# Science to Action:

## Four Town Natural Resources Inventory
## Bolton, Huntington, Jericho and Richmond

**December 2013**

# Appendix 1:

# METHODOLOGY

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# Methodology

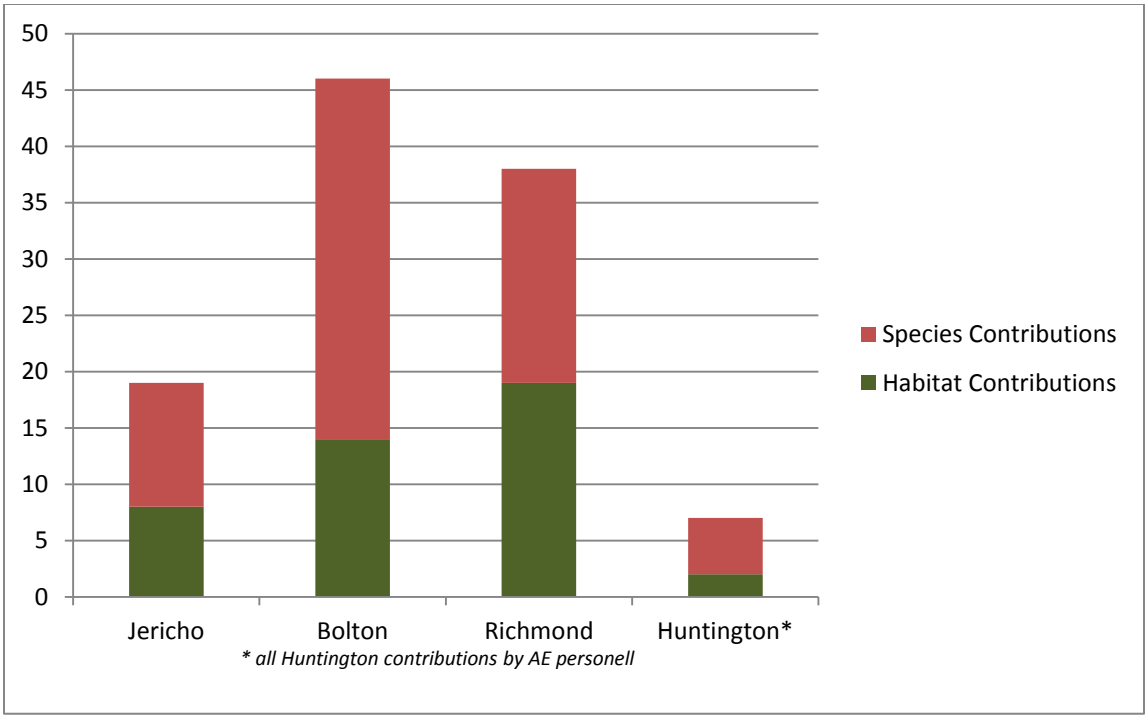
The Science to Action: Four Town Natural Resources Inventory project includes the identification, inventory and assessment of wetlands, wildlife habitat and connecting lands, and upland natural communities in the towns of Bolton, Jericho, Huntington, and Richmond, Vermont. Existing digital and paper databases as well as information gathered from public meetings and interviews were used in determining areas of potential significance and identifying sites for field assessments. These natural areas were evaluated by specific ecological and landscape criteria to determine the significance and value that these areas have to the natural heritage of the towns. The methodology and findings of the inventory are documented in this appendix.

The methodology section is organized into five sections, A. Public Sightings Map, B. Landcover Delineation, C. Wetlands, D. Upland Natural Communities, and E. Wildlife Habitat.

## *A. Public Sightings Map*

The STA Study Committee sought public comments from members of the professional natural resource management community with experience in the 4 town region. An on-line STA mapping application was created whereby professionals could document and map known locations of specific natural communities, wildlife habitat, wildlife crossing areas, or actual sightings of wildlife, or their sign. Access to the application was limited to those with expertise and experience in the region. The following map is the product of that outreach. The data recorded on these maps was incorporated in the analysis and report. The following table, graph and map summarize the local habitat and species sightings contributions to the project.

| Town | Habitat Contributions | Species Contributions | Total Entries |
|---|---|---|---|
| Jericho | 8 | 11 | 19 |
| Bolton | 14 | 32 | 46 |
| Richmond | 19 | 19 | 38 |
| Huntington* | 2 | 5 | 7 |



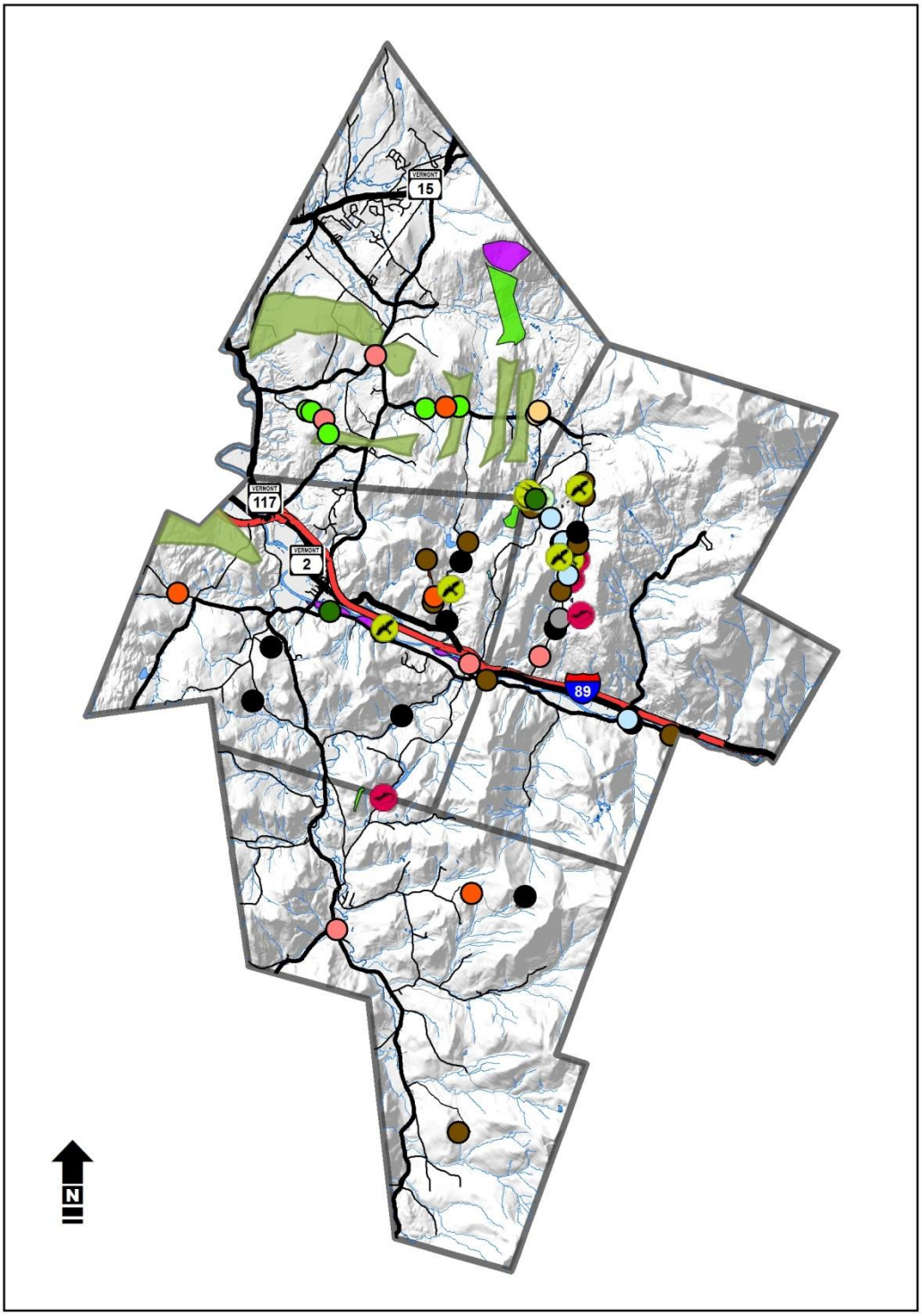



**Figure 1. Local Habitat and Species Sightings Map**

## *B. Landcover Delineation*

Arrowwood Environmental (AE) built several of the GIS layers utilized in this project from a foundation of basic landcover analysis. This analysis was conducted by AE personnel, and is intended to replace the use of the statewide LCLU (landcover/landuse) dataset available from the Vermont Center for Geographic Information (VCGI). Although the VCGI LCLU data is available covering the entire state of Vermont, AE has found the level of detail too coarse (30 meter resolution) to effectively assist on a town-scale analysis of natural heritage elements. For this inventory, AE conducted a combined automated and manual digitization of broad classifications of land cover types.

Development- Developed areas were delineated using a collection of publicly available statewide data sources obtained from VCGI. Features in these source datasets were buffered to approximate an average development disturbance as detailed in the table below.

| Selected Data | Data Source | Source Data Type | VCGI Layer Name | Source Data Date | Buffer Generated |
|---|---|---|---|---|---|
| Driveways | E-911 Driveway Centerlines | Polyline shapefile | EmergencyE911_DW | 2012 | 12 feet both sides of line |
| Houses & Other Buildings | E-911 Site Location | Point shapefile | EmergencyE911_ESITE | 2012 | 100 feet around point |
| Major Roads-Class 1,2, State | Vtrans Road Centerlines | Polyline shapefile | Trans_RDS | 2012 | 30 feet both sides of line |
| Major Roads-US Routes | Vtrans Road Centerlines | Polyline shapefile | Trans_RDS | 2012 | 50 feet both sides of line |
| Minor Roads- AOT Class 3,4, trail & Forest Roads | Vtrans Road Centerlines | Polyline shapefile | Trans_RDS | 2012 | 20 feet both sides of line |
| Railroads | Vtrans_RR | Polyline shapefile | Trans_RR_Line | 2005 | 50 feet both sides of line |

Further modifications were made to the developed areas during the hand delineation process described below.

Open Land- open, non-forested land was delineated by hand from both 2012 NAIP (USDA) 1 meter resolution color orthophotography and 2006/2007's series Vermont Mapping Program 0.5 meter resolution black and white orthophotography. The orthophotography was visually analyzed at a scale of approximately 1:5000 on a computer monitor within a geographic information system (GIS) software platform. Non-forested agricultural, recreational, residential, commercial and industrial areas were digitized by hand in the GIS software.

Transitional areas were best fit by the assessor into "open land" or "developed land" categories.

Using GIS based geoprocessing tools, the buffered developed areas were erased from the hand digitized open areas. From these, wetland natural communities, as described in Section C of this report were also erased. At this point, anything not depicted as developed, open, or wetland was considered an upland natural community and mapped according to methodology explained in Section D. Boundaries were adjusted and classifications adjusted as appropriate through the remainder of the inventory and assessment project. A sample result of this process is shown in Figure 2.

While an effort was made to be relatively accurate at the working scale, the scope of this project did not include either the budget or time necessary to complete a highly accurate manual digitization of landcover classes. The intention of this exercise was to provide a more accurate depiction of landcover types within the towns than is currently available from remotely sensed sources in a rapid fashion. Other than visual review, no quality assurance was conducted, no tests of consistency were completed and no measure of expected accuracy was assessed.

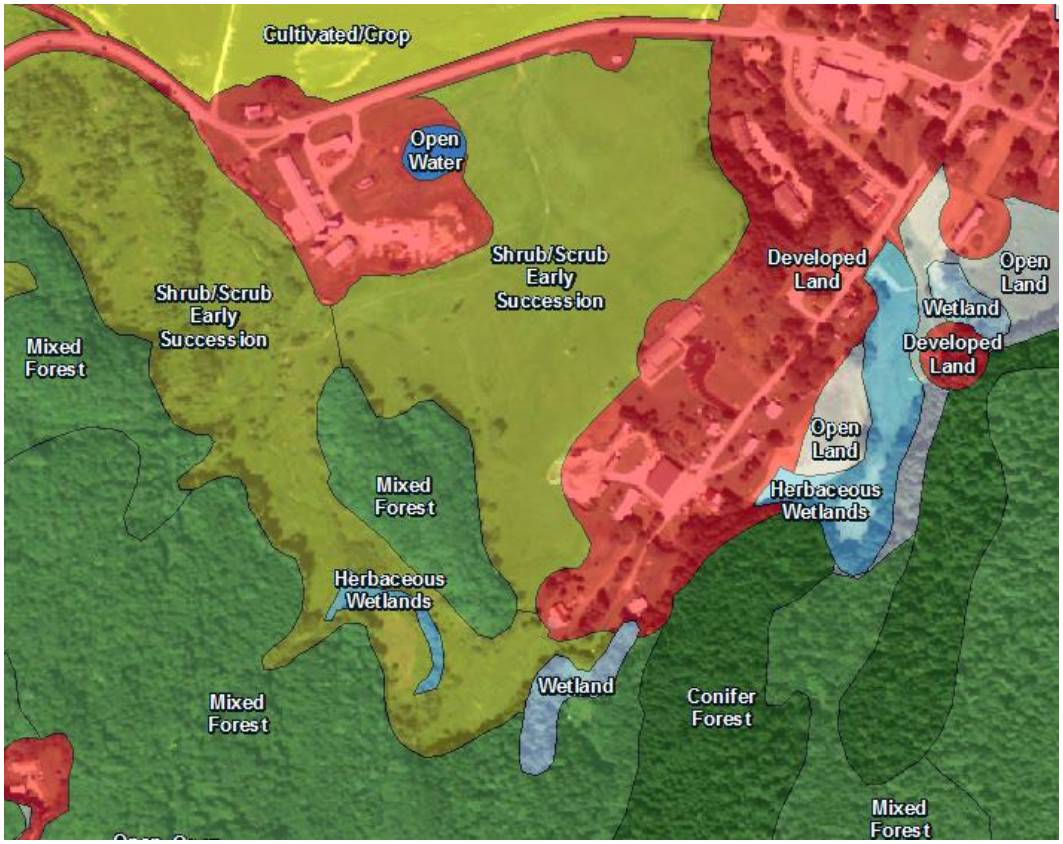



Figure 2. Sample Result of Land Cover Mapping

## *C. Wetland Mapping and Assessment*

For the purposes of this inventory, a wetland is defined as an area that is inundated by surface or ground water with a frequency sufficient to support organisms that depend on saturated or seasonally saturated soil conditions for growth and reproduction. For any particular site to be considered a wetland there needs to be the following three criteria present: 1) hydrophytic (wetland) vegetation, 2) hydric soils, and 3) wetland hydrology. The boundaries of wetlands cannot be determined and/or delineated remotely. The boundaries present on the attached inventory map are for planning purposes only; detailed fieldwork is required to determine the actual presence and extent of wetlands. The field work conducted during this study did not attempt to formally delineate the boundaries of any wetlands. The wetlands inventory consists of three related tasks, 1) Remote Wetland Mapping, 2) Field

Assessments, 3) Public Access Inventory, 4) Remote Functions and Values Analysis and, 5. Wetland Map Creation. The methodology for each of these tasks is outlined below.

### C.1. Remote Wetlands Mapping

The landscape analysis represents the first step in conducting an inventory of a Town's wetlands. As part of this Phase, AE identified and mapped the wetlands in the STA study area through a comprehensive review and interpretation of available paper and digital resource inventories, maps and photographs.

Information sources that were reviewed during the landscape analysis process include: 1:40,000 Color Infra-Red aerial photographs, Natural Resources Conservation Service soil survey maps, Black and White Orthophotography, NAIP Color orthophotography, 2006 Chittenden County orthophographs, Vermont Significant Wetlands Inventory maps and U.S. Geological Survey (USGS) topographic maps.

In general, the process for identifying and mapping wetlands starts with the Color Infra-Red aerial photographs (CIR photos). Wetlands identified from the CIR photos were transferred directly to a digital wetlands database created in an ArcGIS platform using the digital Orthophotographs as a base map. Polygon lines (approximate wetland boundaries) were drawn in this digital wetlands map using common landscape features present in both the CIR photos and the digital Orthophotographs. The digital Natural Resource Conservation Service (NRCS) hydric soils maps, Vermont Significant Wetlands Inventory (VSWI) maps, and U.S. Geological Survey (USGS) topographic maps were also consulted during this inventory. As each wetland was mapped, it was given a preliminary natural community name based on Wetland, Woodland, Wildland. A Guide to the Natural Communities of Vermont (Thompson and Sorenson 2000) and the NNHP updated community classification (January 10, 2012). Each of the data sources that were used during this inventory is described in detail below.

### *C1.a 1:40,000 NAPP Color Infra-Red Aerial Photographs (CIR photos)*

The CIR photos were the main data source used to identify wetlands for this inventory. The data sources described below were used to verify or confirm wetlands discovered using the CIR photos. This set of aerial photographs was flown in the spring (April-May) of 1992-1993 at a scale of 1:40,000. These are "false color" photos which combine infrared reflectance with the green and red visible bands. These photos were examined at 3X magnification under a stereoscope. The use of the stereoscope allows the photos to be viewed in three dimensions, thus enabling the interpreter to see elevation. These photos have proven to be the most useful tool for remotely identifying wetlands in Vermont. When evaluating aerial photographs, the most important characteristic is the "photosignature". The photosignature is the way that a feature, in this case a wetland, presents itself on the photograph. Water on the CIR photos presents a very clear, dark photosignature that is distinct from most other features in the photos.

Many wetlands, however, do not have standing water and the wetland photosignature may be unclear. In some cases, it was possible to confirm the presence of a wetland at these sites by using one of the other wetland data sources. At other sites, it was not possible to confirm or deny the presence of a wetland. In these cases, the site was included in the wetlands map but with a lower confidence or certainty score.

### *C1.b Vermont Significant Wetlands Inventory Map (VSWI)*

The VSWI map is based on the National Wetlands Inventory Map (NWI) and is used as the standard regulatory wetlands map for Vermont by the State Wetlands Office. For the purposes of this inventory, VSWI and NWI are used interchangeably. All wetlands that occur on the VSWI map appear on the attached wetlands inventory map. In many cases, the location of the wetland from the VSWI map is inaccurate and does not reflect the actual location of the wetland. Using the CIR photos and other map sources, these locations were corrected on the wetlands inventory map. In most instances, the wetlands on the VSWI map are indeed wetlands. There are a few instances where information from other map sources suggests that the site is not actually a wetland. In these situations, the wetland remained on the wetlands

inventory map because it is a state regulated wetland and should be checked in the field. In the Comments field of the database, however, it is noted that the site does not appear to be wet from other map sources.

### *C.1.c USGS Topographic Maps*

The USGS topographic maps were used as a secondary map source to better understand a wetlands position on the landscape. The topographic position can give insight to the nature of a wetland and the potential for wetlands to occupy certain areas.

### *C.1.d Digital Orthophotographs*

Orthophotographs are aerial photographs that are geo-rectified and, in the case of this inventory, used in a digital format. Unlike the CIR photos, the photosignature of wetlands in orthophotographs is often unclear. Orthophotographs are important, however, because they are digitized and geo-rectified. This allows the photo interpreter to accurately (and digitally) map a wetland that was identified from the CIR aerial photos. These orthophotographs were therefore used as a base map and all mapping of wetlands was done based on common landscape features present in these photographs and the CIR photos.

### *C.1.e Natural Resource Conservation Service (NRCS) Soil Survey*

A digital copy of the Chittenden County Soil Survey was used during this inventory. A map of all hydric soils in the towns was used to identify areas that may contain wetlands. Each soil type forms under different environmental conditions and can give clues to the nature of the wetland or potential wetland site.

As mentioned above, the presence of a wetland is dependent on hydric soils, wetland hydrology and wetland vegetation. Some areas of hydric soil, therefore, are not wetlands. Wherever hydric soils were present, other remote data sources were used to determine if the site likely contained a wetland. In many circumstances, other data sources led to the conclusion that wetlands occurred only in part of the hydric soil area. In these cases, polygon lines were redrawn to reflect probable wetland boundaries. The NRCS hydric soils boundary and the approximate wetland

boundary are therefore not identical. In most cases, the wetland areas are smaller than the hydric soil areas.

#### *C.1.f Wetland Confidence*

The above remote data provides a lot of information about the presence and nature of wetlands on the landscape. In most cases, using this data, wetland locations and extent can be confidently mapped. In some cases, however, the remote data is unclear if a site contains a wetland or not. This is complicated by the fact that, even in the field, determination of a jurisdictional wetland can sometimes be difficult. In order to track this varying level of mapping accuracy, a wetland "Confidence" ranking is built into the database. Wetlands are ranked Low/Medium/High; wetlands that are ranked Low Confidence could be considered "potential" wetlands. In these cases, a field visit is recommended to determine if the site actually contains a wetland.

### C.2. Field Assessments

Field assessments of selected wetlands were conducted during the 2013 field season. The purpose of the field inventory was to assess the accuracy of the remote wetlands identification procedure and to obtain more in depth data about a wetland's natural community type and functions and values. Wetlands selected for a site visit were chosen with the intent of visiting a cross-section of wetlands in terms of natural communities, functions and values, and remote mapping confidence. Landowner permission for conducting field visits was secured before field visits were made. No parcels were visited without landowner permission.

#### *C.2.a Natural Community Assessments*

Each wetland that was visited received a natural community assessment. This assessment involves collecting data on wetland soils, vegetation structure and composition, topographic position and other relevant ecological information. Special attention was paid to noting factors that may degrade the quality of the wetland community such as invasion of exotic plants, disruption of local hydrology, surrounding landuse or direct development in the wetland. Together, this

information was used to assign each community visited a final natural community name and to give information about the current condition of the community.

For wetlands that received a field visit, the natural community ranking protocol outlined in Section C(4) was employed.

#### *C.2.b Field-Based Functions and Values Assessment*

Each wetland that obtained a field visit also received an in-depth functions and values assessment. The assessment involves evaluating a wetland based on its vegetation, hydrology, habitat diversity, topographic position, shape, size and position in the watershed for select functions and values. The Vermont Wetland Evaluation Form, US Army Corps of Engineers Highway Methodology Handbook and Golet Model Wetland Evaluation Form were used as guides for establishing the functions and values criteria. As a result of the assessment, each wetland is given a functional score based on a scale of no/low/medium/high. Each visited wetland was assessed for the following functions and values:

- Water Storage for Flood Water and Storm Runoff
- Surface and Ground Water Protection (Water Quality)
- Wildlife Habitat
- Fisheries Habitat
- Exemplary Wetland Natural Community
- Rare, Threatened and Endangered Species Habitat
- Erosion Control through Binding and Stabilizing the Soil
- Open Space and Aesthetics
- Recreation Value and Economic Benefit
- Education and Research in Natural Sciences.

The following is a description of how wetlands perform the specified function and/or value listed above. The functional assessment is based upon whether the wetland has the capacity for the function or value and whether there is an opportunity for the wetland to perform the specific function or value

### *C.2.c Water Storage for Flood Water and Storm Runoff*

Wetlands that retain and slowly release floodwaters are usually associated with streams or rivers. In order for a wetland to perform this function, there must be an expandable basin present in the wetland that allows room for the floodwater to disperse. This expandable basin and the presence of persistent vegetation have the effect of slowing the water down and diffusing the energy of the floodwater.

The most significant wetlands for this function are located upstream of significant natural resources or human resources such as developed areas, culverts, and roads. In these circumstances, the upstream wetlands may be protecting these resources from floodwaters, such that any activity that impairs the wetland's ability to perform this function will often have serious impacts to downstream resources.

### *C.2.d Surface and Ground Water Protection (Water Quality)*

Many wetlands filter sediments and nutrients, such as phosphorus and nitrogen, from surface waters resulting in improved water quality. Wetlands that retain nutrients generally have diffuse or sinuous drainage pathways which slow down the flow of water. Slower water velocity provides more opportunity for sediments and nutrients to settle out and to be absorbed by vegetation. The velocity of the water moving through a wetland is determined by slope, landscape position and the outlet conditions in the wetland. Wetlands with constricted outlets generally have much slower water velocities and greater potential for sediment and nutrient removal. The presence of persistent vegetation is also important for slowing down water velocities.

The water quality function takes on particular importance in impaired watersheds where water and its uses are diminished. The opportunity for a particular wetland to perform this function is determined by the presence of agricultural lands, urban impervious surfaces, steep slopes, and areas of impaired water quality. Wetlands that recharge a wellhead protection area or contribute to the flows of Class A surface water may also be of particular importance.

### *C.2.e Wildlife Habitat*

Wildlife use of wetlands is widely variable and dependent upon the size, diversity and structure of the wetland. In general, the wetlands that are the most valuable for wildlife are those that have multiple community types, greater vegetative diversity, some open water and multiple layers of vegetation. The interspersion of the open water and different vegetation cover can also be important for determining wildlife use. In general, a greater diversity of wildlife is often found in wetlands that have open water that is extensively interspersed with vegetation. The interspersion of different vegetation or cover types is also important.

Large wetlands, with ample space and a variety of food and cover resources often harbor a greater diversity of wildlife. Smaller wetlands are also important for wildlife when viewed not as individual wetlands but as groups or clusters of wetlands on the landscape. These smaller wetlands often work in concert to provide habitat for species that utilize several different wetlands throughout their weekly or yearly movements on the landscape.

### *C.2.f Fisheries Habitat*

The fisheries function is determined primarily upon a wetland's connection to a permanent surface water that could provide fish habitat. Wetlands that are associated with these permanent surface waters can increase the fisheries habitat by: 1) providing pools and refugia during periods of low water; 2) providing shade to the surface waters thereby lowering the temperature of the water (which is crucial to some species of fish); 3) providing stream bank stability thereby decreasing the amount of river clogging sediments in the water system; 4) providing undercut banks which offer spawning, nursery, feeding and cover habitat for fish and; 5) providing an input of cool, clean spring water into the surface water system.

### *C.2.g Exemplary Wetland Natural Community*

This function is meant to evaluate whether or not wetlands may harbor significant natural communities or vegetation. In general, wetlands of rare or unusual types are considered significant for this function. Any wetland community that is tracked by NNHP is considered significant. Also, any wetland of the following community

types is considered significant for this function: Dwarf Shrub Bog, Poor Fen, Rich Fen, Alpine Peatlands, Red Maple-Black Gum Swamp, Red Maple-Black Ash Seepage Swamp, Deep Bulrush Marsh, Cattail Marsh, Northern White Cedar Swamp, Spruce-Fir-Tamarack Swamp.

Also, wetlands with deep peat accumulation, old growth swamps, and wetland mosaics are often significant for this function.

#### *C.2.h Rare, Threatened and Endangered (RTE) Species Habitat*

The presence of the RTE function is determined based upon the presence of a Federal or State listed Threatened and Endangered species of plant or animal within the wetland. Also, a wetland can rank for this function if there is a population of a very rare (S1), rare (S2), historic (SH) species present in the wetland. Finally the presence of multiple uncommon (S3) species can also be sufficient reason to rank a wetland for this function.

#### *C.2.i Erosion Control through Binding and Stabilizing the Soil*

Many wetlands located in areas where erosive forces are present are important for this function. This includes wetlands along rivers and streams and wetlands along lakes and ponds where there is enough fetch to produce erosion along the shore. In the STA study area, wetlands found along the Winooski River are most important for this function. The most important element in a wetland significant for this function is the presence of persistent vegetation, especially woody vegetation such as trees and shrubs. The roots of this vegetation act to bind the soil and prevent it from eroding. Wetlands that perform this function upstream of biologically significant areas such as spawning habitat, significant natural communities, or RTE element sites are very valuable.

#### *C.2.j Open Space and Aesthetics*

The Aesthetics function is determined primarily by a wetland's position in the landscape in relation to ease of public viewing. Wetlands that can be readily viewed by the public, such as those on public lands or along the road network are often significant for this function. These wetlands are important because they enhance the

likelihood of observing wildlife and colorful wildflowers. A higher rank is given for wetlands that possess special or unique aesthetic qualities or are prominent on the landscape. Open space becomes a particularly important function in more developed areas.

#### *C.2.k Recreation Value and Economic Benefits*

The recreation function is determined based on the presence or likelihood of recreational activities occurring within the wetland or wetlands that provide economic benefits. This includes wetlands that provide habitat for species that can be fished, hunted or trapped and/or the presence of wild foods that are harvested.

#### *C.2.1 Education and Research in Natural Sciences*

Wetlands that are significant for Education and Research are generally those that have a history of use for these purposes or have the real potential to be used for these purposes. Wetlands that are owned by an education or research institution are typically significant for this function.

### C.3. Public Access Inventory

As part of the inventory process, information on wetland boundaries and community types was gathered from points of public access such as public roads. Observations from this "windshield survey" were used to help refine the wetland map. Roads in the STA study area were travelled and information about wetland boundaries, community types and functions and values was recorded.

### C.4. Remote Wetland Functions and Values Assessments

In order to gain a better understanding of wetlands that did not receive a field visit, a remote functions and values analysis was performed for each wetland in the STA study area. This assessment involves understanding information about a wetland's soils, vegetation, shape and size, connection to surface waters, habitat diversity and position in the landscape to produce a composite picture about a wetland's role in the larger ecosystem. This information is integrated with the criteria for functions

and values (detailed above) to make predictions about the likelihood of a wetland performing any of these listed functions and values.

Because this is a remote inventory process, field work should be used to confirm the results of this analysis.

### C.5. Wetlands Map Creation

Once fieldwork was concluded, field data was compiled and integrated into the Wetlands Inventory Map. This involved adding wetlands that were discovered during the field inventory, changing wetland boundaries on the map and removing sites that were determined not to be wetlands. Data from the field visits were also incorporated into the attribute table which is linked to the map. The information included in the attribute table is listed in Appendix 3.

## *D. Upland Natural Community Mapping and Assessment*

Upland natural communities were identified and mapped in the STA study area during this inventory. Similar to the wetlands inventory, the natural community assessment was conducted in two phases. The first phase was a remote landscape analysis of the study area and the second was field evaluations of selected sites. Results of each of the phases were brought together to create the final Natural Communities Inventory Map. The phases of the assessment are described in more detail below.

### D.1. Remote Uplands Landscape Analysis

Similar data sources described in Section C (5) above were used to remotely map and identify upland natural communities in the STA study area. Preliminary boundaries of natural communities were drawn using various orthophotographs as a base map. Each site was given a preliminary natural community name based on Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont (Thompson and Sorenson, 2000) and the NNHP updated community classification (January 10, 2012).

### D.2. Field Assessments

Field assessments of selected sites were conducted during the 2013 field season. Using the information from the remote analysis, the field inventory seeks to refine the base map and gain more in depth information not obtainable from remote sources. The field inventory focused on 1) classifying the natural communities mapped during the remote analysis and 2) assessing the current condition of those natural communities. Landowner permission for conducting field visits was secured before field visits were made. No parcels were visited without landowner permission.

For natural communities that received a site visit, an overall ecological inventory was conducted. This inventory included the identification of the dominant plant species by strata, information on soils, and an explanation of the development of the community, where appropriate. Notes on the current condition of the community were also taken. This brief assessment includes information on the degree of and time since major human disturbance and information on the presence or absence of non-native, invasive plant species.

### D.3. Uplands Natural Community Map Creation

Once fieldwork was concluded, field data was compiled and integrated into the Upland Natural Communities Inventory Map. This involved adding natural communities that were discovered during the field inventory, changing community boundaries on the map and removing sites that were determined not to be uplands. Due to the difficulty of mapping natural communities on a town-wide scale, some larger polygons contain small fields and areas of residential development. Some smaller forest patches (especially those surrounded by open land) did not get mapped. Data from the field visits were also incorporated into the attribute table which is linked to the map. Attribute information for the upland natural community map is presented in Appendix 3.

### D.4. Natural Community Ranking and Significance Determination

Determining the local or state significance of natural features occurs after all of the field work is completed and the final maps are compiled. The local or state significance methodology is based on the system used by the Vermont NonGame and Natural Heritage Program. For natural communities this methodology takes into account the rarity, size and condition of the community as well as the quality of the landscape that the community exists in.

The state has a system of rarity rankings that are based on a numeric system of 1-5 (from rarest to most common). This rank is usually preceded by an "S" to indicate that the rank is on the state-wide scale. This ranking is assigned to each community type as a whole and does not refer to specific examples of the community. This rarity ranking is included in the database in the "State_Rank" field and is based on the following system:

- S1 Very Rare (1-5 occurrences)
- S2 Rare (6-20 occurrences)
- S3 Uncommon (> 20 occurrences)
- S4 Apparently Secure
- S5 Demonstrably Secure

Particular occurrences of communities are ranked based on the conditions present on the site. As mentioned above, the factors that determine the rank of a particular community include its condition, size and condition of the landscape. This alphabetic ranking (A-D) is included in the database in the "EO_Rank" (Element Occurrence) field. In most cases, sites that did not receive a field visit were not ranked. In some cases, assumptions were made about particular communities based on field work in nearby sites and remote sources.

For many natural communities, the ranking methodology allows for multiple communities to be grouped together and ranked as a single unit. Multiple communities of the same type which are separated by short distances on the

landscape may be considered as one "element" when ranking. The grouping of some of these communities is shown in the "ElementGrp" field.

Once particular communities are ranked, the Element Occurrence ("EO_Rank" field) is compared to the State rarity rank ("State_Rank" field). A community would be considered state significant if the following criteria are met: S1 or S2 communities with an EO rank of A, B or C; S3 or S4 communities with an EO rank of A or B; S5 communities with an EO rank of A. These guidelines are considered in conjunction with professional judgment and knowledge about the site.

Local significance is determined in two different ways. The first method follows the methodology of determining state significance but puts the community in a local perspective. Local geology, biophysical region, size and condition of the community all play a role in determining local significance. All communities that were considered to be state significant are also considered locally significant. In addition, any community that doesn't meet the criteria for state significance but is considered to be significant on the town scale is also labeled as locally significant.

The second method for determining local significance is applicable only to wetlands and is assessed in terms of functions and values. The FxnSum field in the attribute table is a weighted summary score of the individual functions and values criteria ranks. This summary score gives an overall picture of the degree to which each wetland is performing functions and values. The higher the summary score, the greater the overall wetland function. Determination of local significance for a particular wetland takes into account these summary scores along with professional judgment. Wetlands with the highest summary scores are often (but not always) larger wetlands or wetland complexes that have direct connections to surface waters.

The reason for assigning local significance (because of natural community or functions and values) is listed in the "Justificat" (Justification) field of the attribute table.

### *E. Wildlife Habitat Mapping and Assessment*

Wildlife habitat elements were identified within the STA study area utilizing Geographic Information Systems (GIS). All GIS data presented in this project should be considered approximate. The locations depicted are for planning and community level analysis purposes, and further field biological assessments should be considered a requirement for additional understanding of the function of the wildlife unit area on the landscape and its importance to any or all species that may utilize it. This section describes the derivation process for the individual habitat unit polygons, the attributes and assessment are discussed in the study report.

The following habitat elements were identified and mapped:

- Core forest units
- Deer winter habitat
- Mast stands
- Early succession areas
- Forested riparian corridors
- Wetlands
- Ledges, cliffs & talus

#### E.1. Core Forest

Core forest areas for the State of Vermont were originally developed by the UVM Spatial Analysis Lab (SAL) for inclusion in a region wide GAP analysis. AE utilized similar parameters as the original SAL project, but updated the inputs using landcover classifications from the land cover/natural community (NCLC) mapping efforts described above.

Developed and open land features from the NCLC were buffered by 100 meters and the remaining areas within the study area were considered Core Forest. For the purposes of this project, any Core Forest Units with an area of 20 acres or less were eliminated.

### E.2. Deer Winter Habitat

Delineation of deer winter habitat, or deer wintering areas (DWA) began with review of the existing State of Vermont Deeryard data layer. Deer winter habitat was assessed remotely based on upland natural community descriptions discussed earlier in this report. Natural community polygons with an appropriate conifer component were assessed using GIS processing tools for their average aspect. Communities were then ranked using the following matrix where 1 is the highest value and 3 is the lowest and 0 denotes no value as a deer wintering area:

| Natural Community | Deer Winter Rank |
|---|---|
| Dry Red Oak-Pine Forest | 0 |
| Hemlock Forest | 1 |
| Hemlock-Northern Hardwood Forest | 2 |
| Hemlock-Red Oak-White Pine Forest | 2 |
| Hemlock-Red Spruce Forest | 1 |
| Lowland Spruce-Fir Forest | 1 |
| Montane Spruce-Fir Forest | 0 |
| Montane Yellow Birch-Red Spruce Forest | 3 |
| Montane Yellow Birch-Sugar Maple-Red Spruce Forest | 3 |
| Plantation | 3 |
| Rich Northern Hardwood Forest | 0 |
| Mesic Red Oak-Northern Hardwood Forest | 0 |
| Red Pine Forest or Woodland | 3 |
| Red Spruce-Northern Hardwood Forest | 3 |
| Red Spruce-Heath Rocky Ridge Forest | 2 |
| Subalpine Krummholz | 0 |
| Temperate Hemlock Forest | 1 |
| White Pine-Northern Hardwood Forest | 0 |
| White Pine-Red Oak-Black Oak Forest | 0 |
| Spruce-Fir Tamarack Swamp | 1 |

Average aspect was used to further refine the rankings as follows:

| Rank | Aspect | Deer Winter Value |
|---|---|---|
| 0 | Any | None |
| 1 | Any | Likely |
| 2 | South or West | Likely |
| 2 | Other | Potential |
| 3 | Any | Potential |

Following field evaluations, the polygons were modified to reflect conditions noted in the field, including current signs of use and habitat potential based on professional experience.

### E.3. Mast Stands

Hard mast of importance to black bear within the study area is assumed to be American Beech and Red Oak tree species. Mast stands as identified for the purposes of this study originated from the following sources:

- Natural Communities mapped as a component of this project with a significant Oak component.
- Vermont Dept. of Fish and Wildlife bear points database (vector- point)
- Mast locations identified by the public on a project specific online mapping platform set up to collect local knowledge.
- Field visits by AE personnel
- Vermont Dept. of Forest Parks & Recreation, aerial forest health monitoring data- The VT Dept. FPR conducts annual aerial surveys throughout the State of Vermont in order to map forest health threats, insect attacks and tree disease. One disease identified and mapped by the aerial forestry team is Beech Bark Disease, a disease specific to American beech trees, and unfortunately quite prevalent in our region. AE utilized the FPR Beech Bark Disease data as provided in draft form by the VT Dept. FPR to identify areas where concentrations of American beech trees are likely to occur. As this data identifies areas of diseased beech trees, not necessarily those used by black bears, it was not utilized as a primary source for this project, but was referenced during secondary review.

Mast stands from all the above sources were confirmed or refined when visited in the field; however, no attempt was made to provide an accurate depiction of the extent or boundary of any American beech stand or concentration. Mast stands appearing in the data and maps accompanying this report are very general locations. Numerous possible mast areas were not evaluated in the field. This should NOT be construed as a complete accounting of all mast stand areas present within the project area. It is highly likely that unmapped mast stands exist in the towns, and their identification should continue to be a conservation priority. Boundaries presented for this project are to be considered approximate, habitat quality and bear use were not methodically evaluated within the scope of this project.

### E.4. Early Succession Habitat

Areas of early succession forest were delineated as a land cover component during the landcover analysis discussed above. Due to the limitation and resolution of the imagery, the areas defined as early succession were typically logging patch cuts, clear cuts or old fields. Small early succession patches in forested settings were not typically able to be seen, and therefore do not appear in the dataset. Wetlands identified as "old field" as well as beaver complexes and shrub community wetlands were added to the early succession habitat data, as many of these wetlands provide the vegetative structure and composition required by early succession obligate and facultative species. Any additional early succession areas discovered in the field were subsequently added to the dataset.

### E.5. Forested Riparian Corridors

Identification of forested riparian corridors was completed through a remote GIS model with the following inputs:

- Vermont Hydrography Dataset stream layer (line)
- Vermont Hydrography Dataset waterbodies layer (polygon)
- AE STA Landcover analysis, described above

Streams were buffered at 50 meters, giving a 100 meter wide corridor. Areas within the corridor that were described in the AE landcover analysis as open, developed or

misc, or were classified as agriculturally impacted wetlands in the natural community assessment were eliminated. Remaining forested areas within 50 meters of a stream, but separated from the stream by a road or not in contact with the stream centerline or waterbody edge were also eliminated using an automatic selection process.

All resulting corridor areas were merged to provide an approximation of intact riparian corridor areas.

### E.6. Bear Wetlands

Wetlands more likely to be utilized by black bear for spring feeding activity were derived from the complete wetland inventory data described in the study report for this project. The following wetland communities were included in this dataset:

Beaver wetlands, Seeps, Shallow Emergent Marsh, Cattail Marsh, Hemlock-Balsam Fir-Black Ash Seepage Swamp, Red Maple-Black Ash Seepage Swamp, Red/Silver Maple-Green Ash Swamp, Red Spruce Hardwood Swamp, Spruce-Fir-Tamarack Swamp, Alluvial Shrub Swamp, Northern White Cedar Swamp and Alder Swamp.

These wetland types were buffered by 500 feet and the composition of forested to non-forested area within each wetland buffer was derived based on the project land cover types. In addition, the perimeter of each wetland was evaluated for surrounding land cover types and the composition of the immediately surrounding landscape was determined. Because bears are more likely to visit and feed from wetlands in a landscape matrix that affords both thermal and visual cover, the following selection criteria were utilized to identify potential bear wetlands from the natural community group listed above:

Wetlands where: >50% of the surrounding landscape (500' buffer) is forested;

<u>AND</u> for forested wetland community types (ie. Hemlock-Balsam Fir-Black Ash Seepage Swamp, etc.) at least 50% of the wetland perimeter is adjacent to a forested area, <u>OR</u>, for non-forested wetland community types (ie. Shallow Emergent Marsh, etc.) where more than 60% of the wetland perimeter is adjacent to a forested area.

### E.7. Ledges, Cliffs & Talus

Ledges, cliffs and talus areas were derived from the following sources:

- Slopes over 100% (45 degrees)- from an automated slope analysis conducted by AE using the VCGI 10 meter resolution "VT HYDRODEM" elevation data as input.
- Natural community units indicating ledge outcrops, cliffs or talus.
- Field identified ledges, cliffs or talus by AE ecologists.

### E.8. Contiguous Habitat Units

Contiguous habitat units (CHUs) were derived from the above mentioned habitat elements. The contiguous units are patches of habitat that should be expected to provide a range of critical habitat function for a range of wildlife species including mammals, birds, reptiles and amphibians. CHUs were derived through combining the following previously described polygon layers:

- Core forest units
- Deer winter habitat
- Early succession areas
- Forested riparian corridors
- Wetlands
- Ledges, cliffs & talus

In many cases, there are forest zones adjacent to CHUs that likely function as secondary or possibly even primary habitat for some species but fall out of the definition used for development of the CHU layer.

Horizontal diversity was delineated within each CHU from 2006/2007 and 2011 orthophotography. Two separate axis were drawn (1) a north-south axis at the widest point of a core area, and (2) an east-west axis at the widest point of each CHU.

Along each transect a point was given for each natural community type, another point was given when a minor change in the community, such as a change in

hardwood species dominance, or the additional of minor amounts of evergreen trees in an otherwise deciduous forest-- that was at least 100 meters, was encountered. A point was also recorded whenever a major physiognomic change was encountered along the transect and was at least 10 meters in extent. Major changes include a change in dominance from a deciduous to a conifer dominated forest, a change from forest to shrubland, or when a wetland was encountered.

All the changes along both transects were then totaled and divided by the length of the two lines (combined) to arrive at a measure of change per unit linear distance – as a measure of overall horizontal diversity for the CHU. The number of changes divided by the total linear length of the axis yields a measure of the amount of vegetative change per unit length.

The more the vegetation changes along each axis-the greater the gross vegetative structural change within that CHU. By itself, and on a statewide basis, the amount of change per CHU is essentially meaningless (because we do not have this data over the range of the state). However, the high, medium, and low rankings provided in this study are a comparison of the relative diversity of the vegetative structure of CHU areas within the STA study area.

Each CHU was then described by a variety of statistics as presented in summary table format in Appendix 2 and listed below.

- Size of Contiguous Habitat (core habitat and overall)
- Horizontal Diversity of CHU
- Length of Streams
- Size of Deer Winter Habitat
- Area of Wetlands
- Presence (Count) of Vernal Pools
- Area of Early Succession Habitat
- Area of Riparian Corridor
- Presence of Mast Stands
- Presence of Ledge/Cliff/Talus

- Presence of Significant Natural Communities
- Elevation metrics
- Area of Conserved Land

### E.9. Wildlife Travel Corridors

Travel corridors, also called connecting lands or connecting habitats are land areas that serve to link other patches of important wildlife habitats together. Some species of wildlife rely on a variety of habitat features that are often separated from each other by roads, houses or other impediments to easy movement. Species in this category include many amphibians, bobcat, fisher, and river otter. Others species such as moose, deer and black bear require large tracts of similar landscape that are quite rare in the developed northeastern United States. In order to survive in this region, these wide ranging species must move between several habitat patches of similar makeup.

AE assessed wildlife travel corridors in the STA study area in the following ways:

- General wide ranging mammal corridors
- Amphibian road crossing zones

### E.10. General wide ranging mammal corridors

The process of identifying general wildlife travel corridors seeks to predict areas within a town or area that are most likely to provide safe and preferable passage to a wide range of non-specific wildlife from one large habitat patch to another. AE utilized three components in attempting to identify these locations. The components and their parameters all consider the landscape in somewhat general terms, at varying levels of resolution, with the intent of rapidly capturing a sense of potential habitat blocks and movement potential between them. The following steps were taken to identify potential wildlife travel corridors.

1. Road Track Value- road tracking points were counted based on a 60 meter square cell. Cells were assigned a ranking value (1-3) based on the number of track points present:

| # Track Pts | Rank |
|---|---|
| 1 | 1 |
| 2-5 | 2 |
| 6-18 | 3 |
| 0 | NoData |

2. WLCV Value- Wildlife Crossing Value developed by F&W/Vtrans was assigned to 60 meter square cells along roads based on the following matrix:

| WLCV | Rank |
|---|---|
| 1 | 1 |
| >1 | 2 |
| 0 | NoData |

3. CHU Corridor Rank- Corridor values were calculated and modeled in GIS as follows: Cost-Distance values were developed for each CHU within the study area. The result represented a combined distance and cost score for each cell within the study area relative to the CHU. These maps used the Natural Community data to determine travel cost as animals move across the landscape where lower cost represents a "safer" cover type for wildlife movement while numbers in the middle of the scale are considered "neutral" in the Land Cover/Cost table below:

| Land Cover | Cost Score |
|---|---|
| Forested | 1 |
| Mixed Forest | 1 |
| Forested/Shrub Wetlands | 1 |
| Conifer Forest | 2 |
| Herbaceous Wetlands | 2 |
| Deciduous Forest | 3 |
| Open- Grassland | 3 |
| Agricultural | 3 |
| Pasture/Hay | 3 |
| Shrub/Scrub Early Succession | 4 |
| Unknown | 5 |
| Open Water | 5 |
| Barren- Rock/Sand/Clay | 5 |
| Wetland | 5 |
| Upland | 5 |
| Open Land | 6 |
| Developed- Open Space | 7 |
| Cultivated/Crop | 7 |
| Developed Land | 10 |

The costs for each CHU and each of its adjacent CHUs in turn (1-2, 1-12, 2-3, 2-12 etc.) were then summed to provide a relative accumulated cost value for travel between each CHU and each of its neighbors.

The Cost Value between CHUs was reclassified and ranked based corridor potential using the following scale: (note corridor values are relative for the study area and are simply accumulative cost and distance measures, the breakout below was subjective based on professional judgment and local knowledge)

| Corridor Value | Rank |
|---|---|
| 1-800 | High |
| 800-1600 | Low |
| >1600 | None |

4. Combined Corridor Value and placement: The Corridor Rank, WLCV Value and Road Track Value were mosaicked together with the highest value of any cell taking priority to provide a general Potential Corridor placement guide.

5. Potential Corridors: Potential corridors were hand placed using the Combined Corridor Value, public sighting input (from online map), CHU proximity to roads and professional judgment as a guides. The Jericho and Richmond Uplands Project tracking points were used as a final check to cross reference corridor placement.

The Potential Corridor polygons are intended to represent LIKELY or POTENTIAL locations where wildlife in general (not species specific) are able to more safely travel between Contiguous Habitat Units, usually across roads and developed areas.

### E.11. Amphibian Road Crossings

The location of potential crossing sites was determined from remote sources, existing crossing data in Huntington and public sighting records. The location of vernal pools and vernal pool-wetlands was examined in relation to the upland forest habitat and road locations. Using this information along with the known migration distances for the different amphibians that breed in vernal pools, the potential crossing sites were mapped.

The migration distances used to determine likely road crossing sites were taken from the published literature. There is a fair amount of variability in the records of migration distances within amphibian species. The three species considered during this analysis were Wood frog (*Rana sylvatica*), Spotted salamander (*Ambystoma maculatum*) and Jefferson salamander (*Ambystoma jeffersonianum*). Spotted salamanders have been known to migrate up to 2700 ft., but on average around 380 ft. Jefferson salamanders are known to migrate up to 2000 ft. but on average around 500 ft. Wood frogs are probably the well-traveled as a species, with annual migration towards breeding pools around 1500 ft. (Colburn, 2004).

When determining road crossing sites, a rough figure of around 800 ft. was used. If a vernal pool habitat element was found greater than 800 ft. from a road, it was

generally not included in the crossing site map. The reason for using this lower number (instead of the 1500 ft. for wood frogs) was that it is unlikely that all of the vernal pool habitat sites are known in the study area. The farther away a known pool is from upland forested habitat, the greater the likelihood that other suitable habitat is closer. Also, the migration distances for these species in Vermont may be different than those reported elsewhere in the literature. Most of the longer distances were reported from the Midwest where topographic obstacles may not be a factor as they likely are in Vermont.

Potential crossing areas were ranked based on the likelihood and intensity of use. This rank is based on the quality of the upland and wetland habitat and migration distances present. In addition, notes on potentially barriers to amphibian migration were noted. These were most often residential development and open fields.

**Appendix 2**
**Wildlife Habitat Summary Data for Contiguous Habitat Units**

| CHU # | NAME | Size (acres) | Core Area (Acres) | Deeryard Area (acres) | Stream Length (miles) | Wetland Area (acres) | Early Successional (acres) | Forested Riparian Corridor (acres) | Mast Present | Ledge Present | Bear Wetland Present | Vernal Pool Present (#of) | Significant Natural Community Present | Max Elevation (ft) | Min Elevation (ft) | Elevation (mean) | Elevation Range (ft) | CHU Horizontal Diversity Rank | Conserved Area (acres) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Weaver Brook | 112 | 64 | 52 | 1.0 | 1 | 0 | 35 | N | N | Y | 0 | N | 1243 | 834 | 1037 | 409 | H | 0 |
| 2 | Browns Mountain | 164 | 118 | 53 | 0.5 | 0 | 0 | 22 | N | N | N | 0 | N | 1544 | 797 | 1175 | 747 | M | 0 |
| 3 | Shaker Mountain | 250 | 149 | 110 | 3.0 | 4 | 36 | 78 | N | Y | N | 0 | N | 1385 | 716 | 946 | 669 | M | 102 |
| 4 | Huntington Center | 365 | 263 | 54 | 1.0 | 30 | 44 | 39 | N | Y | Y | 0 | Y | 1654 | 698 | 1186 | 956 | H | 0 |
| 5 | Hinesburg Hollow | 743 | 574 | 386 | 3.5 | 40 | 4 | 51 | N | Y | Y | 0 | Y | 1561 | 624 | 945 | 937 | L | 148 |
| 6 | Mailbox Trails | 617 | 445 | 316 | 2.9 | 55 | 14 | 98 | N | N | Y | 0 | Y | 1204 | 607 | 879 | 597 | H | 45 |
| 7 | Ravens Ridge | 1323 | 1086 | 502 | 5.9 | 18 | 6 | 215 | Y | Y | Y | 0 | Y | 1576 | 589 | 1077 | 987 | M | 0 |
| 8 | Economou | 196 | 171 | 21 | 1.9 | 0 | 0 | 68 | N | N | N | 0 | N | 1213 | 752 | 1006 | 461 | H | 0 |
| 9 | Riverside | 200 | 96 | 131 | 1.6 | 18 | 11 | 67 | Y | Y | Y | 0 | N | 921 | 535 | 667 | 386 | H | 0 |
| 10 | Texas Hill | 869 | 690 | 225 | 5.3 | 17 | 7 | 179 | Y | Y | N | 0 | Y | 1480 | 571 | 1003 | 909 | H | 88 |
| 11 | Mayo Mountain | 983 | 654 | 458 | 5.2 | 23 | 22 | 240 | Y | Y | Y | 0 | Y | 1687 | 298 | 886 | 1389 | M | 18 |
| 12 | Camels Hump | 19162 | 1730 | 4139 | 95.9 | 292 | 337 | 3527 | Y | Y | Y | 13 | Y | 4087 | 336 | 1695 | 3751 | L | 1223 |
| 13 | Sherman Hollow | 1111 | 869 | 425 | 7.0 | 26 | 11 | 242 | Y | Y | Y | 0 | Y | 1416 | 513 | 926 | 903 | L | 60 |
| 14 | Owls Head | 236 | 192 | 80 | 0.3 | 6 | 0 | 8 | N | Y | N | 0 | N | 1134 | 653 | 889 | 481 | H | 0 |
| 15 | Collins Mtn | 485 | 406 | 50 | 2.6 | 17 | 3 | 87 | N | N | Y | 0 | N | 1150 | 577 | 884 | 573 | M | 0 |
| 16 | Cochran | 2265 | 1815 | 925 | 12.0 | 23 | 67 | 413 | Y | Y | Y | 2 | Y | 1460 | 299 | 826 | 1161 | L | 220 |
| 17 | Iroquois | 1064 | 925 | 421 | 2.5 | 43 | 52 | 70 | Y | Y | Y | 0 | Y | 1281 | 640 | 953 | 641 | M | 223 |
| 18 | Chamberlain Hill | 450 | 199 | 241 | 3.9 | 53 | 37 | 119 | Y | N | N | 0 | Y | 935 | 288 | 488 | 647 | M | 0 |
| 19 | Joiner Brook | 169 | 88 | 52 | 4.7 | 3 | 0 | 109 | N | Y | Y | 0 | Y | 2080 | 1288 | 1710 | 792 | H | 83 |
| 20 | Yantz Hill | 976 | 629 | 601 | 2.0 | 68 | 106 | 54 | Y | Y | Y | 2 | N | 1140 | 314 | 728 | 826 | M | 42 |
| 21 | Southview | 480 | 225 | 348 | 4.5 | 19 | 37 | 149 | N | N | Y | 0 | N | 739 | 310 | 521 | 429 | L | 0 |
| 22 | Preston Pond | 2106 | 1879 | 641 | 13.7 | 73 | 15 | 360 | Y | Y | Y | 5 | Y | 1771 | 333 | 1171 | 1438 | H | 434 |
| 23 | Snipe Island | 2145 | 1711 | 963 | 14.2 | 168 | 61 | 382 | Y | Y | Y | 2 | Y | 1505 | 329 | 917 | 1176 | L | 1387 |
| 24 | Huckleberry Hill | 3185 | 2717 | 661 | 16.9 | 59 | 163 | 515 | Y | Y | Y | 0 | Y | 1668 | 314 | 953 | 1354 | L | 1277 |
| 25 | Cemetery | 102 | 59 | 7 | 3.1 | 15 | 0 | 58 | N | N | Y | 0 | N | 1030 | 825 | 931 | 205 | H | 98 |
| 26 | Nashville | 118 | 0 | 0 | 2.6 | 114 | 6 | 60 | N | N | N | 0 | Y | 798 | 748 | 766 | 50 | H | 95 |
| 27 | Mill Brook | 203 | 84 | 86 | 3.5 | 41 | 3 | 91 | N | N | Y | 0 | Y | 678 | 328 | 529 | 350 | M | 87 |
| 28 | Research Forest | 948 | 734 | 536 | 3.8 | 3 | 29 | 135 | N | N | Y | 2 | Y | 825 | 291 | 488 | 534 | L | 403 |
| 29 | Gravelpit | 139 | 45 | 61 | 1.0 | 57 | 1 | 24 | N | N | Y | 0 | N | 797 | 579 | 637 | 218 | H | 48 |
| 30 | Jericho Ctr | 106 | 67 | 45 | 0.3 | 0 | 8 | 4 | N | N | N | 1 | N | 1137 | 719 | 918 | 418 | H | 0 |
| 31 | Bolton Mtn | 15192 | 1468 | 2052 | 65.6 | 75 | 91 | 2427 | Y | Y | Y | 6 | Y | 3688 | 326 | 1857 | 3362 | L | 9584 |
| 32 | Birch Hill | 886 | 756 | 212 | 3.3 | 52 | 34 | 110 | Y | N | Y | 9 | Y | 1329 | 613 | 1008 | 716 | M | 624 |
| 33 | Laisdell Hill | 374 | 177 | 260 | 3.4 | 43 | 11 | 88 | N | N | N | 0 | Y | 1041 | 533 | 741 | 508 | H | 0 |
| 34 | OP Hill | 1415 | 1010 | 486 | 9.7 | 239 | 38 | 254 | Y | Y | Y | 4 | Y | 1471 | 690 | 940 | 781 | M | 1415 |
| 35 | Castle | 275 | 215 | 37 | 3.1 | 1 | 0 | 74 | N | Y | Y | 0 | Y | 1241 | 682 | 940 | 559 | L | 275 |
| 36 | Saxon Hill | 126 | 61 | 69 | 1.3 | 0 | 3 | 48 | Y | Y | N | 0 | N | 770 | 295 | 598 | 475 | M | 0 |
| 37 | Skunk Hollow | 1077 | 608 | 647 | 5.0 | 55 | 46 | 158 | N | N | Y | 0 | Y | 913 | 290 | 582 | 623 | M | 264 |
| 38 | Lee River | 157 | 0 | 67 | 3.3 | 64 | 28 | 70 | N | N | Y | 0 | Y | 674 | 491 | 561 | 183 | M | 0 |
| 39 | Jericho | 159 | 74 | 52 | 2.3 | 2 | 0 | 58 | N | N | N | 0 | N | 765 | 515 | 625 | 250 | M | 28 |
| 40 | Bald Hill | 1842 | 1708 | 171 | 6.0 | 7 | 32 | 220 | Y | Y | Y | 5 | Y | 1932 | 672 | 1222 | 1260 | L | 801 |
| 41 | Browns River | 111 | 21 | 18 | 2.5 | 93 | 4 | 16 | N | N | N | 0 | Y | 692 | 625 | 636 | 67 | H | 0 |
| 42 | Cap Hill | 344 | 250 | 40 | 2.3 | 39 | 43 | 61 | N | N | Y | 1 | Y | 1225 | 656 | 941 | 569 | M | 0 |
| 43 | Cilley Hill | 293 | 219 | 25 | 1.4 | 25 | 12 | 49 | N | N | Y | 0 | Y | 1244 | 648 | 860 | 596 | M | 0 |