Significant Natural Communities and Natural Community Systems of Jericho, Vermont

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This report contains an inventory of significant natural community and natural community system occurrences in Jericho, Vermont. This project was undertaken as part of a larger project, the Jericho Significant Wildlife Habitat Project, to identify portions of the Town that are critical for the maintenance of high public and conservation value wildlife populations. As this was the first of a series of Jericho Significant Wildlife Habitat Project modules, additional data beyond natural communities was also gathered and consolidated.

The main body of this report contains introductory information on identifying, evaluating, and the utility of mapping natural communities and natural community systems. It also contains a town-wide perspective on Jericho's natural communities and natural community systems. Appendix I contains detailed occurrence reports and photos of significant natural community and natural community system occurrences documented in Jericho. Appendix I contains sensitive information and will only be distributed to the immediate landowner(s) and the Town of Jericho. Appendix II contains an annotated list of areas needing further inventory work; these areas are likely to contain yet undocumented significant natural community or natural community system occurrences or these areas contain known natural community or natural community system occurrences that are currently unranked due to limited data availability..

What is a Natural Community and Natural Community System

Natural communities are recurring assemblages of plants and animals found in particular physical environments. Each natural community type is distinguished by three primary characteristics:

1. definite plant species composition;
2. a consistent physical structure (such as forest, shrubland, or grassland); and
3. a specific set of physical conditions (such as different combinations of nutrients, drainage, and climate conditions).

In Vermont, there are over 80 upland and wetland natural community types currently recognized. Most are described in *Wetland, Woodland, Wildland* (Thompson and Sorenson, 2000), but more recent refinements and recently described community types are available through the Vermont Nongame and Natural Heritage Program.

Natural communities come in all shapes and sizes, from large occurrences greater than 100,000 acres in size to very small occurrences less than 1 acre in size. Natural communities also vary greatly in their ecological specificity and tolerances. Some communities, like Rivershore Grasslands, are inextricably linked to a very precise combination of environmental factors. In the case of the Rivershore Grasslands, for example, this community is tied to the ebb and flow of the river, the annual ice scour, and very particular substrates and stream gradients. Only when this very precise combination of factors co-occurs, will this community develop and maintain itself. There are numerous other communities only found in similarly narrow ranges of conditions.

Other natural communities, like Northern Hardwood Forests, are found over a wide range of conditions. They are considered to be very plastic and tolerant of a diversity of

conditions and often develop and maintain themselves over a wide range of conditions with very minor compositional or structural (the shape or architecture of a community) differences. Northern Hardwood Forests, for example, are found over a variety of soils, bedrock types, elevations, and aspects.

Based on typical natural community size and ecological specificity we classify natural communities into one of three patch sizes: matrix, large patch, and small patch. The size and ecological specificity of each patch size class are listed below.

Patch Size: these categories describe the typical size of individual contiguous occurrences of the community type, and the specificity with which the community type is associated with particular environmental conditions and ecological processes
Matrix: a natural community type that is dominant in the landscape, occupying 1,000 to 100,000 contiguous acres. Matrix communities have broad ecological amplitude, occurring across a wide range of soil and bedrock types, slopes, slope aspects, and landscape positions. Regional scale processes such as climate typically determine their range and distribution.
Large Patch:a natural community type that occurs in the landscape on a scale of 50 to 1,000 acres and is usually associated with a single dominant ecological process or environmental condition such as fire or hydrology.
Small Patch: a natural community that occurs in the landscape as small, discrete areas typically less than 50 acres, and for some types, consistently under an acre in size. Small patch communities occur where several ecological processes and environmental conditions come together in a very precise way.

Table 1 : Natural Community Patch Sizes from Thompson and Sorenson 2000.

It is also important to note that strategies to conserve or maintain a community of one patch size may not be appropriate for other patch sizes. For example, matrix-forming Northern Hardwood Forests, which occur extensively in Jericho, are often best maintained through a healthy and sustainable forest products industry. One of the most important attributes of these forests in Jericho is their shear size. Being able to utilize and generate money from the resource, often in the form of timber harvesting and/or maple syrup production, has perpetuated the existence of matrix-forming Northern Hardwood Forests in Jericho. The small patch-forming Poor Fens found in Jericho offer little in terms of potential to generate revenue, are extremely sensitive to anthropogenic uses, and are biodiversity treasures. As such, small patch-forming communities, like a Poor Fen, are often best maintained through a formal natural area designation.

A Natural Community System is a recurring assemblage of natural communities that are found in a repeatable landscape position and are linked by a common ecological process, such as flooding. The natural community system approach is often used to complement natural community mapping and protection efforts because:

- for many natural communities, it is a more practical scale for mapping and modeling;
- wildlife often interacts with vegetation at broader scales than most natural communities; and
- the systems approach emphasizes the importance of driving ecological processes.

Natural community system types have not yet been defined or described in Vermont. However, they have been defined in neighboring New Hampshire (Sperduto, 2005) and preliminarily described for the conterminous United States as part of the International Vegetation Classification System (NatureServe, 2003). Concepts and natural community system types are borrowed from both classifications for this project.

Like natural communities, natural community systems come in many shapes and sizes. Typically, a natural community system includes one or more matrix- or large patch- forming

communities, which form the dominant background vegetation for the system, with interspersed small patch-forming communities.

The Naturalness of the a Natural Community

Vegetation plays a dominant role in the classification and description of natural communities and natural community systems. This is because vegetation at a given site is ultimately an expression of the site's ecological growing conditions, which can be influenced by underlying bedrock and surficial deposits, soil, moisture regime, slope, aspect, landform, climate and natural disturbance. Natural community and natural community system types are based on this natural expression of ecological growing conditions.

Figure 1: Old Growth Legacy Trees. These large diameter red oaks and nearby sugar maples and American beech trees are a legacy of the old growth forests that once dominated Jericho. The nearby maples and beech trees have similarly large diameters, but are surrounded by a younger forest that lacks many of the other structures associated with old growth or late successional forests.

Humans have left an indelible and often pervasive mark on the landscape. Many times, anthropogenic influences have disrupted vegetation patterns to such a degree that the natural expression of ecological growing conditions is no longer apparent. Instead the vegetation in these areas is a product of human land uses or management. We often call these areas anthropogenic covertypes. While natural communities can often be mapped in these areas to understand the site's growth or restoration potential, they are not true natural communities or natural community systems.

For the sake of this project, natural communities and natural community systems have only been mapped in areas where vegetation strongly reflects the site's ecological growing conditions. These areas, like all of Vermont, are by no means free of anthropogenic impacts. Instead these impacts have been limited, occurred sufficiently long ago to allow substantial recovery, or have been conducted in such way that natural community composition and structure is maintained. Much of the low impact- or eco-forestry that is practiced in Vermont sufficiently maintains natural community composition and structure.

There is one major exception to the relative naturalness of natural communities or natural community systems mapped in Jericho: inclusions of anthropogenic covertypes in larger communities or systems. Where larger systems or communities have been mapped, there may be small inclusions of forest, wetland, shrubland, or open areas that are a product of historic or recent anthropogenic land uses. These inclusions are generally limited in area and constitute a relatively small portion of the mapped area. These inclusions or exceptions are often detailed in the occurrence reports (Appendix I).

Evaluating Natural Communities and Natural Community Systems

Natural communities or natural community systems are evaluated and ranked at the occurrence level. A **natural community (or natural community system) occurrence** is a stand or patch of a single natural community (or natural community system) type, or a cluster of interacting stands or patches of a single natural community (or natural community system) type. For example, Big Swamp, which is located in the Wolfrun Natural Area, is a single occurrence of the Shallow Emergent Marsh natural community type. The Dry Oak Forests (a natural community type) of Huckleberry Hill in the southern part of Jericho are found as a series of disjunct ridge top islands surrounded by a sea of Mesic Red Oak-Northern Hardwood Forests (another natural community type). These Dry Oak Forest islands are, however, found in a fairly small close cluster – close enough that they likely to exchange genetic material. The bears that feed in these Dry Oak Forest islands only help this exchange, as they regularly feed in one island and defecate in another. Because these Dry Oak Forest islands are relatively close and are freely exchanging genetic material, they have been evaluated as a single occurrence of Dry Oak Forest.

The quality, estimated long-term viability, and conservation value of each natural community or natural community system occurrence is evaluated using three factors: size, condition, and landscape context. As previously discussed, natural communities come in a variety of sizes. Occurrence size is evaluated relative to the natural community type's natural size range. It is generally believed that larger occurrences for a given natural community type have greater long-term viability, as they are less influenced by edge effects, have greater genetic diversity, and are better able to withstand stochastic natural disturbances, such as hurricanes and insect outbreaks. Evaluation of occurrence condition considers maturity, degree of anthropogenic disturbance, and the presence of species, structures, and processes associated with the natural community type. Not only are older and less disturbed occurrences rarer, they are also believed to be more viable over the long-term. Lastly, the landscape context, or condition and connectivity of the surrounding landscape, is considered.

For a given natural community or natural community system occurrence, each of the three evaluation factors is ranked on a scale of A-D (A = excellent; B = good; C = marginal; D = poor). These three ranks are then combined into an overall rank for the occurrence. This overall rank represents the estimated quality, viability, and conservation value for the occurrence. Preliminary ranks for the occurrences evaluated in this inventory have been provided in the associated database and are discussed in Appendix I.

What is a Significant Natural Community or Natural Community System Occurrence

While over 80 natural community types have been identified and described in Vermont, there is a tremendous disparity in the relative rarity or commonness of the 80 plus community types. Some natural community types, like the Pine-Oak-Heath Sandplain Forests of Chittenden County, are extremely limited in their distribution, often being bound to uncommon combinations of substrate, landscape position, and climate. Other natural

community types, like Northern Hardwood Forests, occur throughout the state on a wide range of substrates and landscape positions. As such, each natural community type is given a state rarity rank by the Vermont Nongame and Natural Heritage Program. The ranks, detailed in the table below, are on a scale of S1-S5, with S1 being assigned to natural community types with extremely limited distribution and S5 being assigned to widespread natural community types.

State Rank: these ranks indicate the relative rarity of natural community types and are assigned by the Vermont Nongame and Natural Heritage Program
S1: very rare in the state, generally with fewer than five high quality occurrences
S2: rare in the state, occurring at a small number of sites or occupying a small total area in the state
S3: high quality examples are uncommon in the state, but not rare; the community is restricted in distribution for reasons of climate, geology, soils, or other physical factors, or many examples have been severely altered
S4: widespread in the state, but the number of high quality examples is low or the total acreage occupied by the community type is relatively small
S5: common and widespread in the state, with high quality examples easily found

Table 2 : State Rarity Ranks from Thompson and Sorenson 2000.

Natural community significance is assessed at the occurrence level and is determined through a combination of the occurrence's quality rank (see preceding section) and the natural community type's state rarity rank. An occurrence may be consider significant either because it is of a rare type, or because it is of a common type but exhibits some exceptional characteristics, such as old growth structures or large size.

State and Locally Significant

The Vermont Nongame and Natural Heritage Program has defined specific criteria for state significance. A **state significant natural community or natural community system occurrence** includes:

- S1 or S2 natural community types, with an occurrence rank of A, B or C
- S3 natural community types with an occurrence rank of A or B
- S4 and S5 natural community types with an occurrence rank of A

Known state significant occurrences are tracked by the Nongame and Natural Heritage Program and addressed in most town plans, including Jericho.

Criteria for **locally significant natural community or natural community system occurrence** have not been rigorously defined. For the sake of this project, they include:

- Occurrences that fall just below state significant criteria
- Occurrences that contain or support other significant occurrences, such as seeps that support significant wetlands downstream
- Occurrences that are likely state significant but need further assessment to confirm their status, for example, vernal pools that still need biological assessment
- I also believe that towns should be fully aware and prepared to protect the full diversity of natural communities and natural community systems that occur within their boundaries. Therefore, I also designate as locally significant the best quality occurrences of a given community or system type when no state significant occurrence of that type exists in town. When local significance is designated in this manner, the rationale has been described in the occurrence site reports (Appendix I).

Why Map Natural Communities and Natural Community Systems

Landowners and managers, conservationists, planners, and scientists describe and map natural communities and natural community systems for a diverse array of reasons. I find that many of these reasons can best be described as management or conservation purposes.

Many landowners and land managers map natural communities to develop a better understanding of their property's ecological capacity and potential. Because natural communities are an expression of a site's substrate, topography, climate, and natural disturbance regime, they provide an integrated picture of a site's ecological potential—a natural community map shows what the land wants to grow and where it wants to grow it. Foresters often use natural communities as a management target, seeking to achieve composition and structure associated with the site's natural community. Similarly, restoration projects often use natural communities as a target or desired future condition.

Conservation scientists and practitioners use natural community and natural community systems as conservation targets and as tools to facilitate communication and landscape characterization. Natural communities and natural community systems have intrinsic conservation value in their own right. They are also often used as a means to conserve a target species and its associated habitat, or as conservation surrogates when there is limited data or knowledge on a given species. This is not uncommon for lesser know fungi, plants and insects, which are increasingly being recognized as important conservation targets. Additionally, when a natural community or natural community system is conserved, many non-target species and critical ecological processes are also protected.

Natural community and natural community system classification schemes are also a critical communication tool. They serve as a common language for scientists and practitioners. It is not a perfect system, but the natural community and natural community system classifications allow practitioners and scientists to rapidly inventory and characterize a given area, and then to easily communicate those findings to the broader community. Because natural community and natural community system classifications are embedded in an international classification scheme, it also makes it possible to understand the relative rarity and conservation value of a given community or system in a global context. This global context allows the conservation community to allocate its limited resources in the most critical areas.

Natural Communities and Natural Community Systems of Jericho, VT: A Town-wide Perspective

In Vermont eight biophysical regions are recognized where natural communities, climate, geology, topography, and human uses are observed to be relatively homogenous (Thompson and Sorenson 2000). Jericho sits along the Champlain Valley and Northern Green Mountain transition zone, an area often called the Champlain Hills that exhibits properties, including natural communities, associated with both bioregions.

Champlain Valley

The Champlain Valley has the longest growing season in the state, anywhere from 150 days near Lake Champlain to 130 days in the nearby foothills. This Biophysical region is the lowest in the state, with elevations ranging from 95-1,800 ft (29-549 m). The average July temperature regularly exceeds 70°F (21°C), while the average January temperature ranges between 18°F (-8°C) and 20°F (-7°C). Because of these relatively mild temperatures and the long growing season, the vegetation found within this region is often a mixture of northern and central species (Thompson and Sorenson 2000).

The Champlain Valley is underlain by a variety of typically rich limestones, dolomites, and shales. In more recent geologic times, Lake Vermont and the Champlain Sea inundated this area. This deposited silts and clays, otherwise referred to as lacustrine sediments, in the deepwater environments and sands, or glaciofluvial sediments, in the near shore and shoreline environments. While the foothills of the Green Mountains rise along the eastern boundary of this biophysical region, most of it consists of gently rolling clay plains and large areas of sandy deposits, which sometimes become locally steep where streams have incised through these highly erodable materials.

Jericho exhibits a few features that are characteristic of the Champlain Valley. The silts, clays, and sands that cover the western and valley-bottom portions of the Town, and the processes that deposited them, are typical of the Champlain Valley. While the temperatures of the Jericho area are rather comparable to Burlington and many other parts of the Champlain Valley, Jericho lacks the abundances of more southern species, such as shagbark hickory and white oak that are often found in the Champlain Valley forests. The steep, sandy, incised slopes and the rolling sandy hills along the Winooski, Brown, and Lee River valley margins are a common landform in the Champlain Valley. The areas of glacial till found along the highest points and eastern half of Jericho are, however, more typical of the Northern Green Mountain bioregion.

Northern Green Mountains

The Northern Green Mountains are a relatively short section of the Appalachian Mountain chain. This stretch of mountains includes all of Vermont's highest peaks, including two of Vermont's most famous landmarks: Camel's Hump and Mt. Mansfield. The Northern

Green Mountains has the shortest growing season in the state. Because this bioregion has the highest elevation of the state, it is not uncommon to find temperatures 20°F (7°C), colder than the Champlain Valley. With cooler air temperatures come cooler ground temperatures, resulting in lower levels of radiant ground heat. This cooler climate supports a mixture of northern and montane (red spruce and balsam fir, in particular) species.

The Northern Green Mountain's cooler air temperatures are largely a product of adiabatic cooling, or cooling as a result of elevation increase and air expansion. The mountainous terrain not only has a strong effect on temperature, but also on patterns of precipitation. As weather systems from the west are forced up and over the mountains, the adiabatic cooling causes precipitation, in the form of rain and snow, to concentrate along the western flank of the Green Mountains.

Schists, phyllites, gneisses, and quartzites underlie this region. All of these rock types are relatively nutrient-poor as compared to the bedrock underlying much of the Champlain Valley. Much of this region is above the maximum extent of Lake Vermont and the Champlain Sea; glacial till is the dominant surficial deposit and parent material of the region.

The abundance of till-derived soils in the eastern and higher portions of Jericho is typical of the Northern Green Mountains. With a few minor exceptions, Jericho is primarily underlain by the nutrient-poor schists, phyllites, gneisses, and quartzites of the Northern Green Mountains. The warmer temperatures of Jericho, as compared to most of the Northern Green Mountains, limit the abundance of montane species we find throughout much of this bioregion.

Natural Communities of Jericho

The natural communities of Jericho reflect this transition from the Champlain Valley to the Northern Green Mountains. Not only do we find communities associated with both bioregions, but much of the vegetation is truly intermediary between the two bioregions, lacking the extremes of either bioregion.

Northern Hardwood Forests—a community comprised of varying mixtures of sugar and red maple, eastern hemlock, yellow birch, American beech, white ash, and white pine—is the dominant natural community of Jericho and is found in both bioregions. In Jericho, we primarily find this community on the till-derived soils of intermediate moisture regimes. While Jericho is primarily underlain by weather resistant, nutrient-poor bedrock, there are some small inclusions and pockets of calcium rich bedrock; where this limy bedrock occurs close to the surface or in a cove setting where downslope movement and accumulation of soil and organic matter creates an enriched growing environment, we find Rich Northern Hardwood Forests. This community is very similar to the Northern Hardwood Forest, but generally has increased abundances of sugar maple, white ash, basswood, and calcium loving herbaceous species. Some of Jericho's best sugarbushes are in these areas.

As in the Champlain Valley, we find an intermingling of more southerly hickories and oaks in Jericho's Northern Hardwood Forests; this primarily occurs on warmer south-to-

southwest facing slopes. With a few exceptions, these more southerly species are generally minor components of the forest and do not reach the abundances found in much of the Champlain Valley. One of the major exceptions is the dry south facing ridge lines and shoulders of Huckleberry and Bald Hills, which support Dry Oak Forests; this rare community is dominated by red oak with minor amounts of other northern hardwood species. These Dry Oak Forests are often a stable oak seed source for downslope Mesic Red Oak-Northern Hardwood Forests, the other major exception. Mesic Red Oak-Northern Hardwood Forests are generally found on south-to-southwest facing slopes with shallow-to-bedrock soils. In these warm, sunny locations, red oak is able to out-compete other northern hardwood species and often dominates the canopy. In warmer regions of the state, both of these oak communities can contain white and chestnut oaks. Jericho's oak communities lack these species.

As in the Northern Green Mountains, we find an intermingling of cooler red spruce and balsam fir in Jericho's Northern Hardwood Forests; this primarily occurs on cooler north-to-northeast facing slopes and cold hollows. These cooler species are generally minor components of the forest and do not reach the abundances found in much of the Northern Green Mountains.

Along the sandy hills and steep ravines of the Winooski, Lee, and Browns River valley bottom margins (Lake Vermont and Champlain Sea shorelines), eastern hemlock becomes a major component of the forest. Here the Northern Hardwood Forests give way to Hemlock and Hemlock-Northern Hardwood Forests. These communities are also found in both bioregions.

In wet, saturated areas, such as topographic depressions, areas with high or perched water tables, or beaver flowages, forested communities often give way to open wetland communities. Here, saturated soil conditions often prevent tree establishment and herbaceous and shrub species dominate. In Jericho, these wetland communities may include Shallow and Deep Emergent Marshes, Alder Swamps, Sedge Meadows, Poor Fens, and Alluvial Shrub Swamps. Other than floodplain wetlands (see below) most of Jericho's wetlands are tied to the activities of beavers. Jericho also supports a number of forested wetlands. Hemlock Swamps, Black Ash-Red Maple Swamps, Vernal Pools, and Seeps are all found in Jericho.

The ongoing activities of Jericho's rivers and streams support a unique suite of natural communities that are tied to the ecological processes of these waterways. Annual ice and water scour, sediment deposition, and fluctuating water levels all interact to maintain a dynamic mosaic of rivershore communities: Rivershore Grassland, River Mud Shore, River Cobble Shore, and River Sand or Gravel Shore. The overbank (floodwater) flows of these waterways also support floodplain communities: Silver Maple-Ostrich Fern Riverine Floodplain Forest along the Winooski and Sugar Maple-Ostrich Fern Riverine Floodplain Forest along the Lee and Browns Rivers and Mill Brook. Backwater shrub swamps and emergent wetlands are also commonly found in these floodplains.

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