Wildlife Habitat Assessment Report

Proposed
Groton Wind Farm

Groton
New Hampshire

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Wildlife Habitat Assessment

1.0 Overview and Methodology

On behalf of Groton Wind, LLC (the Applicant), Vanasse Hangen Brustlin, Inc. (VHB) conducted a wildlife habitat assessment of the site of the proposed Groton Wind Farm in Groton, New Hampshire.

The assessment covers approximately 4,180 acres of the leased lands for proposed Project Site, although the wind farm will occupy only about 116 acres when it is constructed. It focuses on the general wildlife habitat observed within the property during the summer and fall of 2009. Critical habitat features are identified and the relationships between the plant communities and the wildlife species utilizing the property are established.

Additionally, at the request of the NH Fish & Game Department (NHF&G), the report provides an assessment of whether eastern brook trout *(Salvelinus fontinalis)* or wood turtle (*Glyptemys insculpta*) or their habitat occurs on site. Potential deer wintering yards are also discussed. This report does not provide data on avian or bat issues, which are addressed in other technical reports completed by Groton Wind, LLC.

This Wildlife Habitat Assessment Report describes current site conditions, including plant communities and wildlife inter-relationships, summarizes the habitat strengths and limitations of the Project Site, addresses potential project impacts, and makes recommendations to minimize potential wildlife impacts. Attached appendices include actual and probable wildlife inventory lists, a photo-log of documented wildlife signs, photo-log and maps of plant community types and of potential wildlife habitat, as well as evidence of agency coordination (Natural Heritage review letter), and NHF&G Wildlife Data Form.

1.1 Proposed Project Description

Groton Wind is proposing to construct a 50 megawatt renewable energy facility in Groton, New Hampshire. The project will consist of the installation of 24 turbines (2.0 MW Gamesa G87 model) which will be placed in three strings along Tenney Mountain (East Ridge), Fletcher Mountain (West Ridge) and an unnamed ridge north of Fletcher (Northwest Ridge). The general layout of the proposed wind farm is shown on **Figure 1.**

In association with the turbines, the proposed project will require the construction and/or improvement of approximately 11.7 miles of gravel access roads, turbine pads, and laydown areas for construction materials and/or spoils. The project will include the construction and/or improvement of access roads designed for the large trucks and heavy equipment that will be used to install the wind turbines. A permanent Operations and Maintenance facility will be built at the site, which will be about 4,000 sq ft in size. A small switchyard for the electrical interconnect will also be constructed in a separate location from the O&M facility. In addition to the wind turbines, a permanent meteorological tower will be installed.

1.2 Site Description

The proposed wind farm site comprises approximately 4,180 acres of leased lands on five privately owned parcels (i.e., the "Project Site"). Of this, the proposed project will occupy approximately 116 acres of land once constructed (i.e., the "Project Footprint"), much of which has already been disturbed by ongoing timber harvesting operations and existing roads and skidder trails.

The Project Site is located along Groton Hollow Road in the northeast corner of Groton, New Hampshire. The site is bounded by the Town of Rumney to the north, the Town of Plymouth to the east, Mount Crosby and the Town of Hebron to the south, and Halls Brook to the west. The majority of the project area is located within the surface watershed of the Baker River with a small section of the located within the watershed of the Cockermouth River.

Fletcher Mountain (West Ridge) and Tenney Mountain (East Ridge) are at peak elevations of 2,070 and 2,340 feet respectively. The primary site access route, Groton Hollow Road, varies in elevation from approximately 1,000 to 1,200 feet. As such, the proposed road access routes climb 1,000 vertical feet or more from existing access ways, and require innovative solutions for site access, with the concurrent goals of minimizing road length, and minimizing impacts to the natural resources while adhering to Groton Wind's roadway design criteria.

The site is presently undeveloped and is the home of an active commercial forest and logging operation. Timber harvesting is ongoing, and the parcels have historically functioned as commercial woodland. The current owners have held these parcels since 1946, and have been harvesting the land since that time.

Access to the site is currently provided by Groton Hollow Road, which extends south from NH Route 25 about 1.1 miles. At that point, the road enters the property at the Rumney/Groton municipal boundary, where it continues south approximately 2.4 miles as a private road. An existing gate is in place at the Groton Hollow Road site entrance at the municipal boundary. The road is gravel along its entire length except for the northern ¼ mile where it joins NH Route 25. A second, unimproved access road extends eastward into the site from Hall's Brook Road.

1.3 Assessment Methodology

Wildlife habitat was investigated in the field during the spring, summer and fall of 2009. Field data was collected, compiled and photos documented along several random transects on the Project Site. Evidence of wildlife signs including observation (visual and audio), feeding activity (e.g., browse), mating activity, travel paths/corridors, borrows or dens, and scat were inventoried. In addition to general habitat features, the field reconnaissance concentrated on identifying priority wildlife habitat components for wood turtle, brook trout and indentifying potential deer wintering yards.

In order to develop a preliminary habitat map for the site, VHB developed a project geodatabase using ArcGIS 9.3, including digital data from the NH Wildlife Action Plan (NHWAP, NH Fish and Game Department, 2006). The NHWAP utilized information from a variety of sources including the 2001 NH Land Cover Classification (Justice, et al. 2001) to develop statewide mapping of vegetative habitat cover types and so relies heavily on Landsat images acquired in the mid- to late-1990s. NHF&G refined the Land Cover Classification with digital spatial data from other sources including the US Geological Survey's 30-meter digital elevation models, "Ecological Land Units" (created by The Nature Conservancy), National Wetlands Inventory (US Fish and Wildlife Service) and the county soils mapping from the Natural Resource Conservation Service.

A Wildlife Habitat Assessment Data Form (developed by the NHF&G, Audubon Society, and the UNH Cooperative Extension Service) was also completed (**Appendix A**). This assessment tool was used to help identify important habitat features and habitats located within the Project Site (e.g., deer wintering yards).

This assessment also presents a list of probable species which was generated using the NEWILD computer program developed by the US Department of Agriculture, Forest Service (Thomasma, et al. 1998). The program generates a list of individual wildlife species based on long standing relationships with particular plant communities or habitat types that are found on an existing property. When the two inventory lists are assessed together, a reasonable and accurate determination can be made of overall wildlife usage.

2.0 Plant Communities and Habitat Types

Wildlife usage is closely linked to the distribution of plant communities on a site. Identifying food sources and preferred habitat structure within a plant community can help establish the potential use of a site by particular wildlife species. Generally, a diversity of plant communities creates wildlife diversity. These relationships and linkages help to determine the value of the overall wildlife habitat.

Descriptions of the upland and wetland plant communities are provided below. The upland plant communities are discussed, including the species composition, tree dominance, stand structure, and historical tree harvesting significance. The wetlands are discussed more generally, as a more detailed description of individual wetland components are provided in the DES Wetland Application (under a separate cover).

2.1 Plant Community Overview

Figure 2 presents a map showing the NH Land Cover Classification data for the Project Site and the surrounding area. These data show the forest cover types on the Groton Wind site include deciduous forest, mixed forest, and coniferous forest.

These cover types are further divided into five individual plant communities or wildlife habitat types (See **Figure 3**) by the NHWAP. Their respective acreages are included provided in **Table 1**.

It should be noted that no invasive species were noted within any of the surveyed upland plant communities.

Of the 4,180 acres on the Project Site, approximately 4,165 acres (99 percent) is mapped as upland, with about 12 acres (<< 1 percent) mapped as wetland. However, it was determined based on field investigations that the NHWAP cover type data substantially underestimates the total amount of wetland on the property. This is because the forest cover types mapped on this property contain inclusions of forested wetlands.

Table 1. Plant Community Cover Types (from NH Wildlife Action Plan)

Community Type	Site Acreage
Hemlock-Hardwood-Pine Forest	1,735
Northern Hardwood–Conifer Forest	1,485
Lowland Spruce-Fir Forest	943
Wet Meadow-Shrub Wetland	12
Rocky Ridge – Talus Slopes	2
Other (non-habitat)	3

Source: VHB analysis of NHWAP GIS database provided by NHF&G

To estimate the total amount of wetland on the property, it is possible to extrapolate from data collected during site-specific wetland delineations. Field-based wetland delineations were conducted on a total of 425 acres of the Project Site (about 10 percent). Of this study area, about 37 acres were determined to be jurisdictional wetland, or about 9 percent of the study area. This indicates that as much as 364 acres of wetland likely exist on the site, the majority of which is forested.

Below, more information is provided on the cover types found on the site, with a discussion of related wildlife habitat use. **Appendix B** provides a photolog of the upland plant and wetland plant communities.

2.2 Upland Plant Community Analysis

2.2.1 Eastern Hemlock-Northern Hardwood-White Pine Forest

This plant community comprises 1,735 acres or approximately 42 percent of the total Project Site. The dominant trees are Eastern hemlock, a mixture of northern hardwoods (mostly sugar maple, yellow birch, American beech, and white ash) and Eastern white pine. The co-dominant tree species include white birch and red maple. This plant community is generally found on acidic soils at low to mid elevations. Long term forestry management and related timber harvesting has substantially altered this plant community by removing a large percentage of the marketable white pine and hemlock trees.

Repeated timber harvests that have been performed every 10 to 15 years have produced several stands of trees of varying age (from seedling to sapling to pole to saw timber sized trees). The mosaic of cutting units of different age classes are found scattered throughout much of this plant community. Stocking levels (the density of trees per acre) in general are higher in the younger to mid aged stands. Northern hardwoods are now the dominant trees occurring in much of the residual stand. Most of the more mature tree component has been largely removed by earlier timber cuttings. The understory layer consists chiefly of witch hazel, stripped maple, American beech, or hobblebush. The herb layer is sparse with wintergreen, partridge-berry, Canada Mayflower, and wild sarsaparilla being evident. An active logging truck road and a network of skidder roads provide good accessibility into a large percentage of this plant community.

2.2.2 Northern Hardwood–Coniferous Forest

This plant community comprises 1,485 acres or 36 percent of the total tract and occurs in the middle to higher elevations at the property. Similar to the Hemlock-Northern Hardwood-Pine Plant Community, dominant tree species include sugar maple, American beech, and yellow birch. Spruce and balsam fir trees are found in lower abundance, but become more dominant as the elevation increases.

The elevation increase also tends to favor yellow and white birch trees. White ash was often also interspersed. Soils within this plant community are poor to nutrient poor. Stony drainages were sometimes encountered in the upper reaches of this plant community. Overall, these types of forests have lower productivity, increased moisture availability, and a higher percentage of herb composition compared to a lower elevation forest. The understory layer (sapling and shrub) consists of several

species including American beech, stripped and mountain maple, white ash, and hobblebush. Wintergreen, partridgeberry, bunchberry, goldthread, starflower, Canada mayflower, blue-bead lily and intermediate wood fern are the chief species in the herb layer.

Past cutting practices generally have favored leaving the higher valued hardwoods like sugar maple, white ash, yellow birch and white birch. Several large areas are, however, occupied chiefly by lower quality American beech. Over time, due to several factors including light stocking levels, lower overall log grade, and difficulty in marketing beech trees, these areas are often left untreated. As a result, these components of American beech provide an important forested niche to a variety of wildlife species with a consistent and highly desired beechnut crop.

2.2.3 Lowland Spruce-Fir Forest

This plant community comprises 943 acres or 23 percent of the total tract and is found at the property mostly at low to mid elevations and along the Clark Brook stream drainage. Typically, these plant communities are occupied chiefly by red spruce, balsam fir, yellow birch, and paper birch. Quaking aspen and eastern larch can occur occasionally. Eastern white pine and eastern hemlock are not normally found. Areas of this plant community were sampled while in the field. It was noted that some tree variation does occur. One of these areas located at about half way up the existing log truck road adjacent the Clark Brook drainage contained red spruce and eastern hemlock. The eastern hemlock, however, was the dominant occurring tree species. Also, along the eastern ridge another section of the Lowland Spruce-Fir Forest was more consistent with a High-Elevation Spruce-Fir Forest. Much of the existing ridgeline (Tenney Mountain), although only situated at a maximum of 2,100 feet in elevation, is quite narrow and drops precipitously to the east and west. Trees are much shorter in height and are routinely exposed to colder temperatures and the prevailing winds. In other sections of the Lowland Spruce-Fir Forest that were inspected, both eastern hemlock and white pine were observed. Stripped maple was a common understory species. Several species were noted as part of the herb layer including wild sarsaparilla, bunchberry, goldthread, wintergreen, and partridgeberry.

Past timber cutting practices within this plant community type have altered its overall structure. In those areas with a heavy concentration of spruce trees, selective harvests have reduced overall stocking levels. The understory layer in these sections is generally sparse. In areas where eastern hemlock predominates, the interspersed mixed hardwood has been removed in previous tree thinning operations. Here, the understory of sapling hemlock is often barked by white-tailed deer suggesting some winter usage by this species. Where eastern white pine and spruce were found together, the larger diameter trees have been harvested selectively leaving stands with reduced stocking levels and smaller diameters. Some of these areas have been cut more heavily than others. Moderate white pine regeneration was evident where the soils have been scarified by logging equipment. One plant Species of Concern

(Mayflower) was identified in one of the sections occupied by the Lowland Spruce-Fir Forest.

2.2.4 Ridge and Talus Slope

This plant community comprises 2 acres. It is located adjacent the southwestern property line. This plant community type occurs on the north side of Crosby Mountain, well away from the main project area. However, similar communities occur along certain portions of the ridges and summits on the Project Site including those with a northern aspect or other shallow to bedrock at elevations of 1,700 to 2,340 feet. The tree canopies are short. These areas can be partially wooded or open. Varying amounts of rock outcrops are typical. Soils are thin and underlain by bedrock. Red spruce and balsam fir are the dominant tree species with white birch occurring occasionally. Heath species are often found interspersed. Low bush blueberry and sheep laurel predominate. The herb layer can range from sparse to abundant. Bristly dewberry, Canada Mayflower, and a variety of lichens and mosses are generally common.

Note that the portion of this community type mapped on Crosby Mountain is identified in the NHWAP as "Tier 2 Habitat," i.e., it was determined to be among the highest ranked habitat in the biological region (by ecological condition).

Cliffs, ledge, talus, and rock outcrop habitat can be associated with certain wildlife species including the peregrine falcon, timber rattlesnake (although generally in southern New England), common raven, porcupine, and bobcat.

2.3 Wetland Community Habitat Analysis

A comprehensive Wetlands Description and Functional Assessment were completed on 20 individual wetlands within proposed Project Footprint. This assessment is included as a section of the DES Wetlands Application. The respective assessment provides a detailed analysis of each wetland including wetland composition, noted wildlife usage and respective function and value. This assessment should be referred to for this specific wetland information. To minimize redundancy, discussion in this part of the report are limited to the identification and discussion of only *critical habitats* provided by the existing wetland systems. See **Figure 4** for a map of the wetland resources delineated within the Project Site, including vernal pools.

A total of 37 acres of wetlands were delineated within the limits of the 425 acre corridor study area. The majority of the wetlands are forested, which are the most common wetland type in the northeast. Many intermittent and ephemeral streams flow to Clark Brook from the summits of the ridges, with some of these becoming perennial streams at lower elevations in the watershed.

2.3.1 Shallow-Deep Marsh Wetland

This wetland plant community is located south centrally just east of the existing log truck road. The associated flowage drains into Clark Brook. The wetland was determined to be 12 acres in size and is occupied by beaver. A well maintained beaver dam and lodge were noted. Shallow marsh, deep marsh, open water, and scrub-shrub components are evident. Vegetation is comprised mostly of sedges, wetland grasses and an interspersion of shrubs. Further expansion by the beaver appears somewhat constrained by its proximity to a large coniferous plant community (i.e., the Lowland Spruce – Fir Plant Community) as hardwood species are favored.

Critical habitat features are provided within this community by both dead standing trees (snags that are utilized by song birds) and basking logs (utilized by turtles). These shallow-deep marsh systems provide potential "critical" habitats to specific nesting birds like the red-winged blackbird, swamp sparrow, song sparrow, and marsh wren. These systems also accommodate small mammals like the northern short-tailed shrew, star-nosed mole and water shrew where the presence of soft soils allows tunneling activities. The presences of several species of amphibians appear likely. It is well documented that the American toad feeds, breeds and over winters in this specific habitat.

The NH Wildlife Action Plan designates the habitat found in this wetland as Highest Ranked Habitat in the Biological Region by Ecological Condition (i.e., "Tier 2 Habitat"). The National Wetland Inventory Map shows this wetland as the largest wetland within the project area, and is one of only three wetlands on the Project Site that were identified by NWI mapping.

A proposed road crossing at the outlet of this wetland over Clark Brook is being designed with special consideration to avoid any change to existing flow paths. There is an existing crossing currently in place which is used as a skidder road. The proposed project will improve this crossing to NHDES stream crossing standards to allow access to a proposed staging service/storage area on the east side of Clark Brook.

2.3.2 Scrub-Shrub Wetlands

Several of these types of wetlands are found throughout the forested property. The larger components of these wetlands are more representative of typical scrub-shrub plant communities. These wetlands are generally dominated by sapling and shrub species. These types of wetlands are considered critical to many species of wildlife for feeding, breeding, and nesting activities. Snowshoe hare and cottontail species may utilize these habitats for browse and essential cover. Black bear, white-tailed deer, and moose may consume large quantities of protein rich wetland plants during the spring and early summer months.

Scrub-shrub wetlands may contain areas of standing water that may provide habitat to vernal pool associated species. Cyclic drying of these pooled areas supply an important set of conditions to species like the fairy shrimp. These pools also provide breeding and egg-laying opportunities to both spotted salamanders and wood frogs. These two species of amphibian may utilize the stems of individual shrubs for egg attachment. Northern spring peeper and gray tree frog species also depend on these habitats.

2.3.3 Vernal Pools

Vernal pool delineations and assessments were conducted in the field by VHB scientists during the Spring of 2009 in accordance with the procedures outlined in the *Identification and Documentation of Vernal Pools in New Hampshire*, 2nd Ed. 2009, published by the New Hampshire Fish and Game Department. Vernal pools were delineated with blue flagging tape affixed to vegetation and located using a mobile sub-meter GPS unit.

During field investigations of the project site, eleven vernal pools were identified, delineated and documented. Another six wetlands that have the potential to be vernal pools were identified. Indicators such as egg masses, tadpoles of indicator species and/or juveniles of indicator species were not observed in these six wetlands. However, since it is known that not all pools are occupied each season, other observations of vernal pool hydrology, topographic characteristics and proximity to other verified pools provided secondary indicators that the wetlands in question could be used by breeding amphibians in subsequent or previous years.

Figure 4 shows the location of each pool and potential pool on the project site, and **Table 2** present summarizes data for each verified pool. Additional data on vernal pools can be found in the wetlands permit application submitted with the SEC application.

2.3.4 Perennial Streams

Many of the larger wetland systems support important stream habitat features, particularly at the lower elevations of the Project Site, including gravelly/stony substrate, submerged debris, and overhanging stream banks. Crystal clear water, cold water temperatures, riffles, deep pools, a forested canopy and associated feeding habitat including essential habitat for macroinvertbrates. Together, these characteristics suggest that the perennial streams on the site including Clark Brook provide cold water fish habitat (see below for a discussion of native eastern brook trout resources on the Project Site). The riparian zones adjacent these streams are valuable habitat to many species such as mink, otter, beaver, and especially cavity dwellers such as raccoons. Many large trees tend to occur in such habitats and those that lean are preferentially used by woodpeckers. Streams attract many kinds of wildlife; not only to access the water but for the ecotonal habitats usually associated with water courses.

Table 2. Vernal Pool Survey Data, Spring 2009

ID	Associated Wetland		Origin	Max Depth	Area (ft^2)	Species Present				Notes
	ID	Class				WFE[1]	WFT[2]	SSE[3]	BSSE[4]	
ER-VP1	ER-47	PFO1F	Natural	6 in to 3 ft	4,385	> 50	0	2	5	One adult wood frog observed.
ER-VP2	ER-25	PFO	Natural	4 -12 in	2,714	2	0	3	1	Within wetland complex; woodland coniferous habitat; <50% shrubs; no tree overstory; emergent vegetation (wet meadow) and braches (dead branches) available for egg/adult cover; leaf litter as bottom cover; all masses photographed.
E-VP1	E-1A	EPH	Unnatural	8-10 in	124	1	100	11	0	Four adult green frogs, two adult red eft, and one adult pickerel frog observed; located in tire rut within log landing area; no woody buffer remaining except to south within 50 ft; may not be given location.
E-VP2	E-1A	EPH	Unnatural	8-12 in	96	0	0	15	0	Two adult green frogs, one adult red eft/newt, and one adult pickerel frog observed; located approximately 30 ft south of VP-1; draining via ditch across road; may not be viable given location.
W-VP1	NWR-2	PFO1E	Natural Modified	2-6 in	194	0	100	1	0	One juvenile wood frog and one ribbon snake observed.
W-VP2	NWR-2	PFO1E	Natural Modified	2-6 in	325	0	100-150	2	0	One ribbon snake observed; pool located within skidder ruts in logging road (less than 10 years ago).
W-VP3	WA-B-TOB	R3RB2	Created	6 in to 2 ft	2,693	0	0	> 20	> 20	Large pool located within old quarry site. Pool is fed by groundwater channel and pool drains via an outlet channel that directs flow back to the adjacent stream.
WR-VP1	WR-21	PFO1E	Natural Modified	10 in	921	0	< 100	1	0	Pool located within forested wetland.
NWR-VP1	NWR-9	PFO	Natural	2-8 in	2,688	0	> 100	8	5	Mucky soils/organic sediments as the substrate.
NWR-VP2	NWR-8	PFO1E & PEM1E	Natural Modified	12 in	208	0	< 100	1	0	Pool is located within old skidder trail.
GH-VP1	GH-20	PSS	Created	6-8 in	54	0	M	0	0	Rutted pool located within an old logging landing area.

Notes:
1 – Number of wood frog egg masses; 2 – Number of wood frog tadpoles; 3 – Number of spotted salamander egg masses; 4 – Number of blue spotted salamander egg masses.

These streams and the associated riparian habitats fulfill requirements of specific wildlife species. In general, these critical habitats increase overall usage by wildlife and may accommodate less than common or rare species. Overall, measures will be implemented to minimize impact to the existing habitats and more important plant communities, as discussed below.

2.4 Plant Community/Wildlife Food Source Relationships

As part of the habitat evaluation, potential feed sources within individual plant communities were identified and quantified. Evidence of feeding activity was also noted. Because there is a strong correlation between availability of food and wildlife usage, and between particular types of feed and respective wildlife species, this provided another tool in assessing overall habitat value. A list of the more important feed sources located at the property was compiled. The feed sources were then cross referenced against known wildlife usage.

The plant community components or individual plant species discussed in this section provide the largest percentage of feed value at the property. There are other plants/trees that are being utilized for feed but with much less significance or contribution. As suggested earlier, it is the abundance of overall feed at the property that creates value for wildlife habitat. Complimenting the feed value is the general thickness of the understory shrub layer and the overall diversity of the associated forest stands. When this is combined with the size of the existing forested acreage and relative distance to adjacent development, the habitat value is increased substantially.

2.4.1 Northern Hardwood Forest

Northern hardwoods comprise the majority of the forested land at the subject property. Prime moose habitat is created when this forest type is manipulated by logging activities which create areas of varied diameter and height. Past studies of moose range have documented the highest densities and lowest winter mortality rates in early successional habitats in areas that are between 5 and 20 years old. Here, moose will "ride down" out-of-reach browse by straddling saplings and small trees and walking forward as the tree bends beneath the animal. Moose presence is closely linked to this specific forest cover type, especially where ongoing timber operations have produced a mosaic of younger age classes.

2.4.2 Large Scattered White Pine

White pine also ranks near the top in importance to wildlife. Although the annual crop of pine seeds varies considerably, the oily seeds are very nutritious. Larger pines also provide important roosting places for both the American robin and mourning dove. The spreading foliage of young pine provides dense and protective

cover to migrating wildlife. These seeds are preferred by several species of bird including the wild turkey, cross-bill (up to 50 percent of their diet), black-capped chickadee, evening grosbeak, red & white-breasted nuthatches and the pine siskin. The seeds are also relished by black bear, gray & red foxes, and white footed mice. The foliage and twigs are oftentimes browsed by white-tailed deer and the bark eaten by porcupine.

2.4.3 American Beech

American beech produces a small rectangular nut high in fat content. Beechnuts are a preferred staple of ruffed grouse and tufted titmice. Black bear, porcupine, gray and red foxes, and chipmunks also access this food. In years of good beech production, beechnuts may comprise between 25 and 50 percent of a black bear's diet. American beech was a large component of the two dominant plant communities found at the property.

2.4.4 Red, Sugar & Striped Maple Component

The seeds, buds or flowers of red maple are favored by evening and pine grosbeaks (10 to 30 percent of their total diet). Gray and red squirrels and eastern chipmunks typically remove the hull and wing of the seed before eating or storing. Moose, white-tailed deer, and porcupine (up to 30 percent of the porcupine's total diet) all browse the bark, twigs, and foliage of red maple. Sugar maple is also browsed heavily. Lastly, there is a strong preference for striped maple (sometimes called "moose maple") by moose. Years of continuous cutting has produced hundreds of acres of this understory shrub.

2.4.5 Eastern Hemlock Component

Pine siskin depends on the seeds of this tree for a considerable portion of their diet. White-tailed deer may utilize the foliage and twigs during the difficult winter months when other feed is in short supply. Porcupine will feed in the tops of hemlock trees, sometimes girdling the main stem. Pockets of hemlock probably play a more important role for the cover that it provides. The thick canopies intercept large amounts of snow reducing the depth of snow found on the forest floor. The dense foliage also can protect against the harsh winter winds. There are definite correlations with feeding activity by the fisher in areas occupied by hemlock during the winter months. Small groups of white-tailed deer also use these areas during the winter for sleeping. Lastly, hemlock stands are the favorite nesting places for several kinds of birds including the veery, black-throated blue warblers, black-throated green warblers, Blackburnian warblers, and slate-colored juncos.

2.4.6 Raspberry/Blackberry Shrub Component

A large component of raspberry and blackberry shrubs were observed along the skid roads and open areas created by the logging. These two shrubs rank at the very top

of foods for wildlife. In addition, the leaves and stems are eaten extensively by deer and rabbit. Besides the great value as a food source, the various species of this group have much value as effective cover.

3.0 Observed and Expected Wildlife Species

There are no known occurrences within the NH Natural Heritage Bureau database of threatened and endangered species and/or exemplary natural communities. However, populations of the peregrine falcon[1] and wood turtle are located in proximity to the project area. (See **Appendix C.**)

Additionally, consultations with NHF&G indicated concern regarding the potential for the site to contain habitat for eastern brook trout and to provide deer wintering habitat.

This section discusses issues related to wildlife occurring on the project site, including the potential for species which are protected or particularly sensitive.

3.1 Species Lists

Two wildlife inventory lists were compiled as a component of the overall evaluation. The first list (**Table 3**) identifies wildlife species directly observed in the field; the second list (**Appendix D**) provides an inventory of wildlife species that are statistically "probable" based on the US Forest Service's NEWILD methodology. The species listed in **Table 3** were documented based on several observation types such as visual, audio, feeding activity, tracks, scat, or other signs.

Appendix E provides a photolog of documented wildlife (signs, structural components, and corridors) within the property.

3.2 Wood Turtle

Consultation with Michael Marchand of the NH Fish and Game Department indicated some concern that wood turtle may occur on the project site. This section discusses the wood turtle habitat and behavior to develop an assessment of whether the species occurs on the Project Site.

[1] Groton Wind, LLC is working with the NH Audubon Society to study peregrine falcon. Their report will be submitted under separate cover.

3.2.1 Habitat and Behavior

The preferred habitat of the wood turtle is riparian area associated with rivers and streams. Low gradient systems with sandy bottoms and heavily vegetated stream banks are favored, particularly for hibernation during the winter months. The turtles may hibernate alone or in large groups in community burrows in muddy banks, stream bottoms, or in-stream woody debris.

Table 3. Observed Wildlife Species

Species (common name)	Observation Type
Mammals	
Eastern chipmunk	Visual
Red squirrel	Visual
Beaver	Dam, Lodge
White-tailed deer	Browse, Scat, Antler, Buck rub, Trails
Moose	Visual, Browse, Scat, Tracks, Trails
Black bear	Tracks, Claw marks on beech tree
Coyote	Scat
Short-tail shrew	Visual (dead)
Birds	
Common flicker	Audio
Pileated woodpecker	Visual, Audio, Cavities, Feeding activity
Blue jay	Audio
Black-capped chickadee	Audio
White-breasted nuthatch	Visual, Audio
Ruffed grouse	Visual, Audio
American crow	Visual, Audio
Amphibians / Reptiles	
Wood frog	Visual – Adults, eggs masses and larvae
Spotted salamander	Visual – Egg masses only
Blue-spotted salamander	Visual – Egg masses only
Red-spotted newt	Visual
Green Frog	Visual
Pickerel Frog	Visual
Ribbon snake	Visual
Garter snake	Visual
Fish	
Brook trout	Visual

Source: VHB Field Observations, 2009

Wood turtles tend to delay their emergence in the spring until water and air temperatures are sufficiently high for the turtles to maintain a warm body

temperature. Open riparian areas that receive ample sunlight for basking are preferred by the emerging turtles. A segment of the wood turtle population may migrate during emergence to nearby vernal pools to take advantage of an abundant food available where the turtles eat amphibian egg masses.

Females eventually move to nesting areas during the month of June. Sandy-graveled areas close to water are very important as the females use the water as a travel corridor and they rest in the water between nesting attempts. The mid- to late-summer months are spent travelling between terrestrial areas to areas of emergent and scrub-shrub vegetation or other aquatic habitats. In the fall months, wood turtles return to either a stream or river system.

3.2.2 Potential Occurrence on the Project Site

Field biologists conducted work during the spring, summer and fall of 2009 and collected observations of potential turtle use of the Project Site. However, no observations of wood turtle were made during this period of time, which comprises an estimated 800 hours of field work on the site by trained biologists.

The property does contain some potential habitats in the form of several streams, a few vernal pools and large scrub-shrub wetland. However, the site lacks low gradient stream habitat. Recent radio-telemetry studies on the distribution and movement of wood turtles in Massachusetts indicate that the animals are absent from streams with a gradient of more than 2 percent (Mike Jones, UMass-Amherst, personal communication, February 23, 2007). Given that the streams on the Project Site are high gradient, it is unlikely the on-site streams provide suitable habitat.

Additionally, vernal pools and scrub-shrub wetland, while present, are not common on the project site due to the sloping nature of the area. The largest such habitat is associated with the beaver flowage in the central portion of the Project Site (described elsewhere in this report). Current research, however, indicate that usage in beaver flowages is rare (Mike Jones, UMass-Amherst, personal communication, February 23, 2007).

More suitable habitat can be found adjacent the Baker River (to the north of the Project Site), which is consistent with Natural Heritage Bureau data that identifies two historical individual turtle sightings along the Baker River. Very steep slopes, sometimes with rocky faces, that run more or less parallel with the Baker River flowage (situated to the south), probably discourages movement by the turtles onto the Project Site however.

3.2.3 Potential Impacts

Given the observations presented above, it seems unlikely that any resident population of wood turtle exists on the site and it is concluded that the risk to this species from this project is negligible.

It appears that the main threats to any wood turtle population are located outside the Project Site. This includes NH Route 25, a heavily travelled road, and the field areas situated on either side of the Baker River. Here, annual mowing of hay occurs which has been determined to be the single largest risk factor for this species.

3.3 Eastern Brook Trout

Consultation with Michael Marchand of the NH Fish and Game Department also indicated that a native population of eastern brook trout may occur on the project site. This section discusses the habitat requirements and behavior of brook trout to develop an assessment of whether the species occurs on the Project Site.

3.3.1 Habitat & Behavior

Eastern brook trout is a cold water fish species that requires clear and well oxygenated cold water, 68 degrees Fahrenheit or less. Brook trout can be found in meadow brooks, rivers, streams and ponds, even small spring-fed headwater streams, especially where cover is available. Fingerlings prefer shallow water about 16 in. deep, and adults do not need much more than that. In streams, they prefer areas where the substrate consists of gravel and cobble. The specific temperature requirements of the brook trout and the low levels of nutrients in a typical trout stream generally limit the fish's life span and size; native brook trout rarely survives beyond four or five years in the wild and rarely exceeds 6 to 8 inches in length in most streams (Stolz and Schnell 1991).

Brook trout may have small home territories, or stations, and may remain by a given rock or log throughout the season, provided it is close to cover. Trout establish hierarchies and exhibit agonistic behavior at feeding stations, but they often will share escape cover. Its primary food source is small insects, mollusks, crustaceans and other small fishes.

Most brook trout spawn annually after reaching maturity. Peak spawning activity can occur as late as mid-October, with spawning completed by early November. Preferred spawning temperatures range from 40 to 49 degrees Fahrenheit. They can successfully spawn over a variety of river bottoms, but prefer gravel beds with low embeddedness. The female constructs a depression in a location in the stream bed (known as a "redd") where groundwater percolates upward through the gravel to provide oxygen to the eggs. One or more males approach the female, fertilizing the eggs as the female expresses them. The eggs are slightly denser than water. The female then buries the eggs in a small gravel mound. The eggs hatch in approximately 100 days. (Stolz and Schnell 1991.)

3.3.2 Occurrence on the Project Site

Clark Brook and its associated tributaries provide habitat which can support native brook trout including clear and cold water temperatures, riffles, deep pools, a forested canopy, and associated feed sources. Biologists observed brook trout within the Clark Brook mainstem. No further population data were collected.

3.3.3 Potential Impacts

The Eastern Brook Trout Joint Venture (EBTJV) has reviewed threats to brook trout throughout its range. Specifically in New Hampshire, threats to brook trout have been listed and ranked by EBTJV (Eastern Brook Trout Joint Venture 2006). These include:

1) Road sedimentation - Ranked as the number one threat to brook trout in New Hampshire. Road construction and poorly maintained roads can increase sedimentation and impair water quality;
2) Presence of one or more nonnative fish, particularly rainbow trout;
3) Acid deposition impacts, especially in the southern portion of the White Mountain National Forest and west of Concord and Manchester;
4) Stream fragmentation caused by poorly designed road culverts; and
5) Dam inundation which causes fragmentation of brook trout habitat and restrict fish movement.

Of these risk factors, only Items 1 and 4 are potentially associated with the proposed Groton Wind Farm. This is related to the fact that Groton Hollow Road, the primary access to the site, parallels Clark Brook for most of its length within the project area. There are 2.4 miles of minor improvements proposed to Groton Hollow Road, and much of this will involve work within 200 feet of Clark Brook and the streams that cross under Groton Hollow Road via existing culverts to enter Clark Brook.

Stream sedimentation, if not properly controlled, could impact brook trout habitat during construction. Erosion and stream sedimentation is a risk associated with the project, especially given the rugged terrain and numerous high energy streams within the project area. However, this project is regulated under the NH Alteration of Terrain Program (RSA 485-A:17) which will require a rigorous review of temporary and permanent erosion controls. The National Pollutant Discharge Elimination System (NPDES) permitting requirements also apply to the project. Under these two programs, the risk of substantial erosion and sedimentation will be minimized.

The proposed gravel access roads and ridgeline roads are also designed to minimize impacts. In many cases, these alignments follow existing logging and/or skidder roads that are currently an ongoing source of sediments to Clark Brook and its tributaries. In these cases, the proposed access roads will represent an improvement over the existing road drainage.

All stream crossings are specifically designed to cross streams at their narrowest point and to minimize the width and length of crossing. Most of the roads run perpendicular to streams and thus the impact on a riparian buffer will be minimal. The only place where the road runs parallel to a stream is along Groton Hollow Road where it parallels Clark Brook for most of its 2.4 miles within the project area. However, there should be minimal impacts to the riparian buffer along Clark Brook as the upgrades to Groton Hollow Road have been designed to expand only on the west side of the road, on the opposite side from Clark Brook. Thus grading and clearing for road improvements will not result in changes to the existing riparian buffer along the Brook.

3.4 Blue-Spotted Salamander

While the blue-spotted salamander *(Ambystoma laterale)* was not called out as a specific concern of the NHF&G or other wildlife agencies, the animal was observed by VHB biologists during field work on the Project Site.

3.4.1 Habitat and Behavior

The blue-spotted salamander is a mole salamander native to North America from southeastern Quebec to Lake Winnipeg, south through Great Lakes region and New England to northern Indiana and New Jersey. Several apparently disjunctive populations occur around the periphery of the range (Hammerson 2004).

The length of these salamanders typically ranges from 3 to 6 in, of which the tail comprises 40 percent. Their skin is bluish-black, with characteristic blue and white flecks on its back, and bluish-white spots on the sides of its body and tail. They have an elongated body, though they are not nearly as slender as the Jefferson Salamander. The vent is typically black, which contrasts with the paler belly. Larvae which have transformed may have yellow splotches; these turn blue once the individual becomes terrestrial. They have long toes: four on the front feet, and five on the hind feet. Typically, specimens will have 12-14 costal grooves. Males tend to be smaller than females, though they have longer, flattened tails.

In New Hampshire, the blue-spotted salamander is listed by the NH Fish and Game Department as a Species of Special Concern, "Category A1." Such species are those that could become Threatened in the foreseeable future if action is not taken; existing threats are such that the species could decline to threatened status if conservation actions are not taken (Hunt 2007; NHF&G 2009). Species of Special Concern are not legally protected under NH's Endangered Species Conservation Act (RSA 212-A), but are under consideration for protection.

3.4.2 Occurrence on the Project Site

A vernal pool study conducted in the spring of 2009 shows that no direct impacts are proposed to vernal pools. However, there are a few vernal pools located in close proximity (within 250 ft) to the proposed project construction limits. One pool is located within the proposed clearing zone for Turbine E-3; Vernal Pool ER-VP1 is located within a forested wetland (Wetland ER-47) and is undisturbed and natural in origin. The pool is approximately 4,385 sq ft in size with water depths that varied at the time of sampling between 6 inches and 3 feet. More than 50 wood frog egg masses were observed at the time of documentation in the spring of 2009. In addition, two spotted salamander egg masses and five blue spotted salamander egg masses were observed.

In addition to ER-VP1, blue-spotted salamander egg masses were also observed in ER-VP2, W-VP3 and NWR-VP1. (See **Table 2**.)

3.4.3 Potential Impacts

ER-VP1 is an important vernal pool and one of the most productive vernal pools documented on the Project Site. Specific mitigation measures will be put in place to minimize impacts: a 100 ft undisturbed buffer around the vernal pool will be maintained to the extent possible, and no logging slash from the clearing for the turbine pad and blades will be placed in the buffer or the vernal pool itself.

Long term impacts to vernal pools within the project area should be minor given these mitigation measures and since the construction of the gravel access roads will not generate pollutants and/or the traffic that would endanger amphibian species. The proposed access roads will not serve to block amphibian travel and will not be salted during the winter thus reducing the likelihood that the water quality within the vernal pools will change.

3.4 Deer Wintering Habitat

While completing the wildlife habitat assessment, special attention was placed on locating potential white-tailed deer winter yards by examining these areas for evidence of actual usage.

Figure 5, which depicts potential deer yard habitat on the Project Site, was developed using a GIS-based habitat model provided by NHF&G. Several combined criteria including coniferous cover type, south or west facing slopes, size of yard area, access to water, and proximity to a fringe of hardwood browse were used to prioritize what areas were reviewed in the field.

Three areas identified as potential deer yards were field checked for wintering deer sign as discussed below.

3.4.1 Potential Deer Yard 1

The first area, located on the east side of Groton Hollow Road on the Project Site (adjacent to the second gate) consisted of an eastern hemlock-spruce cover type. The majority of this area was situated between Clark Brook and a large northern hardwood plant community. A smaller section of this area extended across the brook and adjacent road. Within this stand, several eastern hemlock sapling stems had been stripped by deer. Extensive balsam fir and hardwood browsing were observed along the perimeter of surrounding hardwood cover type. There was good crown closure and nearby rushing water.

It appears that some deer are utilizing this area periodically as a winter yard. Moose sign was also evident suggesting possible co-usage by this mammal during the later winter months. This deer yard's proximity to the existing truck road and orientation on a south east slope (i.e., colder temperatures) may restrain overall yarding activity, especially if the truck road serves as an active snowmobile trail. Due to this yard's position in the lower valley and away from the proposed wind turbines, it is not expected that this seasonal usage by resident deer will be impacted.

3.4.2 Potential Deer Yard 2

A second area, an eastern white pine and spruce cover type was evident. This area is situated along the eastern side of the existing truck road and adjacent Clark Brook. Nearby, the same truck road forks to the southwest. It was noted a large block of this plant community was recently harvested removing much of the tree canopy. Stocking levels are low, thus exposing much of this area to deep snows and winter wind.

This area, with its south west exposure and softwood component (now largely harvested) may have accommodated a previous winter deer yard at one time. The smaller area adjacent the road to the north and south may still provide some yarding opportunities for deer. As stated earlier, this area's position in the lower valley away from the proposed turbine installations probably minimizes overall effect on potential yarding activities.

3.4.3 Potential Deer Yard 3

A third potential deer yard was examined along the East Ridge. It was determined that much of the ridge to the south was hardwood. No cover would be provided by the hardwoods and snow depths could be quite deep. In the coniferous areas (mostly spruce) along the northern part of the ridge, trees are stunted and exposed to northwest winds (energy consumption by the deer would be very high). Because much of this area is considered a "non-commercial" forest, periodic thinning does not occur. This eliminates a potential and critical winter food source (hardwood browse) for deer. Lastly, there is likely no available wintertime water. This is usually accessed in open rushing streams (that do not completely freeze) or in seepages

where good cover provides necessary insulation. Because of the general exposure here to colder temperatures and wind, this area of mostly spruce was not well suited for winter deer yarding.

4.0 Wildlife Assessment Conclusions

This section summarizes the observations discussed above, and provides a discussion of the potential for impact to wildlife habitat resulting from the proposed Groton Wind Farm project.

4.1 Habitat Quality Assessment

The site does not contain commercial development and has substantial wildlife habitat, albeit modified substantially by the timber harvesting operations that have occurred on this site since the 1940s and earlier. The tract contains approximately 4,180 acres of undeveloped habitat. Substantial moose and bear sign (sighting, tracks and scats) were observed especially in areas previously disturbed by logging. Evidence of well established wildlife trails indicates both historical and continuing moderate to heavy use by a variety of wildlife species. Both the logging roads and established trails provide travel corridors through the property's interior and to adjacent properties and their respective habitats.

From a landscape context, most of the adjoining land is also undeveloped which contributes and increases the wildlife habitat value the Project Site. The closest fragmented and ongoing development areas are located to the north in the Town of Rumney, and to the east in the Town of Plymouth.

The presence of wetlands adds to the overall habitat present at the property. The occurrence of a large Wet Meadow–Scrub-Shrub Wetland (beaver flowage area) in the project area provides a high valued shallow/deep marsh/open water habitat that may be utilized by turtles, waterfowl, and mammals. Due to its relatively high diversity, this wetland likely attracts a full range of wildlife species. Fallen logs and dead standing trees (snags) with cavities were observed on this site. Fallen logs provide basking sites, a habitat feature for turtles. Snags with cavities provide feed, cover and nesting sites for a variety of bird species such as the woodpecker and the common flicker. Interspersed scrub-shrub habitat at the perimeter of the beaver flowage provides both excellent cover and supplementary feed for many wildlife species (e.g., waterfowl, insects, amphibians and reptiles).

As already mentioned, scrub-shrub wetlands are also located in the property. These wetlands provide habitats (as previously discussed). The scrub-shrub component of these wetlands creates excellent cover and nesting opportunities. The individual shrubs also are used by amphibians for egg attachment when inundated.

The forested wetlands situated at the property, although less important in overall value, provide additional niches. At several locations, small seepages/breakout were noted. These seepages provide a source of water during the winter months when most streams or bodies of water are frozen.

Four upland plant communities (refer to previous plant community descriptions) contribute to general habitat strength at the property. These communities offer a variety of cover types. A range of diameter classes and varied height classes of trees provide good horizontal and vertical density. This characteristic in forest structure increases the range of wildlife diversity. The thick understory American beech saplings, striped maple, mountain maple, and hobble bush provides another essential requirement of wildlife cover. Vulnerability to predation and/or hunting pressures are reduced with adequate cover.

The abundance of hard mast contributes substantially to the food value of this largely forested acreage. Beech trees (>12 inches diameter) found throughout the property and a limited number of red oak trees located within lower elevations of the property produce hundreds of pounds of beech nuts and acorns per tree. When the sum of individual tree production is considered cumulatively, a substantial tonnage of yearly production is the result. When available, these nuts provide a food source as both small and large mammals prepare for the long winter season. Body fat reserves are increased and drawn upon during the winter when food is much scarcer. Smaller mammals store a vast quantity of these nuts in caches scattered in several locations to assure a source of continuous winter feed.

Supplementing the yield of beech nuts and acorns is the overall abundance and availability of white pine seed. Although rather small in size, the seeds contain fat producing oils and are considered highly nutritious. White pine is found interspersed in the larger conifer stands and due to its relative maturity and large size, the production capability is high. Other feed sources (as previously mentioned) contribute to overall abundance but also provide a good range of variety and may also fill some nutritional requirements of individual wildlife species.

Lowland Spruce-Fir forest and other conifer stands, especially the ones located on a west and south facing slopes provides potential wintering habitat for white tail deer. However, as observed during the field investigations, the Lowland Spruce-Fir forest located adjacent to this wetland have been disturbed by heavy cutting and no longer provides cover for deer. Other conifer stands were also observed and thinning from logging has lowered or eliminated the potential value of the deer wintering yards. By removing the overstory, the snow accumulates and the deer habitat cover is lost.

Rock outcrops observed on the Project Site provide potential cover, denning sites or sunning spots for a variety of wildlife including bobcats, snakes, porcupine, coyote, and black bear, especially sites located on the on the south and west facing slopes.

Several perennial and intermittent stream systems are found in the property and complement overall habitat. Although mostly are small and seasonal in nature, these water courses support additional niche habitats for a variety of macroinvertebrates. These "niche" habitats are relatively free of predators due to their location in the upper reaches of a watershed. This allows these macroinvertebrate populations to later provide feed to upper level populations from amphibians to birds to mammals.

4.2 Impact Assessment

The overall project will disturb approximately 116 acres of land in a narrow corridor that varies in width from about 30 feet to about 280 feet. The total area within the project limits is approximately 4,180 acres. The area to be disturbed is less than 3 percent of the project area.

Because the Groton Wind Farm will introduce new disturbance and permanent structures to the site, some level of impact to wildlife habitat and use is likely. However, because the project does not involve any development that will significantly increase traffic to the area or increased use by humans, habitat fragmentation will be relatively minor, and there should not be a substantial change in the patterns of wildlife habitat use and movement around the site.

The discussion below expands on this general conclusion, and highlights areas where impacts may occur.

Stream crossings are proposed. These crossings are being designed to allow for unimpeded hydrology and so as to have minimal impact on wildlife passage. There will not be frequent vehicle access along these roads once construction is complete and even during construction the vehicles will be moving slowly and should not pose a danger to wildlife any more so than the existing logging trucks and skidders.

A road crossing at the outlet of the beaver flowage wetland into Clark Brook is being designed with special consideration to avoid any change to existing flow paths which could potentially impact the wildlife using this wetland and brook trout that could be found within the Clark Brook and associated streams. There is an existing woods road crossing (a log bridge) over an existing culvert and the project will improve the crossing to the NHDES stream crossing standards. The crossing will be upgraded for access to a proposed staging/storage area on the east side of Clark Brook.

The project does impact a relatively large forest block. However, the roads are quite narrow and thus would not be considered as fragmenting the landscape any more so than under current conditions. The commercial logging operation that occurs within the project limits has a far greater potential to create forest openings and habitat that is broken up by logging roads. The narrow gravel access roads are utilized by large mammals as they tend to follow established trails, skidder roads and logging roads. These created paths are where most of the moose and bear signs were observed (scats

and tracks). There was much evidence of browsing as well as areas where the animals are bedding down for the night in the clearings along the logging roads.

4.2.1 Strengths

- Large acreage (approximately 4,180 acres) of more or less continuous forest cover;
- No presence/documentation of invasive species;
- Abutting large parcels of undeveloped land that support overall wildlife habitat in a landscape context;
- Presence of several large mammals with large home ranges (e.g., moose, bear, white tail-deer, eastern coyote) indicates a habitat of higher significance;
- Presence of eight individual plant communities/critical habitat types providing good overall diversity (including a mosaic of large seedling/sapling stage created by the different logging cutting practices);
- Presence of an abundant food source (native fruit/berry shrubs, beech nuts, white pine seeds, and acorns from a limited number of oak trees - are all favorites and preferred by many species of wildlife);
- Presence of moderate to strong habitat including important features like thick cover and structure including: deer wintering yards, logging debris, stone walls, cliffs talus/rock outcrops, snags, cavities, travel paths (e.g., logging roads), and presence of ground water seepages as a drinking source during winter;
- Presence of wetlands providing at least four critical habitats including: beaver flowage/shallow-deep marsh, shrub-shrub, vernal pools, and cold water perennial streams;
- Presence or nearby sightings of state-listed species including wood turtle, brook trout, peregrine falcon, and blue-spotted salamander;
- Likely presence by members of the weasel family (e.g., mink) within the beaver flowage and stream habitat which usually indicates a habitat that is higher in quality and value.

4.2.2 Limitations

- Land use on the Project Site and in the immediate vicinity is dominated by active private commercial timberland. Active logging activity affects the cover, structure for many wildlife species, especially ones depended on large trees or on dense mature softwood stands used as deer wintering areas;
- Stream pollution/sedimentation caused by logging activity/proposed project road improvements may affect brook trout habitat;
- The increase in roads creates hazardous conditions to many species of wildlife including: road kill, increase in predation, interruption of travel corridors, and overall decrease in important habitat features;

- Future road improvements/wind turbines development may temporary and/or permanently displace some of the larger mammals and more sensitive smaller mammals at the most disturbed sites;
- Potential impact to an existing high valued wetland (beaver flowage) and to other wildlife habitats due road improvement and vegetation clearing for placement of overhead lines.

5.0 List of Preparers including their Responsibilities and Qualifications

Name /Title: Peter J. Walker, Director, Environmental Services
Qualifications: B.A., Biology and Environmental Studies, Williams College; M.S., Biology, University of Vermont.
Eighteen years experience in environmental science and terrestrial ecology.
Responsibilities: Overall supervision of the Wildlife Habitat Assessment; editor of final report.

Name /Title: Nancy Rendall, Senior Environmental Scientist
Qualifications: B.S., Forest Hydrology, University of Minnesota;
M.S., Land Resources, University of Wisconsin.
Twenty-six years experience in environmental science and terrestrial ecology.
Responsibilities: Overall QA/QC of the Wildlife Habitat Assessment and assistant editor of final report.

Name/Title: Earle Chase, Senior Ecologist
Qualifications: B.S., Forestry, University of New Hampshire;
M.S., Environmental Studies, Anitoch University, NH.
Thirty-four years of experience as a forester, wildlife biologist and natural resource scientist; Certified Wetland Scientist (NH #181).
Responsibilities: Completed Wildlife Habitat Assessment including field survey, data collection and findings report.

Name/Title: Carolina F. Vasconcelos Linder, Environmental Scientist
Qualifications: B.S., Biology, University of Massachusetts, Amherst;
B.S., Wildlife and Fisheries Conservation, University of Massachusetts, Amherst;
M.S., Sustainable Resource Management, Technical University of Munich, Germany.
Ten years of experience in environmental science/permitting, including biological data collection, preparation of Environmental Impact Statements,

	Comprehensive Conservation Plans for National Wildlife Refuges.
Responsibilities:	Assisted with Wildlife Habitat Assessment including field survey, data collection and findings report.

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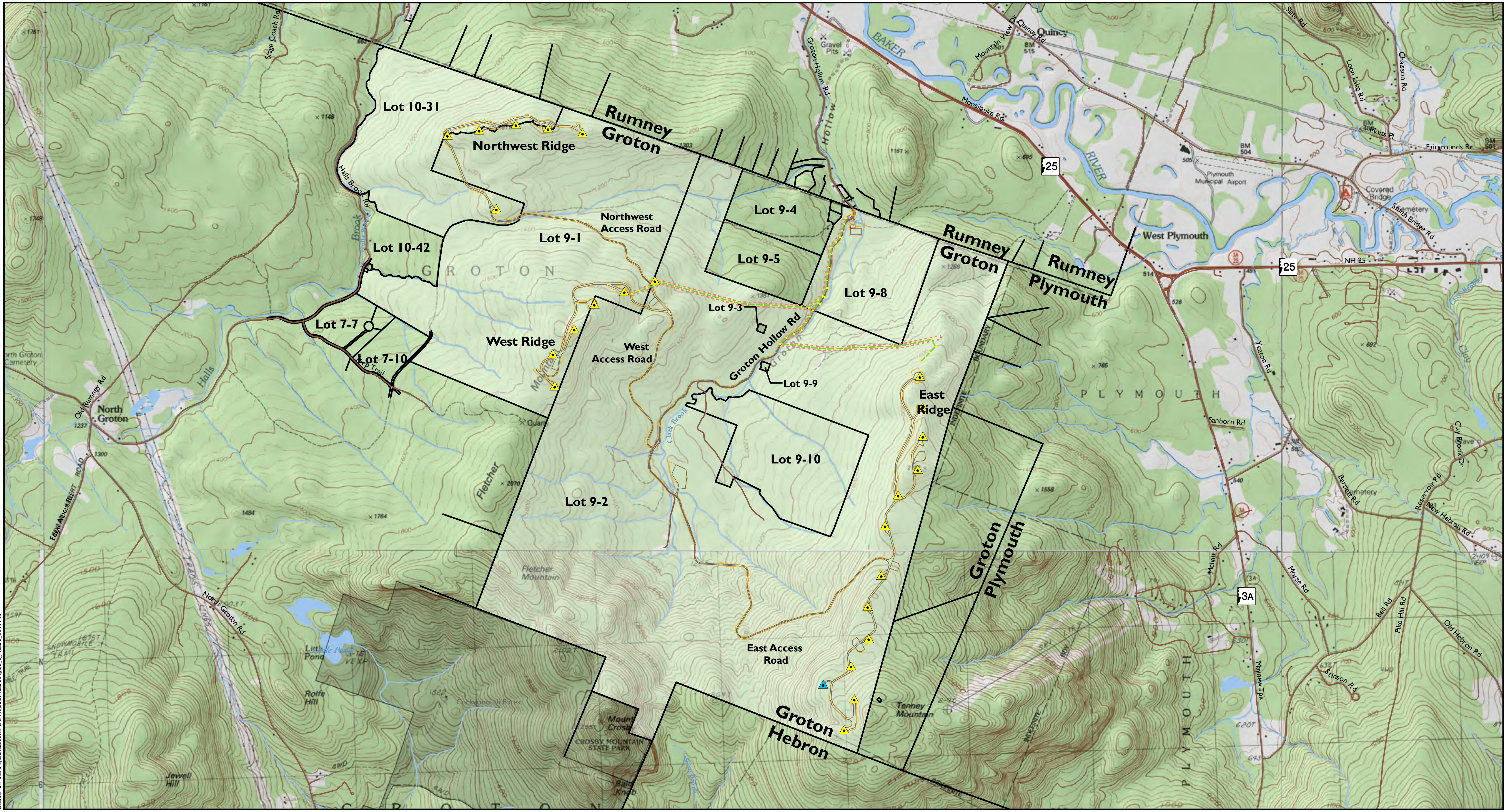
Figures

- Figure 1. Site Location Map
- Figure 2. NH Land Cover Classification
- Figure 3. NH Wildlife Action Plan Habitat Types
- Figure 4. Wetlands and Vernal Pools on the Project Site
- Figure 5. Potential Deer Yard Habitat



Legend

- Proposed Turbine Location
- Proposed Met Tower Location
- Project Location (Shaded White)
- Proposed Building
- Proposed Gravel Areas
- Proposed Overhead Wire
- Proposed Utility Pole
- Proposed Clearing Line
- Property Lines
- Overhead Wire Study Area
- Lake/Pond
- River/Stream
- Conservation/Public Land
- Roads (NHDOT)

0 2,500 5,000 Feet

Source: USGS Quadrangle: Ashland, Mt. Cardigan, Newfound Lake, Plymouth, Rumney, Wentworth
Property Lines based on multiple sources of data including ground survey, and assessing tax maps.
Conservation Lands, Roads, and hydrography data taken from the archives on NHGRANIT.

Vanasse Hangen Brustlin, Inc.

Figure 1

Site Location Map

Groton Wind, LLC

Groton Hollow Road
Groton, NH

IBERDROLA RENEWABLES

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Legend

- Proposed Turbine Location
- Proposed Met Tower Location
- Proposed Building
- Proposed Gravel Areas
- Proposed Overhead Wire
- Proposed Utility Pole
- Proposed Clearing Line
- Property Lines
- Overhead Wire Study Area

NH Land Cover Assessment 2001

- Developed
- Agriculture
- Deciduous Forest
- Coniferous Forest
- Mixed Forest
- Open Water
- Forested Wetland
- Open Wetland
- Disturbed Land
- Bedrock/Vegetated
- Other Cleared
- Lake/Pond
- River/Stream
- Conservation/Public Land
- Roads (NHDOT)

Source:
Property Lines based on multiple sources of data including ground survey, and assessing tax maps. Conservation Lands, Roads, and hydrography data taken from the archives on NHGRANIT. Landcover data from the 2001 Land Cover Assessment for NH as archived in NHGRANIT.

0 2,500 5,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure 2

NH Land Cover Classification

Groton Wind, LLC

Groton Hollow Road, Groton, NH

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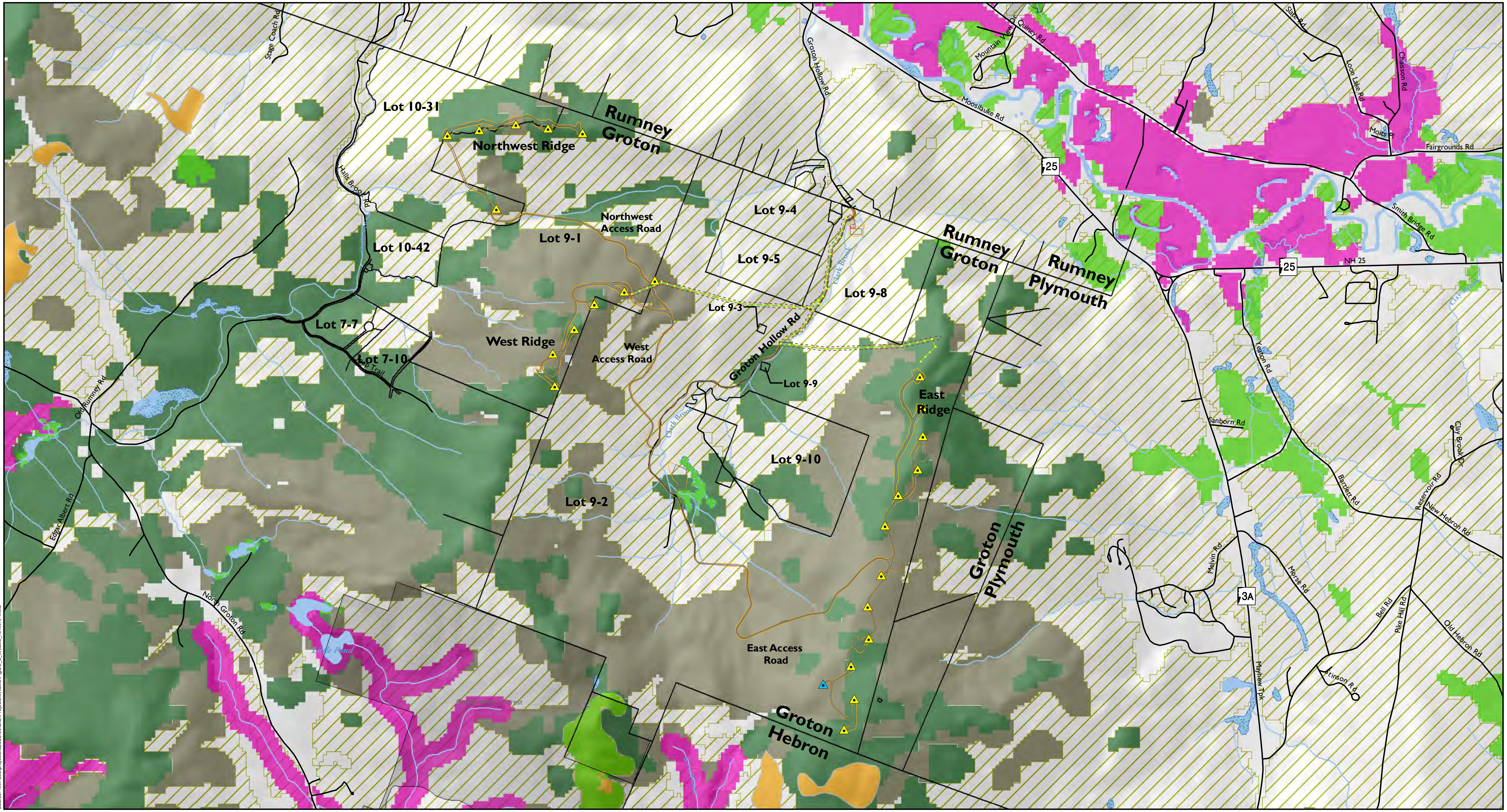


Legend

- Proposed Turbine Location
- Proposed Met Tower Location
- Proposed Building
- Proposed Gravel Areas
- Proposed Overhead Wire
- Proposed Utility Pole
- Proposed Clearing Line
- Property Lines
- Overhead Wire Study Area
- Wet Meadow-Shrub Wetland
- Lowland Spruce-Fir Forest
- Nothern-Hardwood-Conifer
- Hemlock-Hardwood-Pine Matrix Forest
- Rocky Ridge and Talus Slopes
- Highest ranked habitat in NH (by ecological condition)
- Highest ranked habitat in biological region (by ecological condition)
- Lake/Pond
- River/Stream
- Conservation/Public Land
- Roads (NHDOT)

0 2,500 5,000 Feet

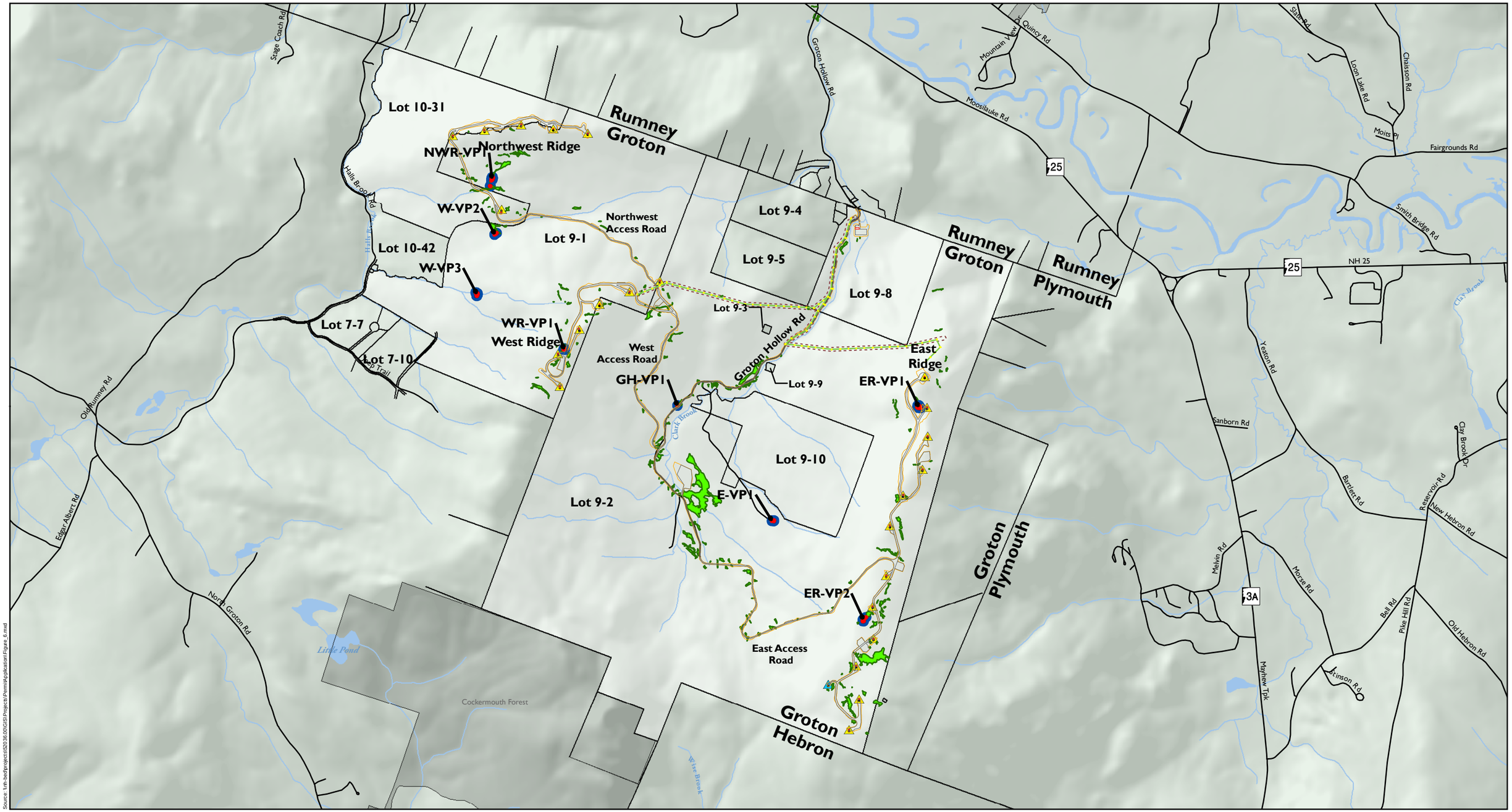
Source:
Property Lines based on multiple sources of data including ground survey, and assessing tax maps.
Conservation Lands, Roads, and hydrography data taken from the archives on NHGRANIT.
NH Fish & Game Wildlife Action Plan (WAP) Habitats taken from the archives of NHGRANIT.

Vanasse Hangen Brustlin, Inc.

Figure 3
Plant Community/Habitat Types
NH Wildlife Action Plan
Groton Wind, LLC

Groton Hollow Road
Groton, NH

IBERDROLA RENEWABLES



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Legend

- Project Location (Shaded White)
- Proposed Turbine Location
- Proposed Met Tower Location
- Proposed Building
- Proposed Gravel Areas
- Proposed Overhead Wire
- Proposed Utility Pole
- Proposed Clearing Line
- Property Lines
- Overhead Wire Study Area
- Wetland Boundary (VHB Delineation)
- Vernal Pool Buffer (100 feet)
- Lake/Pond
- River/Stream
- Conservation/Public Land
- Roads (NHDOT)

0 2,500 5,000 Feet

Source:
Property Lines based on multiple sources of data including ground survey, and assessing tax maps. Conservation Lands, Roads, and hydrography data taken from the archives on NHGRANIT. Wetland and vernal pool boundaries delineated by VHB wetland scientists during the spring, summer and fall of 2009 within the project study area corridor. Other wetlands from NWI and aerial interpretation outside of the project study area corridor. As field delineation was not completed for areas outside of the 425-acre study corridor, this figure may underestimate wetland resources for the entire 4000-acre project.

Vanasse Hangen Brustlin, Inc.

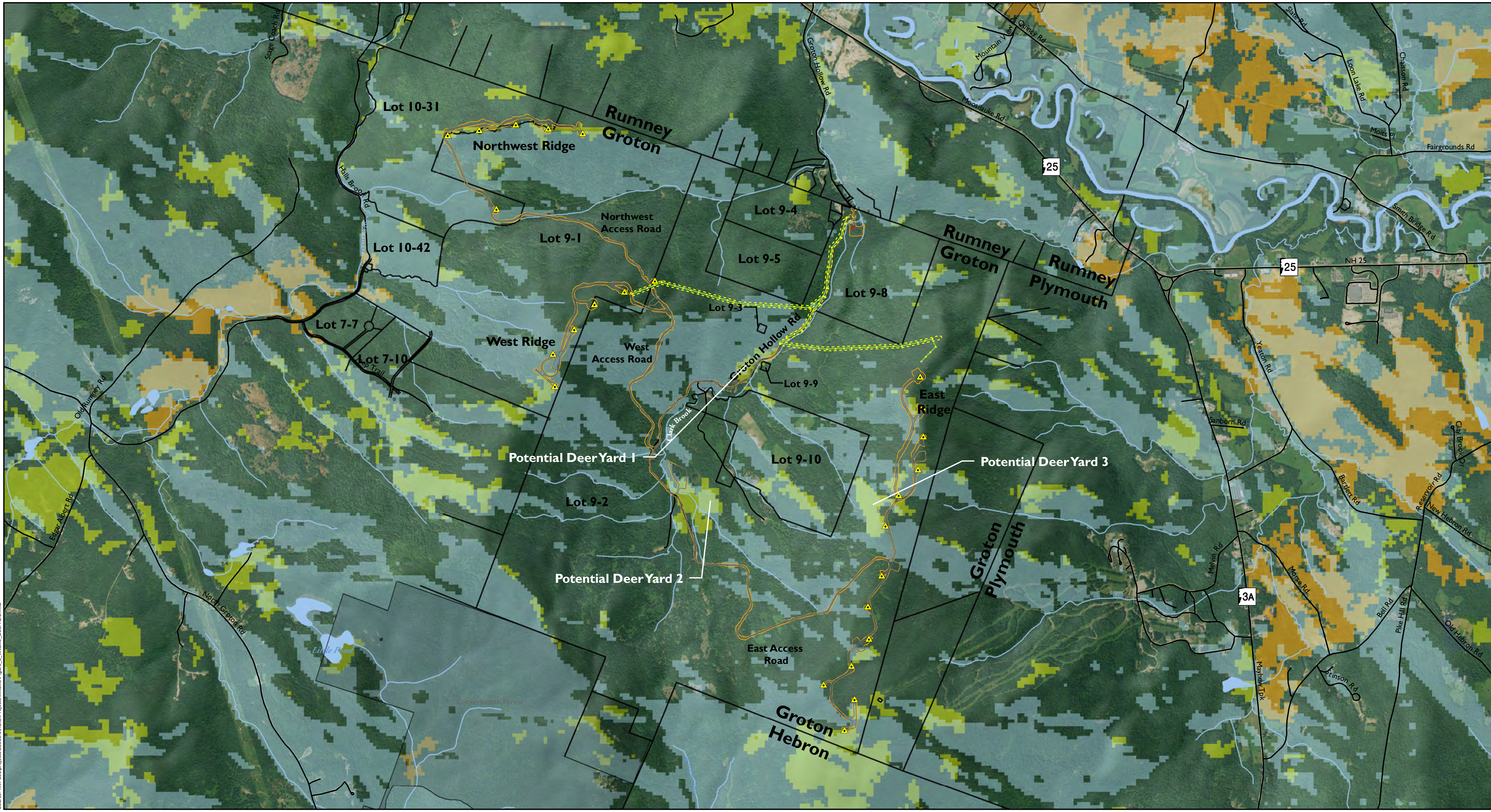
Figure 4

Study Area Wetlands

Groton Wind, LLC

Groton Hollow Road
Groton, NH

IBERDROLA RENEWABLES



Legend

Proposed Turbine Location	Proposed Overhead Wire	NH Fish & Game Deer Yard Model	Lake/Pond
Proposed Building	Proposed Utility Pole	Mapped Deer Yard	River/Stream
Proposed Gravel Areas	Proposed Clearing Line	Potential Deer Yard	Conservation/Public Land
	Property Lines	South to West Facing Slopes	Roads (NHDOT)
	Overhead Wire Study Area		

0 2,500 5,000 Feet

Source:
Property Lines based on multiple sources of data including ground survey, and assessing tax maps.
Conservation Lands, Roads, and hydrography data taken from the archives on NHGRANIT.
Mapped and Pontential Deer Yards provided by NH Fish and Game. South to West Facing Slopes generated from USGS DEM data.

Vanasse Hangen Brustlin, Inc.

Figure 5

Potential Deer Winter Areas

Groton Wind, LLC

Groton Hollow Road
Groton, NH

IBERDROLA RENEWABLES

Appendices

- Appendix A – Wildlife Habitat Assessment Field Data Form
- Appendix B – Photolog of Upland Plant and Wetland Plant Communities
- Appendix C – Natural Resource Agency Correspondence
- Appendix D – NEWILD Wildlife Inventory List
- Appendix E – Photolog of Wildlife (Signs, Structural Components, Corridors)

Appendix A

Wildlife Habitat Assessment Field Data Form

Wildlife Habitat Assessment Field Data Form

Person Completing Form: **Earle Chase** **Date(s) of Assessment: April – November 2009**

Project Name: Groton Wind Farm

I. SITE DESCRIPTION

Project Location (street, town, county): **Groton Hollow Road, Groton, Grafton**
(Attach aerial photo or topographic map with property outline) Acreage: **4,180**

Nearest Road: ☑ On site ☑ Adjacent to site ____ mi from site

Type of Road: ☑ Dirt ☑ Single lane paved 4-lane paved Interstate

Existing Structures on Site: **An old hunting cabin is present**

Adjacent Land Uses (check all that apply): ☑ Forest ☑ Shrubland ☑ Grassland ☑ Cropland ☑ Pasture ☑ Wetland ☑ Open Water Residential Industrial/Commercial Other: _____

Habitat Types Present: ☑ Forest **92%** Shrub/Old Field ___% Grass/Forb ___% Cultivated ___% Pasture ___% ☑ Wetland **8%** Open Water ___% Other: ☑ Rocky Ridge/Talus **<1%**

Streams: None ☑ Intermittent ☑ Perennial Stream Orders: ☑ 1 ☑ 2 3 4 5 6

Water Bodies: ☑ None Small pond - natural Small pond - constructed Great pond Estuary

Wetlands: None ☑ Sedge meadow ☑ Shallow marsh ☑ Deep marsh ☑ Shrub swamp ☑ Bog ☑ Forested wetland Other: _____

Dominant Forest Types: Aspen-birch ___% Northern hardwood **77%** Red Maple ___% Spruce-fir **23%** Hemlock ___% Oak-pine ___% Other: _____%

Forest Age Class: ☑ Regeneration-Seedling **33%** ☑ Sapling-Pole **33%** ☑ Mature **33%** Older growth ___%

II. SITE EVALUATION AND RECOMMENDATIONS FOR WILDLIFE. For more specific guidance if these features are present **consult references listed** or contact NH Fish and Game Wildlife Division at any regional office or headquarters. If threatened or endangered species are present, contact NH Fish and Game Nongame Program at 271-2461.

Develop List of Potential Wildlife Species Present Based on the Site Description

Refer to *New England Wildlife: Habitat, Natural History, and Distribution* by DeGraaf and Yamasaki (2001) to develop a list of potential wildlife species based on the above habitat assessment. Pages 395-456 provide a list of species that occur in New England along with special habitat features and preferred habitat types for each species. This information provides insight into which species likely inhabit an area. Since this is a potential list, fieldwork and judgment when assessing the impacts of a project are still essential.

A. **Avoid or Minimize Impacts to the Following Special Habitat Features and Critical Habitats:**

dense, mature softwood stands (e.g., deer wintering areas) (See *Good Forestry*... pp. 51-54)
☑ stands of hard mast (See " " pp. 55-56)
☑ concentrations of native fruit/berry producing trees or shrubs (See " " pp. 55-56)
active large stick nests (See " " pp. 73-75)
potential raptor nest trees (mature or 3-pronged branching) (See " " pp. 73-75)
☑ standing dead trees (snags) of diameters: 2 18-24" 2 >24" (See " " pp. 57-58)
☑ fallen/decaying logs of diameters: 2 18-24" 2 >24" (See " " pp. 59-60)
☑ observed or documented wildlife travel corridors

Critical Wildlife Habitat[1]	✓ if present	Size (ac.)	Associated wildlife[2] (circle any species present)	Evidence of wildlife presence (and other comments)
Extensive grasslands (>25 ac.)			Eastern meadowlark, horned lark, **purple martin**, vesper sparrow, **grasshopper sparrow**, **upland sandpiper**, **northern harrier**, northern leopard frog, smooth green snake	
Dry shrublands			Eastern towhee, golden-winged warbler, New England cottontail, smooth green snake, black racer	
Merrimack River sand plains/pitch pine			**Eastern hognose snake**, Fowler's toad, black racer, **Karner blue butterfly**	
Pitch pine barrens			Eastern towhee, **common nighthawk**, whip-poor-will, **frosted elfin**, **Persius dusky wing**, **pine barrens zanclognatha moth**, **pine pinion moth**	
Caves/mines			**Eastern small-footed bat**, northern long-eared bat, Eastern pipistrelle	
Cliffs	✓	2	**peregrine falcon**, **golden eagle**	
Mature/overmature spruce-fir	✓	25 +/-	hoary bat, **three-toed woodpecker**, **pine marten**	
Northern or high elevation spruce-fir			**Canada lynx**, Bicknell's thrush, spruce grouse	
Alpine			American pipit, White Mountain butterfly, White Mountain fritillary	
Sedge meadow	✓		**sedge wren**, bog haunter	
Scrub-shrub swamp	✓		spotted turtle, Blanding's turtle	
Deep emergent marsh	✓		**pied-billed grebe**, least bittern, American bittern, common moorhen, spotted turtle, Blanding's turtle	
Vernal pool (seasonal wetland)	✓		**marbled salamander**, Jefferson salamander	Wood frog, Spotted, Blue-spotted salamanders
Northern bog	✓		palm warbler, spruce grouse, mink frog	
Riparian/riverine	✓		wood turtle, **dwarf wedge mussel**, **brook floater**, **bald eagle**	
Riverine cobble	✓		**cobblestone tiger beetle**	
Floodplain forest			Jefferson salamander, northern leopard frog, black racer, red-shouldered hawk	
Lake shore			**common loon**, **bald eagle**, **osprey**	
Estuary			**bald eagle**, **osprey**	
Salt marsh			American bittern, willet, **common tern**, sharp-tailed sparrow, seaside sparrow	
Sand dune			**piping plover**, little tern	
Coastal island Northern boggy lakes and streams			**common tern**, arctic tern, **roseate tern**, black guillemot northern redbelly dace, finescale dace	
Weedy lowland streams and ponds			swamp darter, banded sunfish	
Quiet shallows over mud and sand			tesselated darter	
Coastal freshwater streams			American brook lamprey	

[1] Critical wildlife habitats and associated wildlife species of concern were developed by the NH Ecological Reserve System Project (2000).

[2] **Wildlife in bold** are state endangered or threatened wildlife. **Wildlife in bold and underlined** are Federally listed.

III. BUFFERS: Buffers are undisturbed areas of natural (native) vegetation. Setbacks of buildings need to be adjusted so that lawns and other disturbance do not infringe upon the buffer. Buffers may be smaller than those recommended if greater habitat connectivity can be achieved. **The following minimum buffers are general guidelines based on wildlife needs.** Refer to *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire* and *Buffers for Wetlands and Surface Waters: A Guidebook for New Hampshire Municipalities* for further guidance.

Wetlands and Water Bodies	Buffer Width
☐ Great pond (≥ 10 acres)	300 ft.
☐ Small Pond (<10 acres)	100 ft.
☑ Large Wetland (> 10 acres)	300 ft.
☑ Medium Wetland (1 - 10 acres)	100 ft.
☑ Small Wetland (< 1 acre). If a feature below is present, then	100 ft.
☐ active beaver lodge	
☐ breeding turtles or waterfowl	
☐ emergent marsh	
☑ Vernal Pool. If breeding amphibians are present, then	50 ft.

If any of the following are present in a wetland or water body of any size:

☐ bald eagle or osprey nest	650 ft.
☐ heron colony	300 ft.

Streams

☐ 4th order or higher	600 ft.
☐ 3rd order	300 ft.
☑ 1st and 2nd order	100 ft.

IV. REFERENCES TO CONSULT

Chase, V., L. Deming, and F. Latawiec. 1995. ***Buffers for Wetlands and Surface Waters: A Guidebook for New Hampshire Municipalities***. Audubon Society of New Hampshire. Concord.

DeGraaf, R.M., and M. Yamasaki. 2001. ***New England Wildlife: Habitat, Natural History, and Distribution***. University Press of New England. Hanover and London.

Kanter, J., R. Suomala, and E. Snyder. 2001. ***Identifying and Protecting New Hampshire's Significant Wildlife Habitat: A Guide for Towns and Conservation Groups***. NH Fish and Game Department. Concord.

NH Forest Sustainability Standards Work Team. 1997. ***Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire***. NH Division of Forests and Lands, DRED; and the Society for the Protection of New Hampshire Forests. Concord.

Tappan, A., *ed.* 1997. ***Identification and Documentation of Vernal Pools in New Hampshire***. NH Fish and Game Department. Concord.

Appendix B

Photolog of Upland Plant and Wetland Plant Communities

Photolog of Upland Plant Communities

Photo 1: This is an example of the Eastern hemlock-northern hardwood-white pine forest. Historical logging has removed much of the hemlock and white pine tree component.

Photo 2: This is an example of a Eastern hemlock-northern hardwood-white pine forest. In this particular area hemlock was the predominant tree species. Browse evidence indicated potential winter usage by white tail deer.

Photo 3: This is an example of the northern hardwood-coniferous forest. This type of forest occurs in the mid to higher elevations at the property.

Photo 4: This is an example of a lowland spruce-fir forest. This area also contains white pine trees.

Photo 5: Much of this lowland spruce-fir forest has been altered by continuous timber cutting.

Photo 6: This photo shows an example of a ridge and talus slope natural community where varying amounts of rock outcrops are typical. This type of community was identified by NH Fish & Game (on the north of Crosby Mountain State Park) as one of the highest ranked habitat in biological region (by ecological condition) – this area was not field inspected during this wildlife assessment.

Photolog of Wetland Plant Communities

Photo 7: Forested wetlands (PFO1E) were the predominant wetland found at the property.

Photo 8: Another example of a forested wetland. The chief composition included spruce and balsam fir.

Photo 9: Scrub-shrub wetland (PSS). These types of wetlands are comprised of mostly wetland shrubs which provides critical habitat for many wildlife species.

Photo 10: Example of an emergent wetland (PEM1E). Many of these wetlands have been disturbed by logging activities.

Photo 11: This shows the beaver flowage located adjacent to the Groton Hollow Road. This is an example of a shallow-deep marsh system which provides critical habitat for a diversity of wildlife species.

Photo 12: Several intermittent and perennial streams were found within the project site. These provide critical habitat for brook trout populations and for other aquatic macroinvertebrates.

Appendix C

Natural Resource Agency Correspondence

■

Memo

NH Natural Heritage Bureau

To: Dale Abbott
6 Bedford Farms Drive, Suite 607
Bedford, NH 03110-6532

From: Melissa Coppola, NH Natural Heritage Bureau
Date: 6/24/2009 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB09-1212 Town: Groton
Project type: Tower Construction: Wind power construction Location: Tax Maps: 9-1,9-2,9-8,9-18
cc: Kim Tuttle

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments:

Vertebrate species	State[1]	Federal	Notes
Peregrine Falcon (*Falco peregrinus anatum*)*	T	M	Contact the NH Fish & Game Dept (see below).
Wood Turtle (*Glyptemys insculpta*)	SC	--	Contact the NH Fish & Game Dept (see below).

[1]Codes: "E" = Endangered, "T" = Threatened, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. For some purposes, including legal requirements for state wetland permits, the fact that no species of concern are known to be present is sufficient. However, an on-site survey would provide better information on what species and communities are indeed present.

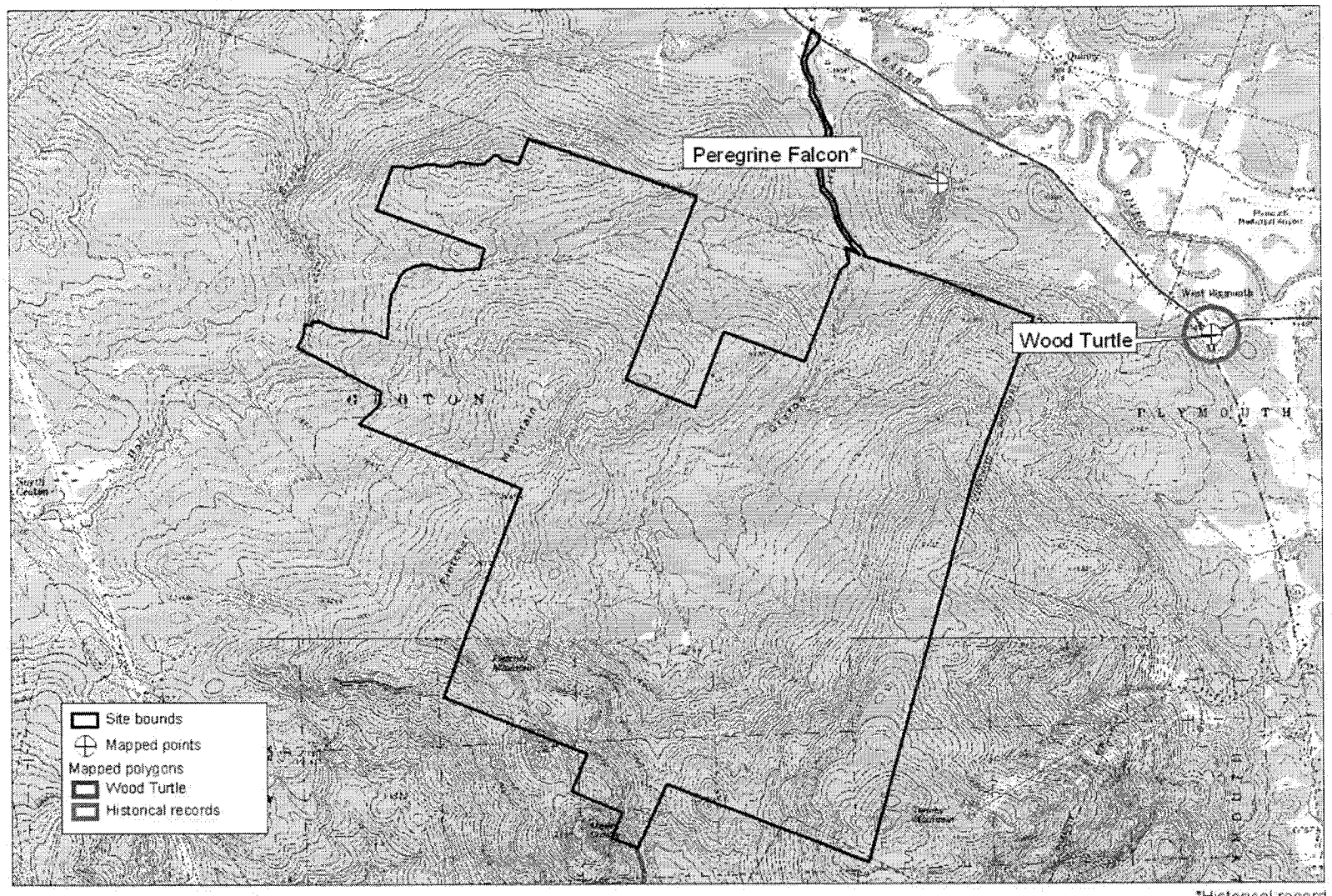
Department of Resources and Economic Development
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DRED/NHB
PO Box 1856
Concord NH 03302-1856

NH NATURAL HERITAGE BUREAU

Known locations of rare species and exemplary natural communities

Note: Mapped locations are not always exact. Occurrences that are not in the vicinity of the project are not shown.



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Valid for one year from this date: 24 Jun 2009

New Hampshire Natural Heritage Bureau - Animal Record

Wood Turtle (*Glyptemys insculpta*)

Legal Status

Federal: Not listed
State: SC

Conservation Status

Global: Apparently secure but with cause for concern
State: Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 1998: 1 male seen. Adult. (Obs_id 1998.0312).
General Area:
General Comments:
Management Comments:

Location

Survey Site Name: Baker River, near Rumney
Managed By:

County: Grafton
Town(s): Rumney
Size: 11.4 acres

USGS quad(s): Rumney (4307177)
Lat, Long:
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 1998: Upland bank of Baker River. Southeast portion of Tax Map 12 Lot 5-4 between Stinson Brook and Baker River. [According to map, location of shell is on upper bank of Baker R., directly north of Russell School which is south of the river on School St.]

Dates documented

First reported: 1998-04-16 Last reported: 1998-04-16

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Wood Turtle (*Glyptemys insculpta*)

Legal Status

Federal: Not listed
State: SC

Conservation Status

Global: Apparently secure but with cause for concern
State: Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2003: 1 adult male. Data from 1996 to 2003 (Obs_id 2003.0183); 1 adult female. Data from 1996 to 2003 (Obs_id 2003.0184).
General Area: 2003: No details (Obs_id 2003.0183, 2003.0184).
General Comments:
Management Comments:

Location

Survey Site Name: Baker River, near Rumney
Managed By:

County: Grafton
Town(s): Rumney
Size: 61.7 acres

USGS quad(s): Rumney (4307177)
Lat, Long:
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2003: Baker River half way between Quincey Rd. and Rumney (Obs_id 2003.0183); Baker River between Buffalo Rd. and Rte. 25 near Gaging Station. (Obs_id 2003.0184).

Dates documented

First reported: 1996
Last reported: 2003

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

Appendix D

NEWILD Wildlife Inventory List

New England Wildlife - search results

Search Summary

The search was done using 23 forested habitats

Number of amphibians:	25
Number of reptiles:	20
Number of birds:	158
Number of mammals:	59
TOTAL:	262

Number of species included in search: 338
Total number of species in NEWILD: 338

All seasons selected

Seasonal use symbols:

B = Breeding season (amphibians and reptiles)
B = Breeding season (birds and mammals)
BF = Breeding and feeding (birds and mammals only)
N = Winter (amphibians and reptiles)
N = Winter (birds and mammals)
NF = Winter feeding (birds and mammals only)
on species list header, * = search restricted to preferred only

Utilized/Preferred symbols:

x = utilized habitat
+ = preferred habitat

Forest size class symbols:

S = Regeneration through seedlings
Sp = Saplings through poletimber
St = Sawtimber
L = Large sawtimber
U = Uneven-aged (Northern hardwoods only)
on habitat list, x = size class selections

New England Wildlife - search results

A search was done using the following habitat components:

Forested habitats (all seasons selected):	S	Sp	St	L	U
Aspen	x	x			
Paper birch	x	x	x		
Northern hardwoods	x	x	x	x	x
Red maple	x	x	x		
Red spruce / Balsam fir	x	x	x		
Eastern hemlock	x	x	x		
Eastern white pine	x	x	x	x	

The following wildlife species were found:

	B	BF	N	NF
Marbled Salamander	+		x	
Jefferson Salamander	+		x	
Silvery Salamander			x	
Blue-spotted Salamander			x	
Tremblay's Salamander			x	
Spotted Salamander	+		x	
Red-spotted Newt			x	
Northern Dusky Salamander			x	
Mountain Dusky Salamander	+		x	
Redback Salamander	x		x	
Slimy Salamander	+		x	
Four-toed Salamander	+		x	
Northern Spring Salamander	+		x	
Northern Two-lined Salamander	x		x	
Eastern Spadefoot			x	
Eastern American Toad			x	
Fowler's Toad			x	
Northern Spring Peeper			x	
Gray Treefrog			x	
Bullfrog			x	
Green Frog			x	
Mink Frog			x	
Wood Frog			x	
Northern Leopard Frog	x			
Pickerel Frog	x		x	
Common Snapping Turtle	x		x	
Bog Turtle			x	
Wood Turtle	x		x	
Eastern Box Turtle	x		x	

	B	BF	N	NF
Eastern Painted Turtle	x			
Five-lined Skink	+		x	
Northern Water Snake	x		x	
Northern Brown Snake	x		x	
Northern Redbelly Snake	+		x	
Eastern Garter Snake	x		x	
Eastern Ribbon Snake	+		x	
Eastern Hognose Snake	x		x	
Northern Ringneck Snake	+		x	
Eastern Worm Snake	x		x	
Northern Black Racer	+		x	
Eastern Smooth Green Snake	x		x	
Black Rat Snake	x		x	
Eastern Milk Snake	x		x	
Northern Copperhead	x		x	
Timber Rattlesnake	x		x	
Great Blue Heron	x			
Green-backed Heron	+	x		
Wood Duck		x		
American Black Duck	x	x		
Common Goldeneye	+			
Hooded Merganser	+			
Common Merganser	+			
Turkey Vulture	x	x	x	x
Bald Eagle	x			
Sharp-shinned Hawk	+	+	+	+
Cooper's Hawk	x	x	x	x
Northern Goshawk	+	+	x	x
Red-shouldered Hawk	+	+	x	x
Broad-winged Hawk	+	x		
Red-tailed Hawk	x	+	x	+
Golden Eagle	x	x	x	x
American Kestrel		x		x
Merlin	+	+	+	+
Peregrine Falcon		x		
Spruce Grouse	+	+	+	+
Ruffed Grouse	+	+	+	+
Wild Turkey	x	x	+	+
Northern Bobwhite			x	x
American Woodcock	+	x		
Mourning Dove	x	x	x	x
Black-billed Cuckoo	x	x		
Yellow-billed Cuckoo	x	x		

	B	BF	N	NF
Eastern Screech-Owl	+	+	+	+
Great Horned Owl	+	x	x	x
Northern Hawk-Owl			+	+
Barred Owl	+	+	+	+
Great Gray Owl			x	+
Long-eared Owl	+	+	+	+
Boreal Owl			x	x
Northern Saw-whet Owl	+	+	+	+
Common Nighthawk	x	x		
Whip-poor-will	+	+		
Ruby-throated Hummingbird	+	+		
Red-headed Woodpecker	+	+	+	+
Red-bellied Woodpecker	x	x	x	x
Yellow-bellied Sapsucker	x	x	x	x
Downy Woodpecker	+	+	+	+
Hairy Woodpecker	+	+	+	+
Three-toed Woodpecker	x	x	x	x
Black-backed Woodpecker	+	+	+	+
Northern Flicker	x	+		+
Pileated Woodpecker	+	+	+	+
Olive-sided Flycatcher	+	+		
Eastern Wood-Pewee	x	x		
Yellow-bellied Flycatcher	+	+		
Alder Flycatcher	+	+		
Willow Flycatcher	+	+		
Least Flycatcher	+	+		
Eastern Phoebe	x	x		
Great Crested Flycatcher	x	x		
Eastern Kingbird	x	x		
Purple Martin		x		
Tree Swallow	+	+		
Northern Rough-winged Swallow		x		
Bank Swallow		x		
Cliff Swallow		x		
Barn Swallow		x		
Gray Jay	+	+	+	+
Blue Jay	+	x	x	x
American Crow	+	x	x	x
Common Raven	x	x	x	x
Black-capped Chickadee	+	+	+	+
Boreal Chickadee	+	+	+	+
Tufted Titmouse	x	x	x	x
Red-breasted Nuthatch	+	+	+	+

	B	BF	N	NF
White-breasted Nuthatch	+	+	+	+
Brown Creeper	x	x	x	x
Carolina Wren	+	+	+	+
House Wren	x	x		
Winter Wren	+	+	x	x
Golden-crowned Kinglet	+	+	x	x
Ruby-crowned Kinglet	+	+	x	x
Blue-gray Gnatcatcher	+	+		
Eastern Bluebird	+	+	x	x
Veery	+	+		
Gray-cheeked Thrush	x	x		
Swainson's Thrush	+	+		
Hermit Thrush	+	+	x	x
Wood Thrush	+	+		
American Robin	x	x	x	x
Gray Catbird	x	x		
Northern Mockingbird	+	+	+	+
Brown Thrasher	x	x		
Bohemian Waxwing				x
Cedar Waxwing	+	+	+	+
Northern Shrike			x	x
European Starling	x	x	x	x
White-eyed Vireo	+	+		
Solitary Vireo	+	+		
Yellow-throated Vireo	+	+		
Warbling Vireo	+	+		
Philadelphia Vireo	+	+		
Red-eyed Vireo	+	+		
Blue-winged Warbler	+	+		
Golden-winged Warbler	x	x		
Tennessee Warbler	+	+		
Nashville Warbler	+	+		
Northern Parula	+	+		
Yellow Warbler	+	+		
Chestnut-sided Warbler	+	+		
Magnolia Warbler	+	+		
Cape May Warbler	+	+		
Black-throated Blue Warbler	+	+		
Yellow-rumped Warbler	+	+		
Black-throated Green Warbler	+	+		
Blackburnian Warbler	+	+		
Pine Warbler	+	+		
Prairie Warbler	+	+		

	B	BF	N	NF
Palm Warbler	x	x		
Bay-breasted Warbler	+	+		
Blackpoll Warbler	+	+		
Cerulean Warbler	x	x		
Black-and-white Warbler	+	+		
American Redstart	+	+		
Prothonotary Warbler	x	x		
Worm-eating Warbler	x	x		
Ovenbird	+	+		
Northern Waterthrush	+	+		
Louisiana Waterthrush	+	+		
Mourning Warbler	+	+		
Common Yellowthroat	+	+		
Hooded Warbler	+	+		
Wilson's Warbler	x	x		
Canada Warbler	+	+		
Yellow-breasted Chat	x	x		
Scarlet Tanager	+	+		
Northern Cardinal	+	+	+	+
Rose-breasted Grosbeak	+	+		
Indigo Bunting	x	x		
Rufous-sided Towhee	+	+		
American Tree Sparrow			x	x
Chipping Sparrow	+	+		
Field Sparrow	x	x	x	x
Fox Sparrow			x	x
Song Sparrow	+	+	+	+
Lincoln's Sparrow	x	x		
White-throated Sparrow	x	x	x	x
Dark-eyed Junco	+	+	x	x
Red-winged Blackbird	x	x		
Rusty Blackbird	x	x	x	x
Common Grackle	+	+	x	x
Brown-headed Cowbird	x	x	x	x
Orchard Oriole	x	x		
Northern Oriole	x	x	x	x
Pine Grosbeak	+	+	x	x
Purple Finch	+	+	+	+
Red Crossbill	+	+	+	+
White-winged Crossbill	+	+	+	+
Common Redpoll			+	+
Hoary Redpoll			+	+
Pine Siskin	+	+	x	x

	B	BF	N	NF
American Goldfinch	+	+	+	+
Evening Grosbeak	x	x	x	x
Virginia Opossum	+	+	+	+
Masked Shrew	x	x	x	x
Water Shrew	x	x	x	x
Smoky Shrew	+	+	+	+
Long-tailed Shrew	x	x	x	x
Pygmy Shrew	x	x	x	x
Northern Short-tailed Shrew	x	x	x	x
Least Shrew	x	x	x	x
Hairy-tailed Mole	x	x	x	x
Eastern Mole	x	x	x	x
Star-nosed Mole	x	x	x	x
Little Brown Myotis	x	x	x	
Keen's Myotis	x	x	x	
Indiana Myotis	x	x	x	
Small-footed Myotis	x	x	x	
Silver-haired Bat	x	x		
Eastern Pipistrelle	x	x	x	
Big Brown Bat	x	x	x	
Red Bat	x	x		
Hoary Bat	x	x		
Eastern Cottontail	x	x	+	+
New England Cottontail	x	x	+	+
Snowshoe Hare	x	x	x	x
European Hare	x	x	x	x
Eastern Chipmunk	x	x	x	
Woodchuck	x	x	x	
Gray Squirrel	x	x	x	x
Red Squirrel	+	+	+	+
Southern Flying Squirrel	+	+	+	+
Northern Flying Squirrel	+	+	+	+
Beaver	x	+	x	+
Deer Mouse	+	+	+	+
White-footed Mouse	+	+	+	+
Southern Red-backed Vole	+	+	+	+
Meadow Vole	x	x	x	x
Rock Vole	x	x	x	x
Woodland Vole	x	x	x	x
Southern Bog Lemming	x	x	x	x
Northern Bog Lemming	x	x	x	x
Meadow Jumping Mouse	x	x	x	
Woodland Jumping Mouse	+	+	+	

	B	BF	N	NF
Porcupine	+	+	+	+
Coyote	x	x	x	x
Red Fox	+	+	+	+
Gray Fox	+	+	+	+
Black Bear	+	+	x	
Raccoon	+	+	+	+
Marten	+	+	+	+
Fisher	+	+	+	+
Ermine	x	x	x	x
Long-tailed Weasel	x	x	x	x
Mink	+	+	+	+
Striped Skunk	x	x	x	x
River Otter	x	x	x	x
Mountain Lion	x	x	x	x
Lynx	x	+	+	+
Bobcat	x	x	x	x
White-tailed Deer	x	+	+	+
Moose	x	+	+	+

New England Wildlife - search results

Search Summary

The search was done using 12 nonforested habitats

Number of amphibians:	26
Number of reptiles:	30
Number of birds:	185
Number of mammals:	58
TOTAL:	299

Number of species included in search: 338
Total number of species in NEWILD: 338

All seasons selected

Seasonal use symbols:

B = Breeding season (amphibians and reptiles)
B = Breeding season (birds and mammals)
BF = Breeding and feeding (birds and mammals only)
N = Winter (amphibians and reptiles)
N = Winter (birds and mammals)
NF = Winter feeding (birds and mammals only)
on species list header, * = search restricted to preferred only

Utilized/Preferred symbols:

x = utilized habitat
+ = preferred habitat

New England Wildlife - search results

A search was done using the following habitat components:

Nonforested habitats:

- Grass
- Forb
- Sedge meadow
- Shallow marsh
- Deep marsh
- Shrub swamp
- Bog
- Stream
- Riparian
- Stable bank
- Ledge, cliff
- Derelict building, debris

The following wildlife species were found:

	B	BF	N	NF
Mudpuppy	+		+	
Marbled Salamander	x		x	
Jefferson Salamander	x		+	
Silvery Salamander	x		x	
Blue-spotted Salamander	x		x	
Tremblay's Salamander	x			
Spotted Salamander	x		x	
Red-spotted Newt	+		x	
Northern Dusky Salamander	+		x	
Mountain Dusky Salamander	+		x	
Redback Salamander	x		x	
Slimy Salamander	x		x	
Four-toed Salamander	+		+	
Northern Spring Salamander	+		+	
Northern Two-lined Salamander	+		+	
Eastern Spadefoot			x	
Eastern American Toad	x		x	
Fowler's Toad	x		x	
Northern Spring Peeper	+		x	
Gray Treefrog	x		x	
Bullfrog			x	
Green Frog	+		x	
Mink Frog	+		x	
Wood Frog	x		x	

	B	BF	N	NF
Northern Leopard Frog	+		+	
Pickerel Frog	+		x	
Common Snapping Turtle	x		x	
Stinkpot	x		x	
Spotted Turtle	+		+	
Bog Turtle	+		x	
Wood Turtle	x		+	
Eastern Box Turtle	x		x	
Map Turtle	x			
Red-eared Slider	x		+	
Plymouth Redbelly Turtle	x			
Eastern Painted Turtle	x		+	
Midland Painted Turtle	+		x	
Blanding's Turtle	+		x	
Eastern Spiny Softshell	+			
Five-lined Skink	x		x	
Northern Water Snake	x		x	
Northern Brown Snake	+		+	
Northern Redbelly Snake	x		x	
Eastern Garter Snake	x		x	
Maritime Garter Snake	x		x	
Eastern Ribbon Snake	+		x	
Northern Ribbon Snake	x		x	
Eastern Hognose Snake	x		x	
Northern Ringneck Snake	x		x	
Eastern Worm Snake	+		x	
Northern Black Racer	+		x	
Eastern Smooth Green Snake	+		x	
Black Rat Snake	+		x	
Eastern Milk Snake	+		+	
Northern Copperhead	+		+	
Timber Rattlesnake	+		+	
Common Loon	x	x	x	x
Pied-billed Grebe	+	+	x	x
American Bittern	+	+	x	x
Least Bittern	+	+	x	x
Great Blue Heron	+	+	x	x
Green-backed Heron	+	+	x	x
Black-crowned Night-Heron	+		x	x
Yellow-crowned Night-Heron	+		x	x
Glossy Ibis	+		x	x
Mute Swan			x	x
Canada Goose	+	+		

	B	BF	N	NF
Wood Duck	+	+		
Green-winged Teal	+	+	x	x
American Black Duck	+	+	+	+
Mallard	+	+	x	x
Northern Pintail	x	x		
Blue-winged Teal	+	+		
Northern Shoveler	+	+	x	x
Gadwall	+	+		
American Wigeon	x	x	x	x
Canvasback	x	x	x	x
Ring-necked Duck	x	x	x	x
Common Goldeneye	x	x	x	x
Bufflehead			x	x
Hooded Merganser	x	x	x	x
Common Merganser	x	x	x	x
Red-breasted Merganser	x	x		
Turkey Vulture		+	x	x
Osprey	x	x		
Bald Eagle	x	x	x	x
Northern Harrier	+	+	x	x
Sharp-shinned Hawk		x		x
Cooper's Hawk		x		x
Northern Goshawk		x		
Red-shouldered Hawk	+	+	+	+
Broad-winged Hawk		+		
Red-tailed Hawk		+		x
Rough-legged Hawk			+	+
Golden Eagle	+	x		
American Kestrel		+	+	+
Merlin				x
Peregrine Falcon	+	x		x
Gray Partridge	+	+	+	+
Ring-necked Pheasant	+	+	x	x
Spruce Grouse	x	x		
Ruffed Grouse		x		
Wild Turkey		x		x
Northern Bobwhite	+	+	+	+
King Rail	+	+	x	x
Virginia Rail	+	+	+	+
Sora	+	+		
Common Moorhen	+	+		
American Coot	+	+		
Killdeer	x	x	x	x

	B	BF	N	NF
Spotted Sandpiper	+	+		
Upland Sandpiper	x	x		
Common Snipe	+	+	+	+
American Woodcock	x	x		
Ring-billed Gull			x	x
Herring Gull	x	x	x	x
Black Tern	+	+		
Rock Dove	+	x	+	x
Mourning Dove		x		x
Black-billed Cuckoo	x	x		
Common Barn-Owl	+	+	+	+
Eastern Screech-Owl	+	+	+	+
Great Horned Owl		x		x
Snowy Owl			x	x
Northern Hawk-Owl			+	+
Barred Owl	+	+	+	+
Great Gray Owl				+
Long-eared Owl		x		x
Short-eared Owl			x	x
Boreal Owl			+	+
Northern Saw-whet Owl		x		x
Common Nighthawk		x		
Whip-poor-will		x		
Chimney Swift	+	x		
Ruby-throated Hummingbird		x		
Belted Kingfisher	+	+	+	+
Red-headed Woodpecker	x	x	x	x
Red-bellied Woodpecker	+	+	+	+
Yellow-bellied Sapsucker	x	x	x	x
Hairy Woodpecker	x	x	x	x
Three-toed Woodpecker	x	x	x	x
Black-backed Woodpecker	x	x	x	x
Northern Flicker	x	x		x
Pileated Woodpecker	x	x	x	x
Olive-sided Flycatcher	+	+		
Eastern Wood-Pewee	+	+		
Yellow-bellied Flycatcher	+	+		
Acadian Flycatcher	x	x		
Alder Flycatcher	+	+		
Least Flycatcher	x	x		
Eastern Phoebe	+			
Eastern Kingbird		x		
Horned Lark	+	+	x	x

	B	BF	N	NF
Purple Martin		x		
Tree Swallow	x	+		
Northern Rough-winged Swallow	+	+		
Bank Swallow	+	x		
Cliff Swallow	+	+		
Barn Swallow	+	+		
Blue Jay	x	x	x	x
American Crow		x		x
Fish Crow	x	x	x	x
Common Raven	+			x
Black-capped Chickadee	x	x	x	x
Boreal Chickadee	x	x	x	x
Tufted Titmouse	+	+	+	+
Red-breasted Nuthatch	x	x	x	x
White-breasted Nuthatch	x	x	x	x
Brown Creeper	x	x	x	x
Carolina Wren	x	x		
House Wren	+	x		
Winter Wren		x	x	x
Sedge Wren	+	+		
Marsh Wren	x	x		
Blue-gray Gnatcatcher	x	x		
Eastern Bluebird		x		x
Veery	+	+		
Hermit Thrush	x	x	x	x
Wood Thrush	x	x		
American Robin	x	x	x	x
Gray Catbird	+	+		
Brown Thrasher	x	x		
Bohemian Waxwing			x	x
Cedar Waxwing	x	x	x	x
Northern Shrike				+
Loggerhead Shrike				x
European Starling	+	x	+	x
White-eyed Vireo	+	+		
Warbling Vireo	x	x		
Red-eyed Vireo	x	x		
Blue-winged Warbler	x	x		
Tennessee Warbler	x	x		
Nashville Warbler	x	x		
Northern Parula	x	x		
Yellow Warbler	+	+		
Chestnut-sided Warbler	x	x		

	B	BF	N	NF
Yellow-rumped Warbler			x	x
Palm Warbler	+	+		
Bay-breasted Warbler	x	x		
Cerulean Warbler	+	+		
Black-and-white Warbler	x	x		
American Redstart	x	x		
Prothonotary Warbler	+	+		
Northern Waterthrush	+	+		
Louisiana Waterthrush	+	+		
Mourning Warbler	x	x		
Common Yellowthroat	+	+		
Hooded Warbler	+	+		
Wilson's Warbler	+	+		
Canada Warbler	x	x		
Yellow-breasted Chat	+	+		
Northern Cardinal	x	x	x	x
Rose-breasted Grosbeak	x	x		
Indigo Bunting	x	+		
American Tree Sparrow			x	x
Chipping Sparrow	x	x		
Field Sparrow	x	x	+	+
Vesper Sparrow	+	+		
Savannah Sparrow	+	+	+	+
Grasshopper Sparrow	+	+		
Henslow's Sparrow	+	+		
Song Sparrow	+	+	+	+
Lincoln's Sparrow	+	+		
Swamp Sparrow	+	+	x	x
White-throated Sparrow			x	x
Dark-eyed Junco				x
Lapland Longspur		x	x	x
Snow Bunting			x	x
Bobolink	+	+		
Red-winged Blackbird	+	+	x	x
Eastern Meadowlark	+	+	+	+
Rusty Blackbird	+	+	x	x
Common Grackle	+	+	x	x
Brown-headed Cowbird	x	x	x	x
Orchard Oriole	x	x		
Northern Oriole	x	x		
Common Redpoll			+	+
Hoary Redpoll			+	+
Pine Siskin	x	x	x	+

	B	BF	N	NF
American Goldfinch	+	+	+	+
House Sparrow	+	x	+	x
Virginia Opossum	+	+	x	x
Masked Shrew	+	+	x	x
Water Shrew	+	+	+	+
Smoky Shrew	+	+	+	+
Long-tailed Shrew	x	x	x	x
Pygmy Shrew	x	x	x	x
Northern Short-tailed Shrew	+	+	+	+
Least Shrew	+	+	+	+
Hairy-tailed Mole	x	x	x	x
Eastern Mole	x	x	x	x
Star-nosed Mole	+	+	+	+
Little Brown Myotis	+	+		
Keen's Myotis	+	+	x	
Indiana Myotis		x		
Small-footed Myotis	+	x		
Silver-haired Bat	+	+		
Eastern Pipistrelle	+	+	x	
Big Brown Bat	+	+	x	
Red Bat		x		
Hoary Bat		x		
Eastern Cottontail	+	+	x	x
New England Cottontail	+	+	+	+
Snowshoe Hare	+	+	x	x
European Hare	x	x	x	x
Eastern Chipmunk	x	x	x	
Woodchuck	+	+	+	
Gray Squirrel	x	x	x	x
Beaver	+	+	+	+
Deer Mouse	+	+	+	+
White-footed Mouse	+	+	+	+
Southern Red-backed Vole	x	x	x	x
Meadow Vole	+	+	+	+
Rock Vole	x	x	x	x
Woodland Vole	+	+	+	+
Muskrat	+	+	+	+
Southern Bog Lemming	+	+	+	+
Northern Bog Lemming	+	+	+	+
Norway Rat	x	x	x	x
House Mouse	+	+	+	+
Meadow Jumping Mouse	+	+	+	
Woodland Jumping Mouse	x	x	x	

	B	BF	N	NF
Porcupine	+	x		x
Coyote	+	x	+	x
Red Fox	+	+	+	+
Gray Fox	+	x	+	x
Black Bear		x	x	
Raccoon	x	+	x	x
Fisher	x	x	x	x
Ermine		x		x
Long-tailed Weasel	+	+	+	+
Mink	+	+	+	+
Striped Skunk	x	x		
River Otter	+	+	+	+
Mountain Lion	x	x	x	x
Lynx	x	+	+	+
Bobcat	x	x	x	x
White-tailed Deer	x	x		x
Moose	x	+	x	x

New England Wildlife - search results

Search Summary

The search was done using 34 structural habitat features

Number of amphibians:	21
Number of reptiles:	25
Number of birds:	177
Number of mammals:	56
TOTAL:	279

Number of species included in search: 338
Total number of species in NEWILD: 338

All seasons selected

Seasonal use symbols:

B = Breeding season (amphibians and reptiles)
B = Breeding season/shelter (birds and mammals)
BF = Breeding season/feeding (birds and mammals only)
N = Nonbreeding season (amphibians and reptiles)
N = Nonbreeding season/shelter (birds and mammals)
NF = Nonbreeding season/feeding (birds and mammals only)
on species list, x = seasonal use

New England Wildlife - search results

A search was done using the following habitat components:

Structural features (all seasons selected):

- Exposed High Perches
- Exposed Low Perches
- Canopy < 15%
- Canopy 16 - 30%
- Canopy 31 - 70%
- Tree Bole Waterside Dead, at least 6" dbh
- Tree Bole Waterside Live, at least 12" dbh
- Tree Bole Non-Waterside Dead and soft, less then 6"
- Tree Bole Non-Waterside Dead and hard, 6-12"
- Tree Bole Non-Waterside Dead and hard, 12-18"
- Tree Bole Non-Waterside Live, columnar decay, 8-12"
- Tree Bole Non-Waterside Live, broken top, 12-18"
- Tree Bole Non-Waterside Live, broken top or large limb >18"
- Tree Bole Non-Waterside Live, hollow >24"
- Midstory, Deciduous
- Midstory, Coniferous
- Midstory, Mixed
- Shrub Layer - Deciduous seedlings, saplings, shrubs
- Shrub Layer - Coniferous seedlings, saplings, shrubs
- Shrub Layer - Mixed deciduous, coniferous vegetation
- Shrub Layer - Wetland shrubs
- Ground Vegetation - Upland Herbaceous <30% coverage
- Waterside decaying logs
- Rocky floor
- Dead and down material
- Duff/Ground - Forest litter and moss
- Subterranean
- Deciduous Overstory inclusions
- Coniferous Overstory inclusions
- Seeps
- Gravel and soil
- Woods road
- Slash piles
- Mast and fruit

The following wildlife species were found:

	B	BF	N	NF
Marbled Salamander	x		x	
Jefferson Salamander	x		x	
Silvery Salamander	x		x	
Blue-spotted Salamander	x		x	
Tremblay's Salamander	x		x	
Spotted Salamander	x		x	
Red-spotted Newt	x		x	
Northern Dusky Salamander	x		x	
Mountain Dusky Salamander	x		x	
Redback Salamander	x		x	
Slimy Salamander	x		x	
Four-toed Salamander	x		x	
Northern Spring Salamander	x		x	
Northern Two-lined Salamander	x		x	
Eastern Spadefoot	x		x	
Eastern American Toad			x	
Fowler's Toad			x	
Northern Spring Peeper			x	
Green Frog	x		x	
Wood Frog	x		x	
Northern Leopard Frog	x			
Stinkpot	x			
Spotted Turtle	x			
Bog Turtle			x	
Wood Turtle			x	
Eastern Box Turtle	x		x	
Map Turtle	x		x	
Red-eared Slider	x		x	
Plymouth Redbelly Turtle	x		x	
Eastern Painted Turtle	x		x	
Midland Painted Turtle	x		x	
Blanding's Turtle	x		x	
Eastern Spiny Softshell	x		x	
Five-lined Skink	x		x	
Northern Water Snake	x		x	
Northern Brown Snake	x		x	
Northern Redbelly Snake	x		x	
Eastern Ribbon Snake	x		x	
Eastern Hognose Snake			x	
Northern Ringneck Snake	x		x	
Eastern Worm Snake			x	
Northern Black Racer	x		x	

	B	BF	N	NF
Black Rat Snake	x		x	
Eastern Milk Snake	x		x	
Northern Copperhead	x		x	
Timber Rattlesnake			x	
Great Blue Heron	x	x	x	x
Green-backed Heron	x	x		
Black-crowned Night-Heron	x	x		
Yellow-crowned Night-Heron	x	x		
Glossy Ibis	x	x		
Wood Duck	x	x		
American Black Duck	x	x		x
Mallard		x		x
Blue-winged Teal	x			
Gadwall	x			
Ring-necked Duck	x			
Common Goldeneye	x			
Hooded Merganser	x			
Common Merganser	x			
Red-breasted Merganser	x	x	x	x
Turkey Vulture	x	x	x	x
Osprey	x	x	x	
Bald Eagle	x	x	x	x
Northern Harrier	x	x	x	x
Sharp-shinned Hawk	x		x	
Cooper's Hawk	x	x	x	x
Northern Goshawk	x	x	x	x
Red-shouldered Hawk	x	x	x	x
Broad-winged Hawk	x	x		
Red-tailed Hawk	x	x	x	x
Rough-legged Hawk			x	x
Golden Eagle	x	x	x	x
American Kestrel	x	x	x	x
Merlin	x	x	x	x
Ring-necked Pheasant	x	x	x	x
Ruffed Grouse	x	x	x	x
Wild Turkey	x	x	x	x
Northern Bobwhite	x	x	x	x
Killdeer	x	x	x	x
Common Snipe	x	x		
American Woodcock	x	x		
Mourning Dove	x	x	x	x
Black-billed Cuckoo	x	x		
Yellow-billed Cuckoo	x	x		

	B	BF	N	NF
Common Barn-Owl	x		x	
Eastern Screech-Owl	x	x	x	
Great Horned Owl	x	x	x	x
Snowy Owl			x	x
Northern Hawk-Owl			x	x
Barred Owl	x	x	x	x
Long-eared Owl	x	x	x	x
Boreal Owl			x	x
Northern Saw-whet Owl	x	x	x	x
Common Nighthawk	x	x	x	x
Whip-poor-will	x	x		
Ruby-throated Hummingbird	x	x		
Belted Kingfisher	x			
Red-headed Woodpecker	x	x	x	x
Red-bellied Woodpecker	x	x	x	x
Yellow-bellied Sapsucker	x	x	x	x
Downy Woodpecker	x	x	x	x
Hairy Woodpecker	x	x	x	x
Three-toed Woodpecker	x	x	x	x
Black-backed Woodpecker	x	x	x	x
Northern Flicker	x	x	x	x
Pileated Woodpecker	x	x	x	x
Olive-sided Flycatcher	x	x		
Eastern Wood-Pewee	x	x		
Yellow-bellied Flycatcher	x	x		
Acadian Flycatcher	x	x		
Alder Flycatcher	x	x		
Willow Flycatcher	x	x		
Least Flycatcher	x	x		
Eastern Phoebe	x	x	x	x
Great Crested Flycatcher	x	x		
Eastern Kingbird	x	x	x	x
Horned Lark	x	x	x	x
Purple Martin	x			
Tree Swallow	x			
Northern Rough-winged Swallow	x			
Bank Swallow	x			
Gray Jay	x	x		
Blue Jay	x	x	x	x
American Crow	x	x	x	x
Common Raven	x	x	x	x
Black-capped Chickadee	x	x		x
Boreal Chickadee	x			

	B	BF	N	NF
Tufted Titmouse	x	x	x	x
Red-breasted Nuthatch	x	x	x	x
White-breasted Nuthatch	x	x	x	x
Brown Creeper	x	x	x	x
Carolina Wren	x	x	x	x
House Wren	x	x		
Winter Wren	x	x	x	x
Golden-crowned Kinglet	x	x		
Ruby-crowned Kinglet	x	x		
Blue-gray Gnatcatcher	x	x		
Eastern Bluebird	x	x	x	x
Veery	x	x		
Gray-cheeked Thrush	x	x		
Swainson's Thrush	x	x		
Hermit Thrush	x	x	x	x
Wood Thrush	x	x		
American Robin	x	x	x	x
Gray Catbird	x	x		
Northern Mockingbird	x	x	x	x
Brown Thrasher	x	x	x	x
Bohemian Waxwing			x	x
Cedar Waxwing	x	x	x	x
Northern Shrike			x	x
Loggerhead Shrike	x	x	x	x
European Starling	x		x	
White-eyed Vireo	x	x		
Solitary Vireo	x	x		
Yellow-throated Vireo	x	x		
Warbling Vireo	x	x		
Philadelphia Vireo	x	x		
Red-eyed Vireo	x	x		
Golden-winged Warbler	x	x		
Tennessee Warbler	x	x		
Nashville Warbler	x	x		
Northern Parula	x	x		
Yellow Warbler	x	x		
Chestnut-sided Warbler	x	x		
Magnolia Warbler	x	x		
Black-throated Blue Warbler	x	x		
Yellow-rumped Warbler	x	x		
Black-throated Green Warbler	x	x		
Blackburnian Warbler	x	x		
Pine Warbler	x	x		

	B	BF	N	NF
Prairie Warbler	x	x		
Palm Warbler	x	x		
Blackpoll Warbler	x	x		
Black-and-white Warbler	x	x		
American Redstart	x	x		
Prothonotary Warbler	x			
Worm-eating Warbler	x	x		
Ovenbird	x	x	x	x
Northern Waterthrush	x	x		
Louisiana Waterthrush	x	x		
Mourning Warbler	x	x		
Common Yellowthroat	x	x		
Hooded Warbler	x	x		
Wilson's Warbler	x	x		
Canada Warbler	x	x		
Yellow-breasted Chat	x	x		
Scarlet Tanager	x	x		
Northern Cardinal	x	x	x	x
Rose-breasted Grosbeak	x	x		
Indigo Bunting	x	x	x	x
Rufous-sided Towhee	x	x		
American Tree Sparrow			x	x
Chipping Sparrow	x	x	x	x
Field Sparrow	x	x	x	x
Vesper Sparrow	x	x	x	x
Grasshopper Sparrow	x	x		
Henslow's Sparrow	x	x	x	x
Fox Sparrow			x	x
Song Sparrow	x	x	x	x
Lincoln's Sparrow	x	x		
Swamp Sparrow	x	x		
White-throated Sparrow	x	x		
Dark-eyed Junco	x	x	x	x
Lapland Longspur			x	x
Snow Bunting			x	x
Red-winged Blackbird	x	x	x	x
Eastern Meadowlark	x	x	x	x
Rusty Blackbird	x	x	x	x
Common Grackle	x	x	x	x
Brown-headed Cowbird	x	x	x	x
Orchard Oriole	x	x		
Northern Oriole	x	x		
Pine Grosbeak	x	x	x	x

	B	BF	N	NF
Purple Finch	x	x	x	x
House Finch	x	x	x	x
Red Crossbill	x	x		
White-winged Crossbill	x	x		
Common Redpoll			x	x
Hoary Redpoll			x	x
Pine Siskin	x	x	x	x
American Goldfinch	x	x		
Evening Grosbeak	x	x		
Virginia Opossum	x	x	x	x
Masked Shrew	x	x	x	x
Water Shrew	x	x	x	x
Smoky Shrew	x	x	x	x
Long-tailed Shrew	x	x	x	x
Pygmy Shrew	x	x	x	x
Northern Short-tailed Shrew	x	x	x	x
Least Shrew	x	x	x	x
Hairy-tailed Mole	x	x	x	x
Eastern Mole	x	x	x	x
Star-nosed Mole	x	x	x	x
Little Brown Myotis	x		x	
Keen's Myotis	x		x	
Indiana Myotis	x		x	
Silver-haired Bat	x		x	
Eastern Pipistrelle	x	x	x	
Big Brown Bat	x		x	
Eastern Cottontail	x	x	x	x
New England Cottontail	x	x	x	x
Snowshoe Hare	x	x	x	x
European Hare	x	x	x	x
Eastern Chipmunk	x	x	x	x
Woodchuck	x	x	x	
Gray Squirrel	x	x	x	x
Red Squirrel	x	x	x	x
Southern Flying Squirrel	x	x	x	x
Northern Flying Squirrel	x	x	x	x
Beaver	x		x	
Deer Mouse	x	x	x	x
White-footed Mouse	x	x	x	x
Southern Red-backed Vole	x	x	x	x
Rock Vole	x	x	x	x
Woodland Vole	x	x	x	x
Muskrat	x		x	

	B	BF	N	NF
Southern Bog Lemming	x	x	x	x
Northern Bog Lemming	x	x	x	x
Norway Rat	x		x	
House Mouse	x		x	
Meadow Jumping Mouse	x	x	x	x
Woodland Jumping Mouse	x		x	
Porcupine	x	x	x	x
Coyote	x	x	x	x
Red Fox	x	x	x	x
Gray Fox	x	x	x	x
Black Bear	x	x	x	x
Raccoon	x	x	x	x
Marten	x	x	x	x
Fisher	x	x	x	x
Ermine	x	x	x	x
Long-tailed Weasel	x	x	x	x
Mink	x	x	x	x
Striped Skunk	x	x	x	x
River Otter	x	x	x	x
Lynx	x	x	x	x
Bobcat	x	x	x	x
White-tailed Deer	x	x	x	x

New England Wildlife - search results

Search Summary

The search was done using 9 habitat breadth and size class combinations

Number of amphibians:	17
Number of reptiles:	10
Number of birds:	44
Number of mammals:	20
TOTAL:	91

Number of species included in search: 338
Total number of species in NEWILD: 338

Habitat breadth symbols:

Dec = Deciduous forest
Con = Coniferous forest
Up = Upland nonforest
Wet = Wetland nonforest
on Habitat breadth list, x = habitat selections

Size class symbols:

S = Regeneration through Seedlings
Sp = Saplings through Poletimber
St = Small Sawtimber
L = Large Sawtimber

New England Wildlife - search results

A search was done using the following habitat components:

Habitat breadth combinations:	Dec	Con	Up	Wet
Forest only	x	x		
Forest-Krummholz	x	x		
Forest-Nonforest-Water	x	x		
Forest-Water	x	x		

Size class combinations:

S-Sp-St

The following wildlife species were found:

Marbled Salamander
Spotted Salamander
Red-spotted Newt
Northern Dusky Salamander
Mountain Dusky Salamander
Four-toed Salamander
Northern Spring Salamander
Northern Two-lined Salamander
Eastern American Toad
Fowler's Toad
Northern Spring Peeper
Gray Treefrog
Bullfrog
Green Frog
Mink Frog
Northern Leopard Frog
Pickerel Frog
Common Snapping Turtle
Bog Turtle
Wood Turtle
Eastern Box Turtle
Eastern Painted Turtle
Five-lined Skink
Northern Water Snake
Eastern Ribbon Snake
Eastern Milk Snake
Timber Rattlesnake
Great Blue Heron
Green-backed Heron
Wood Duck
American Black Duck

Common Goldeneye
Hooded Merganser
Common Merganser
Bald Eagle
American Woodcock
Barred Owl
Great Gray Owl
Pileated Woodpecker
Acadian Flycatcher
Purple Martin
Tree Swallow
Northern Rough-winged Swallow
Bank Swallow
Barn Swallow
Gray Jay
Golden-crowned Kinglet
Ruby-crowned Kinglet
Gray-cheeked Thrush
Swainson's Thrush
Wood Thrush
Northern Shrike
Solitary Vireo
Philadelphia Vireo
Magnolia Warbler
Cape May Warbler
Black-throated Blue Warbler
Black-throated Green Warbler
Blackburnian Warbler
Pine Warbler
Blackpoll Warbler
Cerulean Warbler
Worm-eating Warbler
Ovenbird
Northern Waterthrush
Scarlet Tanager
Northern Cardinal
Rusty Blackbird
Common Grackle
Red Crossbill
White-winged Crossbill
Water Shrew
Long-tailed Shrew
Star-nosed Mole
Little Brown Myotis

Keen's Myotis
Indiana Myotis
Small-footed Myotis
Silver-haired Bat
Eastern Pipistrelle
Big Brown Bat
Red Bat
Hoary Bat
Gray Squirrel
Red Squirrel
Northern Flying Squirrel
Beaver
Black Bear
Marten
Mink
River Otter

Appendix E

Photolog of Wildlife (Signs, Structural Components, Corridors)

WILDLIFE SIGN PHOTOLOG

Photo 1: Deer scat.

Photo 2: This photo shows a buck rub. Male deer utilize these small sapling stems for sparring in preparation for rutting season - documented during field surveys in the spring of 2009.

Photo 3: This photo shows another buck rub. This was observed within the lowland-spruce fir forest.

Photo 4: Feeding activity by white-tailed deer was noted in several locations. Here is a sign of deer browse in a northern hardwood stand.

Photos 5: Balsam fir browse located within a conifer stand area showing past usage/ winter browse by white tail deer or moose.

Photo 6: Signs of moose browse on stripped maple seedlings.

Photo 7: Deer antler.

Photo 8: Hip bone of a member of *Cervidae* family was found within the project site (potentially of a young moose or adult white tail deer).

Photos 9 and 10: Fresh and older moose scats was observed in many locations showing consistent usage of the site.

Photo 10: Moose scat (old).

Photo 11: These black bear tracks were noted in one of the skidder roads. Kidder roads are often utilized by this species as travel paths; while cut over areas are utilized by these species as feeding areas.

Photo 12: Signs of old claw marks of black bear on a beech trees. Black bears climb beech trees to access the nuts - one of their preferred feed sources during the fall moths of the year.

Photo 13: Eastern coyote scat demonstrates how the property also supports large predators.

Photo 14: Short-tail shrew (found dead) shows evidence of small mammal usage within the property.

Photo 15: Ruffed grouse kill - likely caused by a bird a prey based on the fact that it is on top a stone/lookout position.

Photo 16: bird chicks of a song bird species.

Photo 17: Beaver flowage area showing the lodge. These systems attract several species of wildlife due to their high valued habitat. Several snags are interspersed within the wetland providing critical nesting habitat to several species of song birds.

Photo 18: Blue spotted salamander and spotted salamander egg masses observed within vernal pool VP-2A (photo taken during Vernal Pool Survey conducted in the spring of 2009). Several species of amphibian or reptile were observed during the spring 2009 surveys.

Photo 19: Pickerel frog (photo documented during the spring 2009 surveys).

Photo 20: Wood frog (photo documented during the spring 2009 surveys).

Photo 21: Green frog (photo documented during the spring 2009 surveys).

Photo 22: A red eft on top of unidentified scat. This is the terrestrial stage of the Eastern newt.

Photo 23: Garter snake.

STRUCTURAL COMPONENTS PHOTOLOG

Photo 24: Clark Brook showing stony substrate with riffles. These are some of the important criteria for a preferred brook trout habitat.

Photo 25: Clark Brook showing pools. This also an important criteria for a preferred brook trout habitat.

Photo 26: Clark Brook showing clarity of water – another important criteria for brook trout habitat.

Photo 27: Clark Brook – as the brook ascends the width of the brook narrows.

Photos 28 and29: Presence of several interior stone walls and historical "throw piles" provide important structure to many species of wildlife. Piles of stones discarded during New Hampshire's agricultural era now provide potential homes, caches, or escape routes for small mammals.

Photo 30: Scattered stones supply additional structure. These stones may provide "look out" stations for feeding chipmunks and squirrels.

Photo 31: Potential den site.

Photo 32: Potential tree den.

Photos 33 and 34: Presence of mature large diameter trees provides increased horizontal diversity.

Photo 35: Evidence of pileated wood pecker feeding. Cavity holes also provide opportunities or winter refuge to several species of songbirds.

Photo 36: Ground water discharge is occurring in several of the forested wetland drainages at the property. During the winter months when streams and open water components freeze, these seepages provide a critical source of water to many species of wildlife. Although structure related, seepages offer an important habitat feature.

Photo 37: Southern ledge face in northern hardwoods provides potential habitat for bobcat and porcupine. South and southwestern face of mountains are important habitat for wildlife because they provide sun and warmer temperatures during the winter months compared to northern face mountains.

Photo 38: Logs and ground debris also offer important structure to several small species of mammal. Insects are preyed upon and consumed in great quantities. For example, insects comprise a large percentage of a striped skunk's annual diet.

Photo 39: Several species of mushroom are often times consumed by squirrels and chipmunks.

Photo 40: Potential deer wintering yard located near the Groton Hollow Road (stands of hemlock and red spruce). There were signs of browsing on eastern hemlock and balsam fir seedlings.

Photo 41: Coniferous stand (mixture of white pine and spruce) located adjacent to Groton Hollow Road. Both photos show how the area was heavily cut. Essential deer cover is lost when the conifer stocking is low.

Photo 42: A moderate density understory has been produced by repeated timber cuttings.

Photo 43: A moderate density understory provides essential cover and accommodates wildlife movement.

GAME CORRIDOR PHOTOLOG


Photos 44 and 45: Dirt roads and skidder roads within the site are likely used by many wildlife species (moose, deer, coyote) as a travel corridor. Several different scats and tracks were found within skidder roads.

Photo 46: Moose tracks. Several corridors (ephemeral stream beds, along stream banks, skidder roads and dirt roads) were noted while traversing the property. These trails provide "connectivity" to and from other adjacent habitats or feeding territories.

Photo 47: This photo shows a well-traveled corridor. This trail is situated in the uplands at the perimeter of a scrub-shrub wetland. These trails are often utilized by several species of mammal, large and small.

Photo 48: Unobstructed large culverts provide good passages/ corridors for a diverse species of wildlife.