

Natural Heritage Element Inventory and Assessment for Mount Holly, Vermont

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1.0 Introduction

Arrowwood Environmental completed a remote inventory of the natural features of Mount Holly, Vermont in May of 2007 (Arrowwood Environmental, 2007). The purpose of this current inventory was to conduct field assessments to further refine the remote inventory. The field inventory is necessary to verify and more fully assess many of the resources identified during the remote process.

The scope of the project included the assessment and ranking of five resource elements: wetlands, vernal pools, significant natural communities, wildlife habitat and connecting lands and rare elements.

The methodology used in mapping and assessing these resources is presented in Appendix 1. The results of the inventory are divided into the five resource areas and presented below.

2.0 Wetlands

As is typical of Vermont's Southern Green Mountains, the landscape of Mount Holly is characterized by a high plateau intersected by river and stream valleys with numerous wetlands, scattered hills and higher mountains. In Mount Holly the higher peaks ring the southwestern and eastern boundary of the town. Wetlands are most abundant along stream and river drainages, adjacent to the larger ponds and lakes and in the flatter and lower elevation areas in the northern section of town. Rivers flowing

through town drain into three major watersheds. Mill River and its tributaries flow to the northwest into Otter Creek and on to Lake Champlain. Branch Brook and its tributaries drain to the east into the Black River in the Connecticut River Watershed. And a small portion of the southeastern part of town drains to the south into the West River and Connecticut River watershed.

A total of 576 confirmed and potential wetlands were mapped and classified during the wetland inventory (See Table A), covering 1795 acres in town. The Vermont Significant Wetland Inventory Map only shows 235 wetlands. As discussed in the methodology (Appendix 1) some of the wetlands in the present inventory are considered "potential" wetlands. These are sites that need to be field verified to determine if a wetland actually exists on the site, as lack of landowner permission and time did not allow for field investigation.

Table (A) lists the eighteen different types of wetland natural communities/ wetland complexes that were mapped in Mount Holly with information on acreage. Mapped wetlands range in size from ~750 sq.ft to approximately 39 acres. The agricultural fields, old fields and ponds are not considered natural communities, but were included because of their wetland regulatory status and their ability to perform wetland functions. The Beaver Wetland and Floodplain Forest types are mapping units which likely contain a combination of natural

Table A. Summary of Wetland Natural Communities in Mount Holly

Natural Community	Number of Occurrences	Average Acres	Total Acres
Agricultural Field	22	3.09	68
Alder Swamp	87	3.41	296.82
Beaver Wetland	20	3.25	64.92
Cattail Marsh	1	1.01	1.01
Conifer-Hardwood Swamp	15	4.91	73.71
Erosional River Bank	1	.24	0.24
Floodplain Forest	3	17.88	53.63
Intermediate Fen	2	11.86	23.73
Old Field	70	4.72	330.19
Pond	156	.35	55.16
Poor fen	5	2.36	11.78
Red Maple-Black Ash Swamp	11	2.85	31.34
Rich Fen	1	.22	0.22
Seep	12	.61	7.31
Seepage Forest	32	3.00	96.12
Shallow Emergent Marsh	78	4.01	312.42
Spruce-Fir-Tamarack Swamp	57	6.31	359.79
Sweet Gale Shoreline Swamp	3	3.22	9.66
Total	576	--	1795.04

communities which are difficult to map on the landscape at this scale. For more information on the natural community designations used in the inventory see Thompson and Sorenson (2000).

While many wetlands and potential wetlands were mapped during this inventory process, it is likely that more wetlands remain to be mapped. This is especially true of types such as seeps, seepage forest and vernal pools. These sites are usually small and surrounded by a forested matrix, making them difficult to identify and map remotely. Further field work by ecologists or townspeople would likely result in the identification of more of these wetland types in town and would provide a more accurate verification of mapped wetlands as well.

In order to help prioritize the importance of the many wetlands in the town, an assessment of the significance of the wetlands was performed. When determining the “significance” of a wetland, two different sets of criteria were used. A wetland was considered significant because of 1) the functions and values that it performs on the landscape, or 2) the natural community ranking of the wetland. Please refer to section C of Appendix 1 for a full explanation of the natural community ranking procedure. There is currently no state protocol for designating a wetland state significant based on functions and values alone, so wetlands were only designated state significant because of the high rank of the natural community at the site.

Table (B) lists 8 wetland complexes in town that have been assessed and deemed significant for either (or both) functions and values and natural communities. Table (C) lists four additional wetland complexes that are potentially significant. The potentially significant wetlands are sites that from remote sources appear to be highly functioning wetlands. In most cases, lack of landowner permission precluded a field visit to all of these sites. These sites should be visited by an ecologist to

confirm these preliminary findings and more fully assess the wetlands.

Except for the Mount Holly Fen, all of the sites listed as significant or potentially significant are an assemblage of different wetland natural communities. Because adjacent wetland natural communities are interconnected it is useful to think of them and name them as a single unit or “wetland complex”. Eight significant wetland complexes have been named which encompass 33 different mapped wetland communities. Each mapped wetland visited has been individually assessed for its features and its significance.

An important wetland natural community type that merits further attention is Spruce-Fir Tamarack Swamp. With 360 acres of this type mapped in the town, this natural community type is an ecologically important natural feature of Mount Holly, but relatively few sites have been visited due to lack of landowner permission. While not uncommon in Vermont, Spruce-Fir Tamarack Swamps are restricted in distribution by climate, geology, soils and other physical factors. Many of the state’s Spruce-Fir Tamarack Swamps have been severely altered, thus high quality examples are uncommon. Two high quality examples of this natural community have been designated state and locally significant (Table B). Preliminary observations suggest other high quality examples of this natural community type may be identified in town, including two that are listed as potentially significant (See Table C). This type is difficult to positively identify remotely; some areas previously mapped as Spruce-Fir Tamarack Swamp in Mount Holly were determined during field assessments to be Lowland Spruce-Fir, an upland

forest type. Because Spruce-Fir Tamarack Swamps can be difficult to distinguish from other community types without visiting the site, the actual acreage of this type may be considerably different than is shown on the map and table.

Table B. Summary of Locally and State Significant Wetlands in Mount Holly

Site Name	Total Acres	Natural Communities	Locally Significant	State Significant
Lake Ninevah Fen	45.17	Intermediate Fen Poor Fen Sweet Gale Shoreline Swamp	Y	Y
Winslow Flats Wetlands	84.10	Shallow Emergent Marsh	Y	Y
		Alder Swamp	Y	N
Hammond Hill Wetlands	65.05	Spruce-Fir-Tamarack Swamp	Y	Y
		Alder Swamp	Y	N
		Shallow Emergent Marsh	Potential	N
Mount Holly Fen	.22	Rich Fen	Y	Potential
Star Lake Shoreline Wetlands	11.27	Cattail Marsh Shallow Emergent Marsh Alder Swamp Conifer- Hardwood Swamp	Y	N
Star Lake WMA Beaver Wetlands	6.31	Shallow Emergent Marsh Alder Swamp Beaver Wetland	Y	N

Tinney Road Wetlands	17.24	Spruce-Fir Tamarack Swamp	Y	Y
		Shallow Emergent Marsh	Y	N
		Beaver Wetland Alder Swamp		
Tiny Pond Wetlands	15.54	Shallow Emergent Marsh Beaver Wetland	Y	N

Table C. Table of Potentially Significant Wetlands

Site Name	Acres	Natural Communities	Locally Significant	State Significant
Hortonville Conifer Swamp	39.5	Spruce-Fir Tamarack Swamp Conifer- Hardwood Swamp	Potential	Potential
Lake Ninevah Hardwood Swamp	10.4	Red Maple- Black Ash Swamp	Potential	Potential
Packer Road Junction Wetlands	48.7	Spruce-Fir Tamarack Swamp Shallow Emergent Marsh Alder Swamp	Potential	Potential
South Mountain Beaver Meadows	38.5	Shallow Emergent Marsh Beaver Wetland Spruce-Fir Tamarack Swamp Conifer-Hardwood Swamp Alder Swamp	Potential	Potential

Not shown in Tables (B) and (C) are the numerous small wetlands that occur throughout the town. These small beaver wetlands, seeps, shallow emergent marshes and alder swamps may not be deemed significant individually, but taken all together, they offer extremely important wildlife habitat, water storage capacity, erosion control, water quality protection and perform many other functions. The lack of a “significance” ranking for a particular wetland in town does not imply that the site is not important on the landscape. Rather the significance ranking presented here is the first step toward recognizing those wetlands that stand out from an ecological perspective. The wetland map provides important information that can be continually updated in order for the town to carry out the policy explicitly stated in the Mount Holly Town Plan (2008), to protect wetlands and floodplains and other important natural features in town.

Described below are the twelve wetland sites where significant or potentially significant wetlands have been identified. For each site, management recommendations are provided.

Local and State Significant Wetlands

Lake Ninevah Fen

The large peatland at the southern end of Lake Ninevah is a mosaic of three different natural communities: Poor Fen, Intermediate Fen and Sweet Gale Shoreline Swamp. At nearly 43 total acres this peatland is impressive not only in its size but also for the wide variety of habitats and plant species that is

supports. The Intermediate Fen makes up the majority of the open peatland and is home to a large diversity of plant species. The short shrub strata consists of a dwarfed (0.5m tall) layer of sweet gale (*Myrica gale*) and leatherleaf (*Chamaedaphne calyculata*) which share dominance. Large cranberry (*Vaccinium macrocarpon*) is also found throughout this fen and is, in some places, surprisingly abundant. The herbaceous layer ranges from 40-60% cover and is dominated by a mixture of wire sedge (*Carex lasiocarpa*) and bog-bean (*Menyanthes trifoliata*). The non-vascular strata comprises about 50% cover and is dominated by Sphagnum (peat moss) and various liverwort species.



Figure A. The yellow flowers of bladderwort and red flowers of pitcher plants are found scattered throughout the Lake Ninevah Intermediate Fen.

The Poor Fen areas are characterized by dense, tall leatherleaf and sweet gale shrubs and strikingly low plant diversity.

The Sweet Gale Shoreline Swamp areas occupy both the lake-side and upland lag areas and are characterized by dense sweet gale shrubs as well as other minerotrophic indicators. Shrub cover is nearly complete and almost entirely composed of tall (up to 2m) sweet gale shrubs. Other shrubs such as winterberry holly (*Ilex verticillata*), leatherleaf, and meadow-sweet (*Spiraea alba*) are also present at low cover. Above the shrub strata is a scattered layer of red maple (*Acer rubrum*) and, to a lesser extent, black spruce (*Picea mariana*) trees. Herbaceous cover is around 15% and dominance is shared among a wide variety of species including marsh marigold (*Caltha palustris*), hoary sedge (*Carex canescens*), lakeshore sedge (*Carex lacustris*), swamp candles (*Lysimachia terrestris*), and Marsh St. John's-wort (*Triadenum fraseri*). Like the Intermediate Fen, these sites are very wet; standing water is common and the trees typically are confined to the drier hummocks.

There is a small dam on the north end of the lake which was installed in the 1930s for hydropower storage. The impacts that this dam have had on the hydrology of this peatland are unknown. At this point, the peatland appears to be a stable system and shows no signs of human disturbance. No invasive species were discovered during the inventory. Overall the peatlands that make up this impressive wetland complex are in very good condition. All of the wetlands at this site have been deemed state significant natural communities.

Management Recommendations:

This site appears to be well buffered from any development. There was some limited selective logging noted in the upland forest south of the peatland. This logging, however, did not appear to have any impact on the wetland. As long as the hydrology of the Lake does not dramatically change, this site should persist. Any change in the functioning or status of the Lake Ninevah dam, however, may affect this peatland and should be avoided.

Winslow Flats Wetlands

Winslow Flats is a large diverse, locally and state significant wetland complex prominently located south of Route 103 and the Rutland-Burlington railroad corridor. State significant Shallow Emergent Marsh and Sedge Meadow are interspersed with Alder Swamp, Alluvial Shrub Swamp and beaver-flooded areas. The Winslow Flat Wetlands encompass six different mapped wetlands comprising 84 acres. Lowland spruce-fir, spruce-northern hardwoods and northern hardwood forest buffer the wetland to the south. Running through the wetland complex are un-named tributaries of Mill River. Bluejoint grass (*Calamagrostis canadensis*) and tussock sedge (*Carex stricta*) are dominant species in the marsh with scattered shrubs especially near creek channels. Speckled alder (*Alnus incana*) is the dominant species in the Alder Swamps with a variety of shrubs including arrowwood (*Viburnum dentatum*), meadow-sweet (*Spiraea alba*) and steple bush (*Spiraea tomentosa*) increasing in some areas.



Figure B. Winslow Flats Shallow Emergent Marsh and Sedge Meadow (map unit #439) in the foreground with Alder Swamp and conifer forests in the background.

The entire wetland complex has been designated locally significant due to the important ecological functions that the wetland provides including erosion control, water quality protection, flood control and habitat for wildlife. Ideal habitat is provided for a variety of amphibians, reptiles, song birds, raptors, waterfowl and moose, beaver, muskrat and mink. Signs of beaver include dams along the creek, dead trees in beaver flooded areas and open water pools. Notably, the wetland complex was included in a 1972-1973 inventory of significant natural areas in Vermont (conducted by VT Department of Fish

and Wildlife) and mention was made of its excellent food and cover for migrating and breeding waterfowl. Because the large wetland is visible for a large section of Route 103, it is also important aesthetically and may provide recreational opportunities such as bird watching. While the close proximity to roads, railway and a power line compromise the integrity and condition of the wetlands, the high quality marsh is deemed state significant for the extent and high quality condition of the natural community as indicated by the lack of invasive exotic species and human disturbance within the marsh and the presence of forests which buffer the wetlands to the south.



Figure C. Open water in beaver flooded Shallow Emergent Marsh and Alder Swamp of Winslow Flats Wetland Complex (map unit 300).

Management Recommendations:

A relatively small patch (20m²) of Common Reed (*Phragmites australis*) was noted adjacent to Route 103 near the wetland (see map of invasive plants in Section 6 of this report) and should be removed before it has the opportunity to spread into the marsh. Since road corridors are a major means for invasive species to spread, the road side should be evaluated periodically to ensure that species such as Common Reed or Japanese Knotweed (*Polygonum cuspidatum*) or other invasive species regulated by the state or on the Vermont invasive species watch list (www.vtinvasiveplants.org) are removed if they are detected. Further development that impacts the hydrology of the site or impacts the natural community should be prohibited within a minimum buffer zone of 100'.

Hammond Hill Wetlands

The Hammond Hill Wetlands are an extensive 65 acre- wetland complex of Shallow Emergent Marsh, Alder Swamp and Spruce-Fir Tamarack Swamp located along the unnamed creek between Hortonville Road and Old Turnpike Road. A field visit to the Spruce-Fir Tamarack Swamp and Alder Swamp/Shallow Emergent Marsh in the eastern portion of the wetland complex was made. The western portion of the marsh was not visited due to lack of landowner permission, but from aerial photographs it appears to be a nice mix of herbaceous and shrub swamp and open water.

Speckled alder dominates the shrub swamp with lesser amounts of northern arrowwood and meadow-sweet and occasional

balsam fir (*Abies balsamea*). The herbaceous understory is dominated by tussock sedge and bluejoint grass; the vine Virgin's bower (*Clematis virginiana*) is also common. In areas where Shallow Emergent Marsh intermixes with Alder Swamp, the shrubs become less abundant and flat-topped aster (*Aster umbellatus*) and goldenrod (*Solidago spp.*) are common along with the tussock sedge and blue-joint grass.

The canopy of the Spruce-Fir Tamarack Swamp is dominated by red spruce (*Picea rubens*) and balsam fir with a small amount of black ash (*Fraxinus nigra*). The shrub layer is comprised of speckled alder, meadow-sweet and shrubby cinquefoil (*Potentilla fruticosa*). Moss-covered hummocks and hollows characterize the ground surface with standing water in the hollows. Bluejoint grass, sedges (e.g., *Carex cf. scabrata*), cinnamon fern (*Osmunda cinnamomea*), crested wood fern (*Dryopteris cristata*) and dewberry (*Rubus pubescens*) are dominant ground layer species with bunchberry (*Cornus canadensis*) and goldthread (*Coptis groenlandica*) restricted to the drier hummocks.

The entire complex is considered locally significant for its wetland values and functions including extensive habitat for a variety of fish and wildlife species, floodwater retention, erosion control and water quality protection. Recent signs of moose were observed in both the Alder Swamp and the Spruce-Fir Tamarack Swamp. The Hammond Hill Wetland Spruce-Fir Tamarack Swamp is considered state significant for its high quality natural community. Although the occurrence is relatively small, the condition of the swamp, lack of human disturbance in the swamp and its position as part of a larger wetland complex warrants the distinction.



Figure D. The high quality Spruce-Fir Tamarack Swamp natural community, in the Hammond Hill Wetland complex is considered state significant.

Management Recommendations:

If landowner permission can be obtained it is recommended that the Shallow Emergent Marsh in the western portion of the wetland complex be visited by an ecologist to assess the significance of this wetland. It is recommended that a minimum buffer zone of 100' around the wetland be maintained to ensure the wetland is maintained in a natural condition. To protect the fragile soils and not disrupt the hydrology, logging should not

occur within the swamp or within a 50' buffer of the swamp edge.



Figure E. Alder Swamp and Shallow Emergent Marsh in the Hammond Hill Wetland Complex provide important wetland functions and values.

Mount Holly Fen

The Mount Holly fen is a small wetland, 0.22 acres in size, surrounded by Lowland Spruce- Fir Forest and Spruce-Fir Northern Hardwoods, located north of Route 103. The wetland appears to be an example of the Rich Fen natural community type. The area warrants further ecological investigation to determine if the wetland can be confirmed as a state significant rich fen natural community and to evaluate the condition of the natural community and its hydrologic regime. Rich fens are a

rare natural community type, both at the state and global level and never are large in size. They typically have a diverse assemblage of mosses and other plants and are fed by calcareous groundwater.



Figure F. The Mount Holly Rich Fen is a small but potentially state-significant wetland.

As is typical of many fens, this wetland occurs in isolation from other wetlands in a small topographic depression. Ground water seepage was observed near the east end of the fen. Because it is limited in size and not connected with other wetlands, its significance is related to the rarity of the rich fen natural community type. As is typical of Rich Fens, the ground layer was dominated by Sphagnum peat moss and brown (non Sphagnum) mosses. A layer of tall herbaceous vegetation including grasses, sedges, wetland asters and ferns are dominant, but scattered shrubs are also present including steplebush, meadowsweet and shrubby cinquefoil.

Management Recommendations:

Fens are fragile ecosystems that are susceptible to changes in the quantity and quality of groundwater input, thus it is imperative that the hydrology and the soils within and adjacent to the fen are not disturbed. Special consideration should be made not to alter the area of ground water recharge to the fen. A 100' buffer around the natural community would help to ensure that the quality of ground water input is maintained. The vegetation can be susceptible to trampling, so it is important that visits are kept to a minimum.



Figure G. Sphagnum and other mosses dominate the ground layer of the Rich Fen natural community.

Star Lake shoreline wetlands

Star Lake, located in the village of Belmont is the town's most highly visible lake. The lake, formerly a wetland, was dammed in the 1800s to provide power for local mills and factories and thus has undergone considerable ecological change over the years. While much of the lakeshore is developed, the eastern lakeshore supports a nice assemblage of Cattail Marsh, Shallow Emergent Marsh, Alder Swamp and Conifer-Hardwood Swamp occupying approximately 11 acres. Permission was not received to visit these wetlands, but they were examined from the water by canoe, allowing for a preliminary assessment of the lake shore wetland communities.



Figure H. Shallow Emergent Marsh and Cattail Marsh along the shores of Star Lake.

Cattail (*Typha latifolia*) is found in the deepest water near shore. The Cattail Marsh community transitions to Shallow Emergent Marsh and Alder Swamp which occupy shallower water or seasonally-flooded areas further away from the lake. Within a small area of Conifer-Hardwood Swamp observed near shore, red maple (*Acer rubrum*), red spruce and balsam fir are the dominant trees with winterberry holly (*Ilex verticillata*) and sensitive fern (*Onoclea sensibilis*) in the understory. If permission is granted, it is recommended that a field inventory of the Conifer-Hardwood Swamp be conducted to further assess these wetlands.



Figure I. Conifer- Hardwood Swamp adjacent to the shore of Star Lake.

Collectively these wetlands provide numerous functions and values including important food, shelter and breeding habitat for a diversity of resident and migratory species. They provide

important aesthetic attributes and are critical for helping to maintain water quality and retain flood waters.

Management Recommendations:



Figure J. View of eastern side of Star Lake with locally significant shoreline wetlands.

The Mount Holly Town Plan (2008) describes issues that compromise the ecological integrity of Star Lake including runoff of pesticides and fertilizers from agricultural fields (and lawns) leading to significant algal blooms in late summer, the spread of the aquatic invasive species Eurasian milfoil and subsequent treatment with the chemical Sonar. An effort to

restore native vegetation along the lake shore in developed areas would help to improve water quality, while providing aesthetically-pleasing, wildlife habitat and enhance recreational opportunities on the lake.

An effort should be undertaken to control and prevent the spread of invasive species Japanese knotweed which was observed growing within meters of the shore of the lake in several locations off Star Lake Drive and Belmont Road. This species is a highly invasive exotic plant that can readily expand into natural areas and degrade sensitive wetland natural communities significantly decreasing wildlife habitat and wetland functions. It is critical that Japanese knotweed be controlled while it is still fairly limited in extent.

A 100' buffer should be established around the wetland natural communities to retain their natural state and the functions and values they perform. Logging should not occur in the Conifer-Hardwood Swamp because disturbing the fragile soils can disrupt the local hydrology and open the area up to invasion by non-native invasive species.

Star Lake WMA Beaver Wetlands

The approximately 6-acre beaver wetland east of Star Lake provides locally significant wetland habitat upstream from Star Lake. The eastern end of the wetland complex and adjacent upland forests to the north are within the Star Lake Wildlife Management Area. The wetland complex is a diverse assemblage of Shallow Emergent Marsh, Alder Swamp, open

water pools and a narrow creek channel. Recent beaver activity, including a sizeable beaver dam, was observed.



Figure K. Shallow Emergent Marsh and dead trees at Star Lake WMA Beaver Wetlands

The relatively diverse Shallow Emergent Marsh is dominated by cattail, bluejoint grass, sedges (*Carex spp*), rushes (*Juncus spp*), bulrush, (*Scirpus sp*), and wetland herbaceous plants including flat-topped aster and goldenrod (*Solidago graminifolia*). In shrubbier areas, speckled alder is dominant with winterberry holly, and meadow-sweet. There are also a few scattered small red maple and balsam fir trees, as well as numerous older dead standing trees indicating the dynamic nature of this beaver

wetland. This wetland complex provides significant wildlife habitat for a variety of fish and wildlife. As a publicly-owned conservation area near the village of Belmont, it provides important recreational opportunities and open space. Because of its location upstream from Star Lake it is important in protecting water quality in the lake.

Management Recommendations:

Two patches of common reed, (*Phragmites australis*), an invasive wetland species were observed near the northwest and southwest edge of the marsh. Because this species can expand rapidly in wetland areas, thereby degrading wetland values and wildlife habitat, this species should be controlled before the species is allowed to spread further.



Figure L. The invasive plant common reed (*Phragmites australis*) encroaching upon the Star Lake Beaver WMA Beaver Wetlands at the northwestern end (unit 452)

Much of the eastern end of the wetland is owned by the state and it less susceptible to development. However, the western end of the beaver wetland and nearby shoreline wetlands of Star Lake are in private ownership. It is recommended landowners be made aware of the importance of these wetlands to encourage a minimum buffer zone of 100' around the wetland margin be maintained in a natural condition. This buffer can help ensure that the natural communities are not disturbed and the function and values that these wetlands perform are maintained.



Figure M. Open water habitat, a result of beaver flooding in Star Lake WMA Beaver Wetlands

Tinney Road Wetlands

At the base of Tiny Mountain, situated primarily north of Tinney Road is a diverse assemblage of locally significant headwater wetlands including Beaver Wetlands, Shallow Emergent Marsh, Alder Swamp and a state significant Spruce-Fir Tamarack Swamp. The creek flowing through the wetlands drains into Lake Ninevah. The wetland complex occupies approximately 17 acres and provides a variety of wetland functions and values. The entire complex provides abundant wildlife habitat and the Shallow Emergent Marsh is especially important for maintaining water quality and retaining flood waters.

The Spruce-Fir Tamarack Swamp is a small but high quality marsh only slightly impacted by the road that crosses at the south end of the wetland. Red spruce and balsam fir dominate the open canopy. The dense small tree and tall shrub layer is dominated by mountain holly (*Nemopanthus mucronata*), yellow birch (*Betula alleghaniensis*), red maple, speckled alder, and winterberry holly. Scattered low shrubs include blueberry (*Vaccinium myrtilloides*) and wild raisin (*Viburnum nudum* var. *cassinoides*). The herbaceous layer is dominated by cinnamon fern and royal fern (*Osmunda regalis*), and a variety of sedges (*Carex trisperma*, *C. intumescens*, and *C. crinita*). Hummock and hollows characterize the moss-covered ground surface. Peat mosses (*Sphagnum recurvum* and *S. centrale*) are dominant. The low herbs wintergreen (*Gaultheria procumbens*), creeping snowberry (*G. hispidula*) and bunchberry (*Cornus canadensis*) are common on the elevated hummocks.

In addition to speckled alder, yellow birch and red maple are found in the Alder Swamp suggesting the possible transition to forest over time. Manna grass (*Glyceria melicaria*), jewel-weed (*Impatiens capensis*) and arrow-leaved tear thumb (*Polygonum sagittatum*) are found in the herb layer of the shrub swamp.

The Tinney Road Beaver Wetland and Shallow Emergent Marsh is a fairly recently flooded swamp with standing dead conifers, extensive open water and adjacent wetland marsh. Scattered small trees and tall shrubs include red spruce, balsam fir and speckled alder. Herbaceous plants include bluejoint grass and bur-reed (*Sparganium* sp.).

Management Recommendations:

To protect the wetland natural communities and important wetland values and functions, it is recommended that a 100' buffer be established around the wetland complex. Because of the fragile soils in the Spruce-Fir Tamarack Swamp and the potential for disrupting the hydrology, timber harvest should not occur within the swamp forest or within at least 50' of the wetland boundaries. Recent clear cutting has occurred adjacent to the Alder Swamp. In the future, care should be taken to ensure that harvesting not occur closer than 50' from the edge of wetlands.

Tiny Pond wetlands

Along the western shore of Tiny Pond is a diverse mosaic of Shallow Emergent Marsh, Shrub Swamp, Sedge Meadow, Shore Fen and Beaver Wetland encompassing about 15.5 acres. Tiny Pond Wildlife Management Area abuts the eastern edge of the pond and occurs primarily in the town of Ludlow and Plymouth.

The Shallow Emergent Marsh and Sedge Meadow complex occurs near the shore of the pond and is dominated by a rich diversity of herbaceous species including bluejoint grass, cattail, wool-grass (*Scirpus cyperinus*), sedges (including *Carex lasiocarpa* and *C. lacustris*), marsh St. John's-wort, (*Triadenum fraseri*), swamp candles (*Lysimachia terrestris*) and bur-reed (*Sparganium sp.*). Near shore, shrubs are more abundant including sweetgale (*Myrica gale*), northern arrowwood and winterberry holly. Throughout the Beaver Wetland are a series of beaver dams and a mosaic of shrub swamp, open water and marsh. At the edge of the open water, spike-rush (*Eleocharis palustris*) and arrow-head (*Sagittaria sp.*) occur. In addition to cattail and bluejoint grass, a variety of other herbaceous plants are found in the marsh. The entire wetland complex contributes significantly to the fish and wildlife habitat, water quality and aesthetics of Tiny Pond.

Management recommendations:

A 100' buffer should be established around the wetland to retain the natural state of the wetland natural communities and the functions and values they perform. Care should be taken to

ensure that invasive plants such as Eurasian milfoil (*Myriophyllum spicatum*) are not introduced to the pond.



Figure N. Tiny Pond Beaver Wetland Complex showing a mixture of open water beaver flooding Shallow Emergent Marsh and Alder Swamp.

Potentially Significant Wetlands

Hortonville Conifer Swamp

Near the northern edge of Mount Holly bisected by Hortonville Road lies a sizeable Spruce-Fir Tamarack Swamp. From the remote inventory and roadside evaluation, the conifer swamp appears to be a high quality example of this natural community type. The condition of the entire wetland has not been assessed. If landowner permission can be obtained, it would be advisable

to have an ecologist visit the area to evaluate the ecological significance of the wetland.

If preliminary findings are accurate, it is recommended that logging not occur within the swamp or within a 50' buffer of the swamp edge. It is recommended that within a 100' buffer around the edge of the wetland, activities that might disrupt the local hydrology or degrade the natural community not be permitted.



Figure O. Potentially significant Spruce-Fir Tamarack Swamp Forests adjacent to the road (#s136 and 137).

South Mountain Beaver Wetlands

In a basin below South Mountain peak, along the headwaters of Branch Brook lie a series of beaver wetlands and associated wetland natural communities. This extensive wetland complex which occurs between approximately 2300 – 2400' elevation is located entirely in Okemo State Forest. Natural communities that may be found in this area include Shallow Emergent Marsh, Alder Swamp, Conifer-Hardwood Swamp and Spruce-Fir Tamarack Swamp. The South Mountain Beaver Wetlands were not visited during the project, so they are not evaluated here for their significance. In the Okemo State Forest Management Plan, these wetlands are described as “abandoned beaver flowages” and designated a “wildlife emphasis zone” providing “critical bear habitat”. Given its extensive size and remote situation, the beaver wetland complex most likely provides quality habitat for a range of fish and wildlife species. A field visit by an ecologist is recommended to identify and assess the natural communities found and ascertain their potential significance on a state and local level.

If the assessment of significance is confirmed, a minimum 100' buffer zone should be established such that within the buffer zone, activities that impact the hydrology or integrity of the natural communities are restricted. It is also recommended that timber harvest not occur within a minimum of 50' from the edge of the wetlands. Because the wetland complex is found within the state forest, there is little threat of development, however, it is recommended that any forest management and trail and road building occur outside the appropriate size buffer zone.

Packer Road Junction Wetlands

North of Old Turnpike Road, near the junction with Packer Road lies a sizeable Shallow Emergent Marsh with inclusions of Alder Swamp. To the north two sizable conifer forests are mapped as Spruce-Fir Tamarack Swamp. A windshield assessment of the Shallow Emergent Marsh suggests that the large marsh is in good condition and provides numerous functions and values including water quality protection, flood water retention, high quality wildlife habitat and is aesthetically-pleasing open space. While the remote assessment indicates their potential importance, no assessment of the conifer forests could be made from the road. If landowner permission can be obtained, it is recommended that the entire wetland complex be evaluated by an ecologist to assess its ecological significance.

If preliminary findings are confirmed, it is recommended that a minimum buffer zone of 100' should be maintained in a natural condition. The buffer zone would help to ensure that the fragile wetland soils are not disturbed, wetland function and values are preserved and the natural communities are maintained in a natural state. We advise that logging not occur in the forested swamps or within 50' of the swamp edge to protect the fragile wetland soils and not disrupt the hydrology of the site.



Figure P. Extensive shallow Emergent Marsh in the foreground and conifer forest in the background are part of the Packer Road Junction Wetlands as seen from Old Turnpike Road.

Lake Ninevah Hardwood Swamp

Situated along the western shore of Lake Ninevah in an area highly fragmented by lake shore cottages, roads and driveways, lies a roughly 10-acre forested swamp mapped preliminarily as a Red Maple- Black Ash Swamp. Hardwood swamps dominated by red maple are common in much of the lower elevations of Vermont, yet hardwood swamps are highly variable and some types are considered quite rare. In the Green Mountains, hardwood-dominated swamps occur infrequently, as forested wetlands in the higher elevations of Vermont are typically

dominated by coniferous trees. Thus this site is of interest and warrants further evaluation as a potentially uncommon natural community for Mount Holly.

As seen from the road, the forest appears to be dominated by red maple, aspen (*Populus tremuloides*), balsam fir and tamarack (*Larix laricina*) with a tall shrub layer comprised of winterberry holly, speckled alder and dogwood (*Cornus sp.*). The trees near the road appear to be fairly young. An ecological survey is recommended to better characterize the entire natural community, its important wetland functions and values, and ascertain the site's potential ecological significance. Based on its landscape position, adjacent to Lake Ninevah, the wetland likely provides important water quality protection, open space and aesthetic value as well as important wildlife habitat. If preliminary findings of the wetland's significance are confirmed, it is recommended that a 100' buffer be established around the swamp forest in order to maintain the wetland in its natural state and not disrupt the hydrology and fragile soils. It is further recommended that timber harvest not occur within 50' of the swamp.

3.0 Vernal Pools

Vernal pools are seasonal wetlands that typically contain water during the wet spring months but become dry as the summer progresses. These isolated wetlands usually occur under a forest canopy, lack fish, and provide habitat to a wide variety of wildlife.

A total of 28 potential vernal pool locations were identified during the remote inventory. Four more pools were discovered during the course of the field work. The final map (provided in the appendix) shows the presence of 32 vernal pools in the town. Overall, the field work confirmed the presence of 14 of these 32 sites. The remaining 18 sites are considered "potential" vernal pools because they have not been confirmed in the field.

Data on size, depth, and use by amphibians was taken at each pool visited and is included in the attached appendices and digital maps. This data was used to assess the condition of the pools and their quality as amphibian breeding habitat. This data was then used to determine which pools were considered state or locally significant. State significance was determined using the ranking guidelines for the Vernal Pool community established by the NonGame and Natural Heritage Program of the Vermont Fish and Wildlife Department.

Using these guidelines, nine of the 14 sites that were visited were determined to be state significant vernal pools. One other site fell short of the state significance criteria but was determined to be locally significant. The location and specific site information about these significant pools is included in the digital maps attached to this report.

Vernal Pool Management Recommendations

As can be seen on the attached Mount Holly Wildlife Habitat-species specific habitat Map and Figure (Q) below, there are two buffer areas around each vernal pool. These buffer distances are based on the work of Semlitsch (1998), Calhoun and Klemens

(2002), Calhoun and deMayandier (2004). The first buffer distance is 100' in diameter and is important because the density of amphibians within this area is very high both during the spring breeding period and the fall juvenile dispersal period. The nature of the forest immediately around the vernal pool has a tangible affect on the nature of the pool itself. Shading from surrounding trees can drastically prolong the hydroperiod of a pool. In addition, leaf litter that enters the pool from the surrounding trees forms the basis for the food chain in the vernal pool ecosystem.

The condition of the forest in this 100' buffer zone is therefore strongly linked to the condition of the vernal pool itself. For this reason, it is recommended that the vernal pool

envelope be managed in a way that will not interfere with the functioning of the vernal pool. This includes maintaining a complete forested cover within this envelope. Light thinning of forest trees is, in most cases, acceptable but should come no closer than 25' to the pool's edge. Since many amphibians

require a dense leaf litter on the forest floor with un-compacted soils, logging should occur when the soils are frozen and there is adequate snow cover. The creation of ruts in this area can often disrupt the hydrology of the nearby vernal pool. Development and other barriers to amphibian movement should be avoided within this buffer zone.

The next buffer shown in Figure (Q) is calculated at 750' from the vernal pool habitat. This is termed the "amphibian life zone" or the "critical terrestrial habitat". Amphibians that breed in

vernal pools spend most of their adult lives in the forests surrounding their natal pools. These amphibians require a forest with dense leaf litter, decomposing woody

debris, un-compacted soils, and adequate canopy cover. Calhoun and Klemens (2002) recommend maintaining 75% forested cover within this life zone to retain adequate habitat for forest dwelling amphibians. If logging is to occur in this area, it should occur in the winter when the ground is frozen and there is adequate snow

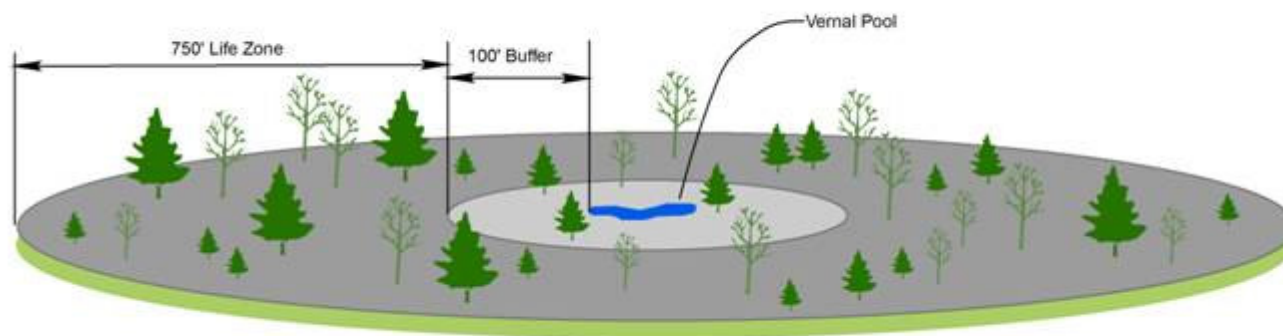


Figure Q. Vernal Pool Buffer Zones

cover. Ruts that occur in the life zone can fill with water and create population sinks as amphibians lay eggs in the ruts and never reach the more reliable vernal pool. Compaction of the soil can also result in direct loss of habitat for mole salamanders.

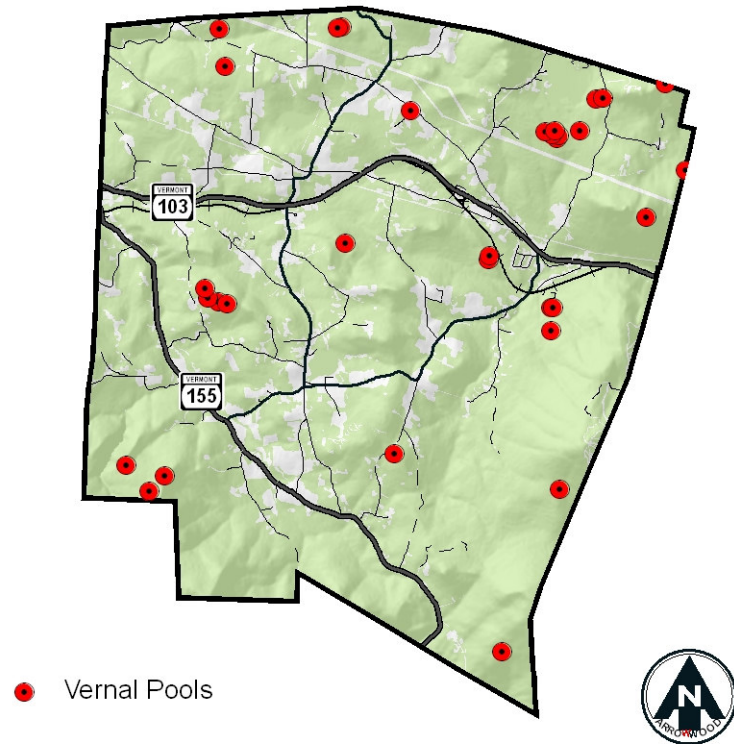


Figure R. Vernal Pool Map

Since many of the potential vernal pool sites on the map above have not been field confirmed, it is recommended that additional field work be conducted to confirm or deny the presence of pools

at these sites. In addition, field work is the best way to discover new pools that could not be detected during the remote inventory.

4.0 Significant Natural Communities

Natural communities encompass three components 1) the group of organisms that inhabit an area, 2) the physical environment, and 3) the processes at work which shape the environment and affect the organisms (Thompson and Sorenson 2000). The concept of natural communities is useful for helping to characterize natural patterns on the landscape and to identify areas that are important habitats for a variety of plants and animals. For this project, potentially significant natural communities were mapped primarily by the groups of plants which occur in conjunction with characteristic physical features (such as topographic position). To be mapped as potentially significant, the natural communities were either a rare type of natural community or a large, unfragmented example of a more common natural community. As described in the Remote Inventory of Natural Features of Mount Holly, Vermont report (Arrowwood Environmental, 2007), mapping natural communities remotely is difficult. Field verification is needed to fully assess an upland community. During the present inventory, there was not ample time and landowner permission to conduct a comprehensive field evaluation of natural communities in Mount Holly. However, the following describes what was accomplished and identifies areas that warrant more emphasis in the future.

Three different potentially significant upland natural community types were mapped during the remote inventory: Lowland Spruce-Fir Forest, Montane Spruce-Fir Forest and Red Spruce-Northern Hardwood Forest. None of these three natural community types are considered rare in Vermont, but high quality examples of each are uncommon.

All of the mapped occurrences of Lowland Spruce-Fir were found on private land in the northwestern part of Mount Holly. Because permission was not granted to visit the sites, the potential significance of mapped Lowland Spruce-Fir was not evaluated during the field inventory. The Lowland Spruce Fir Forest community is often interspersed with the wetland natural community Spruce-Fir Tamarack Swamp. Because these two natural community types appear to cover considerable acreage in town and appear to be an important component of the town's natural heritage and because high quality examples of both forest types are restricted in Vermont, it would be valuable for an ecologist to evaluate the mapped sites if permission can be obtained in the future.

Montane Spruce – Fir Forest and Red Spruce – Northern Hardwood Forest occur in higher elevation, often remote areas of town. Because so much of the field effort devoted to visiting natural communities focused on wetlands during this inventory, there was limited time to focus on these more remote and higher elevation areas. It would be especially valuable for an ecologist to visit the potentially significant Red Spruce Northern Hardwood sites if landowner permission is granted. It would also be beneficial to collect more ecological information on the Montane Spruce- Fir Forest sites in town to provide a more

comprehensive description of the Town's natural heritage. However because mapped examples have been identified as important by the Vermont Nongame and Natural Heritage Program and they occur on public land, their risk of being developed is undoubtedly lower than for other sites.

5.0 Rare, Threatened and Endangered Elements

Historic and current locations of rare plants and animals in the town of Mount Holly were obtained from the Vermont Non-Game and Natural Heritage Program (NNHP). As explained in Appendix 1, each plant and animal in the state is given a rarity rank, known as the S-rank. In addition to this S-rank, some species are listed as threatened or endangered by the Vermont Endangered Species Law (10 V.S.A Chap 123). Table (D) lists the historic and current records of uncommon, rare and threatened species known in the town (there are no records of endangered species in Mount Holly).

Table D. Historic and Current Records of Uncommon, Rare and Threatened Species in the Town of Mount Holly

Species	Status	Site	Comments
Cape May Warbler	Uncommon	Rte 103 Rest Area	One individual observed in 1987
Common Loon	Rare	Lake Ninevah	One nesting pair
White Adder's Mouth Orchid	Threatened	Summit Rd	Not re-located during inventory
Water Bur-reed	Rare	Star Lake	Last seen in 1985
Humped Bladderwort	Uncommon	Star Lake	Last seen in 1993
Farwell's Water-milfoil	Rare	Lake Ninevah	Last seen in 1999
Small water-milfoil	Rare	Lake Ninevah	Last seen in 2007
Nuttal's waterweed	Rare	Lake Ninevah	Last seen in 2007
Podgrass	Threatened	Lake Ninevah Fen	Discovered during inventory

As can be seen from Table (D), there are two known uncommon or rare animals in the town and five plants. Two of the plants, the White Adder's Mouth Orchid and the Podgrass are listed on the official threatened and endangered species list. Time constraints prevented a complete updating of all of these records. Many other government and private organizations have ecological data on species throughout the state and this information was used to provide the town with updated information and focus the field work.

The Lakes and Ponds section of Vermont DEC, for example, regularly conducts inventories of aquatic plants in the state. The information presented in Table (D) includes the most recent

inventory information from that program. In addition, the Vermont Loon Recovery Program collects data on loon populations throughout the state and keeps a database on the status of loons, including those in Lake Ninevah. Finally, the Vermont Center for Ecostudies (VCE) collects and manages data on breeding bird populations throughout the state.

Field work in the present inventory therefore was focused on the known terrestrial plant species. A search of the historic location of the White Adder's Mouth Orchid was undertaken during the present inventory. Even though there appears to be ample habitat present at the site, this species was not re-located. It may be that the species is no longer present at this location. Populations of orchids can fluctuate dramatically from year to year, however, so another search of the area is warranted before concluding this species is no longer present.

While conducting wetland field work, a new population of Podgrass was discovered in the Lake Ninevah Fen during the present inventory. This population of this threatened species is one of the largest currently known in the state, consisting of thousands of individuals. This site appears to be stable. No threats to the habitat or the individual plants were apparent. For a more detailed discussion of the site, see Section 2 of this report.

The common loon is a beautiful species which requires large bodies of water with little or no human disturbance. The Vermont Loon Recovery Program reports that Lake Ninevah provides this habitat. Ninevah has supported a breeding pair of loons (and many intruders) for many years.

The record of the Cape May Warbler in 1987 was a one-time siting of this species. This siting was likely a migrant individual passing through the town. This species was not recorded during the recent Breeding Bird Atlas conducted by Vermont Center for Ecostudies (VCE) and it is unlikely that this species breeds in the area (Rosalind Renfrew VCE, personal communication).

While available to town planners, the precise location of these populations is not public information and should not be distributed.

6.0 Wildlife Habitat

Much of Mount Holly is at a relatively high elevation, ranging from 1,000 to 3300'. Mount Holly summers tend to be cool, winters snowy, and the snow pack lasts long into spring. The town has a variety of wildlife habitat elements, including deep forest core habitat, early successional forest, riparian forest, wetlands, vernal pools, ledges, mast stands, and some deer wintering habitat, which together serve the seasonal needs of a wide range of mammals, amphibians and birds. Habitat areas within the town have varying degrees of connectivity depending on the level of development between them. Fragmentation of habitat has occurred in Mount Holly, but there still remain connections between intact and expansive areas.

Wildlife habitat in Mount Holly is divided into smaller contiguous areas defined by the major paved roads such as Route's 103 and 155, and to a lesser extent Belmont Road.

While these roads do not act as an absolute barrier to wildlife they do deter many of the more wary species from crossing regularly. This "leaky barrier" effect restricts the exchange of wildlife and genetic material between wilder areas of Mount Holly.

North of Route 103, the forests, wetlands, stream courses, and old fields that comprise the habitats of wildlife are more finely subdivided by roads and open fields. Deep forest or core habitat are smaller than they are south of Route 103. North of Route 103 forests and hills range from about 1500 feet to the peak of Sawyer Rock at 2350 feet. Forests, streams and other wildlife habitats largely slope to the south, a favorable aspect for wildlife. Tiny Pond and Lake Ninevah are important wildlife habitats providing open water wetlands, swamps, and forests for mink, river otter, moose, fisher and black bear. Proctor and Roger Hills as well as Sawyer Rocks are a focus of upland wildlife habitat in the area.

South of Route 103, the main fragmentation of wildlife habitat is Route 155. To the west of Route 155 is the contiguous deep forest habitat consisting largely of Green Mountain National Forest lands. The northern hardwood forest here contains habitat for bobcat, fisher, moose, black bear, forest interior songbirds, owls and raptors. South and Ludlow Mountains to the east are over 3000 feet high and provide habitat for Bicknell's Thrush and other high-elevation songbirds as well as large unbroken forests for species such as black bear that require extensive areas un-fragmented by humans to live.

Description of Wildlife Habitat Features

Core Area

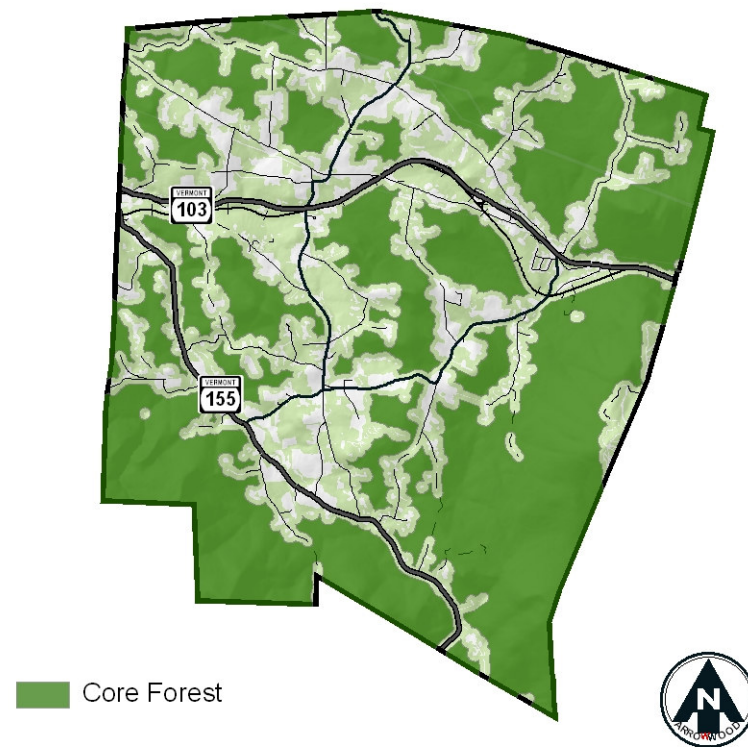
Core habitat is forested wildlife habitat that is far removed from human activities and their artifacts such as roads, houses, and active farmlands. This remote wildlife habitat is qualitatively distinct from small fragmented areas in that it provides important mating, nesting, feeding, and denning habitats for species that cannot survive in more human-dominated fragmented landscapes. These animals also often require travel corridors between various landscape patches that provide these habitat elements such as food and cover.

A wide-variety of birdlife in the northeast utilizes the larger contiguous forests available only in core areas. These birds include species such as the broad-winged and red-shouldered hawks, owls, and forest songbirds like the ovenbird, wood thrush, scarlet tanager, pileated woodpecker, and the Canada and black and white warblers. Several of these species suffer from greater nest predation (by animals such as squirrels, raccoons, snakes and other birds) and nest parasitism (by other birds such as the brown-headed cowbird) where nesting grounds are near human disturbance. Bird populations throughout Mount Holly, therefore, benefit from the deep forest “interior” habitat provided by core areas, see Figure (S) for core forested habitat locations.

Remote wildlife habitat found in core areas can provide the various habitat elements for wide-ranging species such as fisher, bobcat, and black bear. Core areas are often hilly or mountainous, without easy access, and only rarely or seasonally

visited by landowners, hunters, and loggers. Wide ranging species thrive in the remote habitat of the core areas.

Figure S. Core Forest Map



Core areas are often the most important “source areas” where reproductively active female bear, bobcat, fisher, and coyote have their young and contribute to the overall population of these species. In general, the larger the core area size, the greater the population (and territories) of individual species it can support. Larger populations are generally more stable over longer periods. Core areas often provide the breeding grounds and nurseries that support relatively high populations of these deep forest species. Although most human wildlife observations may be near town, within our small woodlots and crossing roads, it is these core areas that produce a surplus of young and without them populations would likely go into decline.

Approximately 19638 acres of core forested habitat were identified within the study area, roughly 63% of the town.

Horizontal Diversity

Horizontal diversity is a measure of the change in vegetative types across an area of different wildlife habitat elements and natural communities. These patterns or changes can result from differing bedrock and soil types, or past disturbances, land use or management activities.

In general, the greater the change in vegetative diversity across a relatively wild area, the greater the overall species diversity of animals within that area. This applies most directly to mammals, such as fox, coyote, deer, moose and black bear, but horizontal diversity is also applicable to bird species. Mammals and birds often need different vegetative structure and species composition

to fulfill various habitat needs. For instance taller trees may be needed for the nesting activity of a bird while the preponderance of feeding activities of this bird may be on smaller saplings or shrubs. Black bear may utilize mid-sized to older American beech trees for fall feeding and then travel to beaver-dam wetlands for spring and summer feeding and utilize areas of dense cover for travel corridors. A wide variety of habitat types can translate into more prey opportunities for predators. When different habitat types (ex. field, wetland, and forest) are in close proximity to one another, or accessible to a population of animals within a given area –then the habitat may have a higher carrying capacity and support more robust populations of wildlife.

When species specific habitat features on the landscape are not otherwise limiting an increase in horizontal diversity usually produces an increase in mammalian and bird species diversity. In Mount Holly we have ranked the horizontal diversity of habitat as high, medium, or low. Horizontal diversity is not a direct, absolute number, but rather a relative measure of the number of different structural vegetative changes one would encounter as one travels across the landscape. A habitat area ranked “high” would have a relatively large number of vegetative changes along such a walk and an area ranked “low” would have fewer. (*Horizontal diversity was measured over the area of each CHU, see page 34 for CHU discussion*)

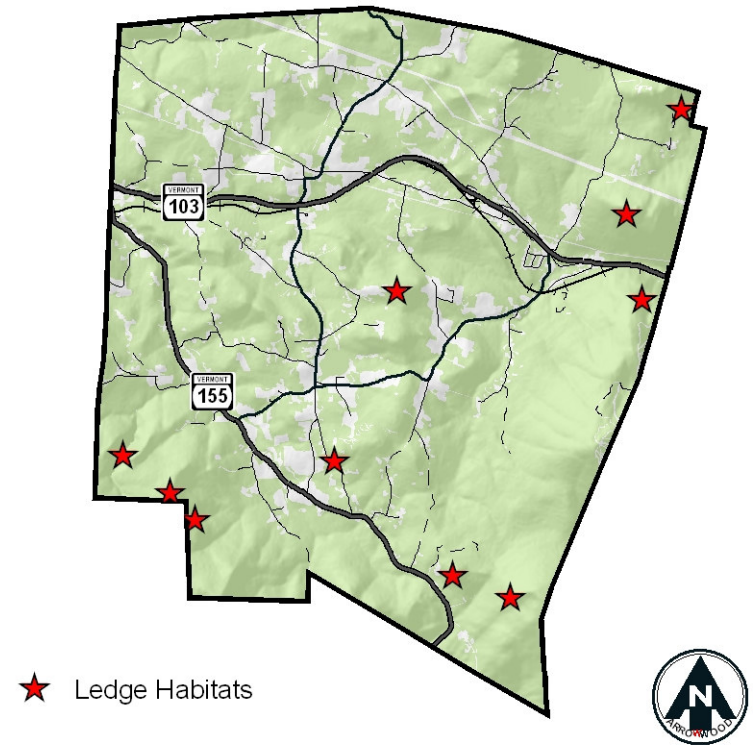
Ledge, Talus and Cliff Habitat

Ledge habitat is generally associated with steep land and vertical rock structure. Vertical rock structure itself is valued by a limited number of species such as nesting peregrine falcon,

common ravens, and the small-footed bat. If the ledge is broken, that is, with crevices, hollows and caves it becomes important habitat for a wide-variety of animals. Porcupines and raccoons live in hollows, under larger rocks, and in deeper cave-like structures in ledge and talus environments. Fisher and coyote often use these sites for protection from the weather while moving throughout their home ranges. Ruffed grouse and small rodents often utilize these areas. In many areas throughout the northeast, bobcats use ledges for courting and breeding grounds and the broken ledge (often at the foot of a ledge) for birthing and rearing of their young. Broken ledge is considered defendable from predators like the coyote that may try to kill and eat bobcat young. Bobcats are reported to also utilize broken ledge (similar to coyote and fisher) when it's cold and snowy as well as when it's hot (for relief from the heat). There is some evidence that ledges facing south and west (areas that generally are more exposed to the sun) may receive higher use by certain species and are more valuable to wildlife.

Ten different potential ledge habitats were identified in Mount Holly. Many were located in the southern part of the town. It is likely that there are additional ledge habitats that remain unidentified. The ledge habitats in the northern part of town generally have a more southern aspect and these sites may have greater potential utilization by wildlife.

Figure T. Ledge Habitat Map



Deer Winter Habitat

In years where significant amounts of snow accumulate in the woods, white-tailed deer utilize evergreen forests for habitat. Evergreen trees intercept snow as it falls to the ground generally resulting in shallower snow depths. These habitats offer an overhead canopy of needles that shield deer from the cold. Deer congregate in these areas when snow depths exceed about 15 inches and often remain until the snow melts in spring. These winter habitats can be critical in limiting the energy expenditures of deer and supporting the overall survival of this species in the north country.

Deer winter habitat that faces into the sun (either west or south) is often more valuable than east or north facing areas. The strong spring sun in these communities melts snow early and warms cold bodies. Eastern hemlock, balsam fir, and Northern white-cedar stands provide the best cover and food value to deer, but pine and spruce will sometimes be utilized. These deer winter habitats are also home to bobcat, coyote, and scavenging bears that come hunting for deer to eat during the winter or carrion to scavenge in spring. Other animals such as evergreen associated birds, porcupines and fisher utilize these habitats during other seasons.

East and north-facing and pine and spruce deer winter habitats may be less likely to be used by deer each year-particularly in the coldest and snowiest of years. Some of these communities may not offer adequate protection from the cold resulting from a less complete evergreen canopy, the dominance of tree species that do not form a closed protective treed canopy, or even from

having a cold northern aspect. Some of these deer winter habitats may be abandoned in early or mid winter for other more protective deer habitats and some may function in varying capacity throughout the winter.

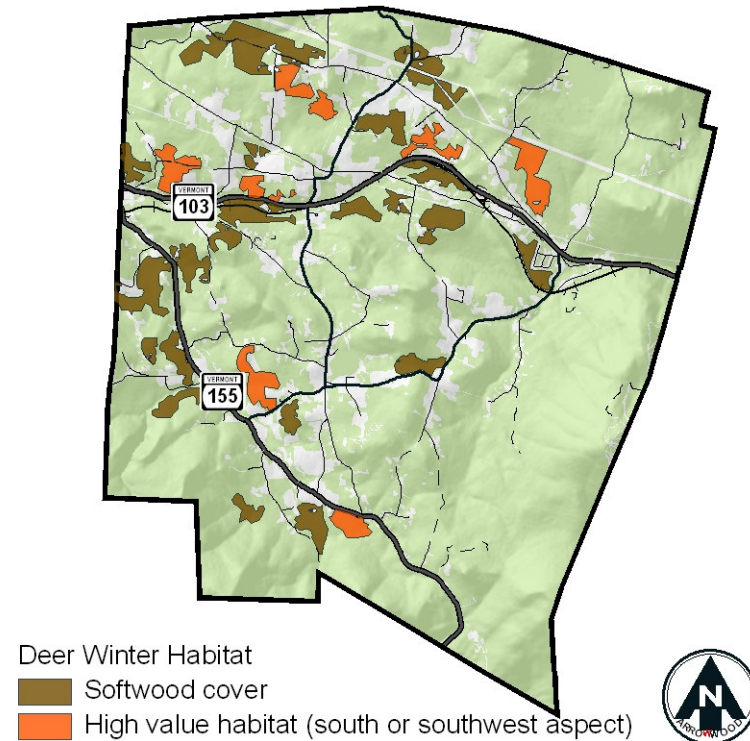


Figure U. Deer Winter Habitat Map

All winter deer habitats provide some thermal benefits and aid deer in fending off starvation, cold and a continually declining energy budget during the harsh Mount Holly winter and spring

months. Energy loss during the winter and spring is cumulative, that is, whatever fat and energy are lost by deer during the early winter months are not available for deer metabolism during late winter and spring. For the most part, it is not until plants produce green leafy material or ripen buds in spring that deer climb out of their energetic downhill spiral.

AE mapped 2500 acres of deer winter habitat in the study area; the State of Vermont had previously mapped 1750 acres.

Mast Stands

Masting trees are those which synchronize fruit production in an area. Masting trees are Northern red oak and American beech trees. Both of these trees, when found clumped into stands are regularly visited by many species of wildlife.

When beech and oak stands are remote, use by black bear is generally higher than stands near human activities. Wildlife attracted to the fruits of American beech (beechnuts) and Northern red oak (acorns) include squirrels, wild turkey, deer, and bear.

The Willard Mountain, Ludlow Mountain, and Roger Hill areas have the greatest potential mast resource. The State has identified several mast stands in each of these areas. The Ludlow Mountain beech stand has been utilized extensively by bears over the years. The State of Vermont Department of Forest, Parks and Recreation Forest Health Data and the Vermont Department of Fish and Wildlife bear point's databases, as well as the Okemo State Forest Wildlife Management Plan were utilized to develop

the Potential Mast Stands map below. The Forest Health Database identifies areas of concentrated beech with the presence of Beech Bark Disease, which over time can damage the health of the trees.

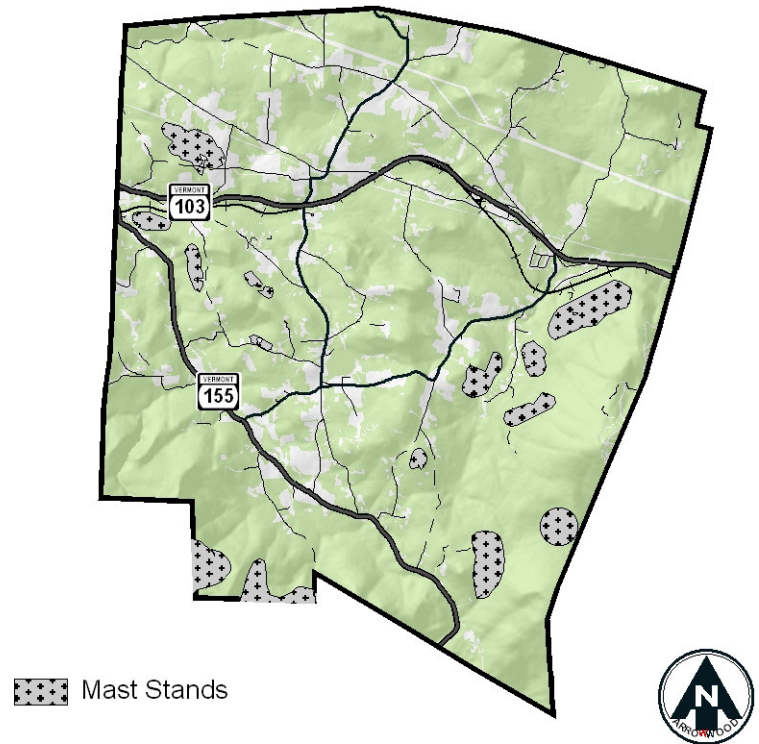


Figure V. Potential Hard Mast Areas Map

Bear will climb the trees in fall to gather beechnuts, leaving scars from their climbing activities. They often return in spring and

scavenge beechnuts from the ground under the beech trees. Bears act in a similar fashion in search of acorns, however, their climbing activities do not usually leave persistent scars and their use is therefore difficult to detect on the tree itself.

Bear Wetlands

Black bear utilize a wide variety of wetlands during the spring and summer months. Forested, shrubby, beaver-flow wetlands, and forested seeps are sought out for the flush of early leafy vegetation that often grows in these environments. In the early spring, wetlands with ground-water discharge promote an early growth of leafy green vegetation at a time when the trees are still barren of nutritious buds and new leaves. Black bears (as well as deer and turkeys among other animals) will utilize this food source and also search out plant roots, grasses, sedges and ants in these environments. Free flowing water is also available at many of these wetlands. Bear wetlands typically have shrubs or tree vegetation nearby which provide cover.

Throughout the study area remote forested seeps are probably the most heavily utilized wetlands by bear. As such, they warrant special protection for their wildlife value. In general, wetland areas that are more remote and situated within a forested habitat matrix have the greatest potential for actual black use.

The 121 wetlands identified as preferential bear habitat in this study represent a mix of wetlands that were observed in the field to have either 1) sign of bear use or 2) fulfill bear wetland habitat requirement (i.e. sufficient cover for bear use and potential food resources). See Figure (W) for Bear Wetlands Map.

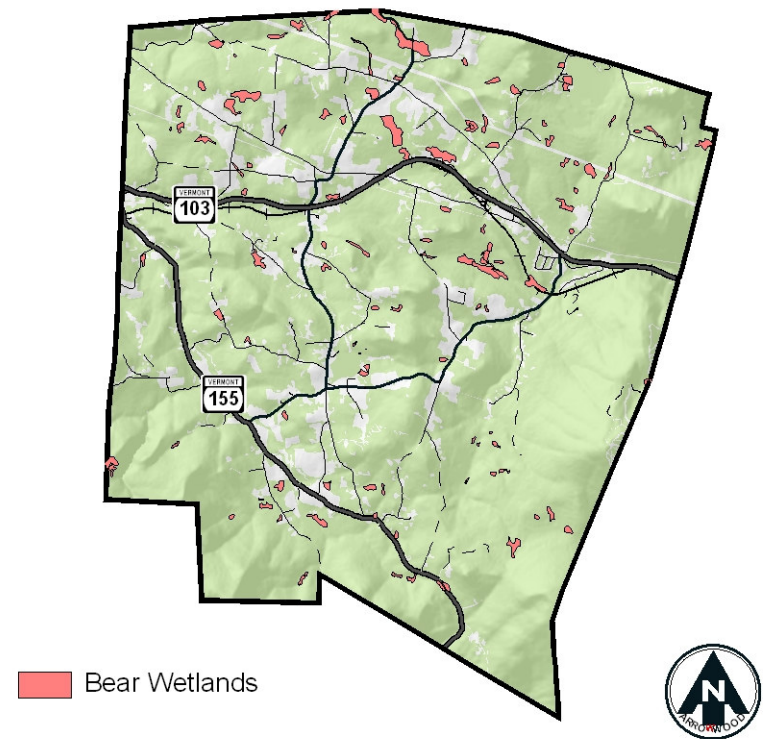


Figure W. Bear Wetlands Map

Early Successional Habitat (ESH)

ESH is forested habitat that is characterized by young, often dense shrubs, saplings or trees. Active forest management or natural disturbances such as disease infestation, ice storms, or wind blow can create a new growth of woody vegetation. Old fields and wetlands with a substantial shrub component were also identified as ESH in this study. ESHs are important for many species of birds and mammals. Bird species that nest in areas with tree saplings and shrubs include: the song sparrow and field sparrow, chestnut-sided and golden-winged warbler (rare), common yellowthroat, gray catbird, indigo bunting, brown thrashers, American woodcock, and ruffed grouse.

Many forest nesting birds flock to ESH habitats and small forest openings in the late summer, stocking up for migration on the many soft mast fruits present in these areas such as raspberry, blackberry and cherries.

ESH that is interspersed with older forestland, old fields, and wetlands harbors many small mammals that are prey for predators. Snowshoe hare, woodchucks, white-footed and woodland jumping mice, and shrews are often found in high densities in areas of successional patches on the landscape. Red and gray fox, coyote, ermine, skunk, raccoon, and bobcat will search these patches for food. Black bears and other animals will utilize these areas extensively in years when berry-producing shrubs are thick with berries.

Approximately 1333 acres of ESH were identified in the study area.

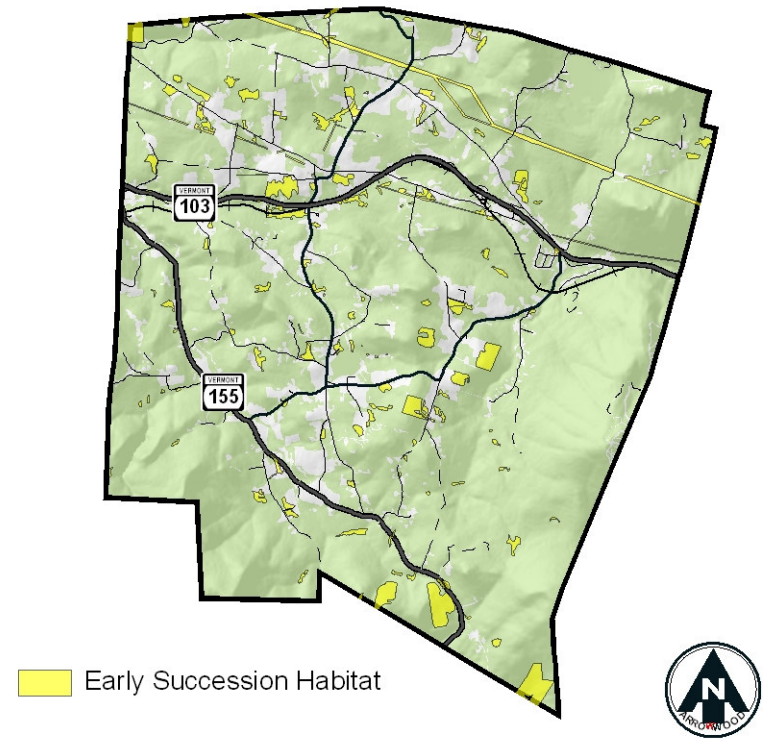


Figure X. Early Successional Habitat Map

Forested Riparian Habitat

Forested streamside riparian habitats are important for species that utilize the aquatic habitats, terrestrial vegetation and cover that are provided. Riparian forested vegetation anchors the stream shoreline and limits streambank erosion. It also provides shade and provides coarse woody debris to streams that adds to the stream structural and substrate diversity as well as provides food that fuels stream food chains.

Amphibians such as the green frog and the Northern dusky salamander live along streams in forested habitat and utilize the adjacent riparian environment. The raccoon and long-tailed weasel use streamside forested habitats to hunt for food and for denning habitat. The moose and white-tailed deer use streams and streamside forested habitats for cover and water. Aquatic animals such as the river otter and beaver use streamside vegetation for cover, denning and food. Several species of bats such as the little brown myotis and the big brown bat use these environments to hunt for insects. Birds such as the belted kingfisher, wood duck, red-shouldered hawk, snipe, Eastern screech and barred owl, the wood pee-wee and alder flycatcher, American gold finch, tufted titmouse, and the yellow, Canada, and cerulean warblers make extensive use of forested riparian habitats.

There are approximately 137 miles of river and stream mapped in the town, and just over 4416 acres of forested riparian habitat was identified.

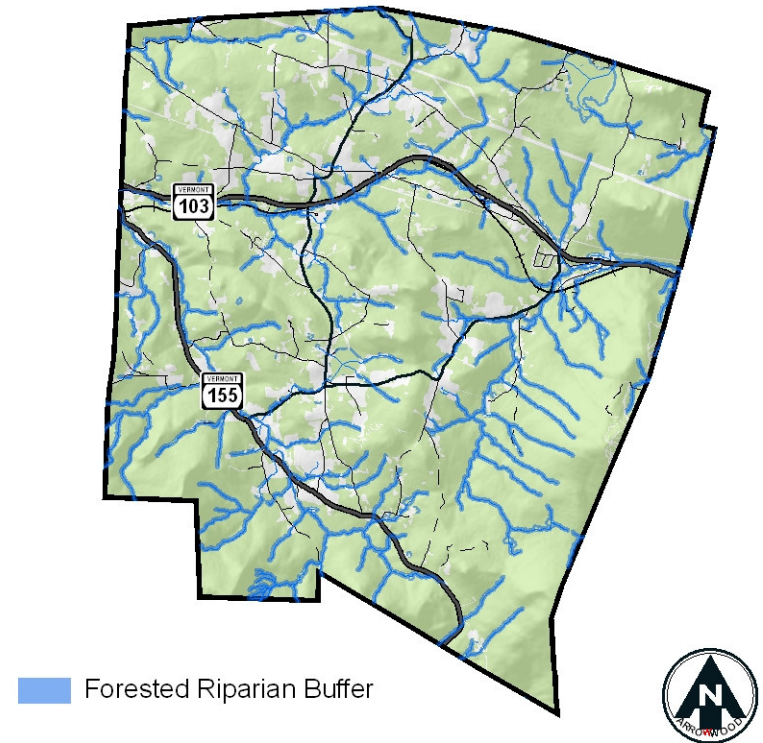


Figure Y. Forested Riparian Buffer Map

Travel Corridors

Travel corridors are places where landscape and land use characteristics combine to form an area where wildlife can move across roads to and from habitat areas. Many species of wildlife utilize a diversity of different habitat and plant community types within their home ranges (or territories). Wildlife move across the landscape for a variety of reasons but generally they move in search of new territories, food resources, and/or potential mates.

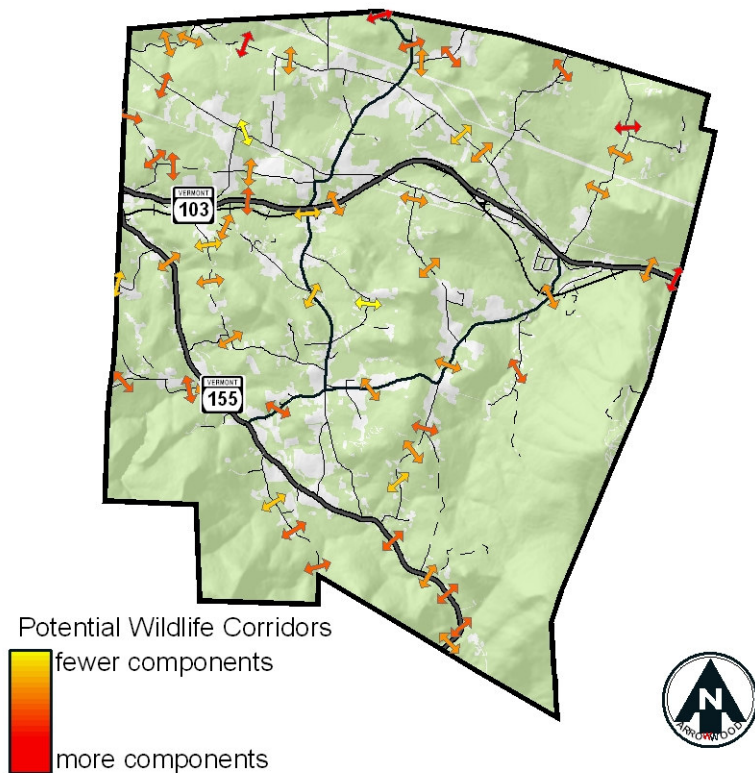


Figure Z. Possible Wildlife Corridors Map

A good example to illustrate seasonal wildlife movements is that of the black bear in Vermont. The black bear typically moves in spring from its high, remote denning areas to wetlands (often forested seeps) lower on the landscape. In summer bear will seek berry patches in openings and along old logging roads within the forest. In fall, bears will move to beech stands, orchards, or possibly corn fields depending on the availability of natural foods in the forest.

General wildlife corridors for wide ranging species are shown on Figure (Z). These corridor areas are likely to be utilized by a variety of wildlife species including large and small mammals and also some species of birds. In addition, travel corridors for amphibians moving from upland to wetland habitats were determined based on location of roads and available habitats.

Detailed discussion of corridor assessment methodology is provided in Appendix 1, Section G. Discussed here are the results of the corridor assessment, focused on the areas listed above.

General Wide Ranging Mammal Corridors

A total of 55 potential corridors were identified within the study area. These potential corridors are likely to be most to deer, bear, bobcat and other wide ranging species. Only one of these corridors was field verified and assessed. One corridor was identified on the Okemo State Forest Wildlife Management Plan. Many of the wide ranging wildlife corridors identified in this project are located within areas of limited development and

contain large, significant habitat features in close proximity to the corridors. As would be expected, wide ranging mammals are likely to find these areas most preferential as movement zones due to the lack of human disturbance and the necessities of moving between critical food, cover and/or other habitats.

There were relatively few probable corridors identified crossing the more developed areas of the study area such as Routes 103 & 155, Belmont Road and Straight Road. The limited opportunities for wildlife travel in these developed areas highlight the importance of maintaining and improving what already exists for movement corridors within these areas.

These probable corridors need to be field verified and, if used by wildlife, should be considered as high conservation and protection priorities.

Improvement and expansion of the vegetated buffer conditions of both the Mill River and Branch Brook and the tributaries feeding them would greatly assist in providing travel corridors across and within this area without putting undue burden on agricultural or development activities. Finally, opportunities for passage structures under the heavily traveled roads such as Route 103 should be sought, especially in those areas where further field work suggests wildlife movements are concentrated.

Land conservation of connecting lands, in conjunction with improved riparian buffers and structures that provide wildlife safe travel, will aid in maintaining a healthy and diverse wildlife population throughout the town.

See Figure (Z) for locations of potential travel corridors.

Amphibian Road Crossing Zones

Many busy roads bisect amphibian travel corridors and amphibians are forced to cross roads to get from their upland forest habitat to the breeding habitat in the vernal pools and wetlands. Fifty potential amphibian road crossings have been identified in the study area. Each of these potential sites was ranked according to the likelihood of use by amphibians. Of the 50 sites mapped, 8 were recorded as highly likely, 26 sites moderately likely and 16 with low likelihood. None of these sites have been field verified. Field verification requires monitoring these road crossing sites during spring migration of the vernal pool amphibians. By knowing the location of the crossings, townspeople can be made aware that they should drive with care during the migration time. Some towns have organized volunteers to be out on nights of the migration to warn drivers and assist amphibians crossing the roads. Other towns have obtained signage to erect near the sites of the highest amphibian mortality.

Forested travel corridors between forest and vernal pool habitat should be maintained to facilitate migration of pool breeding amphibians. Barriers to amphibian movement such as busy roads, large clearings, or intensive development should be avoided or minimized within these amphibian travel corridors. Small developments (e.g. a single family house), yards, and infrequently traveled dirt roads are often not a major barrier to

amphibian movement but may decrease migration success and habitat availability on a meta-population level.

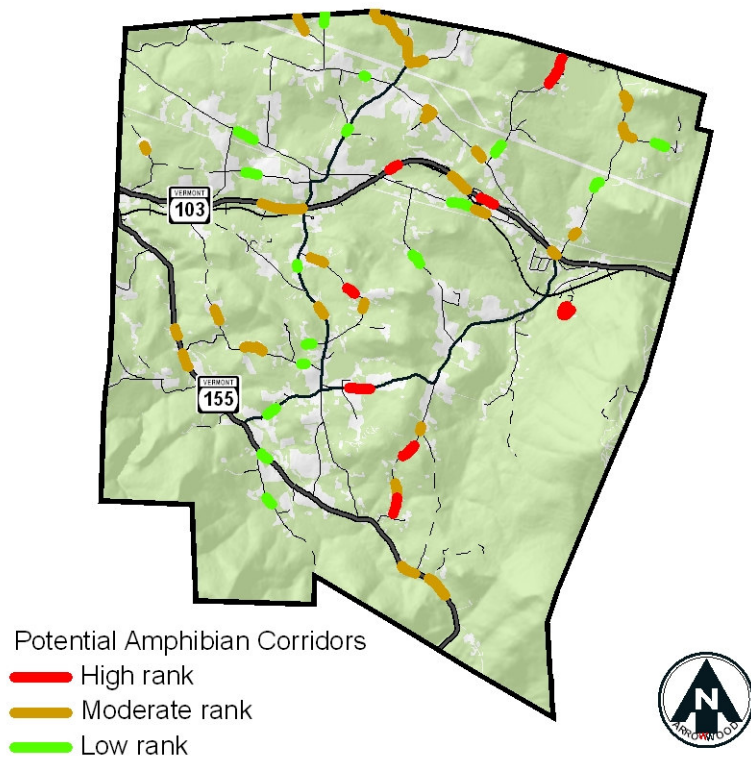


Figure AA. Amphibian Crossings Map

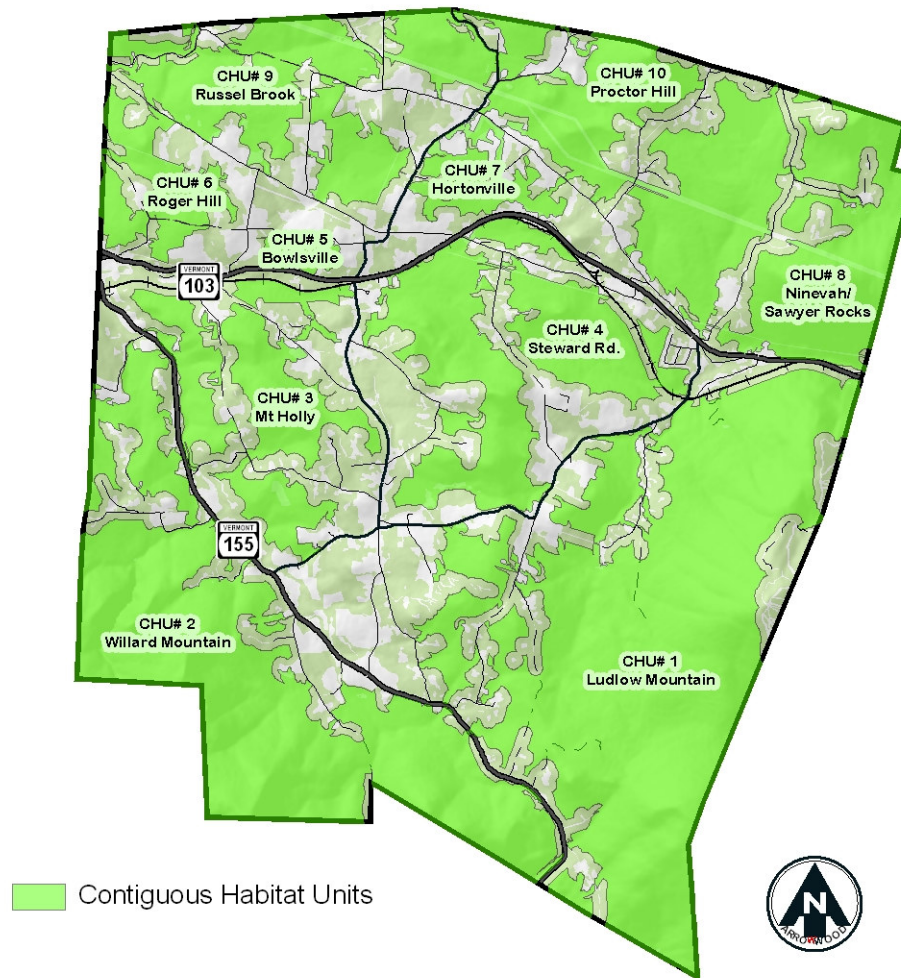
Contiguous Habitat Units (CHU's)

Contiguous Habitat Units are a combination of several different wildlife habitat types combined to form a unit of relatively continuous wildlife habitat. The largest forested area, often the most valuable wildlife habitat is the core area (largely free from most human activities). In constructing CHUs the core areas are combined with early succession habitats, forested riparian habitats, wetlands, deer wintering habitat, mast stands, and ledge or cliff habitats. In some cases, these specific wildlife habitat features (like riparian areas) may not add new area (they are already subsumed within the core area boundary) to the already mapped central core, while in other cases (when they are tangential but not within the mapped core area) they add new area and additional acreage to the CHU.

CHU areas directly adjacent to smaller, unpaved or less traveled roadways were combined in recognition of the ability of wildlife to travel across such barriers. These areas however represent threats to the continued intactness of the CHU, and growth planning should take this into consideration.

The Mount Holly landscape presents a complex array of roads, open fields, village clusters, and wildlands such as forests, wetlands and forested stream side environments. Wildlife and their habitats are divided on the landscape into smaller contiguous units by the presence of roads, villages, clusters of houses, fields and other isolating features. Mount Holly has many of these isolating features as there are only 3 CHUs that are greater than 3000 acres of continuous wildlife habitat.

Figure BB. Contiguous Habitat Units Map



A total of 10 contiguous wildlife habitat units (CHUs) were identified in the study area, see Appendix 1, Section E for methodology. The 10 CHUs comprise a total land area of 22,690 acres, of which 19,638 acres is considered core habitat.

Within the CHUs, approximately 2,526 acres of Deer Winter Habitat has been identified and mapped. Mast stands were identified in 5 of the CHUs. A summary data table is provided in Appendix 2 detailing the individual habitat elements within all the CHUs. A discussion of the CHUs is provided below.

Birds in CHUs

According to the current tally from the 2003-2007 breeding bird atlas there are over 200 bird species that breed in the State of Vermont. Over 100 of those species were recorded breeding in and around the town of Mount Holly. In fact, the northern New-England region is referred to as a “veritable breeding factory” by the Partners in Flight Land Bird Conservation Plan (Rich et al, 2004) for it’s abundance of breeding neo-tropical migrating bird species.

Due to this extensive list of breeding bird species, discussion of breeding birds in CHUs is focused on a set of 40 “Responsibility Species” as developed by Audubon Vermont. This list covers a range of

species that have a high proportion of their breeding population within our Atlantic Northern Forest region.

Many of these species are experiencing global declines in population, sometimes severe. However many of these are fairly familiar to anyone who spends a bit of time in the forests and fields of central Vermont. Focus on these species, and their habitat requirements will help insure that these birds, ubiquitous to our region, remain common and that those experiencing sharp declines may be stabilized or restored before being lost for good.

Examples of responsibility species that are likely to prefer the mix of habitats within a given CHU are listed with each CHU description. These are meant to be representative examples, and are by no means a complete list of all birds, or even all responsibility species, that are likely to be found in the CHU.

Additional information about land management activities that can directly benefit these birds is available from Audubon Vermont at: <http://vt.audubon.org>.

Breeding Bird Atlas, data not yet finalized and published:



http://www.pwrc.usgs.gov/bba/index.cfm?fa=explore.ProjectHome&BBA_ID=VT2003

Figure CC. Scarlet Tanager- a core forest bird

Audubon Vermont- Responsibility Species:

Birds of early-succession and old fields	Birds of mature forests
Chestnut-sided Warbler	Ovenbird
Mourning Warbler	Wood Thrush
White-throated Sparrow	Veery
Ruffed Grouse	Eastern Wood-Pewee
American Woodcock	Yellow-bellied Sapsucker
Nashville Warbler	Black-throated Blue Warbler
Canada Warbler	Blackburnian Warbler
Magnolia Warbler	Black-throated Green Warbler
Northern Flicker	Scarlet Tanager
Birds of high elevation and boreal forest	American Redstart
	Chimney Swift
	Northern Parula
	Purple Finch
Spruce Grouse	Blue-headed Vireo
Black-backed Woodpecker	Birds of wetlands and riparian areas
Olive-sided Flycatcher	
Yellow-bellied Flycatcher	
Gray Jay	
Cape May Warbler	
Tennessee Warbler	
Blackpoll Warbler	
Bay-breasted Warbler	Swamp Sparrow
Palm Warbler	Lincoln's Sparrow
Boreal Chickadee	Rusty Blackbird
Bicknell's Thrush	Alder Flycatcher
	Louisiana Waterthrush

CHU 1: Ludlow Mountain

The Ludlow Mountain CHU contains the largest unbroken forested landscape in Mount Holly. Ludlow Mountain is a 6877 acre area consisting of Northern Hardwood, and Montane Red Spruce-Balsam Fir Montane natural communities. The protected Okemo State Forest is found here and over 50% of the CHU is already conserved. This CHU is dominated by Ludlow

and South Mountains, both of which are over 3000 feet in elevation. These two mountains provide habitat for high-elevation songbirds such as the Bicknell's Thrush and the Blackpoll Warbler. The extensive core forested habitat (6467 acres) provides the remote habitat required by black bear, and interior forest conditions important for fisher, forest raptors and owls as well as numerous deep forest songbirds such as the scarlet tanager, wood thrush and ovenbird. This CHU has extensive unbroken forested riparian habitat and numerous remote stream side beaver impoundments and potential ledge sites. These habitat areas are likely to support breeding of wetland and riparian dependant bird species such as the Louisiana waterthrush, alder flycatcher and American woodcock. The CHU also has several American beech mast stands that have been identified and these stands are known to receive black bear

Ludlow Mountain
<i>6876.8 Acres</i>
Core
Deeryard
Streams
Wetland
Early Succession
Forested Riparian
Mast
Ledge/Cliff
Bear Wetland
Vernal Pools
53% Conserved

use. A recognized bear travel corridor also crosses through this CHU.

Wildlife and wildlife sign observed include: weasel, beaver, coyote, porcupine, snowshoe hare, and black bear.

CHU 2: Willard Mountain

The Willard Mountain CHU contains most of the land in the south-west portion of town. The Green Mountain Forest manages most of this CHU and over 80% is already conserved. The Willard Mountain CHU is 5283 acres, much of which is remote with elevations as high as 2805 ft. a.s.l. This CHU contains 4893 acres of remote deep forest core wildlife habitat. Black bear, bobcat, moose and other wildlife species find

ample space and resources in this large habitat block. The higher mountain habitats are dominated by spruce-fir forest and contain habitat for high elevation songbirds and wildlife. Lower down the hillsides mast stands have been identified. The Willard Mountain CHU contains several stream courses lined with forested riparian habitat. The area has potential ledge habitat that could be used by bobcat, fisher, coyote, porcupine and ruffed grouse among other species. At lower elevations several deer wintering habitats are mapped but as these are north and east-facing their utility as winter deer habitat may be limited. Willard

Willard Mountain
<i>5282.6 Acres</i>
Core
Deeryard
Streams
Wetland
Early Succession
Forested Riparian
Mast
Ledge/Cliff
Bear Wetland
Vernal Pools
81% Conserved

Mountain CHU also has over 130 acres of early succession forest and shrub land which serves the cover and food needs of a variety of wildlife.

The Willard Mountain CHU contains some large patches of early succession habitat in the southeastern corner. In addition to the interior forest birds such as scarlet tanager and black-throated blue warbler breeding in this unit, the early succession habitats are likely to support species such as the chestnut-sided, mourning and Nashville warblers.

CHU 3: Mount Holly

Mount Holly
1277 Acres
Core
Deeryard
Streams
Wetland
Early Succession
Forested Riparian
Mast
Ledge/Cliff
Bear Wetland
Vernal Pools
5% Conserved

The Mount Holly CHU is located south of Route 103 and east of Route 155. This 1277 acre habitat unit is dissected by Gates and Bowlsville dirt roads. There is approximately 900 acres of core forest habitat in the Mount Holly CHU. The Mount Holly CHU has several potential deer winter habitats, wetlands, and vernal pools. The CHU has a northern aspect and may not receive heavy deer winter use. American beech

stands are likely present in this CHU, and used by bear, deer, wild turkeys and other wildlife for food. There is ledge habitat in this CHU which could be used by a variety of predators as well as ruffed grouse and porcupine.

Wildlife and wildlife sign observed include: snowshoe hare, coyote, white-tailed deer, fisher, red fox, and ruffed grouse.

In addition to areas of hardwood forest, wetland and early succession habitat this CHU includes significant areas of softwood (conifer) and mixed forest cover. These forest types tend to attract a different group of responsibility bird species, including the black-throated green warbler, blackburnian warbler and blue-headed vireo.

CHU 4: Stewart Road

The Stewart Road CHU is one of the more visible wildlife habitats in Mount Holly. This 1973 acre CHU, has extensive core forests, forested riparian stream courses, the large marsh and swamp wetland complex (near Summit Road along Route 103) and a large remote beaver wetland complex. This area also has extensive mapped deeryard coniferous forest as well as vernal pool and ledge habitat. The area is relatively flat and intact coniferous forests may well be utilized by wintering deer for cover. The one deer wintering area visited in the field within this CHU had been cut-over and had no value to white-tailed deer in the winter. The Stewart Road CHU has substantial acreage of early succession forest and shrub habitat that provides cover and food for wildlife. The Stewart Road

Stewart Rd.
1973.8 Acres
Core
Deeryard
Streams
Wetland
Early Succession
Forested Riparian
Mast
Ledge/Cliff
Bear Wetland
Vernal Pools
5% Conserved

CHU is quite isolated by roads and development but is an important Mount Holly wildlife viewing area being on Route 103. A moose was observed in this wetland during the field investigation.

Wildlife and wildlife sign observed in the Stewart Road CHU include: white-tailed deer, red fox, grey fox, moose, Eastern coyote, cottontail rabbit, red squirrel, and snowshoe hare.

The extensive wetland complex and large areas of softwood cover make this CHU inviting to a wide range of bird species including swamp sparrow, alder flycatcher, purple finch and black-throated green warbler. The interior forest conditions of this CHU are likely to support birds such as the scarlet tanager, veery and eastern wood-pewee.

CHU 5: Bowlsville

Bowlsville
<i>107.5 Acres</i>
Core
Deeryard
Streams
Wetland
Early Succession
Forested Riparian
Mast
Ledge/Cliff
Bear Wetland
Vernal Pools
Conserved Land

The 108 acre Bowlsville CHU is located just north of Route 103. It is an isolated forest surrounded by roads, open fields and houses. Much of this CHU is comprised of early succession conifer forest. It may serve as cover for wintering deer, and has a stream and forested riparian area along it's western edge. The Bowlsville CHU is small enough it does not provide any deep forest core wildlife habitat.

The large area of early succession habitat in the Bowlsville CHU is likely to support breeding and nesting by bird species such as the chestnut-sided warbler, magnolia warbler and flicker.

CHU 6: Roger Hill

Roger Hill is a 564 acre wildlife habitat located in the western section of town and extends into Wallingford. The area has some potential deer wintering habitat. The Roger Hill area has some wetland habitat and forested riparian zones as well as some early succession forest. Wild turkey were observed in The Roger Hill CHU.

Roger Hill
<i>564.1 Acres</i>
Core
Deeryard
Streams
Wetland
Early Succession
Forested Riparian
Mast
Ledge/Cliff
Bear Wetland
Vernal Pools
Conserved Land

Interior hardwood and conifer forests within this unit will support the breeding of ovenbird, wood thrush, blackburnian warbler and blue-headed vireo among others.

CHU 7: Hortonville

The Hortonville CHU consists of woodlots, wetlands and stream courses. It is a 333 acre unit in north-central Mount Holly. This

Hortonville
<i>332.7 Acres</i>
Core
Deeryard
Streams
Wetland
Early Succession
Forested Riparian
Mast
Ledge/Cliff
Bear Wetland
Vernal Pools
Conserved Land

wildlife habitat is surrounded by some dense human altered landscape and may be quite isolated. The Hortonville unit has several mapped deer wintering habitats and is generally flat or south-facing so these units may receive deer use. A large wetland within the forest also provides wildlife habitat for a variety of wetland dependant wildlife species.

Birds utilizing this CHU are similar to those mentioned for other units, although the large areas of conifer cover will be more likely to attract the softwood associates such as purple finch and blackburnian warbler.

CHU 8:
Lake Ninevah/Sawyer Rocks

The Lake Ninevah/Sawyer Rocks CHU consists of 3083 acres of forested habitat and both Lake Ninevah and Tiny Pond and Sawyer Rocks and Tiny Mountain. The area consists of Northern Hardwood Forests and mixed hardwood-conifer forest communities. Over 50% of this area is conserved. Tiny Pond and Lake Ninevah have extensive wetland complexes adjacent to them providing habitat for fish, amphibians, aquatic mammals, waterfowl, and shorebirds. The forests are large, horizontally diverse, and provide deep forest interior habitat that likely act as source areas

Ninevah/Sawyer Rocks
<i>3083.5 Acres</i>
Core
Deeryard
Streams
Wetland
Early Succession
Forested Riparian
Mast
Ledge/Cliff
Bear Wetland
Vernal Pools
52% Conserved

for species such as black bear. This CHU also has potential ledge habitat that could serve as denning, resting and escape cover for porcupines, bobcats, and ruffed grouse. There are several potential vernal pools mapped in this CHU.

Wildlife and wildlife sign observed in this area include: white-tailed deer, black bear, Eastern coyote, beaver, mink, and raccoon.

The large interior hardwood forests of this CHU encourage breeding by scarlet tanager, wood thrush and many others, and the wetlands along the lake border are notable for their potential as habitat for rusty blackbird, swamp sparrow and alder flycatcher among many other wetland and open water associated breeding birds.

CHU 9: *Russell Brook*

The Russell Brook CHU is located in north-central Mount Holly that extends north into Shrewsbury. This CHU is 1915 acres and contains 1899 acres of core deep forest habitat. The forest has a south-west aspect and contains several potential deer winter habitats. The area also contains over 275 acres of swamp, marsh and other wetland habitats and several vernal pools. The Russell Brook CHU contains a long

Russell Brook
<i>1899 Acres</i>
Core
Deeryard
Streams
Wetland
Early Succession
Forested Riparian
Mast
Ledge/Cliff
Bear Wetland
Vernal Pools
Conserved Land

powerline, providing early

successional habitat, as well as other early succession wildlife habitat areas. Russel Brook and other waterways provide stream wildlife habitat as well forested riparian forest.

An even mix throughout this CHU of hardwood and softwood stands, wetland, riparian habitat and early succession forest make this unit desirable to most of the responsibility species except those nesting at high elevation or in boreal forests

CHU 10: Proctor Hill

The Proctor Hill CHU is located in the northern portion of Mount Holly and extends into Shrewbury and is adjacent to the extensive forests of nearby Plymouth. The Proctor Hill CHU is 1293 acres in size and surrounded by a largely forested matrix. Proctor Hill has a few streams and forested riparian areas and some wetland habitat. A

mapped deer winter area is located in this CHU but Proctor Hill's relatively high elevation limits its utility as deer winter habitat. The orchards near Proctor Hill are likely used by wildlife including black bear. Wildlife and wildlife sign in this area included: wild turkey.

Proctor Hill
1293.2 Acres
Core
Deeryard
Streams
Wetland
Early Succession
Forested Riparian
Mast
Ledge/Cliff
Bear Wetland
Vernal Pools
13% Conserved

Roughly equal amounts of softwood and hardwood cover within the large core forest areas of this unit suggest a range of interior forest dependant bird species such as the scarlet tanager, purple finch, veery, blackburnian warbler, yellow-bellied sapsucker and northern Parula.

Breeding Birds: Mount Holly and surrounding area

A list of bird species identified during the 2003-2007 Breeding Bird Atlas in and around Mount Holly can be found in Appendix 4.

Management Recommendations for Wildlife Habitat

Large Contiguous Habitat Units: The Core Habitat Units described above are areas with large core size, substantial forest interior habitat and generally a wide-diversity of wildlife habitat elements. They provide important habitat for large, wide-ranging wildlife such as black bear, habitat for forest interior birds, as well as specific habitat features critical for a wide variety of other species.

- Forest fragmentation in these larger CHUs should be discouraged. Roads, housing and most other human activities should be restricted to the periphery of these units.
- Forest management activities that support a diversity of forest and early succession natural communities are an appropriate use of these areas.

- Roads built to facilitate forest management activities should be allowed to revegetate when management activities are completed in an area.
- Natural connections between the various wildlife habitats/elements within the units should be maintained.
- To maintain deep forest habitat for many declining songbirds, heavy forest cutting which promotes the development of edge conditions should be limited in these areas. However, many forest nesting birds respond favorably to a diverse and varying vertical canopy structure within the forest. These conditions are easily fostered through appropriate management activities including group and small patch selection cutting.

High Elevation Bird Habitat: High elevation songbird habitat is present on both Ludlow and South Mountain. Bicknell's thrush and other high-elevation birdlife may nest in the higher elevations (generally above 2700 ft) within these units.

- Any forest removing activities proposed for areas above 2700 ft should be assessed by a professional biologist to ensure the minimization of impact to Bicknell's' thrush breeding habitat.

Bear Habitat: Black bear require extensive remote areas to meet their yearly habitat requirements. Large, non-road areas must be preserved to maintain sustainable populations within Mount Holly. Bears must continue to have access to mast stands and

forested wetlands. Bear habitat management can also focus on beech stands that have documented bear use.

7.0 Community Conservation Projects

Involving the local community in conservation-based projects is an essential step in creating awareness of local conservation issues. There are a wide range of options for community involvement in local conservation projects, but it is beyond the scope of this inventory to elaborate on them all. This inventory did, however, illuminate a few areas where community involvement would be a great asset. The list that follows should be viewed as suggestions. The ultimate direction that a local group takes should also be determined by the interest of its members.

Invasive Species. There are a number of sites where non-native invasive species were noted during the field work of the inventory. Eradication of Eurasian water-milfoil (*Myriophyllum spicatum*) from Star Lake and other bodies of water should still be a priority for the town. However, while invasive aquatic species eradication is best left to professionals, eradication and control of terrestrial plant species can be carried out by volunteers. A few of the sites that are worth targeting for this effort are listed in the wetlands section of this report (Section 2). These sites include the Winslow Flats wetlands where a small patch of common reed (*Phragmites australis*) was found. The

wetlands along the shore of Star Lake where some Japanese knotweed (*Polygonum cuspidatum*) was discovered and the Star Lake WMA Beaver Wetlands where another patch of common reed was found. In all of these instances, the populations discovered were relatively small. This means that the sooner action is taken, the easier and more effective the control process will be.

There are a number of resources for helping groups develop methods and strategies for controlling exotic species. Many of these can be found on the internet. Some of the most widely used sites are:

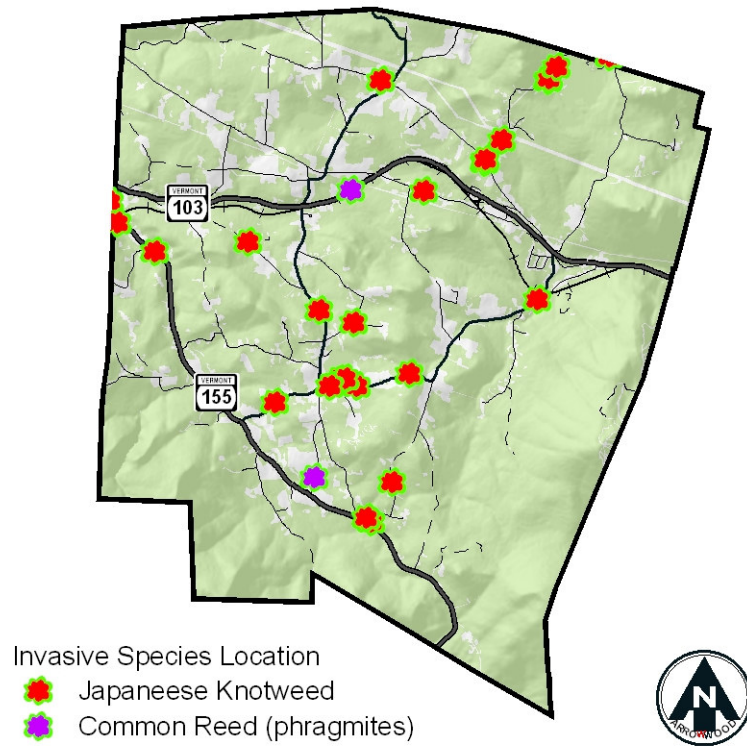
The New England Wildflower Society's Invasive plant program:
<http://www.newfs.org/search?SearchableText=invasive+species>

The Vermont Invasive Exotic Plant Committee:
<http://www.vtinvasiveplants.org/>

The Invasive Plant Atlas of New England: <http://nbii-nin.ciesin.columbia.edu/ipane/>

Vermont Agency of Agriculture Noxious Weeds information:
<http://www.vermontagriculture.com/ARMES/plantindustry/plantPathology/weeds/index.html>

Figure DD. Invasive Species Location Map



The Nature Conservancy of Vermont:
<http://www.nature.org/wherewework/northamerica/states/vermont/volunteer/art21110.html>

In addition, local groups such as the Nature Conservancy, local land trusts, Natural Resource Conservation Districts or other

environmental groups may be able to offer hands-on assistance or guidance.

Amphibian Crossing Zones. Included with the current inventory is a map of potential amphibian crossing zones. These crossing zones are sites where amphibians are likely to cross the roads in order to get to their breeding habitats in the spring. This mass movement occurs in the early spring on the first warm and rainy night. When these amphibians need to cross busy roads, a high degree of mortality can occur from traffic. Many communities are starting to take action by getting volunteers out during this migration to alert motorists and help the amphibians across the road. This activity is a great way to involve the community by directly assisting wildlife. It is also a good way to see some of the more elusive amphibians in your town.

Some Vermont web-based resources are listed below.

North Branch Nature Center Amphibian Monitoring Program
<http://www.northbranchnaturecenter.org/AMP.htm>

Bonneyvale Environmental Education Center (they have established many amphibian crossing brigades)
<http://www.beec.org/projects/salamanders.php>

Save the Salamanders! <http://www.savethesalamanders.org/>

Wildlife Travel Corridors. Another area to focus conservation is wildlife corridors. As discussed in Section 6, there were relatively few probable corridors identified crossing the more

developed areas of the study area such as Routes 103 & 155, Belmont Road and Straight Road. The limited opportunities for wildlife travel in these developed areas highlight the importance of maintaining and improving what already exists for movement corridors within these areas.

These probable corridors need to be field verified and, if used by wildlife, should be considered as high conservation and protection priorities. Field verification of potential travel corridors is very time consuming, but can be conducted by local naturalists and/or citizen volunteers that are trained in the collection of data wildlife corridors. An initial training in track identification was conducted for Mount Holly residents as a component of this project. Additional training of volunteers and collection of wildlife road crossing data over time will help identify high value crossing locations.

Status of Conserved Lands in Mount Holly

Table E. Conserved Lands in Mount Holly

Land Status	Acreage
Green Mountain National Forest	2910
Okemo State Forest	3087
Star Lake Wildlife Management Area	94
Tiny Pond Wildlife Management Area	33
Vermont Land Trust Easement	291
Total Conserved Lands in Mount Holly	6414
Total Acreage in Mount Holly	31241
Percentage of Conserved Lands	21%

As can be seen from Table (E), various federal, state and privately held conserved lands in the town comprise 21% of the

total acreage of the town. With the exception of the two State Wildlife Management areas, most of the conserved land occurs in the higher elevation areas. This is a common pattern throughout the state with the lower elevation communities typically underrepresented as conserved lands.

Given this pattern, targeting lands for conservation should begin by looking at the communities and habitats that occur in the lower elevation areas. One place to start looking at possible areas for conservation is the significant wetlands that were described in Section 2. Most of these sites occur on unconserved lands and yet they are some of the more significant ecological features in the town.

Conserving land, while a worthwhile endeavor, is not always possible due to landowner unwillingness, political barriers or financial constraints. Education of the landowners and land managers in these areas, however, is an incredibly valuable endeavor. Even if land conservation is the overall goal, reaching out to citizens and landowners is the first critical step in this process.

8.0 Conclusions

The inventory of natural features in Mount Holly yielded a large amount of data on the ecological systems and wildlife habitats within the town. Over 500 different wetlands and potential wetlands were mapped comprising 18 different natural communities. A subset of these wetlands were visited and

assessed. These assessments resulted in a list of state and locally significant wetland communities. Ten different wildlife habitat areas were mapped. These include significant habitats such as mast stands, ledges and talus slopes, large unfragmented forests, and lowland wetland habitats. In addition, 55 wildlife travel corridors were mapped. These areas are extremely important for the movement of large mammals such as bear, deer and moose.

This inventory, while in some respects comprehensive, is really only the first step in an ongoing process. This process of knowledge gathering can go on for years and can be done by local naturalists and interested townspeople. The maps that are presented as part of this report are therefore only base maps from which more information can be added to throughout the years. And while adding information to the maps is good, the information presented as part of this inventory is enough to start the process of conservation on the local level. That conservation effort could consist of pursuing land conservation, educating people about the ecologically important areas, controlling invasive species in the town, assisting amphibian migrations, or any number of other projects. Whatever course the local conservation efforts take, we hope that the inventory presented here will assist you in those efforts and lead to a citizenry that is more in touch with the natural features of their town.

9.0 References

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