcel K) which provides 76.7 acres of high elevation spruce-fir forests, which is potential habitat for the American marten. The Mitigation Plan does not provide any information regarding the current presence or absence of marten on or near Parcel K. The protection of Parcel K could partially offset Project impacts on the marten if it is in fact utilized by marten. NPT has not addressed concerns about competition and predation on the marten by wildlife species utilizing access roads to high elevation forests within the northern section of the ROW. Nor has the NPT addressed concerns about the introduction of recreationists on the new ROW and access roads, in particular the use of motorized vehicles.

6.1.2.c.iii Conclusions

AE concludes that the habitat of the American marten has been adequately mapped within the Project area. The Project will result in the direct loss of 238 acres of potentially high quality American marten habitat, as identified by Normandeau. The numerous issues raised by NHFG have not been addressed, specifically related to the northern section of new ROW. NPT has failed to demonstrate that sufficient efforts to avoid impacts to the American marten were made. Specifically, no evaluation was made of alternate routes in the northern section of new ROW that would have potentially less direct impact on high quality marten habitat. Furthermore, no details of any minimization measure have been developed or committed to by NPT. Without incorporating restrictions on winter-time motorized recreation within the new ROW and access roads, and confirming that the proposed mitigation parcel provides accessible high quality marten habitat, AE concludes that the project will likely have an unreasonable adverse impact on this species.



6.2 RTE Birds

No comprehensive breeding-bird survey was conducted for the proposed Project route. Normandeau identified a number of habitat or behaviorally similar avian guilds that could possibly be impacted by the Project, including: grassland birds, special status wetland birds, and nesting raptors and herons. Discussion of RTE birds, both from the perspective of potential habitat impacts and direct impacts to individual birds are discussed here.

Table 6.2-1 details the New Hampshire threatened and endangered bird species, current state and federal status, treatment by Normandeau on behalf of NPT, and species AE has deemed likely to merit further evaluation.

NH Listed Species	NH Status	Fed Status	Normandeau Presence Likelihood (Wildlife Report)	Normandeau Habitat Guild	AE Project Concern
Common Nighthawk	Е		Present	Nighthawk & Whip-poor-will	Y
Golden Eagle	E		Low		Y
Northern Harrier	E		Moderate	Grassland Birds	Y
Least Tern	E		NA		Ν
Piping Plover	E	Т	NA		Ν
Roseate Tern	E	E	NA		N
Sedge Wren	E		Low	Wetland Birds	Y
Upland Sandpiper	E		NA		Y
Bald Eagle	Т		Moderate	Nesting Raptors	Y
Common Loon	Т		Low		Y
Grasshopper Sparrow	Т		Low	Grassland Birds	Y
Peregrine Falcon	Т		Mod/High	Nesting Raptors	Y
Pied-billed Grebe	Т		Low	Wetland Birds	Y
Am. Three-toed Woodpecker	Т		Low		Y
Common Tern	Т		NA		

Table 6.2-1. RTE Bird Species.



6.2.1 Bird Species not Addressed in Wildlife Report

Several RTE bird species, including least tern, piping plover, roseate tern, common tern and upland sandpiper were not discussed by Normandeau beyond mention of a desktop analysis that presumably eliminated them from consideration. Of these, least tern, piping plover, roseate tern and common tern inhabit or frequent only coastal New Hampshire and are unlikely to be impacted by the Project. We concur with Normandeau's apparent assumption that these are unlikely to be species of concern, however find the lack of even brief discussion of their methodology for elimination a failure in the analysis.

Upland sandpiper, although potentially occurring in or near the Project area was not discussed.

American three-toed woodpecker was included in Normandeau's list of bird species potentially present in the Project area, but there appears to be no further evaluation of potential habitat or Project impacts beyond stating that they did not incidentally observe any individuals of this species during Project-related surveys (Wildlife Report, p 9-1).

6.2.1.a Project Impact Summary

Normandeau concludes that these 6 species are unlikely to be impacted by the Project based on their rarity and limited distribution. They, however, have offered no analysis to support this conclusion, even in the case of bird species with records in the vicinity of the Project.

6.2.1.b Agency Issues

According to information provided by Normandeau including agency correspondence, NHFG did not specifically request review of all avian RTE species. They did however, suggest that "If high quality habitat is present in the project area for other state listed species...a survey for those species would demonstrate due diligence. " (Mike Marchand phone conversation with Sarah Barnum, 4-3-2013).



6.2.1.c AE Assessment

6.2.1.c.i Methodology Review

In Normandeau's Wildlife Report, they mention conducting a desktop analysis which eliminated some species from further consideration. They however provided no details as to what parameters were considered, or how their conclusion was reached. In other cases, Normandeau concluded bird species may be present, but conducted no further inventory or assessment and presented no methodology to explain these exclusions.

6.2.1.c.ii Impact Assessment

Some of these species, such as the least tern, piping plover, roseate tern and common tern are very unlikely to be present in the Project area based on their habitat preferences. These four RTE bird species inhabit or frequent only coastal New Hampshire, and beyond very occasional migration sightings, are not recorded anywhere near the proposed Project. Other species, such as the upland sandpiper and the American three-toed woodpecker may have a presence along the Project route. In order to adequately address the concerns of NHFG, some analysis, however brief, should have been conducted with ensuing discussion in the reporting documentation.

Upland sandpiper was not addressed by Normandeau, even within the Grassland Bird analysis. Upland sandpipers require very specific habitat types consisting of large expanses of open managed agricultural or grassland; typically airfields, landfill caps or large agricultural mosaics. According to eBird records, upland sandpiper has been sighted historically in the nearby towns of Henniker, Meredith, Plymouth, and Monroe. At the very least, a desktop analysis should be conducted and duly documented to determine if the habitat is present in the Project area.

The American three-toed woodpecker is a species of boreal and montane coniferous forests (NHFG 2015) which are not uncommon community types in the Project area in Coos and Grafton counties. Sightings have been recorded to eBird in locations throughout the region, including northern New Hampshire, Vermont and Maine. Since the Project is within the documented range and appropriate habitat may be present and impacted by the Project, an impact assessment should have been conducted for this species.



6.2.1.c.iii Conclusions

Although impacts to certain RTE bird species may be unlikely, a thorough analysis requires a minimum effort at documenting steps taken to determine exclusion from further analysis, especially for RTE species such as the upland sandpiper and three-toed woodpecker which are known to be, or have been, present in the region of the proposed Project.

Since there is no description of how Normandeau identified (or ruled out) these species, the nature, extent and duration of potential effects of these species cannot be determined. Given these issues, there is not enough information to conclude that the Project will not have an unreasonable adverse impact on RTE bird species.

6.2.2 Grassland Birds

There are three listed RTE species in New Hampshire that are dependent on grassland habitats for some portion of their life cycle: northern harrier (*Circus cyaneus*), grasshopper sparrow (*Ammodramus savannarum*) and upland sandpiper (*Bartramia longicauda*). In their analysis of grassland habitats, Normandeau also considered three additional species of special concern: American kestrel (*Falco sparverius*), horned lark (*Eremophila alpestris*) and vesper sparrow (*Poocetes gramineus*). All of these species utilize large continuous areas of managed grassland for reproduction and/or nesting.

Grassland habitats in New England are almost entirely the result of human management, primarily for agriculture and large open areas such as airports and landfill caps. Overall agricultural land has decreased significantly in the region, being replaced by developed landscapes or reverting to forest. In the meantime, agricultural management has trended toward more intensive practices, resulting in decreasing habitat availability and poor survival of birds utilizing the remaining grassland habitats.

Management of grassland habitats in a manner conducive to nesting grassland bird species is critical to their survival in the region.



6.2.2.a Project Impact Summary

Normandeau identified 363 acres of grassland within the Project area. Of that, Normandeau estimates less than 0.1% will be permanently lost to the Project footprint and concludes this will have no significant impact on available grassland habitat in the region.

Normandeau acknowledges the potential for temporary impacts to grassland species, notably harrier and kestrel, that may be nesting or foraging in the vicinity of the Project during construction. However, the expectation is that once construction is complete, birds will reoccupy any areas they had been avoiding with no long-term impact to habitat suitability.

6.2.2.b Agency Issues

NHFG specifically requested focus on northern harrier. In addition, they suggested that if high quality habitat for other listed species is present, NPT should survey for those species (Sarah Barnum phone conversation with Mike Marchand, 4-3-2013).

6.2.2.c AE Assessment

From a habitat perspective, powerlines are generally compatible with management of grassland habitat. Impacts are possible from displacement or nest destruction during construction activities. Impacts other than loss of habitat may be incurred from potential collision and electrocution risk discussed in Section 6.2.7.

6.2.2.c.i Methodology Review

Normandeau conducted a remote habitat suitability analysis for the Project route, utilizing available records for the species discussed above as well as New Hampshire Wildlife Action Plan (NHFG 2015) habitat data and recent aerial imagery. Although details of how this desktop analysis was conducted are sparse in their reporting, this is a standard methodological approach and is generally accepted by the scientific community.

Normandeau conducted a preliminary review of habitat specifically suitable to the nesting of northern harrier. This involved remote identification of grassland habitats at least 250 acres in size which were field checked prior to the 2013 nesting season. Field checks revealed that all suitable harrier habitats within the Project area were either mowed hayfields or old fields with



"too much woody vegetation for harriers to use" (Wildlife Report p 4-3). As a result of this, no specific field surveys for northern harrier were conducted, and opportunistic surveys did not yield harrier observations.

While harriers nest in grassland-type habitats, wet meadows and emergent swamps are also quite typical for the species (Degraf 2001). Normandeau makes no mention of wetland habitat types being incorporated into the model used to determine potential appropriate habitat for this species. Normandeau identified more than 500 emergent wetlands along the Project route (Wetland Report, Section 3) suggesting that potential nesting habitat within the Project area was overlooked in the remote habitat analysis.

Additionally, Normandeau provides no metrics upon which they made the determination that either mowed hayfields or old fields were inappropriate habitat for northern harrier, nor have they provided identification of the individual biologists who conducted the field reviews or their familiarity and experience with harrier nesting requirements.

Harriers lay eggs as early as late April and as late as mid-June with an average 32 day incubation period and average 33 days to flight (Degraf 2001). Presumably haying occurring early and/or late in the summer could still be compatible with successful nesting, but Normandeau did not provide information to support their assertion that the mowed hayfields identified would not be likely to support nesting harriers, and no further field investigations were conducted. Likewise for old-field conditions; no objective measure of canopy height, tree or shrub density or other factor was provided, suggesting determinations of habitat quality were made on a subjective basis by unidentified individuals for whom no professional credentials are provided.

Finally, no description or further information is provided as to the mention of "opportunistic surveys." It is not at all clear what constitutes an opportunistic survey, or which individuals with appropriate qualifications were in the appropriate areas and when.

Normandeau appears to have conducted "opportunistic surveys" for other grassland species as well since they acknowledge observing American kestrel in two locations within the existing Eversource ROW in 2013.



6.2.2.c.ii Impact Assessment

We concur with Normandeau's overall assessment that general habitat impacts for grassland nesting species are likely to be insignificant as a result of the Project. Construction disturbance will be temporary, and any birds displaced from the area by the activity during construction will return when that activity ceases, typically by the next nesting season. Additionally, the habitat loss within the footprint of the proposed Project structures is minimal and would not be expected to significantly reduce available grassland nesting habitat regionally.

Northern harrier, kestrel and other grassland birds that are nesting at the time of construction are at risk for displacement which could result in nest or pre-fledgling chick abandonment or destruction.

Normandeau makes note of an occupied American kestrel nest box on Structure 206 in New Hampton and recommends removal of this box during the non-nesting season, and it's reinstallation following construction. We are aware of no formal commitment on the part of NPT to do so, nor is there any proposal for a thorough pre-construction breeding bird survey to reasonably ensure these or other nesting birds are not impacted by Project construction activities.

Normandeau's pre-application "opportunistic" grassland bird field surveys were presumably conducted over the course of several years during the course of other field work. This approach is likely to have been insufficient to adequately identify nesting grassland bird species throughout the Project route. This work is certainly insufficient to identify grassland bird species that will be utilizing the Project route during an as-yet undetermined construction time period at some point in the future.

In their impact assessment, Normandeau recommends searching for northern harrier nests prior to initiating construction during the nesting season (May-August). They further state that construction cannot continue if nesting harriers are found to be present so as to avoid direct impacts to the listed species. However, no specific methodology has been proposed and approved to conduct such studies, so AE is unable to evaluate their effectiveness.



6.2.2.c.iii Conclusions

We agree, in concept, with Normandeau's approach of utilizing pre-construction monitoring to identify and avoid grassland bird species but find the details and commitments to conduct such searches insufficient. It appears likely that Normandeau's habitat assessment may have excluded appropriate habitats for nesting harriers from consideration, and inadequate detail as to the field review methodology was provided.

Furthermore, without a formal commitment on the part of NPT to follow the recommendations of their consultant Normandeau, augmented by appropriate and vetted methodologies for preconstruction field surveys, the Project will pose a potential and unnecessary risk to the listed northern harrier.

Measures undertaken or planned to avoid, minimize or mitigate potential adverse effects on northern harriers present in the Project area are insufficient, may be ineffective and do not represent best practical measures available.

AE concludes that there is insufficient information to fully determine the impacts to grassland bird species, notably Northern harrier, and without a commitment to appropriate pre-construction surveys and/or seasonal restrictions on construction, the Project would likely have an unreasonable adverse impact on RTE bird species.

6.2.3 Wetland-dependent Birds

Two wetland-dependent RTE listed bird species were investigated by Normandeau: The piedbilled grebe (*Podilymbus podiceps*), and sedge wren (*Cistothorus platensis*). Normandeau considered 4 additional species listed as species of Special Concern in New Hampshire: least bittern (*Ixobrychus exilis*), sora (*Porzana carolina*), common gallinule (*Gallinula galeata*), and the rusty blackbird (*Euphagus carolinus*). These bird species utilize a range of wetland habitat conditions, from open water to forested swamps and boreal bogs.

6.2.3.a Project Impact Summary

Normandeau concluded that for five of the species investigated, either it is unlikely that the species in question has suitable habitat within the Project area, or that Project impacts would be



temporary and not have a measureable impact on the habitat value for the respective species or on individuals of the species.

Normandeau reported that the rusty blackbird has been found within wetlands that will be impacted by the Project, however they conclude that creating early successional dense woody growth through clearing for the new ROW may provide additional blackbird habitat by converting existing forested wetlands to more open, early successional wetland types. Normandeau finally suggests that since the entire ROW in Millsfield and Dixville is on land under active forest management, all the wetlands present are subject to logging with or without the Project.

No conclusions are proffered on impacts related to the displacement of wetland nesting birds, including RTE species, as a result of construction during the breeding season. No recommendations are made to conduct pre-construction monitoring to insure that no nesting birds, including RTE species, are impacted during construction activities.

Impacts other than loss of habitat or nest disturbance may be incurred from potential collision and electrocution risk discussed in Section 6.2.7.

6.2.3.b Agency Issues

NHFG appear to have made no specific requests for study or highlighted specific issues related to wetland-dependent RTE bird species. They did suggest more generally, that if high quality habitat for listed species is present, NPT should survey for those species (Sarah Barnum phone conversation with Mike Marchand, 4-3-2013).

6.2.3.c AE Assessment

Wetland habitats may be somewhat more sensitive to impacts from power line construction than grassland or some other habitat types. Wetland habitats are dependent on the presence of hydrology, and there are a range of vegetative structural conditions which provide habitat for different species. Changes to the hydrologic characteristics, through clearing, construction activities or new infrastructure can result in permanent changes to structural conditions, altering habitat availability for species such as pied-billed grebe and sedge wren. Wetlands of varying



hydrologic and structural composition, including large open water and marsh habitats, are present throughout the Project route.

In order to fulfill the NHFG directive, the presence of wetland habitat, coupled with sighting reports in the vicinity of the Project should have triggered field surveys to determine the presence of wetland-dependent bird species in order to adequately assess potential impacts.

6.2.3.c.i Methodology Review

While Normandeau concedes that suitable habitat for pied-billed grebe may be present within the Project area, they did not conduct a habitat suitability analysis in an attempt to identify potential habitat impacts of the Project. By stating "Impacts to this species as a result of the proposed Project are unlikely, due in large part to its rarity and the paucity of suitable habitat for it within the Project area" (Wildlife Report, p 7-7) the analysis appears to primarily consider the rarity of the species and conclude that impacts are unlikely or insignificant because there are not many individuals around to impact. The rarity of such species should never preclude analysis; quite the contrary, we expect it would portend focused evaluation and targeted field studies.

A similar analysis was applied to the sedge wren. However, in this case Normandeau states that the sedge wren has no eBird records within the past 10 years in the vicinity of the Project. While "vicinity" is undefined, AE found eBird sightings recently in several locations throughout the State of New Hampshire, as well as within roughly 12 miles of the border in Vermont in habitats similar to those found along the Project route. Again, the rarity of the species alone should not have provided cause to eliminate the species from consideration for further habitat analysis, especially given the acknowledgment that appropriate habitat is present.

6.2.3.c.ii Impact Assessment

The Project has the potential to impact both wetland bird habitat and nesting individuals or their chicks. Construction activities may alter the conditions of wetlands present such that the structural, hydrological and vegetative characteristics are altered enough to affect habitat quality required by wetland dependent species such as the pied-billed grebe and sedge wren as well as species of special concern.



The primary location of habitat conversion will be in the northern section of new ROW proposed through Dixville, Millsfield and Dummer where existing forest land will be cleared and converted to open or early successional forest types. We generally concur with Normandeau's conclusion that because the pied-billed grebe and sedge wren prefer more open-water and emergent wetland habitat types vs forested wetlands, it is unlikely that Project activities will result in a substantial decrease in habitat available for wetland dependent RTE bird species in this northern section of new ROW.

In their Overhead Line Review, Dewberry points out that the proposed construction methods described in the NPT application are unlikely to be appropriate in some wetlands due to water depth (Dewberry 2016). Turtle Pond, in Concord is identified as one potential site, a mere five miles from a recent eBird sedge wren sighting and the location of 81 individual pied-billed grebe sightings over 57 different eBird records, 48 of which occurred in the last five years (eBird 2016). Clearly pied-billed grebe are, and sedge wren may be, present at this site. That site-appropriate construction details have not been provided leaves it impossible to determine if pied-billed grebe or sedge wren habitat could be impacted by construction and direct impact to nesting RTE species cannot be ruled out if construction takes place during the nesting season.

Because the wetlands along the new ROW route were not surveyed for the presence of nesting rusty blackbirds, we do not agree that there will be no risk of habitat loss for this species. Because the nesting preferences for rusty blackbirds are quite variable, including stream borders, wooded swamps, beaver ponds and shrubby thickets (Degraf 2001), AE cannot conclude that rusty blackbirds are not utilizing the wetlands as they currently exist and any existing habitat would not be lost to forest clearing related to the proposed Project.

Wetland-dependent birds that are nesting at the time of construction are at risk for displacement which could result in nest or pre-fledgling chick abandonment or destruction. Since no specific habitat suitability analysis was conducted nor were any wetland dependent bird species field surveys conducted, it is impossible to determine the likelihood of Project related mortality.

6.2.3.c.iii Conclusions

Construction within the existing ROW portions of the Project will likely result in temporary displacement of wetland-dependent birds, but bird species will likely return and utilize the habitat



again in subsequent breeding seasons. Clearing and construction within the new ROW portions of the Project are likely to change the vegetative structure of the intersected wetlands, but forested wetlands are not habitat types used by wetland-dependent RTE listed bird species. Construction methods described for some portions of the existing ROW route, notably open water wetlands, appear to be inappropriate, and without accurate construction details, potential habitat loss is impossible to assess.

Rusty blackbird, a New Hampshire species of special concern, may experience habitat impacts in the new ROW portions of the Project. Since no investigation was conducted by NPT or their consultants relative to breeding rusty blackbird within the Project route, it is not possible to rule out their presence and similarly impossible to evaluate impacts from clearing activities within wetlands.

Since no habitat suitability analysis or field surveys were conducted, despite records of their presence, the nature, extent and duration of impacts from the construction of the Project to piedbilled grebe or sedge wren is not known. No mitigatory measures such as avoiding construction during the breeding season, or conducting pre-construction surveys have been proposed.

Measures that could have been undertaken to avoid, minimize or mitigate potential adverse effects on wetland-dependent birds present in the area of the Project such as habitat suitability analysis or breeding bird surveys were not conducted. Because no field surveys for wetland-dependent RTE birds were conducted despite records of their presence, it is not possible to identify the nature, extent and duration of potential effects on these species. Since presence has not been appropriately verified, the lack of effort to avoid, minimize or mitigate potential impacts to wetland-dependent birds, including RTE species pied-billed grebe and sedge wren does not represent the best practical measures.

AE concludes that there is insufficient information to fully determine the impacts to wetlanddependent bird species, including pied-billed grebe, and without appropriate habitat assessments and avoidance measures, the Project may have an unreasonable adverse impact on RTE bird species.



6.2.4 Nightjars

Pine Barrens habitat is used by two bird species of the Nightjar family that are both of conservation concern in New Hampshire. The common nighthawk (*Chordeiles minor*) is a state endangered bird and the eastern whip-poor-will (*Antrostomus vociferous*) is a species of special concern. In addition, nesting nighthawks and eastern whip-poor-wills are protected by the Federal Migratory Bird Treaty Act. Both species are known to utilize barren to shrubby habitats typical of both power line rights of way and pine barren forest communities.

6.2.4.a Project Impact Summary

Normandeau concluded that following construction of the Project in the vicinity of eastern Concord, there would be no net loss of nighthawk nesting habitat in and around the existing pine barren communities. Because managed powerlines result in the maintenance of barren to shrubby conditions, depending on environmental conditions present, they conclude that habitat appropriate for nesting by these species will remain or increase in area.

Normandeau also concluded that both common nighthawk and eastern whip-poor-will do likely nest in or near the existing ROW and therefore nesting birds are at risk of direct impacts from construction of the Project. They recommend either daily pre-construction monitoring, or seasonal restriction on construction activities to avoid direct impacts. (Wildlife Report, p 5-3)

6.2.4.b Agency Issues

NHFG appear to have made no specific requests for study or highlighted specific issues related to pine barren nesting RTE bird species. They did suggest more generally, that if high quality habitat for listed species is present, NPT should survey for those species (Normandeau Phone Log, Sarah Barnum calling Mike Marchand, 4-3-2013). The presence of habitat was identified, and surveys were conducted.



6.2.4.c AE Assessment

6.2.4.c.i Methodology Review

Normandeau conducted surveys of both common nighthawk and whip-poor-will in a short section of the proposed Project along the existing Eversource ROW in Concord. Both species were found within the ROW, foraging for food or nesting.

Normandeau presented a brief description of their methodology for nighthawk and whip-poorwill surveys which included appropriate date and temporal ranges, weather conditions and site spacing. A description of how the "areas of suitable habitat" were chosen is not well documented, other than 5 sites "along the ROW where it passes through various industrial and retail developments in the eastern part of Concord, NH." (Wildlife Report, p 5-2) The five sites are all within an approximate 1.5 mile stretch of the existing ROW.

A review of eBird records indicates nighthawk sightings during the June-July breeding season along or near the existing ROW as far north as Curtisville Road. Eastern whip-poor-will have been documented along the ROW as far north as the Northfield/Canterbury town line in recent years. Based on this, it is possible that whip-poor-will and nighthawk may be utilizing habitat across a larger area than the 1.5 mile segment surveyed. If habitat suitability assessments were conducted across a greater linear distance in order to rule out other areas of the existing ROW as potential nesting sites, no methodology or results are presented.

6.2.4.c.ii Impact Assessment

Common nighthawk and eastern whip-poor-will habitat may be temporarily impacted during construction activities, but we concur with Normandeau's assumption that the habitat would become available again following completion of construction activities and the pockets of additional ROW clearing may increase habitat availability for these species.

Common nighthawk and eastern whip-poor-will are at significant risk of direct impacts if construction takes place during the breeding season. Construction activities have the potential to interrupt breeding, displace brooding females, and destroy nests.



Normandeau recommends either daily construction monitoring, from which sightings of nighthawk or whip-poor-will would immediately halt construction, or alternatively, restrictions on the dates of construction. Normandeau does not recommend specific dates for construction restrictions, they did not present or propose the spatial limits of construction restrictions or daily monitoring, and they do not propose a methodology for daily construction monitoring.

Since nighthawk and whip-poor-will have been sighted in recent years across a much broader area than that surveyed by Normandeau, restrictions or monitoring would need to include all potential habitat in order to insure the protection of these species.

6.2.4.c.iii Conclusions

Available habitat for nesting common nighthawk and eastern whip-poor-will will not be significantly impacted following construction of the Project.

Construction during the breeding and fledging season poses risks of direct impact to nesting common nighthawk and eastern whip-poor-will. Normandeau has offered basic recommendations for the protection of these species, but present no details upon which to conclude that the avoidance and minimization efforts they suggest would be sufficient. In addition, NPT has, to our knowledge, made no formal commitment to the avoidance and minimization guidelines proposed by Normandeau.

The lack of a comprehensive habitat assessment results in the inability to determine the nature, extent and duration of the potential impacts on common nighthawk and eastern whip-poor-will. Without adequate measures such as a vetted pre-construction monitoring program or seasonal restrictions throughout the potential habitat range, the Project does not represent best practical measures available to avoid or mitigate direct impacts to common nighthawk and eastern whip-poor-will. Given these issues, there is not enough information to conclude that the Project will not have an unreasonable adverse impact on RTE nightjar species.

6.2.5 High Elevation Birds

Bicknell's thrush (*Catharus bicknell*i) is a robin-sized bird that is found in high elevation early successional spruce-fir forests in New Hampshire. Presently this species is listed as a Species of



Special Concern. The thrush's distribution overlaps that of the Project. Bicknell's thrush breeds and can typically be found at elevations at and above 2700 ft ASL.

6.2.5.a Project Impact Summary

Normandeau conducted a field survey to determine the thrush's presence/absence on Sugar Hill in locations above 2700 ft ASL. No Bicknell's thrush were detected during the survey.

Normandeau has concluded that Bicknell's thrush are not present within the proposed Project area, therefore no impacts are expected. They suggest that the Project's creation of low, dense regenerating fir, especially at higher elevations, could enhance the thrush's habitat.

6.2.5.b Agency Issues

NHFG specifically requested surveys be conducted for Bicknell's thrush due to its potential for Federal listing (Sarah Barnum phone conversation with Mike Marchand, 4-3-2013). It does not appear that NHFG provided significant additional comment or requests as to survey locations or methodology.

6.2.5.c AE Assessment

6.2.5.c.i Methodology Review

Surveys for Bicknell's thrush were conducted in June of 2013. Although avian species typical of high elevation habitats were found to be present, no Bicknell's thrush were identified. Normandeau followed an accepted survey methodology derived from leading experts on the monitoring and distribution of Bicknell's thrush. Because habitat conditions change over time, NPT should have proposed additional monitoring immediately prior to proposed construction following the same methodology.

6.2.5.c.ii Impact Assessment

Given the apparent absence of Bicknell's thrush from the proposed Project route, we agree that it is unlikely that the Project will result in direct impacts or habitat loss to nesting Bicknell's thrush. Monitoring should be conducted immediately prior to construction in order to re-confirm absence.



6.2.5.c.iii Conclusions

Since monitoring for Bicknell's thrush was conducted only once several years ago, additional surveys should be conducted in the nesting season immediately prior to construction to confirm that no Bicknell's thrush are present in areas of appropriate habitat. If Bicknell's thrush are not found, it is unnecessary for the Project to avoid, minimize or mitigate direct impacts or habitat loss to Bicknell's thrush. If Bicknell's thrush are found prior to construction, Project impacts above 2700' in elevation should be prohibited until a complete evaluation of habitat impacts is conducted and appropriate avoidance, minimization and mitigation measures are implemented.

If no Bicknell's thrush are found in the nesting season immediately preceding construction, it is unlikely that the Project poses an unreasonable adverse impact to Bicknell's thrush or their habitat.

6.2.6 Nesting Raptors and Herons

New Hampshire RTE listed raptors, such as bald eagles (*Haliaeetus leaucophalus*) and osprey (*Padion haliaetus*) and to a lesser degree, other raptors such as red-tailed hawks (*Buteo jamaicensis*) protected by the Migratory Bird Treaty occasionally utilize power line structures as nesting platforms. These birds historically nest on elevated features such as large tree snags where predation is minimized and prey is more easily spotted. These birds find tall power line structures functionally similar to traditional nesting features. This is especially true for power lines that pass near water bodies or large wetlands, the habitats most frequented by fish predators like eagles and osprey.

Since some structures will be removed or replaced along the route, the Project risks disturbance to active nests of these species if construction takes place when nests are active. Additionally, removal of unoccupied nests without a permit is a violation of the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712).

Raptors sometimes nest in great-blue heron (*Ardea herodias*) nests and, although these are not typically associated with utility structures, heron nests may indicate nesting raptors. Herons themselves are likewise protected under the MBTA.



6.2.6.a Project Impact Summary

The Project is unlikely to pose a specific habitat risk to nesting raptors, including New Hampshire RTE species such as bald eagles and osprey. However, individual nests could be disturbed if construction activity or actual structure removal takes place while the birds are nesting in or near the proposed Project. For the new ROW route, existing nesting sites may be lost if good snag (standing dead) trees are removed. Along the existing ROW portions of the route, nests built on existing structures may be disturbed. Along the entire route, it is possible the noise and activity associated with construction activities during the nesting season would displace or disturb nearby (off-ROW) nesting raptors to the extent that nest success is compromised even if the nest itself isn't directly disturbed.

Direct impacts to these species are likely to be short-term only, with nesting birds likely returning in the season following completion of construction activities.

Impacts other than loss of habitat or nest disturbance may be incurred from potential collision and electrocution risk discussed in Section 6.2.7.

6.2.6.b Agency Issues

NHFG specifically requested prioritization of "Raptor nesting on existing poles and habitat suitability along new lines" when queried by Normandeau as to avian survey guidance (Sarah Barnum phone conversation with Mike Marchand, 4-3-2013). NHFG made specific comments noting the lack of a plan for addressing conflicts arising from osprey nesting on powerline support structures in their comments on the DEIS (NH Fish & Game Dept., April 4, 2016).

6.2.6.c AE Assessment

6.2.6.c.i Methodology Review

Normandeau conducted an aerial raptor nest survey via helicopter in April of 2014. The Project route was flown from Dummer south to Deerfield over the course of approximately 4 hours in order to identify existing raptor or heron nests along the existing Eversource ROW. Normandeau presented a brief methodology that included appropriate weather conditions and techniques that appear sufficient to identify large bird nests along the existing ROW.



The helicopter survey did not include the new ROW portion of the Project route from Dummer north to Pittsburg. No mention is made as to why the northern portion of the route was not surveyed.

Normandeau conducted this single survey for existing raptor nests in 2013 but despite the NHFG guidance, does not report engaging in any habitat suitability analysis relevant to raptor nesting.

While this approach to nest identification provides a good rapid snapshot of current nest locations, the survey was conducted over three years ago at the time of this writing and did not include the entire proposed route. It's also not clear how far away from the existing ROW was searched such that any conclusions can be drawn as to the likelihood of indirect impacts to nesting RTE raptors from construction activity. Normandeau does confirm the possibility that nests were missed in the surrounding landscape due to canopy cover.

Although recommendations are made for pre-construction monitoring, no methodologies for such further studies are proposed.

6.2.6.c.ii Impact Assessment

Normandeau identified several great-blue heron nest colonies in Northumberland, Lancaster and Franklin during the helicopter survey, but did not find any raptor nests during this investigation.

Regardless of the 2013 survey results, we agree with Normandeau that in order to avoid and minimize impacts to nesting raptors, herons, and other species nest surveys must be conducted immediately prior to construction activities. If the construction is scheduled to begin prior to the nesting season, any nests present should be removed following proper authorization from the USFW Service. If construction activities are scheduled to begin during the nesting season, all construction areas should be thoroughly investigated in a manner sufficient to determine if nesting raptors or other birds are present, and if so construction should be delayed until after fledging is complete.

Since nesting birds are known to be disturbed by nearby construction activity, the survey should extend beyond the limits of the ROW. Normandeau notes that USFW bald eagle management



guidelines suggest a 660' buffer to insulate eagles from power line construction disturbance (Wildlife Report, p 8-3), and this distance should be sufficient to protect other species as well.

The recommendations by Normandeau, while incomplete, would likely be sufficient to address avoidance and minimization of impacts to nesting raptors. If nests are removed during the nonnesting season, mitigation would be appropriate to address this potential impact. Nests could be replaced on new or relocated structures, or a better option may be for NPT to provide artificial nesting platforms as a component of the newly installed or relocated structures in appropriate locations in proximity to the removed nest locations. Such platforms would ensure future nesting locations that provide safety from electrocution risk while also avoiding damage and future maintenance issues to electrical conductors and other infrastructure.

6.2.6.c.iii Conclusions

Adequate avoidance and minimization of impacts to nesting raptors, herons and other birds, including the New Hampshire listed bald eagle and osprey requires thorough investigation of the ROW and at least 660' beyond for the presence of nesting raptors, ravens and herons. Normandeau and NPT have not provided a methodology or a formal commitment for such a survey.

If nests are found, in order to comply with the MBTA, the Project must delay construction in the vicinity (a distance of at least 660') until after chicks have fledged. Subsequent removal of nests during the non-nesting season must be authorized by the USFW Service. As mitigation for nest removal, NPT could propose establishment of nesting platforms on new structures constructed in appropriate habitats.

Lacking adequate mitigatory measures such as a methodology for pre-construction surveys, a commitment to avoidance and minimization through seasonal restrictions around active nests and mitigation proposals for nests that will be removed, the Project is ineffective at avoiding, minimizing or mitigating potential adverse impacts on nesting raptors, herons and other birds, including RTE species- bald eagle and osprey and does not represent the best practical measures.



AE concludes that there is insufficient information to fully determine the impacts to nesting raptor species, including bald eagle, and without appropriate habitat assessments and avoidance measures, the Project may have an unreasonable adverse impact on RTE bird species.

6.2.7 Avian Electrocution & Collision

A significant risk to birds, including those listed as rare, threatened and endangered in the State of New Hampshire, from the Project may be the electrocution and collision risk posed by the installation of high voltage electrical lines above the treeline.

The Project transmission lines represent a source of mortality for birds. Bird mortality results from collisions or through electrocution. Most commonly birds fly into the top or shield wire which tends to be the thinnest and hardest for birds to see. Electrocution most often occurs when perching birds make contact with electrical phase-to-phase or phase-to-ground equipment. As a result of these two types of mortality events, transmission lines in the United States kill an estimated 12-46 million birds a year (Loss et al. 2014).

The Project transmission lines will vary between 70 and 155' high (Wildlife Report, Appendix C, Sect. 3.0;2.3 [sic]), approximately 130 miles long (above-ground portions), and traverse a multitude of different bird habitats. The likelihood of bird collisions and electrocutions is a function of both the engineering factors (e.g. structure type, line size, line placement, and line orientation) and a host of biological factors such as weather conditions, time of day, season of the year, the body size, visual acuity and size of the bird (APLIC 2012).

The Avian Power Line Interaction Committee (APLIC) recommends a three step process for the evaluation and planning of new power lines. 1. Spatial analysis to help choose the optimal route; 2. Field assessment to identify high bird use areas; 3. Avian risk assessment to evaluate collision risk. (APLIC 2012)

6.2.7.a Project Impact Summary

Normandeau states that in New England (and by extension New Hampshire), which is largely treed, perching on wires and structures is not very common. They state that the species most commonly killed by power lined-related mortality are associated with open landscapes, such as



grasslands, wetlands, and open water, however they concede some risk of avian mortality from transmission line interaction is present.

Bird collision with powerlines is a well-documented issue, and significant literature exists from studies worldwide to identify, avoid and mitigate risks to birds from electrocution and collision with overhead high-voltage utility lines (APLIC 2006, 2012). In their Mitigation Report, Normandeau posits that a relative lack of published studies on avian electrocution and collision in New England suggests power lines are not a notable source of avian mortality in this region. While this may be the case, powerlines of the type and scale of the proposed Project are uncommon in this region (US EIA, 2016), and especially in undeveloped portions of northern New England. Regional documentation of collision mortality may therefore be unlikely to correlate positively to the risks posed by the proposed Project.

Normandeau conducted a Qualitative Avian Collision Risk Assessment intended to determine and summarize the risk of avian collision posed by the Project as well as to identify potential risk mitigation through line marking devices. According to their findings, there are 14 locations totaling approximately 6.9 miles along the roughly 130 miles of above-ground proposed route where birds, in general, are at risk of collision with the proposed Project.

According to Normandeau, the design engineers were provided with recommendations as to the areas with the greatest risk of avian collision, primarily determined by proximity to larger marshes and ponds where waterfowl may interact with powerlines while moving between habitats. Normandeau goes on to state that these areas will be assessed post-construction to determine the need for bird diversion devices or other mitigatory measures.

Normandeau suggests that utilization of the suggestions found in the publication <u>Suggested</u> <u>Practices for Avian Protection on Power Lines</u> (APLIC 2006) will reduce avian interactions and mortality from electrocution by power lines and that adding line markers per APLIC (2012) will reduce collision risk. They do not state that the Project has adopted the use of these practices, in fact they specifically state that decisions regarding implementation of line marking avian collision-avoidance devices will be made at some later date, following an undefined postconstruction review.



Normandeau alludes to studies that would be conducted following construction of the Project, but provides no details as to when, where or how such studies would be undertaken. Presumably, the only areas proposed for investigation or mitigation are those 14 locations identified by Normandeau in their Avian Risk Assessment, and even then, one must speculate that mitigatory measures will only be considered after evidence of avian mortality has been witnessed in these specific locations. Normandeau seems to suggest that cost is the driving factor behind employing only post-mortem collision avoidance mitigation by stating "Because line-marking devises [sic] can be costly to deploy and maintain, and may impact transmission operations, they are typically only used in locations were [sic] collisions are known to or are highly likely to occur" (Wildlife Report, Appendix C, Sect. 4.0). This statement does suggest that Normandeau believes that prudent placement of diversion devices is appropriate, however they appear to be deferring to cost containment as a reasonable justification for avian mortality.

6.2.7.b Agency Issues

A review of NHFG communications with Normandeau concerning bird related Project studies suggests only limited recommendations were made to issues of potential avian mortality from collision or electrocution. NHFG requested studies specific to northern harriers, nesting raptors and Bicknell's thrush, while also stating that the presence of high quality habitat for other listed species should result in surveys for those species in order to show due diligence (Sarah Barnum phone conversation with Mike Marchand, 4-3-2013). Mr. Marchand went on to emphasize a habitat-based approach without offering any specifics on habitat types or features to include.

6.2.7.c AE Assessment

While many bird species are at risk from collision with power lines, we focus here on the collision risks to New Hampshire RTE listed bird species. In addition to the requirements for protection of rare, threatened and endangered species in New Hampshire, the habitats utilized by the listed RTE species in turn represent the major habitat types used by many other bird species afforded protection under the North American Migratory Bird Treaty. These RTE listed birds can be considered umbrella species whose protection indirectly safeguards other species relying on the same ecological community.



6.2.7.c.i Methodology Review

Normandeau did not conduct any analysis of electrocution risk, stating only that adherence to APLIC (2006) recommendations would minimize risk of electrocution.

Of the three step process for the evaluation and planning of new power lines recommended by APLIC, NPT and Normandeau appear only to have conducted *Step 3. Avian risk assessment*. An analysis of route options relative to avian collision risk is not discussed as recommended in *Step 1: Spatial analysis to help choose the optimal route*. In regards to *Step 2. Field assessment to identify high bird use areas*, Normandeau did conduct a raptor nest survey via helicopter with the focus strictly on nesting raptors in or directly adjacent to the existing ROWs. Beyond this targeted field investigation, field assessments specific to identification of high bird use areas potentially prone to collision or electrocution risk is not discussed.

Normandeau presents the results of a desktop qualitative risk assessment that identified the locations where avian collisions are most likely to occur in the Project ROW, however very little detail is provided into the methodology utilized and the results appear to underestimate potential collision risk areas.

In light of the NHFG request, AE would expect a habitat-based approach be utilized for the range of RTE bird species with potential or documented presence in the general Project area. As avian species are highly mobile, we expect evaluations would need to extend beyond the limits of the proposed or existing ROW to account for birds occupying the surrounding landscape, but interacting with nearby power lines in the course of their daily or migratory travels.

Normandeau's Qualitative Avian Collision Risk Assessment identified 14 locations along the Project ROW where vulnerable species and their habitats are in close proximity to the Project.

Normandeau does not provide any documentation to describe or support the methodology utilized to determine the 14 avian risk locations other than to say "The habitats identified in and around the ROW that are likely to attract birds and/or promote flight paths perpendicular to the ROW are mostly large wetlands and ponds" (Wildlife Report, Appendix C, Sect. 4.0).



Presumably, Normandeau utilized some sort of natural resource spatial filter to determine which areas along the Project route may pose a "higher risk of collision, as compared to the line as a whole." The table provided by Normandeau (Wildlife Report, Appendix C, Table 1) indicates that perhaps in addition to ponds and large wetlands, large hay fields, sewage ponds, rivers and NHB-mapped osprey and common loon locations may have also been incorporated to inform high collision risk zones. However, Normandeau provides no specifics as to distances, habitat elements, topographical variation, data sources or any other parameters used to derive the resultant higher risk zones. As such, one is left to conclude the exercise may have been a subjective, non-scientifically grounded endeavor.

In fact, there is considerable data readily available upon which species-specific assessments of avian risk could be based. By targeting a collection of appropriate umbrella species for assessment, an objective analysis of potential high collision risk areas could be accomplished.

AE was provided with a current list of all New Hampshire lakes and ponds with breeding populations of common loons (John Cooley, NH Loon Preservation Committee, personal communication, October 2016). According to the NH Loon Preservation Committee's senior biologist John Cooley, movement by a loon between lakes within a breeding territory is typically 3-5 kilometers, although breeding loons are known to prospect or disperse (if displaced) up to 30 kilometers from an established territory. Using the information provided by the Loon Preservation Committee, we were able to identify 8 loon breeding lakes and/or ponds within a scant 0.5 kilometers of the Project's overhead ROW, only three of which were identified in Normandeau's collision risk assessment. Extending out to the 5 km distance from the ROW cited as a typical maximum distance for inter-lake movement within a breeding territory results in 37 lakes and ponds within the risk zone worthy of investigation.





Figure 6.2.7-1. Conceptual Common Loon Collision Risk Zones

AE conducted a brief analysis to further explore these potential loon risk zones. By buffering each breeding pond by a distance of 2.5 km to represent half of the approximate dispersal distances between ponds, Figure 6.2.7-1 shows potential loon risk areas where these buffers overlap the Project route. There are seven discrete linear areas along the overhead route where risk of collision to common loon may exist based on this documented nearby presence and breeding territory range. Four of these areas overlap portions of the ROW identified by Normandeau in their Avian Risk Analysis, but Normandeau's risk zones were significantly



smaller. Three were not identified at all, including a significant stretch through the towns of Millsfield and Dummer where several loon ponds are very close (as little as 0.25 km) to the proposed new ROW.

These seven stretches of ROW at risk for this one species constitute some 43 linear miles of the Project route vs. Normandeau's total linear risk area of approximately 6.9 miles. Although we assume the 43 miles could be reduced through a more comprehensive modeling exercise incorporating additional scientifically vetted parameters, the risk to loon appears significantly underestimated. If Normandeau investigated the potential for loon collision at all appropriate locations and subsequently ruled it out, there is no evidence to suggest so in their reporting or analysis.

This brief review was conducted only for one species, common loon, but it could be considered an umbrella species for other waterfowl (i.e. ducks, geese, grebes, etc.) which could be similarly at risk of collision with Project power lines due to their proximity to breeding habitat and orientation well above tree height. Although it must be stated that other waterfowl have varying habitat requirements that differ from the loon.

Similar lack of detail is likewise present for other RTE bird species that are at risk of collision with Project powerlines. The following three RTE species do not appear to have been methodically assessed for collision risk: Golden Eagle, Bald Eagle, and Peregrine Falcon. Eagles have sharp eyesight, but a large wingspan and hunt primarily over open water, so collision impacts are likely to be focused in certain areas.

Peregrine falcons also have keen eyesight, however as aerial predators, travel at extreme speed with singular focus on their prey and if hunting in the vicinity of electric transmission lines, especially those extending above the surrounding canopy height, collision risk is likely significant. Peregrines are known to collide with guy wires associated with communication and meteorological towers and the State of Vermont typically recommends or requires line marking devices on tower guy wires for this reason (Margaret Fowle, Vermont Audubon Conservation Biologist, personal communication, November, 2011). Beyond mentioning a single local nest location, NPT and Normandeau appear to have conducted no analysis specific to nearby nesting peregrine falcon, although they concede they likely forage within the Project area. A brief



analysis of 2016 peregrine falcon nesting sites provided by NH Audubon (Chris Martin, personal communication, November, 2016) suggests there are several peregrine nest sites within an approximate three mile proximity to the proposed Project above-ground route, which are not included in the data provided by NHB which was apparently used exclusively in Normandeau's review.

Normandeau's focus on large wetland complexes with open water as a primary defining feature of avian collision risk adequately covers the risk posed to the pied-billed grebe. However, without a sufficiently detailed explanation of the methodology for the avian risk assessment, it remains impossible to determine if all appropriate habitat parameters were considered.

AE agrees that an avian collision risk assessment is an appropriate tool to evaluate locations with an increased potential for collision with the proposed Project power lines. However, Normandeau has provided insufficient information to assess the adequacy of their methodology and where assumptions can be made, it appears that the methodology is significantly incomplete to capture areas of elevated risk of collision, in particular for certain RTE species including common loon and peregrine falcon.

6.2.7.c.ii Impact Assessment

Electrocution risk to avian species is easily avoided and/or minimized through appropriate structure design. Normandeau concurs with this statement as they state in their Wildlife Report "The possibility of electrocuting all types of raptors and other large birds will be minimized by following the bird-safe designs recommended by APLIC..." While bird-safe designs are widely recommended, we are not aware of a formal commitment on the part of NPT to implement such practices and designs. Doing so would, in our opinion, represent appropriate avoidance and minimization of avian electrocution risk. A failure to do so would suggest a failure to avoid, minimize or mitigate electrocution risk to avian species, including those listed in New Hampshire.

Normandeau conducted an Avian Risk Assessment which identified 14 locations of potential avian collision risk. They further assert that biologists will conduct a post-construction survey of these 14 areas to determine if collision mitigation measures, such as line markers should be installed. Such a survey would identify bird mortalities in these areas. Normandeau intimates (but



does not actually say) the results of this mortality study would inform the Project decision-makers on the decision of whether to install line avoidance strategies and/or measures at these locations.

It is not at all clear what the outline of a post-construction avian mortality study would look like, and how many bird deaths over what period of time would have to be recorded to trigger the installation of collision mitigation technology such as line markers.

The post-construction avian line collision survey that Normandeau has suggested will be implemented is problematic for the following reasons: 1) the survey would be conducted after bird mortalities have already been sustained; and, 2) the exact details (study area, longevity, identity of the species studied) of the study have not been developed.

6.2.7.c.iii Conclusions

Normandeau has identified avian electrocution as a potentially adverse impact from the proposed Project. NPT fails to provide a formal commitment to implement the suggested practices for both new and relocated distribution and transmission structures as described in APLIC 2006 per the recommendation of Normandeau. Failing to provide this commitment, the Project does not avoid, minimize or mitigate impacts to avian species, including those listed in New Hampshire and protected under the Migratory Bird Act from electrocution.

A route-siting analysis was apparently not conducted per the APLIC 2012 recommendations with respect to avian collision risk. Without this analysis, we cannot conclude any avoidance or minimization measures have been undertaken with regards to Project route selection.

Mitigation of avian collision risk is commonly attained through the use of line marking devices that make the aerial conductors more visible to flying birds. Because of the expense and maintenance involved with use of line markers, they are typically only used in higher risk locations. While Normandeau did conduct an aerial risk assessment of some sort, they have provided few details into the methodology and appear to have excluded some important considerations such as active loon nesting locations. Since we are unable to determine the adequacy of the risk assessment, and have reason to believe there are missing elements we conclude the risk assessment may underestimate or misrepresent potential collision risk areas.



Regardless of the adequacy of the risk assessment, Normandeau goes on to recommend the use of line marking devices only following post-construction monitoring at the locations identified in their risk assessment, however no methodology or parameters for post-construction surveys are offered, nor are proposed survey results which would either preclude or mandate the use of line marking devices at a given location.

Finally, NPT has offered no formal commitment to either conduct the undefined monitoring activities proposed by Normandeau, nor to install line marking devices preemptively or even following discovery of avian collision impacts.

Measures undertaken or planned to mitigate potential adverse effects on the avian species present in the area are either insufficient or appear unlikely to be effective. They do not represent best practical measures available to avoid, minimize or mitigate adverse impacts to birds from collision with the proposed Project.

AE concludes that there is insufficient information to fully determine the impacts to RTE bird species due to electrocution or collision with the proposed aerial power lines and without appropriate BMPs and installation of line marking devices, the Project is likely to have an unreasonable adverse impact on RTE bird species.

6.3 **RTE Invertebrates**

Invertebrates that were evaluated as part of Normandeau's assessment include rare, threatened and endangered freshwater mussels and insects. Each of these groups is presented below. The assessment of the Karner Blue Butterfly is included in Appendix A.

6.3.1 Freshwater Mussels

There are three species of freshwater mussels that are listed or of special concern in New Hampshire and were assessed as part Normandeau's analysis: the dwarf wedgemussel (*Alasmidonta heterdon*), brook floater (*A. varicosa*) and eastern pearlshell (*Margaritifera margaritifera*).

The Dwarf wedgemussel is a state and federally endangered mussel that occurs in the eastern U.S. Most of the current populations consist of small numbers of species. The largest remaining



populations occur in the Connecticut River Drainage in New Hampshire (USFWS 2007). They are found in small streams to large rivers with moderate flow on a variety of substrates, but require clean waters with high dissolved oxygen (NHFG 2015). The populations in New Hampshire are found along the Connecticut River, north to Northumberland.

Similar to the dwarf wedgemussel, the brook floater inhabits clean, well-oxygenated rivers and streams with varying substrates. This species is also declining throughout much of its range, which includes much of the eastern U.S. This species is known in New Hampshire from the Connecticut and Merrimack River and the coastal Watersheds (NHFG 2015). This species is listed as Endangered in New Hampshire.

The eastern pearlshell mussel is also a riverine species but occupies higher gradient, clean, coldwater streams that support Salmonid fish. This species appears to be intolerant of eutrophication and acidification (Nadeau 2008). It is found scattered throughout New Hampshire but typically in low numbers. Eutrophication, siltation, land clearing and dams all threatened this species. The eastern pearlshell is a species of Special Concern in New Hampshire.

6.3.1.a Project Impact Summary

Dedicated mussel surveys were performed by Normandeau at targeted stream crossings in the Project area. No dwarf wedgemussels were discovered. No impacts are therefore expected to this endangered species. Where the proposed Project crosses the Soucook and Merrimack Rivers, small populations of both the brook floater and eastern pearlshell were documented. Normandeau states that localized, short-term adverse effects on these species may occur due to construction and maintenance activities.

6.3.1.b Agency Issues

Both the NHFG and USFWS requested that freshwater mussel inventories be conducted in areas of suitable habitat. Normandeau committed to developing a work plan for the inventories and submitted this to NHFG. The work plan was developed and the inventories were conducted as requested. No agencies appear to have outstanding issues with regards to these species.



6.3.1.c AE Assessment

6.3.1.c.i Methodology Review

The inventory for freshwater mussels consisted of remotely identifying potential mussel habitat in the Project area. Fieldwork was conducted on the subset of streams that had appropriate habitat and would be potentially impacted by the Project. Normandeau states that surveys were conducted in areas with "known or suspected" populations of these three species. The known populations were taken from previous studies of mussels in New Hampshire. No information was provided on how Normandeau determined if a stream was "suspected" to have one of these species, or how many streams were excluded from this assessment.

A qualitative sampling procedure was employed with timed visual searches via view tubes, snorkel or SCUBA gear, depending on the depth of the stream or river. The techniques used for sampling mussels are well-established methods that are sufficient to document mussel populations. AE found no significant deficiencies with this sampling procedure.

6.3.1.c.ii Impact Assessment

As mentioned above, the dwarf wedgemussel was not documented in the Project area and no impacts are therefore expected. This species is known mainly from the Connecticut River south of Stewartstown (NHFG 2015). Since the Project has proposed to cross the Connecticut outside of the known range of this species, it is not surprising that no individuals were discovered.

The other two species were documented in the Soucook River and Merrimack River within the Project area. At the Soucook crossing, nine brook floaters and five eastern pearlshell individuals were recorded. At the Merrimack River crossing, five brook floaters and six eastern pearlshells were recorded. The most likely impacts to these species could occur from construction or maintenance work resulting in runoff entering the rivers. Population declines have been linked to sedimentation and turbidity (Osterling et al. 2010) though establishing a direct relationship between sedimentation and mussel survival and recruitment is sometimes difficult (Box and Mossa 1999). Most of the studies conducted on this topic focus on larger sedimentation events such as major floods or the building of dams.



At the Soucook River crossing, there is a proposed structure within 20 feet of the river bank. Normandeau asserts that "this site and all BMPs will be carefully monitored during construction, and to the extent practicable, this structure installation will be performed during low flow or winter conditions." (p45 App 33). BMPs have not been made available for review and no commitments to seasonal restrictions have been made by NPT. Lacking these documents, statements regarding the potential impacts to mussels cannot be verified or assessed.

6.3.1.c.iii Conclusions

The methods used by Normandeau to identify and map the brook floater and eastern pearlshell mussels within the Project area appear to be sufficient. The potential impacts to the RTE mussel species have been identified by NPT. BMP measures have been suggested that would address potential impacts from construction, but no BMPs have been made available for review. Without these documents, there is not enough information to determine that the Project will not have an unreasonable adverse impact on these rare mussels

6.3.2 Insects

There are 9 species of insects that are listed as threatened or endangered in New Hampshire, five of which have ranges that overlap with the proposed Project. The Karner Blue butterfly is the only federally listed species of the five state listed species and is discussed in-depth in Appendix A. The other four species are the frosted elfin (*Callophrys irus*), persius duskywing skipper (*Erynnis persius persius*), pine pinion moth (*Lithophane ledipa lepida*), and the ringed boghaunter (*Williamsonia lintneri*). The pine pinion moth is listed as state threatened and the others as state endangered. While the range of the ringed boghaunter overlaps with the Project, its habitat requirements are not present where the Project overlaps its known range.

The frosted elfin has a direct association with the state threatened wild lupine plant, similar to the Karner Blue butterfly. The frosted elfin uses the wild lupine as a food source, it also lays its eggs on this plant. The Concord Pine Barrens contain the frosted elfin's only modern New Hampshire population consisting of about 10-30 individuals annually (Chandler 2002; NHFG 2015).

The persius duskywing skipper once inhabited the grassy openings of the Concord Pine Barrens and similar habitats along the Merrimack River in the towns of Merrimack, Milford, and Hudson.


The skipper feeds on wild lupine or wild indigo and lays its eggs on the wild lupine. This species has not been recorded in New Hampshire since 1990 (Chandler 2002).

The pine pinion moth occupies xeric pine barrens and early successional communities dominated by pitch pine (*Pinus rigida*) and scrub oak (*Quercus ilicifolia*). The larval hosts for the pine pinion include red pine (*Pinus resinosa*) and other hard pines (NHFG 2015). The pine pinion has been documented in the town of Webster and in the West Branch Pine Barrens in Madison (Farquhar 1933-35). Neither area is within the Project route. Normandeau states that red and hard pines are also located in the Concord and Pembroke portions of the Project area (Wildlife Report, p 12). NHFG confirmed that this species has not been documented in New Hampshire since the early 2000s (Heidi Holman, NHFG, personal communication 11-14-2016).

6.3.2.a Project Impact Summary

Normandeau concludes that the frosted elfin, persius dusky skipper, and the pine pinion moth are present or have the potential to be present within the Project area. Normandeau concludes that the ringed boghaunter (a dragonfly) is unlikely to be present within the Project area because its habitat requirements are not present where the Project overlaps its known range.

Normandeau concludes that the Project poses no risk to the ringed boghaunter. Impacts to the frosted elfin, persius duskywing skipper and pine pinion moth consist of direct mortality and habitat loss (Mitigation Report, Table 1). Since no inventories were conducted for these species, the amount of direct impacts to the population for each of these species is not known.

6.3.2.b Agency Issues

NHFG has not requested that Normandeau conduct any field surveys for the frosted elfin, persius duskywing skipper, or the pine pinion moth. According to NHFG, no survey of the persius duskywing skipper was requested because no existing protocol for surveying the species has been developed (Heidi Holman, NHFG, personal communication 11-14-2016).

NHFG has stated that they would be satisfied with the protection of these species if construction within the Concord Pine Barrens occurred during the winter months (Heidi Holman, NHFG, personal communication 11-14-2016).



6.3.2.c AE Assessment

6.3.2.c.i Methodology Review

The desktop review conducted by Normandeau for the ringed boghaunter was adequate to eliminate any concern of the presence of this species. AE conducted an assessment using Normandeau's wetland data and information on the range of this species. AE concurs with Normandeau that appropriate peatland habitat was not documented where the range of this species and the Project area overlap.

Normandeau did not conduct any inventories of the Persius duskywing skipper, the pine pinion moth or of the frosted elfin. The presence of each of these species was assumed because of their association with wild lupine or red pine, both of which are present in the Project area.

6.3.2.c.ii Impact Assessment

The Project will directly impact habitat for the Persius duskywing skipper, the pinion moth and the frosted elfin. While both the frosted elfin and the Persius duskywing skipper are known from the Concord Pine Barrens, it is not known how many individuals of these species (if any) will be impacted by the proposed Project. The impacts proposed to the Concord population of lupine include impacts from access roads, construction work areas and the placement of towers. The proposed impacts to this RTE plant species in the ROW are 62% in the Concord population. AE's analysis of the plant population boundaries (the habitat for the RTE insect species) and layout of the proposed development has concluded that no obvious avoidance or minimization measures have been undertaken by NPT.

Normandeau states that "actions undertaken to mitigate for impacts to the Karner blue butterfly will directly benefit and mitigate for impacts to frosted elfin and Persius duskywing skipper." (Wildlife Report p12-4). The lack of information on the populations of these listed species (which were obtained by Normandeau for the Karner Blue butterfly) makes an assessment of direct impacts impossible. Lack of population data also makes an analysis of the effectiveness of the proposed Karner Blue butterfly mitigation plan for the protection of the other RTE species impossible.



6.3.2.c.iii Conclusions

Although the habitat of the RTE insect species has been identified, surveys have not been conducted to determine population numbers within the Project area. The nature, duration and extent of the Project's direct impacts on these individual species have therefore not been determined. No obvious avoidance or minimization measures have been undertaken or committed to by NPT. Failing to provide species specific information on the Persius duskywing skipper, the pine pinion moth and the frosted elfin, the Applicant has not demonstrated that the proposed mitigation measures for the Karner Blue butterfly will be effective. Lacking this basic information, we are not able to conclude that the Project will not have an unreasonable adverse impact on the Persius duskywing skipper, the pine pinion moth and the frosted elfin.

6.4 RTE Reptiles & Amphibians

6.4.1 Introduction

An assessment of the Project's impacts on state listed reptiles and amphibians is described below. Listed species that are not within the range of Project or will not be impacted by the Project are not included.

6.4.2 Black Racer and Eastern Hognose Snake

The Black Racer (*Coluber constrictor*), is a state threatened species and Eastern Hognose snake (*Heterodon platirhinos*) is a state endangered species. The range and habitat preferences of these two species overlap within the Project area. Because of their similar habits and habitats, they are considered together in this section.





Figure 6.4.2-1. State range map of Black Racer and Eastern Hognose snakes.

The Black Racer is a snake that reaches the northern edge of its range in central New Hampshire and southern Maine (Figure 6.4.2-1). It is considered a species of High conservation concern by the Northeast Partners in Amphibian and Reptile Conservation (NEPARC 2011). This species uses a wide variety of early successional habitats such as grasslands, old fields and open areas like powerline corridors. NHFG has undertaken some radio telemetry studies on this species to determine habitat preferences and movement across the landscape. These studies have also



resulted in the discovery of hibernation sites. This species hibernates in underground burrows or rock crevices communally with other black racers or snakes of other species.

The Eastern Hognose Snake is a snake of regional conservation concern in New England (Therres 1999). It is considered a Severe conservation concern in the northeast by the Northeast Partners in Amphibian and Reptile Conservation (NEPARC 2011) and a regional Species of Greatest Conservation need (Northeast RSGCN list 2014). In New Hampshire, this species is listed as Endangered and is known only from the Merrimack River corridor in Concord and south to the Massachusetts state line (see Figure 6.4.2-1). The largest known population is in the Concord/Pembroke area and uses the existing ROW as its primary habitat (NHFG 2015 and Sarah Barnum letter to Adele Fiorillo 4-22-2011). It prefers sandy, well drained soils from glacial outwash and can be found primarily in open habitats. It is one of the few snakes that can burrow (using its up-turned snout) and is often difficult to find because it spends much of its time in underground.

6.4.2.a Project Impact Summary

Four types of impacts to these two species may potentially occur as a result of this Project: impacts to habitat, impacts to individuals during construction/maintenance, impacts to nests, and impacts to hibernacula. Direct impacts to adults of these species are unknown because these are mobile species. In addition, impacts to nests and hibernacula are unknown because the locations of these sites are largely unknown.

In order to mitigate potential impacts to individuals, nests and hibernacula, NPT has proposed to "Avoid known hibernacula, [conduct] surveys prior to work for nests, adults; relocate and excluded snakes as needed." (Mitigation Plan, Appendix B). In addition, this table states that NPT will "Create or protect suitable snake habitat" as an additional Restoration/Compensation strategy.

6.4.2.b Agency Issues

Mike Marchand, from the NHFG, has expressed concern about the timing of construction within the range of the Black Racer. This range should be considered to be "south of the Lakes Region" (Sarah Barnum letter to Adele Fiorillo 4-22-2011). In this area, this species is known to use the



existing ROW. According to Mr. Marchand, construction during the snake's active season would minimize impacts to potential hibernacula (NPT and NHFG meeting minutes 9-3-2015). At the same meeting, Mr. Marchand has suggested that detailed Best Management Plans be developed for this [and other] species and applied in the most likely habitat. NPT has not provided a commitment to seasonal restrictions as requested by NHFG and BMPs for these species have not been made available.

6.4.2.c AE Assessment

6.4.2.c.i Methodology Review

The range of the black racer is known to overlap with the existing ROW in Concord, Pembroke, Allenstown and Deerfield (Figure 6.4.2-1). Since NHFG had conducted radio transmitter studies on this species in Concord and Pembroke, they recommended field surveys for this species be performed in Allenstown and Deerfield. During this inventory, three individuals were observed in the ROW in Allenstown. This work, coupled with the known occurrences in the area is sufficient information to conclude (as Normandeau does) that this species is present in the ROW.

Similarly, the Hognose snake was known to exist within the existing ROW and its presence was assumed within the Project area. No surveys for this species were therefore conducted. Lack of surveying for this species is appropriate if its presence is assumed.

6.4.2.c.ii Impact Assessment

The Normandeau report did not directly address the impacts that the Project would have on Racer and Hognose snake habitat. Evidence from NHFG suggests that the existing ROW has created early successional habitat that is used by the Racer and preferred by the Hognose snake. Construction activities may temporarily decrease the suitability of the habitat for these species. However, long term, the continued maintenance of the ROW is likely a benefit for these species.

As mentioned above, NPT has proposed to "Avoid known hibernacula, [conduct] surveys prior to work for nests, adults..." Since the Racer has been known to hibernate in communal nests, disturbing or destroying a hibernacula can have an immediate and dramatic negative impact on a local population. Hognose snakes more typically hibernate individually (Plummer 2002), so disturbance of a hibernaculum would have less of an impact on the local population. Currently,



there is one documented Racer hibernaculum within the existing ROW and proposed Project area (Mike Marchand, personal communication 10-14-16). Specifics on how (or when) this site will be avoided have not been presented in the SEC application or supporting documentation. Therefore, an assessment of the adequacy cannot be conducted. It is unclear, for example, what steps the NPT will take if the known hibernaculum occurs at the location of proposed structures, access roads or work areas.

Given the length of the ROW and the snake habitat in the vicinity, it is likely that there are more hibernacula that are undocumented. In order to attempt to identify potential hibernacula, Normandeau is using rock features identified from aerial photos during the Small-footed bat assessment. These rocky ledges may serve as hibernacula due to the broken, rocky terrain with deep crevices. However, these are only a subset of the types of habitat that Black racers use as hibernacula. In addition, these types of rocky features are not common in the areas of deep sandy outwash plains, typical in the Concord/Pembroke area. It is AE's position that without radio telemetry studies, hibernacula cannot be reliably located. However, spatially, a hibernaculum is a rare feature on the landscape and the chances of encountering and destroying this feature during construction are small. If one is encountered during the active season, however, impacts to the local racer population could be catastrophic. Impacts to the population would be minimal if the construction is conducted when hibernacula are not being used (spring, summer or fall). Such a seasonal restriction has been suggested by NHFG. However, Normandeau has reported that seasonal restrictions are not necessary if "avoidance measures are followed" (Mitigation Plan, Appendix B). Avoidance of individuals may be possible (see below) but as outlined above, avoidance of hibernacula is not realistic.

NPT has committed to "Create or protect suitable snake habitat" as outlined in Normandeau's Mitigation Report Appendix B. In no other application documents or records made available to AE is there any formalization of this commitment. When asked if any mitigation parcels were obtained with the goal of creating or protecting snake habitat, Normandeau biologists responded in the negative (Lee Carbonneau, personal communication 9/22/16).

Normandeau also mentions conducting surveys of Black Racers (and other snakes and turtles) prior to construction and excluding individuals from the work area with erosion control fencing. In general, this concept is sound, and if conducted correctly can reduce mortality of these species.



However, no specifics have been presented concerning range, timing, or methods for this procedure, and so final determination on the effectiveness of this mitigation strategy cannot be made.

6.4.2.c.iii Conclusions

The habitat of these snakes may be negatively impacted during construction, but long-term impacts are not likely to be adverse. Impacts to individuals, nests and hibernacula during construction could be avoided or minimized by the development of BMPs and seasonal restrictions, but no details about these plans have been made available or committed to by NPT. Lacking this information, AE is unable to determine if the Project will have an unreasonable adverse impact on these species.

6.4.3 Turtles

There are three turtles of conservation concern in the Project area. Since the proposed impacts to these three species of turtles from the Project are similar, they are considered together in this section.

Blanding's Turtle (Emydoidea blandingii) State Endangered

In the northeast, the Blanding's turtle is found in Massachusetts, southern Maine and southcentral New Hampshire, where the largest population is found (Figure 6.4.3-1). This species is considered of Severe conservation concern by NEPARC (2011) and a species of Regional Concern (Therres 1999). This species thrives in areas with a mosaic of upland habitat mixed with a diversity of wetland types. It often travels between wetland habitats using the intervening upland areas (Beaudry et.al. 2009). They nest in open habitats with loose, well-drained soils including human influenced areas such as pastures, sand and gravel pits and powerline ROW. They are long-lived, slow to mature and have low fecundity rates. These factors, coupled with susceptibility to traffic mortality and habitats that overlap with dense human development, have led to decline in populations. Hibernation typically occurs in the muddy substrate at the bottom of open water wetlands.



Spotted Turtle (Clemmys guttata) State Threatened

The Spotted turtle is considered Severe conservation concern by NEPARC (2011) and of Regional Concern by Therres (1999). Its range in New Hampshire is shown in Figure 6.4.3-1. Like the Blanding's turtle, the Spotted turtle requires a mixture of diverse wetland types interspersed with relatively undisturbed upland habitat. They often travel between wetlands using this upland habitat and are subject to mortality from automotive traffic while crossing roads (Beaudry etal. 2009). Similar to the Blanding's turtle, they nest in open areas, grasslands, edges of woodland and human influenced habitats. Hibernation occurs in a wide variety of wetlands including cattail marshes, peatlands and vernal pools (Litzgus et. al., 1999).





Wood Turtle (Glyptemys insculpta) Special Concern

The Wood turtle's range in New Hampshire includes most of the entire length of the proposed Project ROW (Figure 6.4.3-1). This species is considered a Severe conservation concern by NEPARC (2011). The Wood turtle differs from the above two species in that their main habitat consists of rivers and streams with hard (sand-gravel) substrate and the surrounding upland



forests, shrubland and open areas. Most of their upland movements are within approximately 300m of rivers or streams (Kaufmann 1992; Arvisais et al. 2004). Though this species used to be very common, late maturation, low fecundity, habitat loss, and pressure from development have all led to declines in Wood turtle populations across the northeast.

6.4.3.a Project Impact Summary

Normandeau suggests that potential impacts to turtles of concern could occur from the Project in the form of adults or nests being killed by construction activities or if nesting females are harassed during egg laying. Normandeau concluded that the existing ROW offered only low quality habitat for nesting turtles.

6.4.3.b Agency Issues

NHFG indicated that wetland impacts could affect turtles in the active or inactive season depending on the type of wetland impacted. In "turtle-sensitive areas" upland work will be most impacting during April-October (Mike Marchand, NHFG, 9/3/15. Mitigation Plan, p55). However, there has been no commitment by NPT to impose seasonal restrictions on construction activities to mitigate impacts to threatened and endangered turtle species.

6.4.3.c AE Assessment

6.4.3.c.i Methodology Review

The focus of Normandeau's turtle assessment was on turtle nesting habitat within the ROW. Normandeau conducted a GIS model which identified open habitats with well-drained soils within 1000' of open water wetlands to identify areas of the ROW that may be used for turtle nesting. This was followed by selective field inventory. The GIS model and field assessment focus only on suitability of the existing ROW for turtle nesting. From this analysis, Normandeau concluded that the ROW offered only "low quality" nesting habitat.

Normandeau's assessment did not analyze direct impacts to Blanding's and Spotted turtles in open water wetlands, a habitat that is preferably used by these species. Normandeau's assessment did not examine the effects that the Project could have on the Wood turtle other than using the ROW as nesting habitat.



In addition, there has been no analysis on the square footage of proposed permanent or temporary impacts in relation to endangered and threatened turtle habitat.

6.4.3.c.ii Impact Assessment

Normandeau acknowledges that impacts to Blanding's, Spotted and Wood turtles can occur from Project construction activities. These impacts could occur as habitat loss from permanent impacts or as direct impacts to individuals or nests.

No assessment was conducted by Normandeau on the amount of habitat loss due to the Project. AE conducted an analysis of the amount of permanent impacts to suitable wetland habitat within the range of the Blanding's and Spotted turtles. This analysis indicates that these impacts would not result in a significant amount of habitat loss for these species.

In order to minimize direct impacts to individuals or nests during construction, Normandeau suggests implementing BMPs and imposing seasonal restrictions on construction. Each of these measures is discussed below.

The BMPs include minimizing the footprint of disturbance, excluding turtles from active construction zones and educating construction personnel about turtle protection. As mentioned in Section 6.4.2 (Snakes), excluding adult individuals from the construction area, if conducted correctly, can reduce mortality of this species during construction. As part of this process, Normandeau has proposed to "conduct field surveys prior to construction for nests, hatchlings and adults." Conducting field surveys for turtle nests is not a realistic undertaking because undisturbed nests are very difficult to locate. In addition, the strategy of excluding adults will not likely be effective for construction within wetlands (especially open water wetlands), unless a rigorous trapping effort is undertaken. No specifics have been presented concerning range, timing, or methods for this procedure, and so final determination on the effectiveness of this mitigation strategy cannot be determined.

There have also been no details presented on the construction timing restrictions. Ms. Barnum's testimony states that the "Project's impact [on reptiles] will be mitigated by implementing BMPs and construction timing restrictions..." However, the Mitigation Report (Appendix B) mentions that no seasonal restrictions are required "if avoidance measures are followed". It is unclear,



therefore, if seasonal restrictions for construction and maintenance will take place, or if NPT will rely only on BMPs. Since NPT has not committed to either of these measures, assessing the degree of impacts to these listed species is difficult.

In addition to using BMP's and implementing seasonal construction limitations, NPT has suggested a commitment to "Create or protect suitable [turtle] nesting habitat" as outlined in their Mitigation Report. When asked if any mitigation parcels were obtained with the goal of creating or protecting habitat, Normandeau biologists responded in the negative (Lee Carbonneau, personal communication 9-22-16). In addition to purchasing parcels for mitigation, there should be a consideration of enhancing nesting habitat within the ROW after construction. Since suitable nesting habitat can be uncommon, creation and maintenance of turtle nesting habitat within the ROW may mitigate potential impacts on these species. The creation of turtle nesting habitat has been well-established in the scientific literature (Willey and Jones 2014; Beaudry et al. 2010).

6.4.3.c.iii Conclusions

NPT has failed to provide consistent information on avoidance, minimization and mitigation measures for these RTE turtle species. In addition, no details about these plans, including specific BMPs, seasonal restrictions and mitigation measures (such as creating nesting habitat) have been presented or formally committed to by NPT. Lacking this information, AE is unable to determine if the Project will have an unreasonable adverse impact on these species.

6.5 RTE Plants

Rare, threatened or endangered plants are protected under the NH Native Plant Protection Act (RSA 217-A). The New Hampshire Natural Heritage Bureau maintains a list of all plants that are considered rare, threatened or endangered. NHB also maintains a list of all plant species that are ranked as "State Watch" or "Indeterminate" species. State Watch species are those that are uncommon and "vulnerable to becoming threatened." Indeterminate species are those that are under review for listing but whose status, rarity, or taxonomy are not clearly understood.

In this section, the assessment of Normandeau's rare plant methodology as presented in the RTE Report is presented, followed by an assessment of impacts to each RTE plant species. The State Watch and Indeterminate species are considered as a group.



6.5.1 Rare Plant Methodology

6.5.1.a AE Methodology Assessment

As presented in the RTE Report, Normandeau's methodology for conducting the rare plant inventory consisted of targeted surveys along the proposed Project route. Surveys sites were selected by examining known rare plant occurrences within 1 mile of the proposed ROW and determining if those species would likely be found in the ROW. Each species was given a survey priority rank of High, Medium or Low based on habitat characteristics and distance from the proposed route. Species that were ranked "Low" in this process were not inventoried for, while species ranked "Medium" or "High" were inventoried for. Additional habitat areas that may support rare plants were also inventoried. These included Cliffs, Peatlands, Pine Barrens, Talus slopes, areas of calcareous bedrock and sandplains.

When a species specific inventory was performed for "Medium" or "High" ranked species, the inventory was conducted for that particular species, whereas other rare species were only "considered" during the field inventory. A full rare plant survey was not, therefore, conducted even in areas that received a field visit.

Normandeau did not record (or did not make available) a map of where RTE inventories were conducted and where they were not conducted. Normandeau biologists have speculated that approximately 40-50% of the proposed ROW was inventoried (Dennis Magee, personal communication 9-22-16).

The approach to RTE surveys taken by Normandeau relies on three faulty assumptions. First, that rare plants will only occur near other, known populations of that species. Second, that the mapping of rare plants is complete and can be the basis of identifying search areas. Third, that rare species occurring nearby are the only rare species likely to be found in the Project area.

According to documents supplied by Normandeau, nearly ½ of the towns along the ROW were not inventoried for RTE plants. The assumption made is that the ROW through these towns is not likely to support RTE plants and an inventory is therefore not necessary. In order to test the validity of this assumption, AE conducted three days of field work along the proposed ROW in five of the towns where inventories were not conducted. A total of six RTE species (five



Indeterminate and one Watch species) were discovered during this inventory of approximately five miles of transmission line. These species are listed in Table 6.5.1-1 and all data has been submitted to the NHB. In addition to these, it is unknown how many other RTE species Normandeau failed to document along the transmission line.

Latin Name	State Rank
Bartonia virginica	Indeterminate
Lobelia spicata var. hirtella	Indeterminate
Juncus anthelatus	Indeterminate
Elymus trachycaulus spp. trachycaulus	Indeterminate
Aristida basirmea	Indeterminate
Utricularia minor	State Watch

Table 6.5.1-1 RTE Plant Spp. Submitted to NHB.

Normandeau distinguishes between two types of impacts from the Project: permanent and temporary (RTE Report, p 48). Permanent impacts are associated with permanent structures, temporary impacts with work pad and construction areas. These, however, are descriptions of the construction activities and not necessarily descriptive of the potential impacts to rare plants.

The majority of construction impacts are associated with construction pad disturbance areas and considered "temporary impacts." According to John Kayser's prefiled direct testimony, a typical installation of a construction pad consists of the following steps: 1) removal of vegetation; 2) removal and stockpiling of topsoil; and, 3) installation of filter fabric and rock base. Some of these areas will also require grading. Post-construction, the fabric and rock will be removed and native topsoil replaced. No information has been presented describing which construction pads will require all of these steps and which (if any) will not. Given the typical situation described above, and lacking minimization measures, one can only assume that a construction area or work pad will result in direct, permanent impacts to the rare plants that currently occupy that area.



6.5.1.b Conclusions

AE concludes that the RTE methodology employed by Normandeau was insufficient and did not map all of the RTE plants occurring in the Project area. In particular, less than ½ of the proposed ROW was inventoried for rare plants. In addition, many of the areas that were inventoried received only a partial (species specific) inventory. Given this significant lack of data, there is not enough information to conclude that the Project will not have an unreasonable adverse impact on rare, threatened and endangered plants.

AE also disagrees with the categorization of impacts. Based on the description of work activities provided, impacts to rare plants categorized as "temporary" in the Normandeau RTE Report will likely result in permanent impacts to rare plants and should be considered as such.

6.5.2 Butterfly Milkweed

Butterfly milkweed (*Asclepia tuberosa*) is a State endangered species known from 7 sites in New Hampshire, only two of which are recent. This perennial plant prefers dry, sandy or gravelly soil and full sun exposure. The bright orange flowers often attract Monarch butterflies, hummingbirds and other pollinators. This plant is easily grown from seed and is often used in cultivated gardens and restoration plantings.

6.5.2.a Project Impact Summary

As presented in the RTE Report, one individual of this species was discovered along the proposed transmission line during the rare plant inventory. A proposed work pad is expected to impact this population resulting in the eradication of this single plant. Normandeau has claimed that this plant originated from a planting conducted for Karner Blue butterfly restoration and is therefore not of native origin, though no evidence is provided to support this claim. NHB has not been able to confirm the validity of this claim and are treating the plant as a native species (Amy Lamb, personal communication, 12-5-2016).

6.5.2.b AE Assessment

6.5.2.b.i Methodology Review

Normandeau found this population during targeted surveys based on known occurrences.



6.5.2.b.ii Impact Assessment

The location of this plant and the proposed disturbance is shown in Figure 6.5.2-1. As can be seen in this Figure, the plant is located on the edge of the disturbance area and, according to data provided by Normandeau, the impacts are the result of clearing around the work pad. During Project meetings, NHB had requested that the disturbance area be configured to avoid this plant (Amy Lamb, phone conversation with Lee Carbonneau, 5-11-2016). Seasonal restrictions, construction matting, or reconfiguration of the disturbed area are all standard techniques that could avoid or minimize impacts to this plant. However, Normandeau has proposed no such measures.

Figure 6.5.2-1. Population of Butterfly Milkweed (Asclepia tuberosa). From RTE Report, Appendix D.



6.5.2.b.iii Conclusions

One population of this endangered species has been identified within the Project area and would be eliminated by Project disturbance. The Applicant has failed to provide materials showing that any steps were taken to avoid or minimize impacts. In addition, the Applicant fails to provide a mitigation plan that provides adequate measures to mitigate impacts to this endangered species. Given these issues, there is not enough information to conclude that the Project will not have an unreasonable adverse impact on this species.

6.5.3 Blunt-leaved Milkweed

Blunt-leaved milkweed (*Asclepias amplexicaulis*) is a state threatened species in New Hampshire with seven recent and seven historical populations known, mostly in the southern part of the state. It prefers well-drained soils in meadows, forest edges and clearings and full or nearly full sun exposure. Like all milkweeds, this is a perennial plant.

6.5.3.a Project Impact Summary

As presented in the RTE Report, the inventories for this species within the Project area documented two populations, one in Pembroke and one in Concord. There are no direct impacts to either of these populations proposed. The population in Pembroke is approximately 6' away from a proposed access road. The population in Concord is approximately 3' from a proposed access road.

6.5.3.b AE Assessment

6.5.3.b.i Methodology Review

Normandeau found these populations during targeted surveys based on known occurrences.

6.5.3.b.ii Impact Assessment

Both of these populations are in very close proximity to proposed disturbance from the construction and maintenance of an access road. Given the close proximity of the construction area, inadvertent impacts to these plants are possible. Employing BMPs during construction, including the establishment of a well flagged construction limit and exclusion zone around these



populations, as well as use of a botanically knowledgeable environmental compliance monitor will likely minimize the potential for disturbance.

6.5.3.b.iii Conclusions

Two populations of this species were found in the Project area. The Project has been designed to avoid impacts to this species. Given the close proximity of the construction area to these populations, inadvertent impacts to these plants are possible. Employing effective construction BMPs, as well as use of an environmental compliance monitor will likely minimize the potential for disturbance.

6.5.4 Spiked Needle Grass

Spiked needle grass (*Aristida longespica*) is a State endangered species. Previous to the rare plant inventories conducted for the Project, this species was known from only three recent and six historic locations in New Hampshire, mostly in the southern part of the state. This small grass is an annual that occurs on dry, sandy soils and moderately disturbed areas in clearings, meadows and forest edges. It generally cannot become established if there is dense (perennial) vegetation. A moderate level of disturbance is therefore required for this species to become established and thrive.

6.5.4.a Project Impact Summary

According to Table 12a in the RTE Report, there are three populations that will be impacted by the Project. The first population is in Concord, consisting of approximately 498 individual plants, all of which will be impacted by the Project. The second population in Concord, which consists of >21,000 plants, will have impacts consisting 8% of the plants. The third population (spanning the Concord/Pembroke town line) will impact 28% of the 476 plants present.

6.5.4.b AE Assessment

6.5.4.b.i Methodology Review

Normandeau conducted targeted surveys based on known occurrences.



6.5.4.b.ii Impact Assessment

Determining impacts to individuals of this species from the Project is complicated by the fact that this species is an annual and requires moderately disturbed habitats. Because this species is an annual, individuals found in a particular area one year, may not be in that area the next year, or occur at the same abundance. Accurately calculating impacts to individual plants from proposed Project construction may therefore not be feasible. In addition, potential impacts to an individual are potentially much less detrimental to the long-term viability of a population than impacts would be to a perennial species.

Figure 6.5.4-1. Concord Pop. of Spiked Needle Grass (Aristida longespica). From RTE Report, App. D.

A more accurate method to evaluate impacts for this species may be to assess impacts to habitat. The current populations of this species in the ROW are known to exist in moderately disturbed areas with open, sandy soil and along the margins of sandy access roads. Therefore, in areas where impacts to a patch are proposed along an existing access road, avoidance of disturbance may be less of a priority, because this activity would be maintaining the preferred habitat.



For disturbance resulting from construction work pads (the majority of the proposed disturbance to this species), the degree of impact has not been identified, so the effect on this species is unknown. According to John Kayser's prefiled direct testimony, a typical installation of a construction work pad consists of removal of vegetation and extensive earthwork.

The largest population of this species in the state is the population found in Concord consisting of >21,000 individual plants. This population alone contains the vast majority of all of the plants known to occur in New Hampshire. This site is shown in Figure 6.5.4-1 (red outline). Impacts to each of the three populations will consist of loss of individuals and short-term loss of habitat.

NPT has proposed no avoidance, minimization or mitigation plan to address the impacts to this species, even though NHB has requested such avoidance (Amy Lamb, Project meeting notes, 6-15-2015). Impact could also be partially mitigated for by a variety of techniques such as seed collection prior to construction, establishment of conserved areas, or re-seeding of appropriate habitat.

Impacts to the habitat of this species are not likely to be adverse long-term. It is possible that the Project will result in the creation of suitable habitat for this species following construction. In addition, long-term maintenance of the ROW will likely continue to provide some habitat for this species into the future.

6.5.4.b.iii Conclusions

Three populations of this species were found that will be impacted by the Project, including the largest in the state. The Applicant has not provided an alternatives analysis within the application materials showing that any steps were taken to avoid or minimize or impacts. In addition, the Applicant fails to provide a mitigation plan that provides adequate measures to mitigate impacts to this endangered species. Without these measures, the Project will likely have an unreasonable adverse impact on this species.

6.5.5 Licorice Goldenrod

Licorice goldenrod (*Solidago odora*), State Endangered, is found in southern New Hampshire and known from eight recent and 13 historic sites. This perennial species typically occupies dry, sandy sites that are somewhat disturbed and is recognizable by its anise-scented leaves. Like



many species of goldenrod, licorice goldenrod has a short, stout underground stem (called a caudex).

6.5.5.a Project Impact Summary

One large population of licorice goldenrod was documented during the rare plant survey along the ROW in the town of Pembroke. This population consists of 15 different patches, seven of which are proposed to be impacted (Figure 6.5.5-1). Table 12b of the RTE Report summarizes the proposed impacts to these patches and states that 13% of the area of this population will be impacted, comprising 10-18% of the total number of plants.

Figure 6.5.5-1 Licorice Goldenrod (Solidago odora). From RTE Report, App. D.

6.5.5.b AE Assessment

6.5.5.b.i Methodology Review

Normandeau conducted targeted field surveys for this species based on known occurrences within the range of this species. Field work conducted by AE also documented additional licorice goldenrod plants that were not mapped during the Normandeau survey. These plants were found north of SO14 but were not in an area with proposed Project impacts.



6.5.5.b.ii Impact Assessment

As mentioned above, Table 12b of the RTE Report states that 10-18% of the population will be impacted by the Project. Presenting impacts as a range is unique in this table and arises from the fact that accurate population counts were not conducted. Table 12a shows that patches SO10 and SO14 each have "100-500" specimens. Given such a wide range in numbers of individuals, it is difficult to assess the impacts that the proposed Project would have on the overall population and to compare the population to others in the state. Lacking accurate population counts, impacts should be evaluated using the higher number in the range (i.e. 500 plants in patches SO10 and SO14). Doing so, this population appears to be among the largest in the state.

As indicated by its absence in Table 12a, no impacts are identified for patch SO11. Analysis of proposed impacts has revealed that this patch is approximately 2' from the construction activities of the proposed access road. Given the close proximity of the construction area, inadvertent impacts to this patch are possible. Best management practices during construction, including the establishment of a well flagged construction limit and exclusion zone around patch SO11, as well as use of a botanically knowledgeable environmental compliance monitor will likely eliminate potential disturbance.

Field work conducted by AE in the summer of 2016 indicated that approximately 75% of the area depicted as patch SO12 has been filled with gravel and converted to an equipment storage area subsequent to the field surveys conducted by Normandeau. While not a Project impact, it nonetheless represents a significant taking of this endangered species. Previous to this disturbance, 16% of this patch was calculated to be impacted. Since disturbance, the actual impacts would be in the 50-70% range.

As mentioned in Section 6.5.1 of this report, "temporary" construction impacts have the potential to result in permanent impacts to individual plants. In the case of licorice goldenrod, which has a caudex (a short, underground stem), it is conceivable that some re-sprouting of individuals will occur in a post-construction environment, depending on the nature of the construction impact. However, specific details related to temporary construction impacts have not been provided, such as the timing and degree of impact. Lacking this basic information, conclusions about colonization of this species post-construction cannot be made with any degree of certainty.



6.5.5.b.iii Conclusions

A population of licorice goldenrod was identified in Pembroke and is likely one of the larger populations of this species in the state. Eighteen percent of the individuals in this population are proposed to be impacted by the Project. The Applicant has not provided an alternatives analysis within the application materials showing that any steps were taken to avoid or minimize impacts. In addition, the Applicant fails to provide a mitigation plan that provides adequate measures to mitigate impacts to this rare species, specifically, development of construction BMPs and/or a transplantation plan for individuals to be taken. Without these measures, the Project will likely have an unreasonable adverse impact on this species.

6.5.6 Wild Lupine

Wild lupine (*Lupinus perennis*) is a state threatened perennial species which prefers sandy, well drained soils and ample sun exposure. It is known from 12 historic and 17 recent sites in New Hampshire, mostly in the southern part of the state. This species spreads by seeds and by underground stems (rhizomes) and was likely historically more abundant when fire was part of the Pine Barrens ecosystem. This species provides important habitat for both the Karner Blue butterfly and the Frosted Elfin. The Karner Blue butterfly assessment is presented in Appendix A and Frosted Elfin assessment in Section 6.3.2.

6.5.6.a Project Impact Summary

As presented in the RTE Report, Normandeau's inventory documented two populations of this species in the Project area, one in Concord and one in Pembroke. The Concord population consists of 15 different patches comprising a total of 529 individuals. The Pembroke population consists of a single patch comprising a total of 143 plants. Normandeau estimates that 62% (330 plants) of the Concord population and 17% (24 plants) of the Pembroke population will be impacted by the Project.

6.5.6.b AE Assessment

6.5.6.b.i Methodology Review

Normandeau conducted targeted surveys based upon known occurrences.



6.5.6.b.ii Impact Assessment

As mentioned above, there are proposed impacts to both of the populations of this species found in the Project ROW. The proposed impacts to the Pembroke population are related to the construction of an access road. As can be seen in Figure 6.5.6-1, the lupine patch (outlined in red) does not extend across the ROW. The new proposed access road cuts through the heart of the lupine population and does not appear to use an existing access road (visible in the background image of Figure 6.5.6-1). Re-routing the Project access road to completely avoid this patch of lupine appears to be a practicable alternative. However, no avoidance or minimization measures were presented in the application materials for this site.

The lupine population in Pembroke is located on property owned and managed by the NH National Guard, who have fenced the lupine population to protect it from ATV traffic. According to the manager of this site, Arin Mills, complete avoidance of the population by the Project would be preferable (Arin Mills, personal communication 11-21-16).

The impacts proposed to the Concord population of lupine include impacts from access roads, construction work areas and the placement of towers. During technical sessions, Ms. Carbonneau stated that the towers could not be moved, but that the location of work paths and access roads had been relocated to avoid impacts to the lupine (Lee Carbonneau, personal communication, 9-22-16). These avoidance measures, however, are not readily apparent when examining the plant locations and proposed layout (Figure 6.5.6-2). For example, the access road between towers bisects three lupine patches, C-LP12, C-LP13 and C-LP14A when there appears to be space for avoidance. NPT has offered no explanation or justification for the lack of avoidance measures performed in this location.



Figure 6.5.6-1. Lupine in Pembroke. From RTE Report, App. D.

Proposed tower placement and associated construction work areas would also impact lupine populations at this site. Tower structure (#3132-147) and associated work area at the C-LP12 location in Figure 6.5.6-2 would result in the taking of 80% of the plants in this patch. Analysis of this site plan and RTE plant populations indicates that there is an area directly to the north of the proposed work area and tower location (to the left in Figure 6.5.6-2) that does not harbor the threatened lupine. Movement of the tower locations to the north could result in little or no impacts to the lupine. NPT has offered no explanation or justification for the lack of avoidance measures performed in this location, even though movement of the tower appears to be possible. The distance from tower #3132-147 to the corner structure is approximately 405 feet. The



distance from the corner tower to the next line tower is approximately 570 feet. In order to move structure #3132-147 out of the lupine patch, the span would need to increase to 520 feet. Given the spacing to the next tower in the ROW and the relatively flat topography present, it is unclear why this avoidance measure was not taken.

Figure 6.5.6-2. Wild Lupine in Concord.

The work area associated with the corner tower (structure #3132-148) at this site will impact 7 different patches of lupine. Ms. Carbonneau has indicated that this structure could not be moved because it is located on the corner of the ROW. The shape and dimensions of the work area at this location appear to be standardized and roughly centered on the tower locations. Elsewhere in the Project, work areas were shifted to avoid wetland resources. It appears that no effort was made to shift the work area at this location in order to avoid or minimize impacts to the lupine patches. NPT has offered no explanation or justification for the lack of avoidance measures performed in this location.

As discussed in Section 6.5.1 of this Report, construction impacts categorized as "temporary" have the potential to result in permanent impacts to individual plants. Normandeau's botanist, Mr



Magee believes that lupine will readily become re-established at the site post-construction and that the impacts will be temporary. (Dennis Magee, personal communication 9/22/2016) As mentioned above, this particular species can spread by underground stems (rhizomes). Depending on the nature and degree of impact in the temporary work areas, colonization of this species post-construction is a possibility. Normandeau has suggested that certain mitigation measures could take place, but none have been developed or committed to by NPT. Lacking these details or commitments, one can only assume that the disturbances related to these impacts are "typical": the vegetation and topsoil would be removed, fabric would be placed over the site followed by rock and/or gravel fill. Post construction, the rock and fabric would be removed and the soil replaced (John Kayser, pre-filed direct testimony). Under these conditions, it is highly unlikely that lupine would become re-established from the original rhizomes.

The standard approach to dealing with potential impacts to sensitive resources is a sequential process of avoidance, minimization and mitigation. All practicable steps are first taken to avoid the resource. If not all impacts can be avoided, steps should be taken to minimize impacts. If, after these steps, the impacts still are significant, mitigation should be considered. In the case of impacts to the wild lupine, it appears that NPT has skipped the "avoid and minimize" steps in the process, and is attempting to mitigate for avoidable impacts.

An assessment of this mitigation package is presented with the Karner Blue butterfly assessment in Appendix A.

6.5.6.b.iii Conclusions

The proposed impacts to this RTE species in the ROW are 62% in the Concord population and 17% in the Pembroke population. The SEC considers the "significance of the affected [resource]" when assessing potential impacts (Site 301.14 e). Since the wild lupine is a state threatened plant, provides necessary habitat for a state and federally endangered insect and a state endangered insect, this level of taking should be considered of high significance. AE's analysis of the plant population boundaries and layout of the proposed development has concluded that no obvious avoidance or minimization measures have been undertaken by NPT. The degree of impacts combined with the apparent lack of avoidance and minimization lead AE to conclude that the Project would have an unreasonable adverse impact on this significant resource.



6.5.7 Small Whorled Pogonia

The Small Whorled Pogonia (*Isotria medeoloides*) is a small orchid that is a globally threatened species with most of the world's population occurring in New Hampshire and Maine (USFWS 1992). It is often considered to be the rarest orchid in temperate North America (Mehrhoff 1983). In New Hampshire, it has been documented in all counties except Coos, Sullivan and Cheshire. It grows in young deciduous forests with abundant leaf-litter, often near streams. Sperduto and Congalton (1996) developed a model to predict habitat for this species, which includes soils with a restrictive layer, slopes between 11 and 17 percent and a deciduous or mixed forest type.

6.5.7.a Project Impact Summary

Normandeau did not document this species within the Project area.

6.5.7.b AE Assessment

6.5.7.b.i Methodology Review

As presented in the RTE Report, Normandeau obtained the known locations of small whorled pogonia within five miles of Project area. In these areas, the Sperduto and Congalton (1996) model was used to predict habitat and target field surveys for this species. By limiting their search area to within five miles of only known occurrences, Normandeau presumably only inventoried the southern sections of the proposed line in the towns of Deerfield, Allenstown and Pembroke, where known occurrences have been documented.

Normandeau states that a five mile search area was chosen because this represents the likely dispersal distance of seeds from the source (RTE Report, p5). In fact, orchid seeds are very small, wind dispersed seeds that have been known to travel hundreds of miles under the right conditions, though most seeds do fall near the parent plant (Montgomery 2014; Jersakova and Malinova 2007). Utilizing the non-scientifically based five mile search area, Normandeau fails to inventory all appropriate habitats within the known range of the species within the Project area. At a minimum, this would include inventorying all habitat areas south of the town of Campton. By limiting their search area, it appears that Normandeau inventoried only ¹/₃ of the ROW for this species within its range.



In the limited areas that were inventoried, the field surveys were to extend 50 feet from the edge of where vegetation cutting is proposed (Normandeau 2011). This was proposed because forest clearing in the vicinity of a population will likely have impacts on the habitat and individuals growing nearby. Since Normandeau did not have permission to inventory outside the existing ROW, landowner permission was to be obtained in order to inventory these areas. However, no landowner permission was ever obtained for these inventories, and these surveys were not conducted (Lee Carbonneau, personal communication 9/22/16).

6.5.7.b.ii Conclusions

Normandeau did not document this species in areas targeted for field surveys. Based on the known range of this species, Normandeau failed to conduct an adequate inventory to confirm its presence or absence in the Project area. Lacking a sufficient inventory, it is impossible to conclude that the Project would not have an unreasonable adverse impact on this species.

6.5.8 State Watch and Indeterminate Species

State Watch (SW) species are plant species that are, for a variety of reasons, vulnerable to becoming threatened but have not reached the rarity threshold for being designated as threatened. Indeterminate (IND) species are plant species that are under review for SW, threatened, or endangered designation but whose status, rarity, nativity or nomenclature are not clearly understood (NHB 2010).

The State Watch (SW) and Indeterminate (IND) species are considered as a group in this section.

6.5.8.a AE Assessment

6.5.8.a.i Project Impact Summary

Normandeau conducted targeted surveys based upon known occurrences. It appears that adequate surveys were conducted for these species within their ranges.

Some SW and IND species documented in the Project area thrive in forested habitats. These species were typically documented in the northern section of new ROW of the Project area. Indirect impacts in the form of ROW clearing and maintenance constitute a significant change of habitat for these forest species and will likely have an adverse impact on the local populations.



However, in all instances, the local population represents a small percentage of the species present in the state. These species are presented in Table 6.8.8-1.

The Direct and Indirect Impacts are taken from Normandeau's RTE Report. The "Significance" column is AE's assessment on whether the proposed local population impacts would constitute an unreasonable adverse impact on these species. The "Justification" column provides the reasoning behind each "Significance" determination.

Some SW and IND species documented in the Project area tolerate or require the open habitat created by the ROW maintenance. In these circumstances, the indirect impacts of ROW clearing and maintenance are not a substantial impact to the local populations long-term. These species are presented in Table 6.5.8-2.

Given the potential cumulative impacts of the Project on local populations of swamp buttercup, AE reviewed the status of this species and likely abundance in the state. Research reveals that there is some dispute regarding the status of this plant as its own species. Some authors (Gleason and Cronquist 1991; Gilman 2015) treat this as a variety of the common Ranunculus hispidus. For this reason, the information on this plant's distribution and abundance in the state may be lacking. Flora Conservanda (2012) follows Haines (2011) methodology, which recognizes this as its own species, but does not list it as a conservation concern. For this reason, AE believes that this species is likely under-reported and more abundant than current records would indicate.



Population	Direct Impacts*	Indirect Impacts	Unreasonable Adverse	Justification
Wild Leek (Clarksville & Pittsburg)	28%	45%	Ν	Large population, most of which is outside of the proposed ROW. Local population will likely persist.
Wild Leek (Stewartstown)	0	100%	Ν	Local patch will be completely eradicated, but this local patch size is very small compared to overall population numbers in the state.
Canada Violet (Dixville & Stewartstown)	5%	13%	Ν	Small amount of impact to local population. Most of population occurs outside of ROW and will not be impacted.
Northern Wild Licorice (Dixville & Stewartstown)	68%	87%	Ν	Significant impacts to local patch, but species is likely under-reported with appx 50-80 occurrences statewide.
Goldie's Fern (Dixville)	1%	0.5%	Ν	Small amount of impact to local population. Most of population outside of ROW and will not be impacted.
Pale Jewelweed (Dixville)	5%	13%	Ν	Small amount of impact to local population. Most of population outside of ROW and will not be impacted.
Squirrel Corn (Dixville)	5%	12%	Ν	Small amount of impact to local population. Most of population outside of ROW and will not be impacted.
Millet Grass (Pittsburg & Clarksville)	33%	92%	Ν	Significant change in habitat, but some individuals may persist. Local patch size is small compared to overall population numbers in the state.
Millet Grass (Stewartstown & Dixville)	9%	34%	N	Largest population documented in ROW, but only moderate impacts, some individuals may persist. Local patch size is small compared to overall population numbers in the state.
Millet Grass (Dixville)	14%	36%	Ν	Moderate amount of impact to local population. Local patch size is small compared to overall population numbers in the state.

Table 6.5.8-1. State Watch and Indeterminate Species- forested habitats.

* Direct impacts shown are Temporary + Permanent Impacts, rounded to the nearest whole percent.



Population	Direct Impacts*	Indirect Impacts	Unreasonable Adverse	Justification		
White-tinged Sedge (Stewartstown)	100%	100%	Ν	Local patch will be completely eradicated, but this patch size is very small compared to overall population numbers in the state.		
Swamp Buttercup (Millsfield)	8%	83%	Ν	Small direct impact to local population; population will likely persist.		
Swamp Buttercup (Dixville)	5%	2%	Ν	Small amount of impact to local population; population will likely persist.		
Swamp Buttercup (Dixville)	40%	65%	Ν	Moderate impacts to local patch, but this patch size is small compared to overall population numbers in the state.		
Swamp Buttercup (Clarksville)	13%	78%	Ν	Small amount of direct impact to this local patch; population will likely persist.		
Swamp Buttercup (Stewartstown)	17%	97%	Ν	Small amount of direct impact to this local population; population will likely persist.		
Swamp Buttercup (Stewartstown)	13%	65%	Ν	Small amount of direct impact to this local population; population will likely persist.		
Swamp Buttercup(Clarksville & Pittsburg)	14%	31%	Ν	Small amount of direct impact to this local population; population will likely persist.		
Narrowleaf Sedge (Lancaster)	20%	7%	Ν	Small amount of direct and indirect impact to local population; population will likely persist.		
Branching Needle Grass (Canterbury)	50%	6%	Ν	All of the direct impacts in this case are temporary. This species thrives on moderate disturbance; long- term impacts are therefore not expected to be adverse.		
Branching Needle Grass (Concord)	33%	-	Ν	All of the direct impacts in this case are temporary. This species thrives on moderate disturbance; long- term impacts are therefore not expected to be adverse.		
Branching Needle Grass (Pembroke)	5%	-	Ν	Small amount of impact to this local population; population will likely persist.		
Fall Witch-grass (Concord)	40%	-	Ν	All of the direct impacts in this case are temporary. This species thrives on moderate disturbance; long- term impacts are therefore not expected to be adverse.		
Fall Witch-grass (Pembroke)	31%	0.2%	Ν	All of the direct impacts in this case are temporary. This species thrives on moderate disturbance; long- term impacts are therefore not expected to be adverse.		
Toothed White-topped Aster (Concord)	16%	-	Ν	Small amount of impact (2 individuals) to this local population; this patch size is very small compared to overall population numbers in the state.		
* Direct impacts shown are Temporary + Permanent Impacts, rounded to the nearest whole percent.						

Table 6.5.8-2. State Watch and Indeterminate Species- non-forested habitats

Arrowwood Environmental

For most species shown in the above tables, the amount of proposed impacts would not threaten the entire local population. For the one case where the entire local population is going to be impacted (white-tinged sedge) this patch is relatively small. In addition, populations such as the branching needle grass and fall witch grass which show a higher percentage of impacts are disturbance-dependent species and are likely to benefit from the habitat created by the construction.

6.5.8.a.ii Conclusions

Normandeau documented 13 State Watch and Indeterminate species that would be impacted by the Project. The Project will have both direct and indirect impacts to the local populations of these species. However, given their relative lack of rarity or indeterminate status, it is unlikely that these local impacts would rise to the level of being unreasonable.



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Appendix A: Karner Blue Butterfly



Environmental Assessment of the Northern Pass Transmission Project Karner Blue butterfly (*Lycaeides melissa samuelis*)

By: Michael Amaral

EXECUTIVE SUMMARY

Among the 9 federally- and 29 state-listed wildlife species that have the potential to occur in the entire Northern Pass project study area, the project "May affect and is likely to adversely affect" (DEIS Supplement 2015, p. 16) only the Karner Blue butterfly. Indeed, the Karner Blue butterfly appears to be the only federally listed, threatened or endangered species where many individuals are likely to be killed as a result of construction of the NPTP.

The application filed in support of the Northern Pass Transmission Project (NPTP) by Eversource demonstrates adequate field assessments for occurrence of Karner Blue butterflies and wild lupine plants in the Concord Pine Barren's reach of the NPTP right-of way. There was adequate communication and coordination between Eversource's representatives and state and federal natural resource agencies. There is documentation among the parties that adverse effects from the construction of the project can be offset through compensatory mitigation, particularly conservation parcel acquisition and implementation of a NPTP ROW management agreement. While this reviewer concurs with that position, compensatory mitigation should follow in sequence **after** efforts to avoid and minimize effects.

The details of how compensatory mitigation would be implemented, at what level of support and over what time period are essential elements that are currently unavailable. An agreement that stipulates how the Regional Drive mitigation parcel and the ROW through the Main Site will be restored and managed should be established before a certificate is granted. As there is little evidence that Eversource made a concerted effort to avoid and minimize impacts to the KBB and wild lupine at the Main Site, and the compensatory mitigation plan and ROW management agreement has not been completed, these impacts are therefore unreasonable adverse effects.

INTRODUCTION

The objective of the following review is to examine whether construction and operation of the proposed Northern Pass Transmission Project (NPTP) will have an unreasonable adverse effect on the natural environment and the natural community that includes and supports the federal and state endangered Karner Blue butterfly (*Lycaiedes melissa samuelis*) in the Concord Pine Barrens. Accordingly, this review focuses solely and narrowly on that small segment of the proposed NPTP right-of-way (ROW) (approximately 2 miles) that coincides with current and recent occurrences of the Karner Blue butterfly (KBB) in Concord and Pembroke, New Hampshire. This reach of the NPTP can be generally described as beginning south of the intersection of the existing Eversource ROW at Pembroke Road in Concord, and then south to the NH Army National Guard Regional Training Institute

(RTI) in Pembroke, NH.

Eversource's current transmission ROW and NPTPs proposed alignment intersect an essential habitat for the KBB and wild lupine (*Lupinus perennis*) for a length of about 800-1000 feet south of Pembroke Road in Concord. This location is often referred to as the "Main Site" (aka Praxair or Tafa Corp site) to distinguish it from other locations where KBBs occur nearby, such as the Concord Municipal Airport and the U.S. Fish and Wildlife Service (USFWS) National Wildlife Refuge easement on Chenell Drive (Figure 1). The Main Site was so-called because in the 1990's, it was the last location in the Concord Pine Barrens where the KBB was known to persist. Main Site is perhaps now a misnomer, as the KBB is more abundant on the more extensive habitat available at the Concord Municipal Airport. NH Fish and Game (NHFG) reports that KBBs have been documented at the Main Site within the Eversource-NPTP ROW annually since 2006 (NHFG 2012, H. Holman, NHFG, 2016 *in litt*.).

For the purposes of this review, "current" is considered having a documented record of species occurrence within the past 5 years and "recent" is considered having a documented record within the past 10 years. Throughout this analysis and in documents submitted to the SEC by the Applicant, wild lupine is often used as a surrogate (or indicator) for effects on the endangered butterfly. This is because the KBB requires wild lupine for successful larval development. Wild lupine is the sole source of food for KBBs in the larval (caterpillar) stage and adult females under natural conditions will only lay their eggs on or in close proximity to wild lupine plants (Pickers and Root 2008a *in* USFWS 2012). However, adult KBBs as with other species of *Lepidoptera*, also require nectar. A natural community (or a managed ex situ environment) that can sustain KBBs will contain many species of flowering plants that bloom throughout the flight season for the KBB (e.g., late May to early August), as well as wild lupine (USFWS 2003). The habitat will also contain plants of sufficient variety and structure to provide micro-habitats, where the butterflies can seek shade, warmth, and shelter from the rain or predators, as needed.

Therefore, while impact to wild lupine is a useful surrogate in evaluating effects of an activity on the KBB, it would be invalid to use as the sole indicator. In this context, it may be useful to consider the occurrences of wild lupine as primary habitat for the KBB, and occurrences of other (nearby) nectar producing plants, grasses and shrubs as secondary habitat for KBB (as noted by Tony Tur, USFWS *in litt.* May 1, 2015, Memo by S. Barnum, Normandeau).

The KBB is a habitat specialist and its distribution from New Hampshire to Minnesota is closely associated with the northern range of its larval food plant, *Lupinus perennis* (USFWS 2003). Wild lupine is an early successional species that is adapted to survive in the dry, infertile soils typical of pine barren and oak savannah habitats (USFWS 2003). In the absence of disturbance such as wildfire, surrounding vegetation may shade and over top lupine plants, and lupine will decline or die out. Accordingly, wild lupine not only tolerates some level of habitat disturbance, disturbance is usually necessary to set back plant succession. Since KBBs are dependent on lupine as a larval food plant, they also rely on disturbance to maintain and regenerate the openings within pine barren habitats where lupine can thrive. Ironically however, no life stage of KBB is immune to mortality from activities that cause

disturbance, whether from wildfire, prescribed fire, mechanical mowing or timber harvest. Because of the fragmented and urbanized nature of the remaining patches of pine barren habitat in Concord, wildfire must be suppressed. While small controlled burns are carried out at and near the Concord Airport, human mechanical management actions have replaced fire as the primary mechanism to maintain and regenerate lupine and KBB habitat in most of the Concord Pine Barrens.

Many agencies in Concord including The Nature Conservancy, City of Concord, NH Natural Heritage Bureau, NH Fish and Game, NH Army National Guard, and U.S. Fish and Wildlife Service have all cooperated in management efforts for rare and endangered pine barren species. Private companies, such as Praxair, which owns the parcel under the Eversource ROW at the Main Site, has also funded and participated in efforts to restore lupine and other pine barren species. Eversource's predecessor, PSNH routinely cooperated with NHFG and USFWS when it was periodically necessary to conduct ROW vegetation management at the Main Site. Taking management one step further, the NHFG Department has become adept at raising lupine plants from the local collection and planting of seeds. The Department annually out-plants several hundred lupine plants. NHFG has also become adept at raising Karner blue butterflies in a captive rearing facility at the Army National Guard's State Military Reservation in Concord. Between 2000-2015, over 28,000 Karner blue butterflies and over 5,000 lupine and other nectar producing species have been propagated in Concord (NHFG 2015).

The KBB recovery program enjoys broad support from and including: the state and federal agencies noted in the above paragraph, private businesses on the Heights, such as Praxair and the NH Distributors Company, the Roger Williams Park Zoo, which raises KBBs and lupine, and the Community of Concord in general. In the past two decades, more than a million dollars have been invested in the restoration of the Karner blue butterfly and the pine barren habitat in Concord on which it depends. In addition, the National Wildlife Federation and NHFG have coordinated the assistance of several thousands of Concord area children from kindergarten to high school and technical school levels, in the growing of wild lupine in their classrooms and out planting those seedlings in the Concord Pine Barrens. In 2015 alone, approximately 500 students from grades K-9 participated in the highly visible and successful "Kids for Karners" restoration program (NHFG 2015).

CRITERIA ANALYSIS

The organization of this review and subsequent analysis will follow six SEC criteria for determining whether a project will have an unreasonable adverse effect. The analyses that follow provide an independent evaluation of the Applicant's methods and conclusions about the environmental affects to the endangered KBB through assessment of 1) methods; 2) identification of rare, threatened and endangered species and natural communities; 3) identification of critical habitats; 4) adequacy of the assessment of effects on the above; 5) measures to avoid, minimize and mitigate potential adverse impacts: and 6) communication and coordination with state and federal natural resource agencies.

<u>Criterion 1. Description of how the applicant identified significant wildlife species, rare plants, rare</u> <u>natural communities, and other exemplary natural communities potentially affected by</u> <u>construction and operation of the proposed facility:</u>

Main Site wild lupine and KBB surveys: Wild lupine and other nectar species that occur in the Concord Pine Barrens and comprise essential components of habitat for the KBB are generally readily identifiable by trained botanists and the informed lay public. NPTP botanists apparently conducted lupine surveys in the vicinity of the Main Site in 2011 and 2013 (Memorandum from S. Barnum, Normandeau to Tony Tur, USFWS and Heidi Holman, NHFG April 15, 2015). A subsequent Memorandum from S. Barnum, Normandeau to Tony Tur and John Kanter (May 1, 2015) and personal communications with Heidi Holman of NHFG confirm that Praxair funded, and their employees assisted NHFG in planting lupine and other nectar plant species for the KBB on Praxair property under the Eversource ROW (the Main Site) in spring 2014. Participants at the 2015 Normandeau/Agency meeting concurred that the lupine population at the Main Site needed to be re-surveyed since it has expanded since the prior surveys. The NPTP 2015 KBB Egg Survey, Concord, NH (Oct 2015) indicates that the lupine patches at the Main Site were again surveyed by Normandeau in July 2015. The locations where wild lupine occurs along the Eversource and NPTP ROW are depicted in Figure 2 [note marked Confidential] in the Normandeau KBB Egg Survey (2015).

Conclusion: The surveys for wild lupine in the area of the NPTP known as the Main Site were conducted at the appropriate time of year and were of sufficient number (multiple years) to adequately assess species abundance and distribution. The lupine surveys, complimented by actual butterfly surveys conducted by NHFG and the KBB egg surveys by Normandeau in 2015 (described below) provide an adequate basis to assess habitat for and abundance of Karner Blue butterflies present at the Main Site.

Lupine and KBB Surveys at the Pembroke NH Army National Guard RTI: As noted in Normandeau's October 2015 RTE Report, wild lupine was also documented along the proposed NPTP ROW in Pembroke on a 214 acre parcel acquired by the NH Army National Guard in 2009 for a regional training institute (RTI) (Figure 3, excerpted from Appendix D of the RTE Report). Lupine is a perennial plant (reemerges in spring from roots or rhizomes). The occurrence of lupine at the RTI is referred to as a single patch, indicating there are multiple closely spaced plants with many stems, that are geographically very localized. The date of this Normandeau survey is apparently 2011, when 143 specimens were tabulated (Table 12a in Normandeau Oct 2015), so this survey is marginally out of date. Table 1 of a 2015 report of the NH Army National Guard (2015) lists the following more comprehensive data (number of flowering stems) for this lupine patch at the Pembroke RTI within the Eversource NPTP ROW: 2011 – 234, 2012-1,171, 2013 – 176, 2014 – 131, 2015-205.

The year to year variability of lupine at this site is believed to be associated with vegetative shading, browsing by deer and disturbance and damage from ATV use (A. Mills, National Guard, *in litt*.) and may not be indicative of lupine status and vigor elsewhere. While use of the multi-year National Guard data would have been far superior to the one Normandeau survey in 2011, for the purposes of this review

what is important is the relationship of this lupine patch to the effects analysis for the Karner Blue butterfly. Annual surveys at the RTI for KBBs and other rare Lepidoptera have been conducted by the National Guard for their own inventory purposes and planning use, and KBBs have not been documented at this lupine patch. In 2009, two individual KBBs were observed on the RTI along the Eversource ROW about 1,000 feet to the north (A. Mills, NH National Guard, pers. comm., Jones and Mills 2010). The NHFG and the USFWS concur that any KBBs associated with this lupine patch are likely transient individuals and not likely to be breeding at the site. This reviewer concurs with this conclusion because only three individual Karner Blue butterflies have been observed on the RTI property in the past decade (one in 2006 and two in 2009) and none were observed at the subject lupine patch in the NPTP ROW. More importantly, despite annual Lepidoptera surveys by the NH Army National Guard (A. Mills, NH Army National Guard, pers. comm.), no KBBs have been observed on the RTI parcel more recently from 2010-2016. The lupine patch at this location is isolated by some 2,000 feet from other lupine plants that have Karner Blues associated with them. The intervening landscape between the RTI lupine patch and the Concord Airport to the West where KBBs occur is mature mixed deciduous-coniferous forest and the Soucook River, and are unsuitable habitat for the butterfly. Alternatively, KBBs dispersing from the Main Site east and south along the Eversource ROW would similarly have to transit urban and industrialized areas of unsuitable habitat.

Conclusion: The NHFG and USFWS do not consider the lupine patch on the NH National Guard's RTI in Pembroke to be essential to the near-term recovery of the KBB in the Concord Pine Barrens. This reviewer concurs with that determination. Given the above, the Applicant's survey method (one year) was not optimum, but will not result in an erroneous conclusion with respect to effects of the NPTP on the endangered KBB.

<u>KBB Egg Survey</u>: In regard to the Karner Blue butterfly egg survey, it is noted on pages 9 and 10 of S. Barnum's October 16, 2015, Pre-filed testimony, that "...an egg survey for the Karner blue butterfly was conducted in July of 2015 to provide the basis for estimating impacts to this species as a result of construction." In preparation for this survey, Normandeau employees S. Barnum and S. Hegarty received training in KBB egg identification and KBB egg laying ecology from NHFG biologist, Heidi Holman (Memo from L. Carbonneau to Files, July 20, 2015). Given Ms. Holman's extensive experience with the KBB captive rearing program and the training aids (KBB eggs and plant materials) NHFG made available to Normadeau biologists, this training was determined sufficient by NHFG to enable the Normandeau biologists to independently identify KBB eggs at the Main Site. As this reviewer was not present during the training that was provided, no position on its adequacy is offered. As described in section 3.4 of Normandeau's 2015 Karner Blue Butterfly Egg Survey, Concord, NH, lupine patches were mapped in the field with GIS, plants and stems in each patch were counted, the number of KBB eggs per stem of lupine was estimated and then "the number of plants or stems that would be impacted was estimated by overlaying the lupine patch map with the construction work footprint" (p. 3-1).

A shortcoming in the above survey method was that the egg survey was conducted on only one day in one year, on July 23, 2015. Given that many insect populations are known to fluctuate widely due to the vagaries of weather, disease, parasite infections, etc., it is difficult to determine if the 2015

estimate is representative of either current status or an average baseline. When this question was asked of Sarah Barnum of Normandeau during the September 2016 Technical Session, she replied (paraphrased as follows) that *one survey during the second flight of the KBB was based on the recommendations of the NHFG and USFWS.* The agencies were satisfied that one survey during the second brood (July) during 2015 was sufficient. Notwithstanding, multiple sampling events during late July 2015, or alternatively, sampling during more than one year would have improved the methodology and increased confidence in the estimate.

Similarly, no KBB egg surveys were conducted at the Pembroke NH Army National Guard RTI lupine site, with concurrence from NHFG and USFWS, even though KBBs have been observed along the NPTP ROW there in the past decade (in 2006 and 2009, A. Mills, NHANG pers. Comm. and *in litt.* 2016). However, despite subsequent annual lepidoptera surveys by the NH National Guard from 2010-2016, no more recent occurrences of KBBs have been documented at the Pembroke RTI location (NH Army NG 2015 and NH Army NG 2016). Given these facts and the reasons discussed in the previous section, the reviewer concurs that expanding the egg survey to the lupine patch on the Army RTI parcel would not have resulted in the detection of any additional KBBs likely to be directly harmed by the NPTP.

Conclusion: With assistance from NHFG, Normandeau biologists received training on KBB egg identification and observation methods. With the concurrence of the NHFG and the USFWS, the applicants utilized a one day survey (sampling) of lupine plants at the Main Site to arrive at an estimated number of KBB eggs (with the potential for) being "taken" (destroyed) as a result of construction of the NPTP through the Main Site. Multiple days of sampling and/or multiple years of data collection would have increased confidence that this estimate more accurately represents current baseline. Finding butterfly eggs that are approximately the size of this asterisk * (0.7 mm) (Dirig 1994 in USFWS 2003) in the jumble of dead and dying lupine plants and twisted grass leaves is problematical and the chance for error (present but not detected) is likely significant. Given the affirmative number of KBB eggs identified and extrapolated by Normandeau, 208, for which "there is a potential loss" (p.5-1), observation conditions in 2015 were apparently favorable. No KBB egg survey was conducted on the lupine patch within the NPTP ROW at the NH Army National Guard RTI, however no KBBs have recently been documented there despite annual surveys by the NH Army National Guard (2010-2016). Accordingly, it is the professional judgement of this reviewer that no KBB eggs were overlooked by the failure of the Applicant to survey lupine at the RTI location within the ROW. In summary, the methods for the egg survey that resulted in the finding that 208 KBB eggs have the potential to be taken from construction of the NPTP appear reasonable.

<u>Criterion 2: Identification of significant wildlife species, rare plants, rare natural communities, and</u> <u>other exemplary natural communities potentially affected by construction and operation of the</u> <u>proposed facility.</u>

For the purposes of this review, which is narrow both in scope (the Karner blue butterfly and its habitat) and geographic extent (only that portion of the NPTP ROW in Concord south of Pembroke Road and on the NH Army National Guard RIT in Pembroke), documents filed by the Department of

Energy (DOE) and by Eversource in support of their SEC application verify numerous scoping meetings and correspondence with natural resource agencies. These documents include but are not limited to Wildlife Habitats, Natural Communities and Rare Species Analysis for Concord, New Hampshire (Sperduto 2010), Wildlife Technical Report prepared for the Department of Energy (Ecol. and Env. Inc., July 2015), Northern Pass Transmission Project Draft Environmental Impact Statement Supplement (November 2015), Appendix 35 – Rare, Threatened, and Endangered Plants and Exemplary Natural Communities (Normandeau October 2015), and Pre-filed testimony (Normandeau October 16, 2015). The RTE report (Normandeau October 2015), correctly identifies the exemplary natural community, Pitch Pine Scrub- oak Woodlands, that occur in Concord and Pembroke, NH and the occurrence of state-threatened wild lupine and federal and state endangered Karner Blue butterfly that are associated with that habitat.

In addition, the administrative record available for this project indicates that multiple memoranda and additional written communications have been exchanged, and meetings have occurred between the Applicant's consultants (particularly Normandeau Assoc.) and state and federal natural resource agencies including the NH Natural Heritage Bureau (NHNHB), the NHFG and the USFWS. These communications ensure that information on rare, threatened and endangered species have been provided to the Applicant and its consultants. In addition, the USFWS has provided a "species list" to the DOE dated June 12, 2015 that correctly identifies the KBB, wild lupine and the other habitat features comprising secondary habitat present in the NPTP ROW in Concord. It is unlikely that other federally listed species occur in this portion of the NPTP ROW due to the characteristics of the habitat present and the significant number of biological surveys that have occurred in this area since 1990.

The Applicant's statement that there is "No exemplary Pine Barren habitat within the NPTP corridor" contradicts Figure 4 (excerpted from Appendix D of the RTE Report) that delineates a substantial area of "NHNHB Exemplary Natural Community" along the Eversource ROW both north and south of Pembroke Road. Even though the Eversource ROW has a history of forest alteration and vegetation management, the habitat is located within the historical occurrence of the Concord Pine Barrens, has excessively drained, sandy soils typical of scrub oak - pine barrens and supports RTE species characteristic of this natural community. Sperduto and Kimball (2011, p. 1) describe a natural community as "recurring assemblages of plants and animals found in particular physical environments" and an exemplary natural community (p.3) "represents the best remaining examples of New Hampshire's biological diversity."

Conclusion: The Applicant has adequately identified the rare, threatened and endangered species present in this portion of the ROW with respect to the Karner Blue butterfly, but apparently refutes that the pine barren habitat within the Eversource ROW is a natural community since it has long been maintained through utility corridor vegetation management. The determination of whether the habitat within the Eversource ROW in Concord is an "exemplary natural community" has already been made by the NH Natural Heritage Bureau, which affirmatively maps it as such per Figure 4. More important than its classification as exemplary (or not), the protection and management of the Main Site for the KBB and other pine barren dependent species is essential to their status and recovery in

New Hampshire.

<u>Criterion 3: Identification of critical wildlife habitat and significant wildlife resources potentially</u> <u>affected by construction and operation of the proposed facility.</u>

The definition that the SEC uses for "critical wildlife habitat" refers to the designation process set forth in section 4 (a)(3) of the Endangered Species Act of 1973, as amended. To the maximum extent practicable, the U.S. Fish and Wildlife Service is required to designate critical habitat concurrently with the listing of a species, which for the KBB occurred on December 14, 1992 (57 FR 59236). In the Federal Register listing the KBB, the USFWS explains that determining what habitat is critical to the butterfly in 1992 was indeterminable. USFWS reported that because most populations occur on fragmented habitat of varying and often declining suitability, it would be problematical to designate them ascritical.

Moreover, the size, spatial configuration and juxtaposition of habitat areas needed to provide for the long term survival of existing [and future] populations had not yet been identified (57 FR 59236-59244). Even though nearly two and half decades have passed since the USFWS made this finding, critical habitat has still not been designated for this species. With recovery efforts proceeding positively within several of the states where the KBB occurs (USFWS 2012), it is likely believed that a critical habitat designation provides little additional benefit to the conservation of the species. Accordingly, no critical habitat has been designated for the KBB in New Hampshire or any of the other states where recovery is on-going.

The New Hampshire Wildlife Action Plan (2015) notes that the Pine Barren habitat in Concord and Pembroke is among the "Highest Ranked Habitat" in the state (NHFG WAP 2015 Highest Ranked Habitat by Ecological Condition). It is unclear if the documents filed in support of the SEC application cite that, but they do acknowledge that the ROW in Concord passes through pitch pine, scrub oak woodland habitat.

Conclusion: In the discipline of wildlife and plant ecology, species cannot be discussed in isolation, nor can their numbers or population status be assessed without a comprehensive discussion of habitat. The Applicant and Normandeau recognize that relationship and it is generally reflected in their impact analyses for wild lupine and the KBB. Documents filed by the Applicant (e.g., USFWS Species list dated June 12, 2015) are correct that no federally designated critical habitat exists for the KBB or any other federally listed species within the subject NPTP ROW. It is unclear to what end the Applicant contends that there is "No exemplary Pine Barren habitat within the NPTP corridor" citing the history of vegetation management within the ROW. Whether natural or human altered or maintained, the area supports rare species characteristic of that natural community and should be considered habitat essential for the persistence and recovery of both wild lupine and the KBB in New Hampshire. For example, wetlands are highly regulated and valuable habitats whether they are "natural" or were created by human action.

<u>Criterion 4. Assessment of potential impacts of construction and operation on significant wildlife</u> <u>species, rare plants, rare natural communities, and other exemplary natural communities, and on</u> <u>the wildlife habitat and significant wildlife resources, and on critical wildlife habitat and significant</u> <u>wildlife resources, including fragmentation or other alteration of terrestrial or aquatic significant</u> <u>habitat resources.</u>

Normandeau mapped the location of wild lupine plants in the segment of the Eversource and proposed NPTP ROW known as the Main Site in 2011 and 2015. In addition to enumerating lupine plants, Normandeau also estimated the square footage occupied by those plants and estimated the amount (20 SF) that will be permanently lost by placement of structure foundations, and the area of lupine that will be temporarily impacted by construction activities (about 17,000 SF) (Normaneau Appendix 36, 2015). In total, Normandeau (2015) identified 529 individual lupine plants in 15 discreet lupine patches (clusters of plants) that occupied about 28,044 SF at the Main Site. The subsequent impact analysis determined that 0.05 % (14 SF) of the lupine area at the Main Site will be permanently lost and 61% (17,028 SF) of the lupine area will be affected by temporary access routes, work pads and other construction activities. Table S-19 of the Draft NP EIS (2015, p. S-34) notes that with regard to lupine, there could be effects on individuals, but with implementation of "applicant proposed measures," no population level impacts are expected. It is unclear exactly what measures the Applicant has committed to in arriving at this finding and whether it is supported by an analysis of the number of lupine plants present (both those affected and not likely to be affected) at the Main Site and elsewhere within the Concord Pine Barrens.

In total, 330 of the 529 lupine plants (62% of lupine present at the Main Site in 2015) will be effected by project construction and based on the KBB egg survey, as many as 208 KBB eggs (actually first instar larvae, USGS 2011 *in* USFWS 2012) may potentially be taken (killed). It appears that the estimated number of KBB eggs (208) that will be present on lupine plants in the path of construction is being used as a measure of both more generally, "effects on the species" and the level of take anticipated (i.e., KBBs directly killed) from construction. The analysis not provided, is the number of years that will be required for the KBB and wild lupine to return to baseline (pre-project condition) following the direct, indirect, and short term adverse project effects. This information is important to address the significance and duration of the project's effects on lupine and the KBB, and will influence the viability of these species at the Main Site in the future (see also discussion of injury debit below).

Normandeau's Wildlife Report and Impact Assessment (2015 Appendix 36) acknowledges that additional impacts may be incurred if the period to restore the site following temporary impacts requires more than a single growing season. Further analysis of impacts over time until compensatory mitigation offsets those impacts is not provided.

When a natural resource injury occurs, such as impacts from an oil spill or a major construction project, there may be both a permanent and temporary loss of individuals, habitat area, and ecosystem function. If compensatory mitigation follows, then over time an impacted habitat may return to baseline (the pre- event or pre-project condition), but the period of time between the impact

(loss of individuals, habitat and function) and the return to baseline remains as an injury debit (Hampton and Zaforte 2002). It is useful to consider the injury debit as loss of value(s) per time. To erase the debit, compensatory mitigation must exceed baseline conditions in number of individuals and species restored, as well as acres of habitat available. [Ecosystem function is not so easily measured or assessed.] For this reason, ideally, compensatory mitigation would occur (e.g., off site) before the resource injury has taken place, or alternatively, (on site) as soon after the impacts of construction have occurred. To compensate for lost habitat and the injury debit (the time required to create habitat or restore it), ratios of compensatory habitat often far exceed the amount of habitat lost or degraded. Perhaps in light of that, the Applicant has committed to a mitigation package that will include enhancement of approximately 15 acres of pine barren habitat in Concord to compensate for impacts to lupine and the KBB (Normandeau 2015 Appendix 36). As noted on page 13, the size of the parcel that may be acquired for restoration is 7 acres and it is unclear if 15 acres remains a mitigation target for the KBB and pine barrens habitat.

Among the 9 federally- and 29-state listed wildlife species that have the potential to occur in the entire project study area, the project "May affect and is likely to adversely affect" (DEIS Supplement 2015, p.16) only the Karner Blue butterfly. Indeed, the KBB appears to be the only federally listed, threatened or endangered species where many individuals are likely to be killed as a result of construction of the NPTP. The Applicant has not discussed the effect of the potential loss of 208 KBBs on the status of the population at either the Main Site or within the Concord Pine Barrens. Population estimates of wild (versus captive reared and released) second brood adult KBBs throughout the Concord Pine Barrens have varied in the past 5 years, from less than 500 in 2011 to about 1800 in 2014 (Figure 3 in NHFG 2015).

Conclusion: The finding that the NPTP "May affect and is likely to adversely affect' the Karner Blue butterfly is significant. The assessment of potential effects on wild lupine, the KBB and secondary habitat at the Main Site from construction appear adequately supported by the data collected and the methods used in analysis. However, there is an aspect of the SEC permit application that is deficient. More detail is needed on where, when, how, at what level of funding, and at what time scale, compensatory mitigation would address project effects on wild lupine, the KBB and the injury debit for those species and their habitat. An analysis on what the effect of the removal of 208 KBB eggs (first instar larvae) from the Main Site population would have on the future occupancy of that site, and whether it would affect the recovery of the KBB at the Main Site and in the Concord Pine Barrens is lacking.

Effects of operation of the NPTP with respect to the KBB are not discussed in depth, and will presumably be described in detail in a management ROW maintenance agreement. As with any overhead electric transmission line ROW, vegetation must be maintained at or below certain prescribed heights. This necessitates periodic timber cutting and/or removal, causing ground disturbance that will damage lupine patches, nectar producing plants and could result in the future take of KBBs. Until the ROW management agreement is completed, the frequency of vegetation management (e.g., every 4 years), the timing (season) when that work will occur and the extent of

physical disturbance and involvement of the natural resource agencies is unclear. This too is a deficiency in the application.

State threatened wild lupine also occurs along the existing Eversource ROW through the NH Army National Guard's RTI parcel in nearby Pembroke. In section 3.7.1.3 "Wild Lupine" of Normandeau's RTE Report (2015), it is noted that the Pembroke lupine Element Occurrence (EO) was surveyed in 2011 and that it consisted of one patch of 143 plants (specimens), of which 24 will be impacted by the project (temporary effects from an access route). As the NHFG and the USFWS do not presently consider this lupine patch essential to the recovery of the KBB (a judgement that this reviewer concurs with), the temporary impacts to 24 lupine plants will have no effect on the KBB. However, as a state threatened plants species that might in the future provide additional habitat for an expanding KBB population, measures that avoid, minimize, mitigate and compensate for impacts should be observed at this location.

<u>Criterion 5. Description of the measures planned to avoid, minimize, or mitigate potential adverse</u> <u>impacts of construction and operation on wildlife species, rare plants, rare natural communities,</u> <u>and other exemplary natural communities, and on critical wildlife habitat and significant wildlife</u> <u>resources, and the alternative measures considered but rejected by the Applicant.</u>

Ms. Lee Carbonneau's pre-filed testimony (October 16, 2015) generally describes NPT Project's work to avoid and minimize impacts to wetlands and other important natural and cultural resources, including rare, threatened and endangered plants. Since the occurrence of the federally endangered Karner Blue butterfly in the Concord Pine Barrens is invariably linked to the occurrence of state-threatened wild lupine, efforts to avoid and minimize impacts to wild lupine in Concord will also (partially but not entirely) avoid and minimize effects to endangered Karner Blue butterflies.

As indicated in the NPTP 2015 Karner Blue Butterfly Egg Survey (October 2015, p. 5.1), ~62% (330 of 529) of the lupine plants documented in the Main Site segment of the project area "will be affected by project construction". In other words, a majority of the lupine plants present at the Main Site will be impacted by construction of the NPTP. During the technical session in Concord on September 20 and 22, 2016, the following question was asked of Ms. Carbonneau of Normandeau Associates, "Can you explain what measures were implemented (or considered and rejected) to AVOID the effects on KBB and lupine at the Main Site". The answer provided by Ms. Carbonneau is paraphrased as follows: We marked the locations of lupine [at the Main Site] on GPS and then overlaid the footprint of location of structures, poles, access roads and pads on that map. We then looked to see if there were ways to avoid conflicts by tweaking the position of some of the structures, but that was not workable – the structure where the ROW makes a corner could not be moved without creating a ripple (domino) effect on the placement of other structures. Some potential effects from the location of the temporary construction access road were apparently avoided (or minimized), although where this avoidance occurred is not apparent in Figure 2, which depicts the large degree of overlap between temporary impact areas and lupine patches.

A follow up question was asked with regard to the 330 of 529 lupine plants permanently or temporarily affected (62% of lupine present), and an estimated 208 KBB eggs potentially destroyed. What would those effects have been if you had not "avoided"? The response provided by Ms. Carbonneau was that, [paraphrased] *that analysis was not done*.

No information was provided that there was consideration of alternative routing that would have avoided the Main Site by using new ROW, nor was there apparent consideration of alternative methods, like horizontal directional drilling, in order to tunnel the line and avoid ground surface disturbance.

Indeed, it appears that the consideration of alternatives was very limited. The preferred route was the existing Eversource ROW, and the preferred method was construction of overhead HVAC lines. If avoidance and minimization did occur, it was in designating where the temporary work areas and access roads would be located within this ROW with respect to known lupine and KBB locations. This is very different from an analysis that placed avoidance of known lupine and KBB occurrences as a high priority. Consideration of an alignment that avoided the Eversource existing ROW through the Main Site would largely avoid impacts on wild lupine and would entirely avoid the take of Karner Blue butterflies. The Applicant's response to Technical Session data request set 3 (docket 2015-06, p. 10 and 11) for a list of the locations where changes to the preferred route occurred to avoid or minimize impacts to natural resources does not identify the Praxair/Main Site location.

It is acknowledged that purchasing property rights for a new ROW or otherwise seeking alternative routes through this urban section of the NPTP is problematical. However, if geographic (spatial) avoidance was determined to be not practicable, then temporal avoidance through the timing of construction activities should have received even more emphasis. Appendix 36 of the NPTP Wildlife Report and Impact Assessment (Normandeau Oct. 2015, p. 12-3) notes that "because some life stage (adults, eggs, larva, and/or pupae) of this species is always present in the locations known to host it, impacts to it cannot be avoided through seasonal construction restrictions ...". This is correct. However, it is incorrect to assume that the adverse effects to lupine, KBB, and other nectar producing plants at the Main Site from construction during the growing season would be identical to the effects from a non-growing season construction schedule. Indeed, the July 23, 2013 meeting minutes (p. 1) prepared by Courtney Dohoney of Ecology and Environment Inc., report that Tony Tur of the USFWS "felt that some level of take [of KBB] is unavoidable with this route [through the Main Site], but the magnitude of the take could vary widely depending on the construction timing and methods employed." This meeting summary (p. 2) further indicates the view by the USFWS (at that time) that minimization measures could be implemented that nearly eliminate take [of KBBs], and notes that, "Seasonal restrictions on construction in the ROW (construction only during the dormant period for lupine) or using low pressure construction equipment to minimize damage to vegetation could be utilized along with marking lupine ahead of time so the area can be avoided."

Timing of construction may also influence how long efforts to restore species and habitat will take during post-construction. Normandeau's Wildlife Report and Impact Assessment, page 12-3 in section

12.1.5 notes that "the length of time required for restoration will depend in part on if the season of construction overlaps partly or fully with the growing season." Intuitively, if the impacts are greater during a growing season construction schedule, then more time may be needed to return the habitat to a pre-project condition.

Despite the recommendation of the USFWS and the potential for substantially reducing adverse effects on lupine and KBB from a non-growing season construction schedule, the Applicant has not committed to that avoidance and mitigation measure. In this regard, an April 15, 2015 memorandum from Sarah Barnum (Normandeau) to Tony Tur (USFWS) and Heidi Holman (NHFG) indicates that the time of year for construction of the NPTP in the area of the Concord Municipal Airport (presumably including the Main Site south of Pembroke Road) is dependent on approvals sought from the FAA. On page one of this memorandum, it is stated, "Due to time constraints of those approvals, this area [in known Karner Blue butterfly habitat] will be the first to be constructed after final project approvals are issued, in order to meet the requirements of the FAA approval. The timing of the construction season in this location will be dependent upon the date of receipt of final project approvals." However, at the September 20, 2016 technical session in Concord, the Applicant's legal representative noted that the FAA permit being sought will have an 18 month time line and could be extended if necessary. This appears to provide the Applicant the flexibility to schedule construction in the Concord Pine Barrens during the non-growing season to avoid some impacts on lupine, the KBB and secondary habitat through reduced ground disturbance and to minimize some of the other adverse effects that cannot be avoided.

The Natural Resources Mitigation Plan (NRMP) (Appendix 32 Normandeau 2015) contains several measures that could be effective in reducing the extent and duration of adverse effects on primary habitat (Lupine patches) and secondary habitat (nectar and other plants) required by the KBB. Foremost among these is scheduling work in rare plant areas during the time of year when the ground is frozen, using timber mats to minimize ground disturbance, marking or fencing off exclusion zones, and on-site monitoring by environmental professionals to ensure compliance by construction contractors. Several of these measures have been used during construction and maintenance activities in this ROW in the past and are believed to reduce ground disturbance and adverse effects. Additional measures for Pre- construction planning, Construction, Restoration and Post-construction phases of the project are discussed in Appendix B of the NRMP (2015). Although this Appendix is titled, Northern Pass Commitments for Rare Plant and Natural Community Impact Avoidance and Minimization, it is mis- titled, as many of the measures are more appropriately considered mitigation and compensation.

Further information has been provided about an off-site but nearby 7 acre parcel that <u>may</u> be acquired by Eversource as a conservation/compensation measure. This parcel is believed to be located on Regional Drive in Concord and is strategically positioned between the Main Site habitat and the USFWS KBB Refuge Easement on Chenell Drive. This parcel will require both time and funding for restoration, as the remains of a concrete foundation requires removal and much of the top soil containing the seed bank of pine barren plants has been altered. Elsewhere in the NRMP (page 5-9 and 5-10), 15 acres is identified as the "preservation package" for the KBB and pine barrens habitat. If the "15 acre pledge"

for compensatory mitigation has been reduced to 7 acres (parcel acquisition), it should be clarified that it will be supplemented with additional acreage at the Main Site in a ROW habitat management agreement.

As described in the Introduction, wild lupine is adapted to sunny, grassy openings within pitch pinescrub oak barrens, and disturbance through fire or mechanical clearing, is generally necessary to create and/or maintain these openings. The history of cooperative ROW vegetation management at the Main Site is likely to have strongly influenced project planning for the NPTP. Eversource may have decided that avoidance and/minimization of impacts to lupine and the KBB were less important than cooperatively working with NHFG and USFWS to mitigate and compensate for those effects. Based on past work by NHFG, USFWS, City of Concord and the National Guard, it has been demonstrated that both lupine and the KBB can be actively restored through on-going seed collection, propagation, out planting and butterfly release efforts. Notwithstanding, the fact that lupine, KBB and some nectar species can be propagated and restored, is not a substitute for ensuring that all reasonable and practicable measures are undertaken to avoid and minimize the take of these species during preproject planning.

Recently, the USFWS announced the availability for public comment of a draft Compensatory Mitigation Policy under the Endangered Species Act (ESA) (81 FR 61031). The policy can be reviewed at https://www.federalregister.gov/documents/2016/09/02/2016-20757/endangered-andthreatened-wildlife-and-plants-endangered-species-act-compensatory-mitigation-policy. The draft policy is the first comprehensive treatment of compensatory mitigation under authority of the ESA to be issued by the USFWS. This policy, which the agency recommends agencies and federal permit applicants should now consider in on-going project planning, asserts that compensatory mitigation should only be considered after all feasible and practicable efforts to avoid and minimize. The policy (p. 60135) asserts that "mitigation elements are categorized into three general types that form a sequence: Avoidance, minimization, and compensatory mitigation for remaining unavoidable (also known as residual) impacts... This draft policy adopts the Department's definition of compensatory mitigation— compensation for remaining unavoidable impacts after all appropriate and practicable avoidance and minimization measures have been applied...".

The draft USFWS policy also requires a Restoration or Habitat Development plan (p. 61050 and 61051), further emphasizing the need to complete the NPTP Pine Barrens Mitigation Plan. The policy also encourages compensation in advance of impacts, which would reduce the injury debit discussed above in Criterion 4. At the September 2016 technical session, Normandeau representatives reported that they have not done pre-emptory compensation or mitigation to reduce or eliminate that period of "natural resource deficit" also called the injury debit (Hampton and Zafonte 2002). However, Eversource reports that a purchase and sales agreement has been signed on the 7-acre restoration parcel on Regional Drive. Compensation in the form of habitat management and species restoration in advance of project effects would be an additional means to eliminate or reduce the injury debit to KBB, lupine and nectar plants. While Eversource has put forth several meaningful steps to address the impacts, until the habitat is acquired and the funding and management agreements for restoration at

that site and within the ROW are committed to in writing, the duration and the severity of effects to lupine and the KBB are uncertain. An agreement that stipulates how the Regional Drive mitigation parcel and the ROW through the Main Site will be restored and managed should be completed and approved by state and federal natural resource agencies. This agreement should be established before a certificate is granted. Absent this completed agreement, it is not possible to estimate how many years it will take to compensate for lost Karner Blue butterflies, lupine and nectar plant species as a result of construction of the NPTP.

Conclusion:

Eversource's submittals and application materials are insufficient to substantiate that reasonable measures and alternatives were considered that could have avoided and/or further minimized adverse effects on lupine, the Karner Blue butterfly and the other nectar producing plants that occur at the Main Site. Further, the Applicant has not avoided and minimized effects temporally, by formally committing to a non-growing season construction schedule, and other restrictive construction practices that would reduce temporary effects on lupine and nectar plants that will be dormant at that time. Instead, it appears that mitigation and compensation were emphasized, rather than avoidance and minimization. Accordingly, the effects on wild lupine and the KBB at the Main Site are an unreasonable adverse effect.

Table 1 of Normandeau's Natural Resources Mitigation Plan provides a summary of impacts to the KBB and lupine, and the anticipated mitigation measures, including compensatory [habitat] preservation in Concord/Pembroke, management funding, and/or a ROW management agreement with NHFG and USFWS. These are meaningful steps that can be taken to reduce the adverse effects of the NPTP on the KBB and its habitat, but without much more detail, e.g., a comprehensive Karner Blue butterfly and Concord Pine Barrens Management Plan, they are difficult to assess qualitatively. Given that NHFG and USFWS have more than 25 years of experience restoring habitat, lupine and the KBB in the Concord Pine Barrens, the effects from construction of the NPTP can be offset by compensatory mitigation, but those effects should be proactively reduced by the Applicant to only those that cannot be avoided or minimized.

<u>Criterion 6: Description of the status of the applicant's discussions with the New Hampshire</u> <u>Department of Fish and Game , the NH Natural Heritage Bureau, the U.S. Fish and Wildlife Service,</u> <u>and any other federal or state agencies having permitting or other regulatory authority over fish,</u> <u>wildlife and other natural resources.</u>

In regard to communications with state and federal natural resource agencies, the document library filed in support of the NPTP lists numerous written correspondence, as well as memoranda and minutes from several site visits and coordination meetings pertinent to the KBB. These communications were between the DOE, the DOE's environmental consultant, Ecology and Environment In., representatives of Eversource, and Normandeau biologists with the NHFG, NHNHB, the NH Army National Guard, and the USFWS.

Correspondence from NHFG and USFWS confirm agreement that all appropriate measures should be used to reduce effects from construction at the Main Site, such as marking lupine patches in advance, using protective construction mats, use of soft tire equipment, on-site training of contractors and presence of environmental monitors. While representatives for the Applicant have been in (and continue) frequent contact with the natural resource agencies, several important documents are yet to be completed. These include the DOE's Biological Assessment pursuant to section 7(a)(2) of the ESA, which must be submitted to the USFWS when a major federal action (requiring preparation of an EIS per NEPA) is found to "may affect" a federally endangered species. If the Biological Assessment concludes that the NPTP is likely to "adversely affect" the KBB (a foregone conclusion since KBB eggs or larvae will be taken), then formal consultation pursuant to section 7 of the ESA is required. The Biological Assessment is likely to contain Conservation Measures, which are essentially required conditions that alter the project description sufficiently (in this location) to reduce the project's adverse effects on- and take of KBBs. The USFWS will provide its Biological Opinion on whether the NPTP is likely to "jeopardize the continued existence" of the KBB within about 135 days of receipt of the Biological Assessment. The DOE, as the lead federal agency in the consultation with the USFWS, will not issue a permit for the project until they have completed formal consultation with the USFWS. Lastly, a Karner Blue butterfly compensation and habitat mitigation plan has not been completed.

Conclusion: Communication between the Applicant and their representatives appears adequate for an exchange of information on the project location and design, and the species, habitats and other natural resources present in the ROW in Concord and Pembroke. Notwithstanding, several key documents that will have an important influence on the timing, duration, location, funding and other specifics on the nature of compensatory mitigation, if the project moves forward, have not been completed.

SUMMARY

As an endangered species, the Karner blue butterfly is a resource of state and national significance. The population in New Hampshire is localized to a small geographic area in Concord, where it persists on a few hundred acres – a remnant of thousands of acres of pine barren habitat that once occurred along the Merrimack River from Canterbury to Nashua (VanLuven 1994). The KBB population in Concord, NH is the only remaining occurrence of the species in New England and the easternmost for the species across its range. For an isolated population to persist, multiple subpopulations are beneficial. Thus, the KBBs and the modest habitat provided in the Eversource ROW (at the Praxair/Main Site) contribute positively to the survival and recovery of the species in NH.

Construction of the NPTP through the existing Eversource ROW in Concord will result in affects to 62% of the lupine plants present at this location and the potential death of 208 KBBs. This is the only location along the 192 miles of the NPTP where adverse effects on a state and federally endangered species are likely and the mortality of a significant number of individuals is anticipated. The SEC application filed in support of the project does not adequately describe how measures that would avoid and minimize the effects of the project on wild lupine and the KBB in Concord were considered,

implemented or rejected. Moreover, the lack of commitment to a non-growing season construction schedule, preferably when the ground is frozen, demonstrates a "compensate/mitigate" rather than an "avoidance/minimize" approach to project planning. In view of the above, the adverse effects on lupine and the KBB at the Main Site are unreasonable.

Remaining pine barren habitat in Concord is already highly fragmented by residential and industrial development, roads, and the airport. However, with appropriate vegetation management, the NPTP through the existing Eversource ROW will not result in further, permanent fragmentation of habitat that supports the KBB in Concord. Moreover, the acquisition (and restoration) of an intermediate, largely undeveloped parcel off Regional Drive that lies between the Main Site and the USFWS KBB Easement and Concord Municipal Airport could improve conductivity among the three locations where the butterfly presently occurs.

Measures have been identified to reduce effects from construction at the Main Site, such as marking lupine patches in advance, using protective construction mats, use of soft tire equipment, on-site training of contractors and presence of environmental monitors, but these need to be enumerated and better defined in a KBB and ROW management agreement. In addition to those measures, state and federal natural resource agencies appear to agree that the impacts from construction could be offset by compensatory mitigation in the form of acquisition and restoration of an off-site 7 acre parcel, a funded plan to restore it and a ROW management agreement identifying how the agencies would work together with Eversource to manage the area(s) post-construction. This agreement should be established as a condition prior to the granting of a certificate.

Notwithstanding, the final "acceptance" (or not) of any compensatory mitigation addressing the take of KBBs and its primary habitat, wild lupine, will be forthcoming in the USFWS's Biological Opinion to the DOE and Eversource as the federal permit Applicant.

Eversource and its representatives have adequately enumerated the impact of the NPTP through the Eversource ROW in Concord and Pembroke on wild lupine and the KBB in terms of acres, square feet, numbers of individual plants, stems, and animals. However, they have not demonstrated an analysis or discussed those impacts in the context of effects on the status of the local and regional populations of those species. Absent this analysis, it is unclear how Normandeau concluded no unreasonable adverse effects.

The plan to compensate for the temporary effects to habitat, lost lupine plants and Karner Blue butterflies is not completed. Until it is, it is not possible to determine the injury debit. In other words, it will be difficult to estimate how many years it will take to compensate for lost Karner Blue butterflies, lupine and nectar plant species as a result of construction of the NPTP as currently proposed.

The application demonstrates adequate communication and coordination between Eversource's representatives and state and federal natural resource agencies. There is documentation among the parties that infers that adverse effects from the construction of the project can be offset through

compensatory mitigation, particularly conservation parcel acquisition and implementation of a ROW management agreement. While this reviewer concurs with that finding, the details of how compensatory mitigation would be implemented, at what level of support and over what time period are essential elements that are currently unavailable or incomplete.

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Figures Redacted per NH NHB Confidentiality Agreement

Appendix B: Bats



Impact Assessment of

The Northern Pass Transmission Project

on Bats

report prepared by:

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19 December, 2016

EXECUTIVE SUMMARY

The Northern Pass Transmission Project ('NPT Project') proposes the construction or expansion of a 192mile (309 km) electrical transmission corridor from northern New Hampshire down into southern New Hampshire (roughly from Candia down to Deerfield). NEES was retained on behalf of the Department of Justice (the Counsel for the Public) to provide analysis and opinion on the potential of the NPT Project to have an unreasonable adverse effect on bat populations within the Project area. By the SEC criteria of significant wildlife species, this includes the Federally Threatened northern myotis (*Myotis septentrionalis*), and NH State Endangered eastern small-footed myotis (*Myotis leibii*), and the NH Species of Concern tricolored bat (*Perimyotis subflavus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*).

The Applicant conducted pre-construction surveys targeted at two species; the northern myotis and the eastern small-footed myotis. Pre-construction surveys for the northern myotis were limited to acoustic monitoring across 177 km of the proposed right-of-way ("ROW") and 21 km of access roads and substation footprints. The total sampling effort was extensive and met the USFWS Guidelines for minimum survey effort. Using this methodology, the Applicant identified multiple project segments with potential northern myotis populations. Pre-construction surveys for the eastern small-footed myotis entailed an evaluation of potential rocky outcrop habitat using visual surveys of aerial photographs, field-sampling of these sites to document potential roosting habitat, and acoustic monitoring of potential roost sites. Using this methodology, only three sites were determined to be potential roosting habitat.

Based on these pre-construction surveys, the Applicant has proposed limiting tree-clearing activities near the northern myotis sites to the non-active season (October 01 - April 31) and limiting construction and blasting activity near the eastern small-footed myotis sites to times when non-volant pups are unlikely to be in the roosts (interpreted as roughly August 15 - June 01). The Applicant has also suggested that widening of the current ROW and expansion of new transmission corridors will generate additional forest edge habitat that will benefit all bat species, and possibly generate new exposed rocky outcrops that will provide additional roosting habitat for the eastern small-footed myotis. The Applicant has also suggested that habitat conservation through conservation easements will generate additional roosting and foraging habitat regionally.

I have reviewed all of the relevant material submitted by the Applicant and identified six primary concerns related to the scope or extent of surveys, the appropriateness of proposed impact minimization plans, and the adequacy of the mitigation proposals. In addition, I have strong concerns about the failure of the Applicant to address the concerns of multiple wildlife agencies, particularly with regard to the development of research and monitoring plans.

Ultimately, habitat loss is not the primary threat to any of the significant bat species being addressed by the SEC process. Despite the general absence of site-specific data, it is my opinion that there is relatively little risk that development of the NPT Project would have a detrimental impact on any of the state Species of Concern. I am also confident that, in the context of appropriate construction and post-construction monitoring plans, there will be no unreasonable adverse effect of the NPT Project on the federally Threatened northern myotis. However, inadequate analysis by the Applicant and an inappropriate impact minimization plan prevents an informed conclusion of no unreasonable adverse effect for the eastern small-footed myotis. I therefore recommend the development of both construction and post-construction monitoring plans to ensure that any construction activities address potential impacts to crevice-roosting small-footed myotis. The development of these plans should be a condition of any SEC approval.

INTRODUCTION

The Northern Pass Transmission Project ('NPT Project') is a proposed electrical transmission corridor that extends 192 miles from northern New Hampshire down into southern New Hampshire. According to the Applicant, the NPT Project would provide 1,090 MW of electricity to the region while reducing electrical costs by \$80 million annually and generate up to 2,600 jobs during peak construction. According to the Applicant, the electricity transmitted via the NPT Project would help the state reach its Regional Greenhouse Gas Initiative (RGGI) and Climate Action Plan goals.

North East Ecological Services ('NEES') was retained by Arrowwood Environmental, on behalf of the Department of Justice (the Counsel for the Public), to provide analysis and opinion on the potential for the NPT Project to have an unreasonable adverse effect on significant bat species or bat habitat. According to Site 102.50 of the SEC (2016), 'significant wildlife species' means (a) any species listed as threatened or endangered by the U.S. Fish and Wildlife Service ('USFWS'); or (b) any species listed as threatened, endangered, or of Special Concern by the New Hampshire Department of Fish and Game ('NHFG'). Site 102.49 identifies 'significant habitat' as any habitat used by a wildlife species for critical life cycle functions (SEC, 2016). To make a determination of the potential for unreasonable adverse effect, NEES relied on the Applicant's submitted information, with specific regard to the criteria identified by the SEC (2016) to evaluate the potential for unreasonable adverse effect. Specifically,

- (1) Description of how the applicant identified significant wildlife species potentially affected by construction and operation of the proposed facility;
- (2) Identification of critical wildlife habitat and significant habitat resources potentially affected by construction and operation of the proposed facility;
- (3) Assessment of potential impacts of construction and operation on significant wildlife species, and on critical wildlife habitat and significant habitat resources, including fragmentation or other alteration of terrestrial or aquatic significant habitat resources;
- (4) Description of the measures planned to avoid, minimize, or mitigate potential adverse impacts of construction and operation on wildlife species, and on critical wildlife habitat and significant habitat resources, and the alternative measures considered but rejected by the applicant; and
- (5) Description of the status of the applicant's discussions with the New Hampshire Department of Fish and Game, the New Hampshire Natural Heritage Bureau, the United States Fish and Wildlife Service, and any other federal or state agencies having permitting or other regulatory authority over fish, wildlife, and other natural resources.

For the NPT Project, this included an evaluation of the Wildlife Report and Impact Assessment ('Wildlife Report'; Normandeau, 2015a), the Natural Resource Mitigation Report ('Mitigation Report'; Normandeau, 2015b), and materials supplied by the SEC and the Applicant during the deposition and discovery proceedings.

To reach my opinion on the potential for unreasonable adverse effect on significant bat species and bat habitat, I used the criteria set forth by the SEC (2016) and itemized below:

- 1. The significance of the resource or affected species;
- 2. The nature of the impact on the specific wildlife species or resource (including the nature, extent, and duration of the impact);
- 3. The impact on significant terrestrial or aquatic habitat or migration corridors;
- 4. A review of the analyses and recommendations of relevant agencies, including the USFWS and NHFG;
- 5. A review of the effectiveness of proposed avoidance, minimization, and mitigation measures for the specific resource (e.g. do they represent best practical measures?)

- 6. A review of the effectiveness of proposed avoidance, minimization, and mitigation for the significant habitat or migration corridor; and
- 7. Are specific conditions needed for post-construction monitoring and reporting, or for adaptive management, to address unpredictable potential adverse impacts (SEC, 2016).

White-nose Syndrome

The primary threat to bats in New Hampshire is unquestionably White-nose Syndrome ("WNS": Blehert et al., 2009; Frick et al., 2010). WNS is a cutaneous fungal disease caused by *Pseudogymnoascus destructans*, an emergent psychrophilic ("cold-loving") fungus that was first identified from a hibernaculum in western New York in 2006 (Blehert et al., 2009). WNS has been documented in almost all species of hibernating bats in the eastern United States (Locke, 2008; Reeder & Turner, 2008), including all of the hibernating bats known to occur in New Hampshire. Although the exact mechanisms of mortality are still uncertain, bats infected with WNS appear to have difficulty maintaining homeostasis during hibernation and generally die in early spring as a result of electrolyte imbalance, dehydration, and starvation (Cryan et al., 2010; Turner et al., 2011). Within two years of this initial discovery, WNS had spread to all known hibernacula within 80 miles of the epicenter, and is currently documented from 31 states and four provinces in Canada, causing the mortality of an estimated six million bats (USFWS, 2016) and population reductions of up to 98% in northern myotis (Turner et al., 2011).

Prior to the emergence of WNS, the NHFG had conducted multiple surveys of the hibernating bat population within the state and all the evidence suggested a robust and growing population across all species. Since the outbreak of WNS in New Hampshire in 2009, the population of hibernating bats has experienced a 99.8% decline, with bats extirpated from three of our eight known hibernacula, and two of the remaining hibernacula having only a single bat as of 2015 (Reynolds, unpublished data).

Primarily in response to similar levels of decline throughout their range, the northern myotis was listed as a federally threatened species under the U.S. Endangered Species Act on April 02, 2015, with a final ruling released in January 2016 under the authority of section 4(d) of the ESA that establishes prohibitions with limited exceptions that are specific to this species [50 CFR 17.40(o): USFWS, 2016].

SIGNIFICANT BAT SPECIES

Based on the definition of significant wildlife species used by the SEC (see Introduction above), an impact assessment should be conducted on six species of bats (Table 1). One of these species (Northern myotis) is listed as a Threatened Species by both the USFWS and the NHFG. The eastern small-footed myotis is listed as Endangered by the NHFG, and the remaining four species are listed as Species of Special Concern by the NHFG. The first three species (northern myotis, small-footed myotis, and tricolored bat) are hibernating species that are known to spend the winter in New Hampshire. The latter three species (eastern red bat, hoary bat, and silver-haired bat) are migratory tree-roosting bats that summer in the northeast and migrate south during the winter months.

Table 1. List of Significant Bat Species in New Hampshire			
Common Name	Scientific Name	Listing Agency	Listing Status
Northern myotis	Myotis septentrionalis	U.S. Fish and Wildlife	Threatened ¹
Northern myotis	Myotis septentrionalis	N.H. Fish and Game	Threatened ²
Small-footed myotis	Myotis leibii	N.H. Fish and Game	Endangered ²
Tricolored bat	Perimyotis subflavus	N.H. Fish and Game	Species of Concern ³
Eastern red bat	Lasiurus borealis	N.H. Fish and Game	Species of Concern ³
Hoary bat	Lasiurus cinereus	N.H. Fish and Game	Species of Concern ³
Silver-haired bat	Lasionycteris noctivagans	N.H. Fish and Game	Species of Concern ³

¹ USFWS, 2016; ² NHFG, 2015; ³ NHFG, 2009

Northern Myotis

Federally Threatened

State-Listed Threatened Species

Species Background

The northern myotis (*Myotis septentrionalis*) ranges throughout the eastern United States and much of the lower Canadian provinces (Caceres & Barclay, 2000). During summer, female northern myotis form small maternity colonies (usually less than 30 bats) within tree hollows, crevices, or under exfoliating bark (Foster and Kurta, 1999; Menzel et al., 2002; Owen et al., 2003). Tree species used as roosts are highly variable and include maples (*Acer spp*), green ash (*Fraxinus pennsylvanicus*). yellow birch (*Betula alleghaniensis*), red oak (*Quercus rubra*), sassafras (*Sassafras albidum*), American basswood (*Tilia americana*), black cherry (*Prunus serotina*), black locust (*Robinia* pseudoacacia), and red spruce (*Picea rubens*; Menzel et al., 2002; Owen et al., 2002; Broders and Forbes, 2004). Like most tree-roosting bats, the roost trees of northern myotis are taller and wider than randomly selected trees (Sasse & Pekins, 1996; Owen et al., 2002; Ford et al., 2006a; Perry & Thill, 2007a). Owen et al. (2003) found that the majority of roost trees used by *M. septentrionalis* were located in intact forests (70-90-year-old forests with no timber harvest activity within 10-15 years), often close to open water (Larson et al., 2003). Less is known about the summer ecology of male northern myotis, although they are known to use tree roosts (more likely under exfoliating bark than in cavities: Perry & Thill, 2007a), bat houses (Whitaker et al., 2006) and caves (Whitaker & Rissler, 1992) during the summer period.

Northern myotis show a strong preference for foraging in and near forested habitats (Ford et al., 2005). They are commonly captured in managed forests along the edges (Hogberg et al., 2002), but are also found foraging over ponds and streams (Caceres & Barclay, 2000). Northern myotis are probably the most abundant member of the *Myotis* genus at high elevation habitats (Lacki & Schwierjohann, 2001; Menzel et al., 2002; Lacki & Cox, 2009) and one of the few species where reproductive females can be

captured at high elevation (NEES, 2008). Research has shown that northern myotis have home range sizes of approximately 70 ha (Owen et al., 2003; Lacki et al., 2009).

During the fall, northern myotis migrate to available hibernacula. Once winter begins, the northern myotis hibernates, generally using small holes, cracks, and crevices along the walls and ceiling (Reynolds, pers. obs.; Durham, 2000). Northern myotis hibernate in relatively cold regions of the hibernaculum (Schmidt, 2003) and are often found farther away from the entrance (Durham, 2000). Most of the data available on the population biology of northern myotis is based on winter surveys at known hibernacula. Although this has proven effective in some species of *Myotis* (Frick et al., 2010), the reliability of these population estimates for the northern myotis is hard to estimate because they often roost in small crevices or inaccessible parts of a hibernaculum (Gates et al., 1984). Consequently, winter surveys of northern myotis often suggest much lower population sizes than summer surveys within the same region (Mohr, 1932; Martin & Hawks, 1972). Historically, northern myotis were known from each of the eight winter hibernaculum tracked by the NH Fish and Game; the most recent survey of hibernacula from the 2014-2015 winter season documented only a single northern myotis from one hibernaculum in Lyman (Grafton County: Reynolds, unpublished data).

Project Impact Summary

The Wildlife Report states that no habitat suitability analysis was conducted throughout the NPT Project area because the broad definition of suitable habitat adopted by the USFWS "includes most types of forested and semi-forested habitats in New Hampshire". However, Normandeau assessed the potential winter and summer roosting habitat by conducting a records search of known hibernacula within the Project area (winter habitat) and an acoustic monitoring survey across the NPT Project ROW (summer habitat).

The Wildlife Report states that there is no known winter habitat within the NPT Project area, although the Natural Heritage Bureau states that there are three known hibernacula within five miles of the NPT Project site. Normandeau did not conduct any further impact assessment because two of these hibernacula are located in the vicinity of the underground portion of the NPT ROW. The third hibernaculum (in Bristol; Grafton County; located approximately 1 km from the Project ROW) is a known hibernaculum for northern myotis, having as many as 83 individuals during the winter (Reynolds, unpublished data). The Wildlife Report states that approximately 35 acres of forest clearing would occur within five miles of this hibernaculum.

According to the Wildlife Report, the acoustic survey sites used to identify potential summer roosting habitat were established by Normandeau "in locations within the Project footprint where forest clearing will occur as a result of Project construction". The acoustic monitoring was conducted throughout the 2015 summer active season using full-spectrum acoustic detectors that were calibrated and deployed in conformance to the USFWS Guidelines (USFWS, 2015). Specifically, the Guidelines require two detector-nights of survey for each km segment of the NPT Project. According to Normandeau, data collected from these surveys were analyzed using federally-approved software packages (Kaleidoscope Pro) and manually vetted for species identification by an internal bat acoustics expert.

The acoustic monitoring survey was conducted from May 26 through August 09, 2015 at a total of 206 locations along the above-ground sections of the NPT Project ROW. Bats were documented from 93% of these sampling sites, with 19 locations (9% of all survey sites) having evidence for the presence of northern myotis. Manual visual analysis of these data was ambiguous at 13 of these sites, and one site (Deerfield) was confirmed as having northern myotis. Based on the USFWS Guidelines, each of these 14

sites would be classified as probable northern myotis sites and therefore would fall under the 4(d) Ruling for this species (USFWS, 2016).

The NPT Project proposes the removal of 681 acres of forested habitat; 222 acres along the edge of the existing ROW and 459 acres along the proposed ROW north of Dummer. The Wildlife Report acknowledges that most of the forest habitat that will be removed meets the criteria of 'suitable roosting habitat' described by the USFWS. The Wildlife Report further acknowledges that tree clearing during the active season (May 01 – September 30) has the potential to disturb or kill roosting northern myotis. The Applicant proposes that all tree clearing activity at sites that are documented as potential roosting habitat (14 sites from acoustic monitoring) will occur in the non-active season (October 01 – April 30) to minimize the direct impact on northern myotis.

The NPT Mitigation Report (Table 1) identifies 731 acres of forest will be cleared and over 660,000 ft^2 of permanent loss of rare or threatened forested habitat, and states that northern long-eared bats are assumed to be present in these tracts of land. The mitigation proposed for this species includes Compensatory Preservation of large forest blocks (identified in Table 6) and seasonal restrictions on tree clearing to avoid times of the year "when and where threatened northern long-eared bats may be roosting with pups" (Section 2.7). In Appendix B of the Mitigation Report, the Applicant reiterates that they will not conduct tree clearing from May 01 – September 30 "in and around locations in Table C" of the Appendix.

Agency Issues

The NPT Wildlife Report (Section 10.1) identifies the northern myotis as a Threatened Species by both the NHFG and the USFWS, as well as a Forest Sensitive Species by the U.S. Forest Service. In Section 10.2.3 of the Wildlife Report, Normandeau (2015a) suggests that northern myotis are widely distributed throughout New Hampshire. The Wildlife Report further states that northern myotis use a variety of forested and wooded habitats and commute using linear features such as fencerows, riparian forests, and other wooded corridors and suitable summer habitat typically occurs "within three miles of a documented capture record" or "within 1.5 miles of a known suitable roost tree", where suitable roost tree was defined as any tree with a diameter of three inches or greater that exhibits exfoliating bark, crevices, cavity, or cracks.

The NPT Wildlife Report (Section 10.1) states that the U.S. Forest Service requested a habitat suitability assessment be completed for the northern myotis within the White Mountain National Forest portion of the NPT Project.

At a July 2013 meeting, the USFWS stated that tree clearing was the "primary concern both from a habitat loss perspective as well as from direct mortality that can result when trees are cleared during the summer season". At that same meeting, the USFWS informed the Applicant that another utility company with a transmission corridor extending from New Jersey to Boston was conducting mist-netting at any acoustic sampling sites where myotis species were detected. Tony Tur (USFWS) further stated that if "Northern Pass is unable to guarantee clearing out of season, then some level of acoustics and targeted mist-netting if Myotis species are detected, should be conducted." At this same meeting, Jacob Tinus (Burns & McDonnell) proposed a Programmatic Agreement between the Applicant and USFWS to determine "where and how to survey (habitat, acoustics, mist-netting) should sections of the project not allow for out of season clearing".

On July 15, 2015, Normandeau Associates met with NH Department of Environmental Services ('NHDES') personnel to discuss compensatory mitigation for the NPT Project. Lee Carbonneau stated

that that they were unlikely to conduct mist-netting due to the limited distribution of the species and would instead rely on seasonal clearing restrictions to prevent incidental take.

On September 03, 2015, Normandeau Associates met with NHFG personnel to discuss wildlife issues, including the northern myotis. At this meeting, John Kanter requested a "thoughtful review of roosting habitat" and an analysis comparing forested habitats that detected northern myotis to those that did not detect this species.

NEES Assessment

Methodology review

The major methodology employed in the NPT impact analysis was acoustic monitoring for species of concern. In order to objectively evaluate this methodology, I generally look at the results and conclusions of a study in the context of total sampling effort. The only measure of sampling effort provided in the Wildlife Report was that 206 sites were sampled, generally for two nights each. However, no summary statistics were provided in the report, such as total detector-nights, total calls identified, and average calls per detector-night; these are standard metrics used in most acoustic monitoring surveys, including surveys conducted by Normandeau Associates. These data were requested, and some of the effort summaries were provided to me, as part of the discover motions (EXP 1-179) but they should have been included in the publicly-available report.

My primary concern with the overall acoustic survey is the broad sampling period that was necessitated by the scale of the NPT Project site. Because of limited equipment resources or personnel, Normandeau placed a few acoustic monitors out across the NPT Project site from May through August of 2015. However, the level of likely bat activity is not uniform across this sampling period, so it is difficult to determine whether sites sampled in May or August reflect low levels of bat use in that habitat, or nonseasonal sampling of that habitat. The number of sites that did not maintain the USFWS Guideline sampling conditions (ambient temperature above 10°C and wind speeds below 9 miles/hr) suggest that seasonal effects may have been present. Unfortunately, this was not investigated by the Applicant, and the Applicant refused to provide additional information when asked about such an analysis as part of my discovery motion (EXP 1-180).

My secondary concern is in regard to the manual analysis conducted to identify potential northern myotis. First, it does not appear that the manual re-analysis was as extensive as required by the USFWS Guidelines. Specifically, the USFWS Guidelines state that all sites that have potential northern myotis calls should be re-analyzed manually, and that this analysis should include all files collected at that site. This is to minimize the chance for false negative detections as well as reduce false positive detections. However, Appendix D of the Wildlife Report suggests that only suspected northern myotis calls were re-analyzed:

"If bat call files were identified by the software package as belonging or potentially belonging to the NLEB, they were manually examined by Lauren Hooten or Stephen Lindsey, both trained bat acoustic experts, for a final determination."

If this is the case, the manual analysis does not meet the criteria of the USFWS Guidelines. This is highly relevant because there were in fact 1,850 *Myotis spp.* files identified by the original call analysis (information provided in an Excel summary sheet as part of discovery response EXP 1-173). These files were generated by Kaleidoscope Pro and contained 197 calls listed as MYSE, or northern myotis. In addition to these 197 files, there were over 300 calls that had northern myotis as the primary alternative
identification. Because these files were initially assigned to another myotine bat species, they were not manually re-analyzed as required by the USFWS Guidelines. In addition to this discrepancy, Table E-1 lists only 134 possible northern myotis files that were re-analyzed manually, not the 197 that were identified as possible northern myotis by the original analysis.

I am always circumspect in reviewing acoustic data from bats within the genus Myotis ('myotine bats') because there is such a high overlap in the echolocation signature of these bats. This is particularly true in cluttered forest habitats where ecomorphological constraints of ultrasound become more dominant factors in the signature than phylogeny. Although more data can increase the confidence of species identification (Britzke, 2005), resolution of acoustic calls within myotine bats represents the most problematic task among all the temperate bats (Jones et al., 2004). Species identification software, such as Kaleidoscope Pro or EchoClass do not increase the accuracy of this task, but merely increase the repeatability of the methodology and the precision of the errors. This is why the USFWS Guidelines recommends manually vetting of potential myotine calls by a qualified expert. Although I do have concerns about the technical qualifications of the Normandeau acoustic experts, my primary issue is that neither of their analysts appeared to have any direct knowledge of NPT Project site, nor were they involved with the deployment of the acoustic monitors and thus have limited familiarity with the sampling conditions under which the data were collected. Given the importance that sampling conditions have on the ability to distinguish myotine bats, it is unclear how they controlled for the impacts of clutter on call structure. That being said, the visual analysis of the calls generated by Normandeau appear to be relatively conservative, with one site 'confirmed' for the presence of northern myotis and 13 of the 19 sites deemed inconclusive. Based on these results, 14 sites with the NPT Project area will require some form of impact minimization for the northern myotis.

Conclusions

I have many technical concerns regarding the overall methodology used to assess the potential impact of the NPT Project on northern myotis. However, all of these concerns are negated by the fact that the US Fish and Wildlife Service has determined that "incidental take attributable to maintenance, development, and rights-of-way expansion is not prohibited" provided conservation measures are followed (USFWS, 2016). These conservation measures include seasonal tree removal activities to reduce the likelihood of bats occupying potential tree roosts at the time of the construction. The Applicant's proposal to avoid any tree clearing from May 01 – September 30 should minimize the risk of incidental take without compromising the conservation or recovery of this species. In this regard, the impact minimization proposed by the Applicant is consistent with the USFWS 4(d) ruling for the northern myotis (USFWS, 2016).

In a 2013 meeting with the Applicant, the USFWS specifically stated that their primary concern was the "direct mortality that can result when trees are cleared during the summer season". They also stated that if "Northern Pass is unable to guarantee clearing out of season, then some level of acoustics and targeted mist-netting if Myotis species are detected, should be conducted." At that time, the Applicant proposed the development of a Programmatic Agreement between the Applicant and USFWS to determine "where and how to survey (habitat, acoustics, mist-netting) should sections of the project not allow for out of season clearing". I recommend that such an agreement be developed for any section of the NPT Project that will require tree clearing activities (and thus have the potential for suitable roosting habitat) for the following reasons:

- the Applicant acknowledges that most of the forest habitat that will be removed meets the criteria of 'suitable roosting habitat' as described by the USFWS
- the Applicant acknowledges that tree clearing during the active season (May 01 September 30) has the potential to disturb or kill roosting northern myotis
- the Applicant failed to conduct a habitat suitability analysis as requested by the USFWS, which could have excluded segments of the NPT Project site
- the Applicant determined that 9% of the NPT Project site had potential northern myotis bat activity
- there are inconsistencies and possible inadequacies of the manual identification analysis that suggests limiting seasonal clearing to these sites would not adequately protect this species.

Based on information that has been submitted by the Applicant to date, in my opinion they have not met the criteria necessary to state that the NPT Project will not have an unreasonable adverse effect on the northern myotis. A Programmatic Agreement that has been approved by the USFWS and NHFG, preferably in consultation with disinterested bat biologists and biostatisticians, should be developed to ensure that any construction activities that occur in forested habitat will be designed and implemented in a manner that will minimize any direct or indirect impact on the northern myotis. Furthermore, it is my opinion that such a Programmatic Agreement must be developed and approved prior to this issuance of any certificate by the SEC.

In regards to minimizing the impact of tree clearing on known hibernacula, I would recommend that no tree removal activity be conducted in proximity to the Bristol mine location between August 01 and May 31, as the hibernaculum has the potential to be used as a swarming area and winter hibernaculum throughout this time period. I suggest additional acoustic monitoring within the 35-acre area that is proposed for clearing. This monitoring could be conducted and analyzed in June and, assuming the absence of northern myotis bat activity, the trees could be removed in July prior to any potential swarming activity.

The additional measures offered by the Applicant, specifically with regard to the Compensatory Preservation will not have any impact on the conservation or recovery of this species because there is no evidence that this species is habitat-limited in general (USFWS, 2016) or within any section of the NPT Project area.

Eastern Small-footed myotis

State-Listed Endangered Species

Species Background

The eastern small-footed myotis (*Myotis leibii*) has an extensive distribution (from Ontario to New England, southward to Georgia and Westward to Oklahoma), although it is not considered common anywhere within its range. The status of the eastern small-footed myotis has been the subject of regular revision throughout the past fifty years. Prior to its current classification as *M. leibii* in 1984 (van Zyll de Jong, 1984), the eastern small-footed myotis was considered a subspecies (*Myotis leibii leibii*) of neartic small-footed myotis (Glass & Baker, 1968). Prior to 1968, this species was referred to as *M. subdulatus* (Miller & Allen, 1929 cited in Thomas, 1993). This taxonomic discontinuity has most likely played a significant role in the lack of federal protection afforded to this species, considering the eastern small-footed myotis is one of the rarest bats in North America (Griffin, 1940) and 'without doubt the least known of all northeastern bat species' (Thomas, 1993). Although *M. leibii* is not federally protected, it has special status in most of the states in which it is documented, and is state-listed as *Endangered* in New Hampshire (NHFG, 2015).

Summer capture data suggest that small-footed myotis tend to use rocky hillsides as maternity roosts (Fenton et al., 1980; LaGory et al., 2008). Although this is typical habitat in mountainous regions, they appear to be more versatile throughout their range, using rock slabs, rocky outcrops, talus slopes, earthen dams, hollow trees, abandoned tunnels, and even human structures (Thomas, 1993; Best & Jennings, 1997; LaGory et al., 2008). Summer populations of small-footed myotis appear to be patchy throughout their range, and summer activity is often concentrated around hibernacula (Thomas, 1993; Johnson & Gates, 2008; Reynolds et al. 2016). Most of the research suggests that eastern small-footed myotis travel extremely short distances between winter hibernacula and summer roost areas. For example, Johnson and Gates (2008) reported migration distances of between 0.1 and 1.1 km from hibernacula to summering locations for four female eastern small-footed myotis. Data from Reynolds et al. (2016) suggest that in some locations, eastern small-footed myotis may remain in the same vicinity year-round as long as they have access to both roosting and foraging habitat.

Research conducted by myself and Jacques Veilleux (Franklin Pierce University; Rindge, NH) has documented eastern small-footed myotis from only one hibernaculum in New Hampshire (Gorham; Coos County). In addition to caves and mines, I have documented small-footed myotis hibernating along a talus slope at the New Boston Air Force Station (New Boston; Hillsborough County: Reynolds et al., 2016). Data collected from hibernacula suggest that small-footed myotis are a relatively cold-tolerant species, choosing to hibernate near entrances in narrow crevices (Veilleux, 2007), low along the wall or even among rock debris (Thomas, 1993). They enter hibernation later than most other species and leave earlier (Best & Jennings, 1997; Reynolds et al., 2016), giving them a substantially longer active season than other hibernating species. Data from spring emergence studies indicate that some small-footed myotis leave their winter hibernaculum from mid-March to early April (Johnson and Gates, 2008; J.P. Veilleux, unpublished data).

Project Impact Summary

Section 10.2.2 of the Wildlife Report states that the habitat preference for the eastern small-footed myotis is "closely associated with southeast to southwest facing rocky areas, including rip-rap, rocky cliffs, and rocky outcrops". The Wildlife Report also states that little is known about the summer distribution of this species within New Hampshire, but that this "is as much a function of the distribution of survey efforts to date as it is a reflection of the distribution of the species". Normandeau assessed the potential winter and summer roosting habitat of eastern small-footed myotis using two methodologies: 1) conducting a records search of known hibernacula within the Project area (winter habitat) and 2) noting "the location of rock

Appendix B: NPT Bat Impact Assessment

features, including rocky outcrops, exposed ledge, and large boulders that could potentially provide [small-footed myotis] roosting habitat" via aerial photography or field surveys (summer habitat). The Wildlife Report states that there is no known winter habitat within the NPT Project area, although the Natural Heritage Bureau states that there are three known hibernacula within five miles of the NPT Project site. As two of these hibernacula are located in the vicinity of the underground portion of the NPT ROW, no further impact assessment was conducted. The third hibernaculum (located in Bristol; Grafton County) has no documented use by eastern small-footed myotis.

For summer roosting habitat, Normandeau field-checked all rocky outcrops that were identified from aerial photographs and which coincided with the construction footprint of the NPT Project. Potential suitability as roosting habitat was defined by Normandeau as 1) the presence of cracks and crevices where bats could gain protection from the elements and predators while roosting, 2) unobstructed access to these crevices from vegetation, and 3) a southern trending exposure that provided insolation for roosting bats. When suitable roosting areas where documented, Normandeau placed acoustic detectors in proximity to the rocky outcrops to monitor for the presence of eastern small-footed myotis. A total of 24 rocky outcrop features were identified that fell within the construction footprint of the NPT Project area and all but three of these sites were determined to be inadequate as potential roosts because the rocky areas had "the capability of providing suitable summer roosting habitat but likely inadequate protection from sub-freezing temperatures during hibernation". The Wildlife Report further stated that other suitable roosting habitat was observed within these rocky outcrop areas, but they did not overlap with the construction pad "and therefore will not be impacted by construction".

The remaining three sites were acoustically monitored for bat activity in May 2015 and one site (Deerfield Segment 510) had acoustic activity consistent with eastern small-footed myotis. In addition to these sampling sites, eastern small-footed myotis were documented at three additional sites as part of the northern myotis impact assessment; the identification as eastern small-footed myotis could not be excluded at any of these sites (Table 4 of Appendix 5 of the Wildlife Report).

The Wildlife Report (Section 10.5.2) states that construction activities could negatively impact roosting habitat on rocky outcrops. Specifically, blasting, drilling, and vibration are all identified as potential negative impacts. The Wildlife Report states that it "is unlikely that rock shift would eliminate all potential roosting locations" and that these impacts could be avoided by "limiting construction to the time of year when bats are active but when they do not have non-volant pups, so that they can escape as needed". Specifically, the Wildlife Report suggests that May, prior to pupping, and late August through mid-October (prior to hibernation) would be appropriate.

In Appendix B of the Mitigation Report, the Applicant states that there will be no structural work conducted in rocky outcrop habitat at the Deerfield location "unless bat absence is verified". The Mitigation Report also states that the Applicant will "avoid blasting during summer/winter roost periods at known or estimated bat locations". The Wildlife Report concludes that eastern small-footed myotis will potentially benefit from the additional forest edge habitat, and possibly even additional rocky outcrop habitat, that may be generated by expansion of the NPT Project ROW; in fact, the primary Compensation Strategy for this species is listed as additional rocky outcrop clearings due to expansion of the NPT ROW.

Agency Issues

The NPT Wildlife Report (Section 10.1) identifies the eastern small-footed myotis as an Endangered Species by the NHFG, as well as a Forest Sensitive Species by the U.S. Forest Service. The NPT Wildlife Report (Section 10.1) states that the U.S. Forest Service requested a habitat suitability assessment be

completed for the eastern small-footed myotis within the White Mountain National Forest portion of the NPT Project.

At a meeting on March 04, 2013, the NHFG recommended that a habitat assessment be conducted using a GIS suitability analysis containing cover type mapping and elevation data. These maps could then be field verified and monitored. On September 03, 2015, NHFG requested an investigation of blasting effects and specifics about the locations and impacts of this blasting activity with regard to the eastern small-footed myotis.

NEES Assessment

In Section 10.5.2 of the Wildlife Report, Normandeau states that rock shifts due to construction and blasting are unlikely to eliminate all potential roosting locations, and that construction will be limited to the time of year when bats can "escape as needed". As part of our discovery motions (EXP 1-170), NEES requested a description of all efforts that were conducted to investigate blasting effects, including "specifics about the locations and impacts" as requested by the NHFG in September 2015. The Applicant responded that the locations of blasting have not yet been determined, precluding an analysis of specific locations and impacts. At the Technical Sessions, Sarah Barnum (Normandeau) stated that she had no knowledge of the magnitude of any likely rock shifts, nor was she aware of any evidence that bats would be able to escape as needed during blasting and other construction activities.

I have fundamental concerns about both the approach that the Applicant has taken to address the likelihood of impact to the small-footed myotis as well as their mitigation strategy to reduce this impact. First and foremost, there was very little effort made to evaluate likely presence of this species along the NPT ROW. The US Forest Service requested a habitat suitability assessment for this species and the NHFG specifically recommended GIS modelling using cover type mapping and elevation data. Despite this, the Applicant limited their approach to a database search and a visual analysis of aerial photographs to determine possible roosting locations. I agree with the conclusion that there are no *known* hibernacula within the NPT Project area for this species that will be impacted by construction activities. However, it is well known, or at least intuitively obvious to those who study the ecology of this species, that most of the population hibernates in unknown locations, which are presumably rocky outcrops with crevices and fissures deep enough to remain thermally stable throughout the winter months. Excluding potential summer roosting sites because they provide "inadequate protection from sub-freezing temperatures during hibernation" is not an appropriate criterion to limit surveying effort, as summer roosting bats at these sites could find alternative crevices farther from the NPT Project to hibernate. If this occurred, these summer populations would not be surveyed or protected using the criteria employed by Normandeau.

The primary method of assessment of the presence of small-footed myotis was a visual analysis of the NPT ROW based on aerial photographs. Although Normandeau stated that the northern myotis monitoring protocol would also sample for small-footed myotis, a summary of the results of this survey effort (12 calls over 546 detector-nights) compared to the rocky outcrop survey effort (16 calls over 12 detector-nights) shows that the former survey was not adequately sampling small-footed habitat. I conducted a similar visual analysis of the proposed NPT ROW using Google Earth and identified 31 potential rocky outcrops, with 27 sites south of the New Hampton area (Figure 1). Based on GPS coordinates of the sites, I confirmed eight of the same locations as the Normandeau analysis, including multiple locations near Franklin and Deerfield. However, several other sites were also identified including locations near Signal Mountain and the Stark Quarry (Coos County) and the NH Army National Guard facility in Pembroke (Merrimack County). Arrowwood Environmental also generated a GIS model for potential small-footed myotis habitat using the criteria requested by the NHFG. This model used cover type (Cliff and Talus, Outcrop and Summit Scrub), slope (> 30°), exposure (south or southeast exposure), and proximity to water (< 1 km) to generate several additional locations, as shown as yellow stars in

Figure 1. This GIS suitability analysis was requested by the NHFGD in March 2013 but never conducted by Normandeau.



Figure 1. Potential small-footed roosting locations based on visual analysis and GIS modelling. Purple bubbles are NEES locations, red bubbles are NEES/Normandeau locations, and yellow stars are likely habitat based on GIS modelling.

Appendix B: NPT Bat Impact Assessment

The second major concern I have with the approach taken by Normandeau is with the assumption that the impact of construction activities will be minimized by allowing bats to "escape as needed" when construction activities begin. In my opinion, bats roosting or hibernating in rock crevices within rocky outcrop habitat will not "escape as needed" when blasting and other construction activities occur because they are unlikely to abandon their roosts in the daylight hours in response to sound or vibration. This is particularly true for the fall and winter seasons when low temperatures will result in torpor that would prevent the bats from escaping even if they correctly assessed the hazard. The idea that this risk can be minimized by avoiding blasting activities when there could be non-volant pups in the roost does not adequately address this risk. Any rocky outcrop containing a roosting population of eastern small-footed myotis is potentially going to be utilized year-round as both summer roosting and winter hibernacula. Therefore, there is no time of the year when it is unlikely that bats would not be present in the rocky outcrop. And even if the roost is only used seasonally, I do not think it is plausible that bats will abandon the roost during the daylight hours ('escaping as needed') and consequently they could be severely impacted by the proposed blasting and construction activities.

The final major concern is that the Applicant has not yet investigated or attempted to estimate either the scale or magnitude of any construction impact within rocky outcrop habitat, as confirmed the Applicants own statements in both the discovery motion EXP 1-170 and in the Technical Session response of Sarah Barnum. Furthermore, the Applicants' sole mitigation proposal (to let bats "escape as needed") is not based on any best management practice or knowledge of the biology of the eastern small-footed bat. Again, the Applicant's consultants have confirmed that this approach is not based on any data or literature that would suggest its likelihood of success, thus falling far short of being considered a best management practice.

Conclusions

In my opinion, construction activity in general, and blasting in particular, will have a large impact on crevice space configurations that would impact roosting bats with little to no warning, thereby crushing bats within those crevices or trapping them behind sealed crevices such that they could not escape. It is irresponsible to conduct such activities in the absence of appropriate efforts to determine whether bats are roosting within these sites. Therefore, pre-construction monitoring should be performed at all sites adjacent to or directly impacting rocky outcrop habitat, including all construction sites that will involve blasting or removal of surface rocks. The proposal to have unrestricted construction and blasting activity outside of a two-month period when pups are non-volant lacks any site-specific or biological context, particularly given the knowledge that these roosts could potentially be occupied by bats year-round. In my opinion, the Applicant should establish a Programmatic Agreement with the USFWS and NHFG for the eastern small-footed myotis that would address appropriate pre-construction survey methods and adequate post-construction impact assessments.

Tricolored bat

State-Listed Species of Concern

Species Background

The eastern tricolored bat (*Perimyotis subflavus*), formerly known as the eastern pipistrelle (Hoofer et al., 2006), occurs throughout much of the eastern United States, north to southeastern Canada, and south through Honduras (Fujita & Kunz, 1984). It is believed that the northern edge of their range coincides with the southern edge of the Wisconsonian glacier due to the infilling of caves by glacial till (Brack & Mumford, 1984). There are data suggesting that the tricolored bat has seen a recent range expansion of tricolored bats both to the north and west as artificial hibernacula (mines) have become more available (Geluso et al., 2005; Kurta et al., 2007). During summer months, female tricolored bats typically form small maternity colonies (under 10 individuals) in trees, usually using both dead leaf clusters and live foliage (Veilleux et al., 2003). In terms of roost tree preference, tricolored bats prefer oak trees (*Quercus* spp.) over other available tree species, but maples (*Acer* spp.), yellow poplar (*Liriodendron tulipifera*), eastern cottonwood (*Populus deltoides*), and hackberry (*Celtis occidentalis*) are used relatively often as well (Veilleux et al., 2004a). Like most tree-roosting bats, tricolored bat roosts are in trees that are taller and wider than the surrounding trees (Perry & Thill, 2007b). Radiotracking of individuals suggests that tricolored bats prefer roost trees in both upland forests and riparian woodlands (Veilleux et al., 2003).

Summer foraging habitat of the tricolored bat is predominantly low elevation riparian habitat, although they are also found in pine stands and upland hardwoods (Carter et al., 1999; Veilleux et al., 2003; Ford et al., 2005). Eastern tricolored bats appear to remain relatively close to roost sites while foraging, with minimum foraging distances ranging from 0.05 to 2.61 km (mean = 0.72 km) from roost sites (Veilleux et al., 2003). In Indiana, Veilleux et al. (2004b) reported that tricolored bats first arrived at their summering areas during the first two weeks of May, and most individuals appeared to leave their summering area for their hibernation site by late August. In Missouri, LaVal and LaVal (1980) reported tricolored bats leaving summering areas for hibernacula during late July through August. During winter, caves and mines are typically used as hibernation sites; although they have also been documented using dams (Kurta & Teramino, 1994) and turnpike tunnels (Mohr, 1942). Eastern tricolored tend to hibernate alone but can be abundant in some hibernacula (Fujita & Kunz, 1984; Hicks, 2003). Historically, tricolored bats have been documented in small numbers six of the eight winter hibernaculum tracked by the NH Fish and Game; the most recent survey of hibernacula from the 2014-2015 winter season failed to document any tricolored bats within the state (Reynolds, unpublished data).

Project Impact Summary

The NPT Wildlife Report (Section 10.2.1) identifies the tricolored bat as a Special Status species, listed as a Species of Concern by the NHFG and a Forest Sensitive Species by the U.S. Forest Service. However, no further review or analysis of potential impact was conducted for this species.

The Wildlife Report states that there is no known winter habitat for this species within the NPT Project area, although the Natural Heritage Bureau states that there are three known hibernacula within five miles of the NPT Project site. As two of these hibernacula are located in the vicinity of the underground portion of the NPT ROW, no further impact assessment was conducted. The third hibernaculum (located in Bristol; Grafton County) was historically the largest known hibernaculum for tricolored bats, having as many as 17 individuals during the winter (Reynolds, unpublished data).

The NPT Mitigation Report (Table 1) identifies 731 acres of forest will be cleared and over 660,000 ft² of permanent loss of rare or threatened forested habitat, and proposes Compensatory Preservation of large forest blocks (identified in Table 6) that have suitable habitat for the tricolored bat.

Agency Issues

The NPT Wildlife Report (Section 10.1) states that the U.S. Forest Service requested a habitat suitability assessment be completed for the tricolored bat within the White Mountain National Forest portion of the NPT Project. Outside of this request, I am not aware of any specific issues that the wildlife agencies presented to the Applicant in regards to this species.

NEES Assessment and Conclusion

It is difficult to generate a quantitative assessment of the risk of the NPT Project on the tricolored bat because no effort was made to survey for this species or to mitigate for any potential impact to this species. The impact of the NPT Project on this species is relevant to the SEC's assessment of Unreasonable Adverse Impact because it is a state Species of Concern, and was identified as such in Section 10.2.1 of the Wildlife Report. However, Normandeau Associates was presumably working under the assumption that survey efforts and mitigation efforts concentrated on the northern myotis would be similarly effective at identifying and protecting tricolored bats as well. I do not disagree with this premise, although sampling sites chosen to document the presence of northern myotis would be different than those chosen to document tricolored bats. Data provided by the Applicant in response to discovery motion (EXP 1-179) stated that only 11 calls (< 1% of total bat activity) were documented from the tricolored bat across 546 detector-nights, suggesting this species is not common along the NPT Project area.

In my opinion, it is unlikely that the NPT Project will have any population-level impact on the tricolored bat if construction activities are conducted in accordance with best management practices targeted towards the conservation and recovery of the northern myotis.

Eastern Red Bat

State-Listed Species of Concern

Species Background

Eastern red bats (*Lasiurus borealis*) are one of the best known migratory tree bats and are a common resident of much of the United States, Central and South America (Shump & Shump, 1982b). In the spring, they migrate into the northeast from more southern latitudes. Although red bats do not hibernate to the extent of the cave bats, they have been documented foraging in winter (Easterla, 1967; Dunbar & Tomasi, 2006; Dunbar et al., 2007), occupying tree roosts and leaf litter roosts during the winter (Mormann et al., 1999; Mormann & Robbins, 2007), and are known to be capable of using torpor at low temperatures (Davis & Lidicker ,1956; Genoud, 1993; Mormann et al., 2004).

During summer months, eastern red bats roost in the foliage of trees (Shump & Shump, 1982b; Whitaker & Hamilton, 1998). Research on the roost tree preferences of red bats suggest that tree selection is highly variable. Several studies throughout their range (Menzel et al., 1998; Hutchinson & Lacki, 2000; Mager & Nelson, 2001; Limpert et al., 2007) document a wide variety of species including oaks (*Quercus* spp.), maples (*Acer* spp), hickories (*Carya* spp.), sweetgum (*Liquidambar styraciflua*), black walnut (*Juglans nigra*), yellow poplar (*Liriodendron tulipifera*), and American beech (*Fagus grandifolia*). Despite the diversity of tree species, red bat roost trees are almost always deciduous and found within mature forest stands (Ford et al., 2006b; Perry et al., 2007; Perry et al., 2008). The research is also consistent in the fact that roost trees are typically taller, larger, and have a higher crown base than random trees (Menzel et al., 2000a; Perry et al., 2007).

In terms of overall habitat preference, both Menzel et al. (1998) and Hutchinson and Lacki (2000) found that the majority of roost trees used by eastern red bats were located in hardwood forests and in upland areas. In contrast, Medlin and Risch (2008) and Hendricks et al. (2006) found red bats to prefer riparian and bottomland forest habitat. Clearly, red bats are flexible in their roosting habitat requirements and can be considered habitat generalists (Ford et al., 2005; Elmore et al., 2005) as long as the roost trees are located close to permanent water sources (Hutchinson & Lacki, 2000). Red bats have a relatively small foraging areas (less than 100 ha: Elmore et al., 2005; Walters et al., 2006). Historically, red bats have been one of the most common bats in the eastern United States (Lewis, 1940), but there are some data to suggest that populations have declined substantially since the late 1970's (Winhold et al., 2008). In the wake of WNS, red bats are frequently the most abundant species of bat captured in surveys throughout the northeast.

Project Impact Summary

The NPT Wildlife Report (Section 10.2.1) identifies the eastern red bat as a Species of Special Concern by the NHFG. In Section 10.4.1, the Wildlife Report states that there is mature forest habitat within the existing Project ROW, and there are large potential roost trees within the proposed Project ROW. Although Section 10.5.1 states that there will be "some loss of roosting habitat associated with the clearing of trees", Normandeau concludes that roosting habitat is regionally abundant and the "impact of tree clearing should be negligible". The conclusion of the Wildlife Report is that the NPT Project will increase potential foraging habitat of this species along the uncleared portion of the Project area as this species prefers to forage in edge habitat, and that widening of the existing ROW will have no impact on the presence or use of this edge habitat. Beyond this statement, there was no further review or analysis of potential impact of the NPT Project conducted for this species.

Agency Issues

To my knowledge, the eastern red bat was not specifically identified as a concern by either the USFWS or the NHFG, so I am not aware of any agency issues with the potential impact of the NPT Project on this species.

NEES Assessment and Conclusion

It is difficult to generate a quantitative assessment of the risk of the NPT Project on the eastern red bat because no effort was made to survey for this species or to mitigate for any potential impact to this species. The impact of the NPT Project on this species is relevant to the SEC's assessment of Unreasonable Adverse Impact because it is a state Species of Concern, and was identified as such in Section 10.2.1 of the Wildlife Report. However, Normandeau Associates was presumably working under the assumption that survey efforts and mitigation efforts concentrated on the northern myotis would be similarly effective at identifying and protecting eastern red bats as well. I do not disagree with this premise, and many of the sampling sites chosen to document the presence of northern myotis would be similar to sites chosen to document red bats. Data provided by the Applicant in response to discovery motion (EXP 1-179) stated that red bats were relatively abundant, with over 4,000 calls identified (7% of total bat activity) across 546 detector-nights. This suggests eastern red bats are among the most common species in the region; a conclusion that is consistent with many other population surveys conducted in the region.

In my opinion, it is unlikely that the NPT Project will have any population-level impact on the eastern red bat if construction activities are conducted in accordance with best management practices targeted towards the conservation and recovery of the northern myotis.

Hoary Bat

State-Listed Species of Concern

Species Background

The hoary bat (*Lasiurus cinereus*) occurs throughout much of North and South America (Cryan, 2003). Despite the wide geographic range of this species, there are relatively few data that describe their habitat preferences and seasonal movements. However, it is believed that most individuals winter in southern latitudes and migrate north each spring into the northeast, with males migrating to more western regions and females to more eastern regions, although there are exceptions to these generalities (Cryan, 2003, Perry and Thill, 2007c). Although hoary bats do not generally hibernate, they are known to be capable of prolonged torpor during harsh weather conditions (Genoud, 1993; Cryan & Wolf, 2003; Willig et al., 2006).

Large-scale population surveys suggest that hoary bats are found in a variety of habitats, but they appear to be more commonly found foraging in riparian habitats than upland forests (Hart et al., 1993; Heady & Frick, 1999; Menzel et al., 2005; Ford et al., 2005). Hoary bats are tree-roosting bats that suspend from foliage in the upper canopy of both deciduous and coniferous trees (Perry & Thill, 2007c; Veilleux et al., 2009) but are associated with coniferous forests at higher frequency than other tree-roosting bats (McClure, 1942; Perkins & Cross, 1988). Hoary bats are known to use a wide variety of tree species including white spruce (*Picea glauca*: Willis & Brigham, 2005) and eastern hemlock (*Tsuga canadensis*: LaGory et al. 2008), but also deciduous species such as white oak (*Quercus alba*: Perry & Thill, 2007c). Roost trees are typically taller and wider than random trees used for comparison (Perry & Thill, 2007c; Miller & Miles, 2008). Hoary bats are also known to use other atypical roost sites such as woodpecker holes (Shump & Shump 1982a), squirrel nests (Neill, 1952), and even clumps of Spanish moss (Sherman, 1956).

The foraging habitat of hoary bats is quite diverse; Hart et al. (1993) found hoary bats utilizing forested and aquatic habitats in greater proportions than non-forested and non-aquatic habitats. Cryan and Veilleux (2007) suggested that hoary bats concentrate their activity in forested habitats (nearly 70%), with less foraging occurring in open fields (17%) or wetlands (15%). Hoary bats are commonly caught in edge habitat (Furlonger et al., 1987). In New Hampshire, LaGory et al. (2008) found hoary bats have a foraging area of 156 ha. Hoary bats have been documented migrating throughout their range, but little is known about the pattern of these migratory events. Overall, it appears hoary bats are similar to birds in that they migrate in groups (Provost & Kirkpatrick, 1952), often in episodic waves across the landscape; in some cases, these movements coincide with migratory birds (Findley & Jones, 1964).

Project Impact Summary

The NPT Wildlife Report (Section 10.2.1) identifies the hoary bat as a Species of Special Concern by the NHFG. In Section 10.4.1, the Wildlife Report states that there is mature forest habitat within the existing Project ROW, and there are large potential roost trees within the proposed Project ROW. Although Section 10.5.1 states that there will be "some loss of roosting habitat associated with the clearing of trees", Normandeau concludes that roosting habitat is regionally abundant and the "impact of tree clearing should be negligible". The conclusion of the Wildlife Report is that the NPT Project will increase potential foraging habitat of this species along the uncleared portion of the Project area as this species prefers to forage in edge habitat. Beyond this statement, there was no further review or analysis of potential impact of the NPT Project conducted for this species.

Agency Issues

To my knowledge, the hoary bat was not specifically identified as a concern by either the USFWS or the NHFG, so I am not aware of any agency issues with the potential impact of the NPT Project on this species.

NEES Assessment and Conclusion

It is difficult to generate a quantitative assessment of the risk of the NPT Project on the hoary bat because no effort was made to survey for this species or to mitigate for any potential impact to this species. The impact of the NPT Project on this species is relevant to the SEC's assessment of Unreasonable Adverse Impact because it is a state Species of Concern, and was identified as such in Section 10.2.1 of the Wildlife Report. However, Normandeau Associates was presumably working under the assumption that survey efforts and mitigation efforts concentrated on the northern myotis would be similarly effective at identifying and protecting hoary bats as well. I do not disagree with this premise, and many of the sampling sites chosen to document the presence of northern myotis would be similar to sites chosen to document hoary bats. Data provided by the Applicant in response to discovery motion (EXP 1-179) stated that hoary bats were commonly found across the NPT Project site, with over 1,300 calls identified (2% of total bat activity) across 546 detector-nights. This suggests hoary bats are well distributed across the Project area; a conclusion that is consistent with many other population surveys conducted in the region.

In my opinion, it is unlikely that the NPT Project will have any population-level impact on the hoary bat if construction activities are conducted in accordance with best management practices targeted towards the conservation and recovery of the northern myotis.

Silver-haired Bat

State-Listed Species of Concern

Species Background

The silver-haired bat (*Lasionycteris noctivagans*) occurs throughout much of the majority of southern Canada and the United States (Kunz, 1982). Females appear to migrate to northern latitudes during spring to give birth, while males appear to remain closer to their winter range in the south (Cryan, 2003). The silver-haired bat is a tree-roosting species and during summer months roosts in tree hollows and under exfoliating bark (e.g. Vonhof, 1996; Betts, 1998; Crampton & Barclay, 1998), although there are records of silver-haired bats using artificial roosts (Whitaker et al., 2006). In terms of landscape level choice, Betts (1998) found most roosts used by silver-haired bats are found in mature stands, particularly in coniferous forests (Perkins & Cross, 1988; Jung et al., 1999). Arnett (2007) found that silver-haired roosting habitat was highly associated with high snag density and low elevation, whereas Campbell et al. (1996) found roost sites concentrated near riparian areas and moderately-sloped habitat. Like most treeroosting bats, the roost trees of silver-haired bats are diverse in species, but are typically taller and wider than random trees used for comparison (Campbell et al., 1996; Vonhof, 1996; Betts, 1998).

Barclay (1985) found that the silver-haired bat used similar foraging habitat as hoary bats, with the highest level of activity found in forested habitat, particularly when in proximity to ponds or streams (Schmidly, 2004). Similarly, Duff and Morrell (2007) found low elevation habitat and long riparian flyways to be strong predictors of silver-hair bat activity. Silver-haired bats have historically been seen migrating in groups along the Atlantic Coast (Miller, 1897; Mackiewicz & Backus, 1956). Post-construction mortality surveys at the Buffalo Mountain Windfarm in Tennessee suggest that silver-haired bat migratory activity was later than migratory activity of hoary bats and red bats, with most of the silver-haired bat mortality occurring outside the period of peak bat mortality (Fiedler et al., 2007). Although this species does not hibernate to the extent of the cave bats, they have been captured foraging during the winter (Dunbar et al., 2007), they have been tracked to winter roosts in caves (Beer, 1956; Martin & Hawks, 1972; Izor, 1979), houses (Gosling, 1977; Clark, 1993; Sherwood & Kurta, 1999) rock crevices and under exposed roots (Perry et al., 2010), and under leaf litter (Menzel et al., 2000b).

Project Impact Summary

The NPT Wildlife Report (Section 10.2.1) identifies the silver-haired bat as a Species of Special Concern by the NHFG. In Section 10.4.1, the Wildlife Report states that there is mature forest habitat within the existing Project ROW, and there are large potential roost trees within the proposed Project ROW. Although Section 10.5.1 states that there will be "some loss of roosting habitat associated with the clearing of trees", Normandeau concludes that roosting habitat is regionally abundant and the "impact of tree clearing should be negligible". The conclusion of the Wildlife Report is that the NPT Project will increase potential foraging habitat of this species along the uncleared portion of the Project area as this species prefers to forage in edge habitat. Beyond this statement, there was no further review or analysis of potential impact of the NPT Project conducted for this species.

Agency Issues

To my knowledge, the silver-haired bat was not specifically identified as a concern by either the USFWS or the NHFG, so I am not aware of any agency issues with the potential impact of the NPT Project on this species.

NEES Assessment and Conclusion

It is difficult to generate a quantitative assessment of the risk of the NPT Project on the silver-haired bat for two reasons. First, no effort was made to survey specifically for this species or to mitigate for any potential impact to this species. The impact of the NPT Project on this species is relevant to the SEC's assessment of Unreasonable Adverse Impact because it is a state Species of Concern, and was identified as such in Section 10.2.1 of the Wildlife Report. However, Normandeau Associates was presumably working under the assumption that survey efforts and mitigation efforts concentrated on the northern myotis would be similarly effective at identifying and protecting silver-haired bats as well. I do not disagree with this premise, and many of the sampling sites chosen to document the presence of northern myotis would be similar to sites chosen to document silver-haired bats. However, silver-haired bats are acoustically similar to big brown bats; therefore, acoustic monitoring does not provide an accurate assessment of their distribution or abundance. Data provided by the Applicant in response to discovery motion (EXP 1-179) stated that silver-haired bats were the second-most abundant species found across the NPT Project site, with over 6,800 calls identified (11% of total bat activity) across 546 detector-nights. This is clearly an inaccurate assessment of their abundance and is caused by the fact that many of these calls were misclassified big brown bats. This critique is not specific to Normandeau or to the Kaleidoscope software they relied upon, but it does prevent an accurate estimate of the potential distribution of this species across the NPT Project site.

In my opinion, it is unlikely that the NPT Project will have any population-level impact on the silverhaired bat if construction activities are conducted in accordance with best management practices targeted towards the conservation and recovery of the northern myotis.

CONCLUSION

I have seven primary concerns regarding the efforts of the Applicant to evaluate the impact of the NPT Project on bats related to i) their failure to evaluate the potential impact of the NPT Project on four species that meet the SEC significant wildlife criteria, ii) their reliance on a narrow sampling window to evaluate the potential risk to all bat species, iii) their reliance on a single survey method to evaluate the impact risks to all bat species, iv) the impact assessment and minimization for the eastern small-footed myotis are inadequate, not based on the biology of the species, and do not represent best management practices, v) the Mitigation Plan lacks any species-specific information to develop impact mitigation and minimization strategies, vi) their inability to follow-through on the recommendations and requests of the relevant wildlife agencies, and vii) the lack of follow-through on any mitigation plan given the lack of commitment to develop such a plan.

- i) According to the definition of significant wildlife species, the Wildlife Report should have contained species-specific impacts, mitigation, and conclusions for six species of bats. The Wildlife Report was limited to the two species of myotine bats, the federally Threatened northern myotis and the state Endangered eastern small-footed myotis. No substantive effort was made to document the impact of the NPT Project on any of the US Forest Service Sensitive Species or the NHFG Species of Concern. Given that the first step of the process for evaluating the potential for unreasonable adverse effect is to describe how significant wildlife species were identified (SEC, 2016), this omission is a major deficiency of the Wildlife Report.
- ii) Given the magnitude and scale of the NPT Project, a significant amount of effort should have been undertaken to ensure adequate information was available to make an assessment of potential impact. This is particularly true for bats, which we know are undergoing severe population decline even though we lack background information and population estimates throughout the region. The acoustic monitoring survey conducted for the northern myotis met the USFWS Guidelines (2016) for sampling effort; however, due to limited equipment or personnel, the surveys were conducted from May through August despite the fact that bat distribution and abundance are likely to vary significantly across this time period, independent of habitat. A statistical analysis of the impact of date, latitude, or ambient temperature on bat activity would have provided some protection against this concern. The use of replicate sampling (beyond consecutive nights) or multiyear surveys would also have provided more information.
- iii) Normandeau Associates relied exclusively on acoustic monitoring to assess species distribution across the NPT Project site. Acoustic monitoring is a valuable sampling methodology, particular in large-scale projects where the focus is on determining the diversity of species present within a variety of habitats. Where acoustic monitoring can fall short is when the focus is on determining the abundance of a species, or when the focus of the survey is to distinguish between species within the genus *Myotis*. For the NPT Project, the clear focus of the Wildlife Report was to document the presence of two myotine bat species; the northern myotis and the eastern small-footed myotis. However, this is the most difficult genus in North America to distinguish by acoustic signature and therefore the results generated from such an analysis are guaranteed to be replete with misidentifications. Given the huge impact that sampling conditions have on the shape of these acoustic signatures and the fact that the identifications were conducted by

technicians who were unfamiliar with the specific sampling conditions (the analysts are based in Florida and were sent the acoustic data by field personnel), the qualifications of the technicians becomes relatively immaterial. In my opinion, more effort should have been done to evaluate the likelihood of accurate species identification through mist-net sampling at sites that were evaluated as likely northern myotis and eastern small-footed myotis habitat.

- iv) The Wildlife Report and Mitigation Report state that the impact of construction, including blasting and vibration, on the eastern small-footed myotis can be minimized by conducting all blasting and vibration activities outside the period when non-volant pups are likely to be in the roost crevices. The Wildlife Report further states that construction activity is unlikely to eliminate all crevices and that bats will be able to escape freely in advance of the construction activity and to avoid being crushed or trapped in the rock debris. I am not aware of any research that supports this approach as biologically appropriate. At the Technical Sessions, Sarah Barnum (Normandeau) could not provide any references to support this approach, nor did she offer a biological rationale to suggest why it might work. In my opinion, this is not a reasonable approach, and certainly not a best management practice, for minimizing the impact to a listed species.
- v) The Mitigation Report has no species-specific recommendations to mitigate for the impact of the NPT Project on the northern myotis and eastern small-footed myotis. It identifies generic forest habitat management goals to protect and enrich roosting habitat for all bat species but does not account for any of the stand or landscape characteristics that are known to be indicative of high quality roosting or foraging habitat for these species. In light of WNS, forest conservation is unlikely to provide any benefit to these species in the short-term. The Mitigation Report ignores this fact and relies on generic conservation goals to suggest that the NPT Project will actually enhance and conserve roosting and foraging habitat for all bat species.
- vi) In meetings with both state and federal wildlife agencies, the Applicant has agreed to develop programs, agreements, and analyses to provide information that can be used to assess the impact of this project. Without exception, the Applicant has failed to generate any of these documents:
 - a. habitat analysis of sites with documented northern myotis activity: NHFG,
 - b. Environmental Monitoring Plan (NHDEC),
 - c. Habitat Suitability Assessment (US Forest Service),
 - d. Compensatory Preservation of Forest Plan (US Forest Service, USDES),
 - e. Post-Construction Monitoring Plan (USFWS),
 - f. Construction and Blasting Impact Plan (NHFG),
 - g. Habitat Management Plan (USFWS, NHFG), and
 - h. Programmatic Agreement for impact to northern myotis (USFWS).
- vii) Given the failure of the Applicant to follow through with any of these documents (collectively 'Environmental Monitoring Plans'), or even develop a timeline for the completion of these documents suggests a lack of commitment to the SEC process in general and the conservation and protection of these species in particular. The Applicant

has suggested, through testimony and discovery motions, that many of these documents may be developed on a time table closer to construction. However, SEC approval of this project reflects one of the last points of accountability for the Applicant, and therefore no approval should be granted without a commitment and schedule to complete these tasks to the satisfaction of the requesting agency. In my opinion, development and approval of these documents should occur prior to the issuance of a certificate from the SEC. Furthermore, I believe that disinterested biologists should be engaged in the development of the documents and third-party monitors should be incorporated into the implementation of any construction monitoring plans.

THE LIKELIHOOD OF UNREASONABLE ADVERSE EFFECT

Bats represent a significant wildlife resource to the state of New Hampshire, and their conservation is clearly within the mandate of the SEC process. That being said, bats are very different from many of the other species under consideration by the SEC. First, the threats to bat conservation are not related to habitat loss, and therefore strategies to conserve habitat are not currently primary to the conservation and recovery of bat species in the region. Therefore, habitat management and habitat conservation are not reasonable measures to stabilize or recover these species. Second, our general level of knowledge on bat populations is relatively low because there has been little effort at the state or federal level to conduct basic biological research on this group of mammals. Therefore, the range of best management practices is often limited and we must rely on our knowledge of their biology, physiology, and ecomorphology to predict the likely impacts of any development on these species. This lack of practical experience limits our confidence in any management activity, necessitating a reliance on the Precautionary Principle when assessing the likelihood of impact of the NPT Project on significant habitat (specifically, exposed rocky outcrops). The concept of the Precautionary Principle in the context of environmental protection states that, in the absence of information or scientific consensus on the impacts of an action, four issues should be addressed: i) preventative action should be undertaken in the face of uncertainty, ii) the burden of proof that these actions will not cause an unreasonable adverse effect falls upon those taking the action (i.e. the Applicant), iii) the Applicant should explore alternatives to those actions, and iv) the public should be more directly engaged in the decision-making process (Kriebel et al. 2001).

The primary threat to the four foliage-roosting bats (eastern red bat, hoary bat, silver-haired bat, and tricolored bat) with regard to the NPT Project is direct mortality and indirect impacts caused by treeremoval activities during the summer breeding season. Habitat loss in general is not a conservation concern for these species at this time. The Applicant failed to provide any evidence that the NPT Project would not impact these species, and has not provided any information as to how it will avoid direct and indirect impacts to these species during the construction of the Project. If the Applicant produces an Environmental Monitoring Plan that is scientifically sound and meets the rigor and scope of relevant agencies and interested parties, it is my opinion there is relatively little risk that the NPT Project would have a detrimental impact on these species and thus generate an unreasonable adverse effect.

The primary threat to the three hibernating bat species that meet the SEC criteria of significant wildlife species (northern myotis, eastern small-footed myotis, and tricolored bat) is White-nose Syndrome. Although the NPT Project could be perceived as a cumulative threat to these already imperiled species, it is the opinion of the US Fish and Wildlife Service that such additional sources of mortality will have no impact on the risk of extinction or the rate of recovery for these species. I concur with this opinion in general, but the Applicant has failed to provide adequate information as to how it will avoid direct and indirect impacts to these species during the construction of the Project. If the Applicant produces an

Environmental Monitoring Plan that is scientifically sound and meets the rigor and scope of relevant agencies and interested parties, it is my opinion there is relatively little risk that the NPT Project would have a detrimental impact on two of these hibernating bat species; the northern myotis and the tricolored bat. Assuming there are safeguards to ensure that the Environmental Monitoring Plan is properly implemented, I am confident that there is relatively little risk that development of the NPT Project would have a detrimental impact on the northern myotis and tricolored bat. Thus it is my opinion that the NPT Project would have a detrimental impact on the northern myotis and tricolored bat.

The remaining significant wildlife species (eastern small-footed myotis) is the only species that appears to be at a precarious place with regards to the NPT Project. First, they are the only hibernating bat species in the region that appears to have a stable or slowly declining population trajectory that warrants review of other potential cumulative effects. Second, they have the most restrictive habitat requirements of all the bat species under review by the SEC, relying almost exclusively on rocky outcrops and talus slopes for their roosting habitat. Third, there is clear evidence that the NPT Project will require blasting and other construction-related impacts on rocky outcrops. Given that Normandeau is fully aware of these facts and testified in support of these facts, it is unacceptable that such little effort has been made to quantify these impacts either to extent (where are they going to blast?) or degree (what impact will blasting have on these crevice-roosting bats?). The only proposed mitigation (limiting blasting to the non-volant period so bats "can escape as needed") lacks any biological basis or evidence and therefore can't be considered best management practice. Therefore, I believe that the development of an Environmental Monitoring Plan, that includes a Construction and Blasting Impact Plan, needs to be developed and approved prior to any issuance of a certificate by the SEC. This plan needs to be based on the best science available and needs to be implemented in a manner that places the burden of proof (regarding the absence of an impact) on the Applicant.

FINAL OPINION

In my opinion, the NPT Project is unlikely to have an unreasonable adverse effect on most of the significant bat species in the state of New Hampshire. However, the Applicant failed to provide an adequate review of four of the significant species, and provided an inadequate research effort and an inappropriate mitigation proposal with regard to the eastern small-footed myotis. Given these failings, it is difficult to reach a conclusion of no unreasonable adverse effect of the NPT Project. Given that the issuance of a certificate by the SEC represents one of the last points of accountability for the Applicant, it is my opinion that the SEC should not grant a certificate for approval of the NPT Project application until the Applicant meets commitments they have made throughout the consultation process, and those commitments meet the approval of all necessary state and federal agencies, as well as other parties knowledgeable or concerned with the conservation of bats within the region. In particular, I recommend the following conditions be met prior to issuance of a certificate from the SEC:

- 1. The Applicant should develop an Environmental Monitoring Plan that meets the approval of the USFWS and other parties to develop research and monitoring guidelines, as well as tree clearing protocols, that minimize the impact of construction and deforestation activities on the northern myotis.
- 2. The Applicant should conduct all active season tree removal in conformance to the Environmental Monitoring Plan.
- 3. The Applicant should not conduct any active season (May 01 Sept 31) tree removal at any site with potential northern myotis activity (the 23 segments identified in Table 2 of the Wildlife Report).
- 4. As part of the Environmental Monitoring Plan, the Applicant should develop a Construction and Blasting Impact Plan that meets the approval of the NHFG and other parties to minimize impact on the eastern small-footed myotis.
- 5. As part of the Environmental Monitoring Plan, the Applicant should develop a Post-Construction Monitoring Plan, that meets the approval of the USFWS, NHFG, and other parties to monitor the impact of the NPT Project on northern myotis and eastern small-footed myotis.

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