

**NATURAL RESOURCES INVENTORY:  
PHASE II  
CITY OF MONTPELIER, VERMONT**

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**Natural Resources Inventory: Phase II**

# City of Montpelier, Vermont

## TABLE OF CONTENTS

	<u>Page</u>
1.0 OBJECTIVES .....	1
2.0 GENERAL APPROACH .....	1-2
3.0 FIELD INVENTORY RESULTS .....	2-19
3.1 Wetlands.....	2-8
3.2 Upland Natural Communities.....	8-12
3.3 Wildlife.....	12-17
3.4 Rare Elements .....	17-19
4.0 RESOURCE MAPS .....	19
5.0 CITIZEN TRAINING WORKSHOP .....	19
6.0 CONCLUSIONS .....	19-20

## ATTACHMENTS

	<u>Page</u>
Natural Resource Evaluation Data Summary Tables .....	1-3
Wetlands Map .....	4
Wildlife Habitat Map .....	5
Upland Natural Communities Map .....	6

# Natural Resources Inventory: Phase II

## City of Montpelier, Vermont

### 1.0 OBJECTIVES

Arrowwood Environmental was retained by the City of Montpelier to conduct a natural resources inventory of the City of Montpelier, Vermont. The inventory project has four primary objectives: 1. identification of potentially significant natural resource areas within the City and the relative ranking amongst those identified resource areas; 2. creation of a digital map locating potentially significant resource areas; 3. field evaluation of priority resource areas; and 4. training of citizen volunteers to conduct basic resource assessments.

This report documents the work completed for the second phase of the project, objectives three and four listed above. Documentation of the first phase of the project, identification of potentially significant natural resource areas and relative ranking of those areas, and creation of a preliminary digital map locating priority resource areas was provided under separate cover, dated June 5, 2002.

This document, Phase II of the Natural Resources Inventory is a refinement of the evaluation delivered in Phase I based on the outcome of field investigations. Resource assessments and final resource maps created in Phase II are based on field investigation and are therefore more accurate than the preliminary analysis conducted in Phase I. Preliminary resource maps created in Phase I served the solve purpose of focusing fieldwork in Phase II.

### 2.0 General Approach

The first phase of the project consisted of the identification, ranking and preliminary mapping of potentially significant natural resource areas within the City of Montpelier. The purpose of the first stage was to remotely evaluate the significance of existing natural resource areas within the City. The preliminary evaluations were used to prioritize the field evaluations that have been conducted in the second phase of the study.

The resource assessments conducted as the second phase of the project focused on identifying the extent/boundaries of the natural resource on the landscape, and the value or significance of the resource to the community.

The maps and tables which accompany the Phase I assessment are intended to be used for planning purposes. Due to difficulty in obtaining landowner permission to access parcels, Arrowwood Environmental was not able to conduct field investigations of all resource areas. Caution is to be used when using Phase I materials, such as maps and summary data tables as they are based on remote assessment and not field investigation.

The maps and tables which accompany the Phase I assessment report were preliminary maps pending revision based on field investigation. The maps presented with the Phase II report are meant to replace the preliminary Phase I maps and should be used to the exclusion of all previous maps.

### 3.0 Field Inventory Results

The resource assessments for significant wetland, wildlife habitat and upland natural community resources are detailed in this section. The assessments include determination of resource unit boundaries (shown on the attached Resource Maps and ArcView shape files), natural community assessment, and functional assessments. Assessment criteria used for each of the three resource categories (wetlands, wildlife habitat, and upland natural communities) is detailed in the Phase I report, dated June 5, 2002.

Field investigations of resource areas were restricted to windshield surveys from public roads, and assessments for parcels for which landowner permission was obtained. A windshield survey was conducted of the entire study area, resulting in general observations made from the road. Select properties were visited and reviewed for each of the three resource categories. Observations from the windshield survey, and field assessments were used to help refine information interpreted from maps and digital orthophotography in Phase I of the inventory. As a result of the field investigations resource boundaries presented on the preliminary Phase I maps were modified and additional resource areas also identified.

Final maps, in the form of ArcView shape files, have been created showing the location and approximate boundaries of wetlands, wildlife habitats and upland natural communities in the study area. Assessments have been conducted for select resource areas accessible for field investigation. Discussion of functional assessments and biological and ecological conditions are provided for these resource areas.

#### 3.1 Wetlands

Seventy-six (76) wetland systems have been identified in the Montpelier study area. The wetlands consist of Class II and Class III wetlands as defined by the State of Vermont Wetland Rules. Wetlands occupy approximately 200 acres of the study area. There is a diverse array of wetlands in the study area including eleven (11) different wetland community types. The number and extent of wetland communities is presented in the following table.

**Table 1: Number and Extent of Wetland Communities in Montpelier**

Natural Community Classification*	Total Size (Acres)	Total Number of Occurrences
Alder Swamp	6.5	4
Alluvial Shrub Swamp	20.5	5
Emergent Marsh	38.3	17
Red Maple – Black Ash Swamp	2.5	1
Silver Maple-Ostrich Fern Riverine Floodplain Forest	26.7	5
Spruce-Fir-Tamarack Swamp	18.8	1
Seep/Forested Seep	2.8	5
Vernal Pool	.01	1
Natural Community Classification*	Total Size (Acres)	Total Number of Occurrences
Pond	4.25	21

Old Field**	32.1	8
Agricultural Field**	46.3	7

\* Each wetland was given a natural community name based on the classification presented in Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont (Thompson and Sorenson, 2000).

\*\* Only fields that are potentially wetlands were included in this table and accompanying map.

Wetlands identified in the study area were informally delineated. The boundary determinations of the wetland areas were based on interpretation of 1996 orthophotography, Color-infrared photographs, NRCS soil survey maps, National Wetland Inventory maps, and field observations when possible. Formal delineations of resource areas were not in the scope of this project. Therefore, boundary lines are meant for planning purposes only.

The Wetland Units described below correspond to the polygon ID's in the ArcView shape file. See attached Resource Map for wetland unit locations.

### Alder Swamp

Alder Swamps occupy a variety of landscape positions. This type occurs in wetter areas where shrubs such as speckled alder (*Alnus incana*) and willows (*Salix spp*) dominate. It differs from the Alluvial Shrub Swamp in usually not being located along a stream and having peat soils. Statewide, this is an extensive, widespread community. Many of the old, wet fields in Montpelier are being colonized by shrubs and may be succeeding to this community type. From a natural community perspective there are no significant examples of Alder Swamps now known in Montpelier.

The largest shrub swamp found within the study area (~ 4 acres) is located along Blanchard Brook (Wetland Unit #28) and is dominated by willow species. This site likely provides significant water quality protection, flood control, erosion control, wildlife habitat, and fisheries habitat. In particular, woodcock may utilize these habitats. As the Blanchard Brook eventually drains into the Winooski River, the health and integrity of the Winooski is intricately related to the maintenance and protection of the multiple wetland communities located along the banks and floodplains of its tributaries.

### Alluvial Shrub Swamp

Alluvial Shrub Swamps differ from Alder Swamps in that they are found in the floodplains of rivers and streams and typically contain mineral soils. These communities occur along the shores of small rivers and streams where annual flooding is the main ecological force driving the community. These swamps are typically dominated by speckled alder and willow shrubs, with larger willow or box elder (*Acer negundo*) trees occasionally present. There are five examples of this type currently mapped in Montpelier, comprising approximately 20 acres. Most of these wetlands occur along the banks of the North Branch River and are likely a fraction of their original size due to fragmentation from agricultural activities. From a natural community perspective, there are no significant examples of this natural community currently mapped in Montpelier.

The functions and values of Montpelier's Alluvial Shrub Swamp communities are similar, each providing some degree of water quality protection, erosion control, fisheries habitat, and wildlife habitat. These sites do offer a riverside buffer and provide

cover for wildlife and stabilize the banks to prevent erosion. Given the location in the landscape that these communities occupy, adjacent to rivers and streams, they provide important habitat and corridors for the movement of many wildlife species, including river otter, mink, muskrat, and beaver.

### Emergent Marsh

The Emergent Marsh community is a broadly defined community that occurs in a wide variety of physical settings and is dominated by a wide diversity of plants. In general, it is an herbaceous dominated community that experiences wet conditions from surface water (pond, stream, lake, etc.), ground water, or a perched water table. Many of the examples of this community in Montpelier are beaver influenced wetlands. The vegetation is variable within the units, depending on soils, hydrology, disturbance history and landscape position. There are two locally significant examples of this community (Wetland Unit #s 1 and 35).

Wetland Unit # 1 is a beautiful Emergent Marsh that is beaver influenced and the site of an old oxbow along the North Branch River. There are areas of open water, the actual extent of which is dependent upon recent beaver activity. The deeper open water, shallow shores and peat dominated ground areas result in high plant diversity and offer a wide variety of wildlife habitat. Dominant vegetation includes bur reed (*Sparganium chlorocarpum*), blue joint grass (*Calamagrostis canadensis*), cattail (*Typha latifolia*) and sedge (*Carex lurida*). The wide variety of open water, deep marsh, emergent marsh and shrub swamp often found at these sites is extremely important for plant diversity and wildlife habitat. These sites also tend to serve other important wetland functions and values, including water quality, flood storage, erosion control, fisheries habitat, recreation, and aesthetics.

*Management Recommendations:* This area is used by the North Branch Nature Center as an educational resource. Human disturbance to this valuable site should continue to be kept to a minimum to allow natural processes to continue.

Wetland Unit #35 is another old oxbow wetland along the North Branch River. Part of this wetland has been impacted by the construction of a nearby parking lot. However, much of the wetland seems to still be in fair condition. It is dominated by common rush (*Juncus effusus*), bulrush (*Scirpus atrovirens*) sensitive fern (*Onoclea sensibilis*) and sedges (*Carex spp.*). During the field investigation, there was approximately 3 inches of standing water throughout the site with deeper pools common close to the River. There appeared to be a lot of bird and amphibian use of this wetland.

*Management Recommendations:* This wetland is important in terms of wildlife and floodwater control. Further development that infringes on its borders or buffer zone should be discouraged. The managers may consider planting shrubs along its border with the parking lot to offer cover for wildlife and help prevent erosion into the wetland.

### Red Maple- Black Ash Swamp

This widespread community is a forested wetland dominated by red maple (*Acer rubrum*) and black ash (*Fraxinus nigra*). It occurs in many low-lying areas affected by ground water, perched water tables or surface waters. There is only one known occurrence of this community in Montpelier (Wetland Unit # 54), which sits in a back

swamp position near the North Branch River. It is separated from the River by a levee and differs from nearby Floodplain Forests in its soils, floristic composition and historic flooding regime.

Back swamps tend to flood less frequently than communities closer to the active river channel and therefore accumulate more peat. This example of this community type is rather small (2.5 acres) and is dominated by black ash with lesser amounts of red maple. Shrub layers are sparse but the herbaceous layer is dense and dominated by sensitive fern and cinnamon fern. The soils are characterized by approximately 10 inches of peat over a fine sandy loam. Much field investigation needs to be conducted within this community to determine its relationship with other Red Maple-Black Ash Swamps in the region. This example of the Red Maple-Black Ash Swamp community type is considered locally significant.

*Management Recommendations:* Any development that is to occur in the vicinity of this community should maintain a minimum buffer of 100 feet around the border of the wetland in order to minimize the impact on the community. Given its importance in water quality relating to the North Branch River, disturbance in this community should be avoided. Logging should be excluded from this wetland. Rutting of the soil in communities of this type can disrupt local hydrology and leave the site open for colonization by non-native, invasive plants. Invasive plants have the potential to colonize large areas of the wetland, exclude native species and degrade the overall quality of the community. There are small populations of the invasive morrow's honeysuckle (*Lonicera morrowii*) and barberry (*Berberis vulgaris*) already present in this wetland. Land managers may consider controlling these invasive plants. This site, along with the nearby Floodplain Forest, could be a potentially valuable educational resource for the City.

### Seep

Seeps are a common wetland community type associated with ground water discharge and often found as small sites within a forested community. This community type is very difficult to map remotely. The most reliable method for mapping Seeps is through extensive fieldwork. There were five Seep communities found during the inventory. There are likely many more seeps in Montpelier that remain to be identified and/or mapped. Though no single example found in Montpelier is state significant, taken together, these seeps are extremely important for wildlife habitat, plant diversity and water quality in the City. In particular, early spring vegetation present in remote seeps can be an important source of food for black bears first emerging from their winter refuge. Deer and wild turkey also extensively utilize seeps.

Wetland Unit # 63 is a locally significant seep that sits at the headwaters of a small, unnamed brook just outside of Hubbard Park. This example has much in common floristically with the Shallow Emergent Marsh community but its landscape position and role in the ecosystem functions more as a seepage community. The mapped boundaries of this Unit are provisional pending further fieldwork. There are scattered red maple and meadowsweet (*Spiraea alba*) plants, but the community is primarily dominated by drooping sedge (*Carex crinita*) and sensitive fern. The soils are characterized by 10 inches of peat over a mottled silt loam.

*Management Recommendations:* This site has a recreational trail passing through the

edge of the community. This portion of the trail is not only difficult to hike through, but disrupts the soils and vegetation of that area. The trail should be re-routed to pass through the adjacent upland.

Wetland Unit # 53 is a very interesting example of a forested seep that runs perpendicular to the west-facing slope. There are scattered red maple and black ash trees overtopping a fairly dense shrub layer dominated by speckled alder and black ash. Common horsetail (*Equisetum arvense*) is the dominant herb. The soils are characterized by 10 inches of peat mixed with gravel over a coarse sand/gravel soil layer. This example of the Seep community is unique in its vegetation structure and composition and has no signs of recent human disturbance. Because of this and the community's landscape position, this site is considered locally significant.

*Management Recommendations:* Because seeps receive ground water input year round, soils in these communities often do not freeze in the winter. This makes them susceptible to rutting by heavy logging equipment. This rutting can disrupt the local hydrology of the seep and negatively affect the community. If logging is to occur in the area, machinery should be restricted from the seep area and a 50-foot buffer should be maintained around the wetland boundary.

### Silver Maple-Ostrich Fern Riverine Floodplain Forest

Floodplain forests occur in flat areas adjacent to rivers and streams and have historically been subjected to annual flooding from spring runoff into the rivers. The damming of many larger rivers and the conversion of much of these areas to agriculture has made intact Floodplain Forests uncommon in Vermont. There are five examples of this type in Montpelier, all occurring along the banks of the North Branch River but varying in their size, extent, and condition. The forest stands are generally characterized by scattered silver maple (*Acer saccharinum*) and black willow (*Salix nigra*) trees with a sparse shrub layer. The herbaceous layer varies depending on the site but generally includes sensitive fern, blue joint grass, ostrich fern (*Matteucia struthiopteris*) and/or reed canary grass (*Phalaris arundinacea*). Because of regular scouring by floodwaters, these communities are susceptible to invasion by exotic species. Morrow's honeysuckle and reed canary grass are the two most common invasive plants found in this community in Montpelier.

Given the position in the landscape that these communities occupy, adjacent to the North Branch River, each wetland is likely significant for wildlife habitat, erosion control and water quality maintenance as well as fisheries habitat. The Floodplain Forests are associated with other wetland communities which when viewed as a whole complex provides functions of water quality protection, flood control, open space, education and recreation.

A locally significant example of this type is found along the North Branch just south of Cummings Street (Wetland Unit #30). Due to lack of access, this site was surveyed from the River. Unfortunately the Unit has a healthy population of the non-native reed canary grass established in some areas, but seems to lack any other invasive species. There is a wetland drainage that runs through this community, connecting it to the River. This swale provides habitat for many reptiles, birds and amphibians as well as increasing the plant diversity at the site. This site warrants a thorough survey for rare plants and determination of the extent and condition of the community.

*Management recommendations:* A partial trail currently passes through this community. The trail appears to cause no harm to the community, and allows the public access to a locally significant site. The trail should not be extended to cross the wet swale, as this would disturb the soils and provide habitat for the invasion of more exotic species. A 100-foot buffer should be maintained between this community and any proposed development.

The largest example of this floodplain forest community is Wetland Unit #10, which occurs just northeast of the North Branch Nature Center. The sparse canopy is dominated by black willow and butternut (*Juglans cinera*). There is a scattered shrub layer of speckled alder and Morrow's honeysuckle. Blue joint grass and giant goldenrod (*Solidago gigantea*) dominate the herbaceous layer. This is a relatively large occurrence of this type and it is connected to an Emergent Marsh (Wetland Unit #1). The wetland is, however, plagued by invasive species. Morrow's honeysuckle and reed canary grass have colonized a significant part of this site. This decreases the overall quality of the community.

Management Recommendations: Eliminating the invasive species at this site, while advantageous, would likely prove to be an impractical endeavor. The upland forested border to this community should remain intact and undeveloped. This border provides access for wildlife, prevents erosion and adds to the wild nature of the community.

### Vernal Pool

Vernal Pools are classified as small, temporary bodies of water that typically occur in forest depressions. Vernal pools usually hold water in the spring and dry up during the summer months. They can provide vital habitat for many species of reptiles and amphibians that rely on these ephemeral habitats for reproduction. Like the Seep community, reliable mapping of Vernal Pools is done through extensive fieldwork and it is likely that future fieldwork will result in the identification of more vernal pools within the City.

Only one occurrence of this community was found during the course of this study (Wetland Unit #64). This occurrence is of moderate quality given its size and surrounding land use. More vernal pools of much higher quality undoubtedly exist within the City limits. These communities are vital to the survival and reproduction of many amphibians. Research indicates that maintaining a forested buffer around these pools is essential for the migration and survival of these amphibians. It is recommended that once additional vernal pools are located and mapped, a three hundred foot buffer be maintained around them where possible.

### Pond

The Pond classification refers to water bodies that are either manmade or too deep to offer habitat for aquatic vegetation. There are twenty-one Ponds that have been mapped in Montpelier. There are likely other small manmade ponds scattered throughout the City. Nearly all of these sites are manmade ponds used for recreation or agricultural activities. Since these sites usually do not harbor natural communities, they were not surveyed for this feature. Some do, however, perform significant wetland functions and values. Often the most important function that these areas provide is

related to water quality protection. The Ponds can act as stormwater treatment basins, providing temporary to long-term storage and treatment for potentially polluted surface waters before discharge to other surface waters.

*Agricultural Field*

There are seven potential wetlands that occur in agricultural fields. This includes fields that may currently be under cultivation, fields that are used as pasture or hay fields and, in some cases, old abandoned fields. Though none currently support any natural communities, if agricultural practices stopped, the sites would revert to a natural community. These wetland areas are generally significant for few wetland functions and values. As with the Pond classification, the most significant function of the Agricultural Fields is to provide water quality protection, and to a lesser extent flood control in certain locations.

*Old Field*

There are eight occurrences of this type in the City. Unlike the agricultural fields, these sites may be reverting to natural communities and may contain areas of Alder Swamp, open water or Emergent Marsh. The most significant function of these old fields is to provide water quality protection and, in some areas, flood control protection and wildlife habitat. In particular, old fields bordering forested areas can provide important habitat for small mammals that utilize the forest/open edge for food and refuge. If allowed to develop into shrub-dominated communities these areas can be important wildlife habitats used by woodcock, raccoon and predators such as bobcat.

**3.2 Upland Natural Communities**

Eight (8) different upland natural community types have been identified in Montpelier. These eight types consist of sixty-two different upland natural community units, the number and extent of which are outlined in Table 2 below. The Upland Natural Community Units described below correspond to the polygon ID's in the ArcView shape file. See attached Resource Map for unit locations.

Many of these community types are matrix forest communities that form large patches on the landscape. Within any one of these matrix forming communities, the slope, aspect, elevation, landscape position and soils can vary widely. This results in a fair amount of plant and animal diversity within these types. In addition, because these communities are so large, inclusions of other natural community types are common. The Resource Map is primarily based on remote sources (orthophoto interpretation, color infrared photo interpretation, etc.) and not on extensive fieldwork, therefore, the Resource Map should be considered a baseline from which further work can continue.

**Table 2: Number and Extent of Upland Natural Communities in Montpelier**

<b>Natural Community Classification*</b>	<b>Total Size (Acres)</b>	<b>Total Number of Occurrences</b>
Hemlock Forest	85.07	5
Hemlock-Northern Hardwood Forest	11.2	1

Mixed Conifer- Northern Hardwood Forest	910.85	2
Northern Hardwood Forest	836.86	22
Rich Northern Hardwood Forest	18.33	2
Red Spruce-Northern Hardwood Forest	233.96	4
Red Oak-Northern Hardwood Forest	10.31	1
White Pine-Northern Hardwood Forest	1318.51	22

\* Each site was given a natural community name based on the classification presented in Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont (Thompson and Sorenson, 2000).

Each of the eight (8) upland natural community types is discussed in detail below. Management recommendations are given for all communities that are considered state or locally significant.

### Hemlock-Northern Hardwood Forest

This widespread community occurs in a variety of landscape positions, usually sites that are below 2000 feet elevation and have well-drained, shallow soils. There is one mapped site of this type in Montpelier, but many other sites exist under the Mixed Conifer-Northern Hardwood Forest mapping unit. This community exists where hardwoods such as red maple, yellow birch (*Betula alleghaniensis*) and hemlock (*Tsuga canadensis*) co-dominate in the canopy. The sites usually sit on sloped or undulating topography and are relatively nutrient poor. Inclusions of Seep communities and Hemlock Forest communities are common within this community. Depending on the site, ledges and bedrock outcrops may also be common.

Within Hubbard Park, there are large areas that are Hemlock-Northern Hardwood forest (mapped as Mixed Conifer-Northern Hardwood Forest). These stands are generally in very good condition. Additional fieldwork is necessary to further map and rank these communities.

### Hemlock Forest

The Hemlock Forest community differs from the Hemlock-Northern Hardwood Forest in that it lacks a significant component of hardwood trees in the canopy. It generally occupies steeper sites with shallow soils. The hemlock canopy often creates a dense shade on the forest floor resulting in sparse understory growth. The largest mapped Hemlock forest in Montpelier, Upland Natural Community Unit # 51, was partially visited during this inventory. It sits on a west and northwest-facing slope and contains inclusions of Hemlock-Northern Hardwood Forest. Some areas consist of very large, old trees (both living and dead) and hint at the stately nature of old growth examples of these communities. There are very few rock outcrops or seeps in this particular occurrence of the Hemlock Forest type. What was visible at this site appears to be in very good condition with little recent human disturbance. Because of its extent, condition and landscape position, this site is considered locally significant.

*Management Recommendations:* If logging is to occur at this site, areas of older growth should be excluded. In addition, logging should occur on a selective scale with the ultimate goal that of maintaining this community as a Hemlock Forest. Extreme steep slopes and wet seepy areas should be avoided during all logging operations.

### Mixed Conifer- Northern Hardwood Forest

This community type is a designation created because of mapping limitations. It generally consists of Hemlock-Northern Hardwood, White Pine-Northern Hardwood and, to a lesser extent, Red Spruce-Northern Hardwood Forest communities. These communities often grade into each other on the landscape making the task of separating them on a preliminary natural community map such as this unfeasible. For further explanation of this type, look under the community descriptions for those communities mentioned above.

### Northern Hardwood Forest

This is a widespread community in Montpelier and throughout the state. Its canopy generally consists of sugar maple, beech, white ash (*Fraxinus americana*) and/or yellow birch trees. The single largest stand of Northern Hardwood forest in Montpelier was not accessible for this study. Most of the other forest stands in the City are relatively small. While these stands are important for wildlife habitat and open space in the town, from a natural community perspective, none are large enough or in exceptional condition to warrant a "significant" ranking from a region-wide perspective. Fieldwork may reveal other Northern Hardwood sites not visited during this survey to be significant.

### Red Spruce-Northern Hardwood Forest

The Red Spruce-Northern Hardwood Forest community typically occurs on cold mountain slopes, benches and knolls where soils are thin and somewhat nutrient poor or a hardpan exists. The canopy is a mixture of beech, red maple, yellow birch, red spruce and balsam fir (*Abies balsamea*) trees. There are four mapped occurrences of this community in Montpelier, though more exist within the Mixed Conifer- Northern Hardwood Forest mapping unit. The largest of these mapped occurrences is Upland Unit # 3. This stand comprises 182 acres, and is much larger if one considers the part of the forest outside of the City limits. As is typical for most of these sites, this example contains inclusions of Hemlock Forests and White Pine.

### Red Oak-Northern Hardwood Forest

There is only one example of this community mapped in Montpelier (Upland Unit # 12). It exists on a very steep east-facing slope and a more gradual south-facing slope. There are some signs of mineral enrichment that are more prominent on the steep east-facing slope. The canopy is dominated by red oak (*Quercus rubra*), sugar maple, and white ash trees. Shrubs consist of sugar maple, red oak, and ironwood (*Carpinus caroliniana*) The herbaceous layer is typically sparse. Soils are well drained loams or sandy loams. Some of the canopy trees in this stand are relatively large, especially the red oaks. There appears to have been very little recent human disturbance. Overall, this stand is in very good condition and is a fine example of the community type. This community type is fairly common further south, but large examples of this type in good condition are infrequent in central Vermont. This stand is considered locally significant.

*Management Recommendations:* There are a number of hiking trails that pass through this forest. These trails offer an opportunity for interpretive signs and nature walks. Given the use by and proximity to the public, logging and further development within this forest should be discouraged.

### Rich Northern Hardwood Forests

There are two examples of this community type that were found in Montpelier during the inventory. Since there were large tracts of land that were not visited, other examples of this community may also be present in the City. The formation of these communities is dependent upon presence of calcareous bedrock or colluvial processes that transport nutrients down slope. These situations give rise to nutrient rich soils that create habitat for a wide variety of unique herbs.

Upland Unit # 16. This forest is an 11.5-acre Rich Northern Hardwood forest on a steep east-facing slope. This is an absolutely beautiful site with high plant diversity, numerous bedrock outcrops and inclusions of Seep communities. The canopy is typical for this community, consisting of sugar maple and white ash trees. The forest floor is carpeted with blue cohosh (*Caulophyllum thalictroides*), maidenhair fern (*Adiantum pedatum*), jack-in-the-pulpit (*Arisaema triphyllum*) and many other herbs. The site grades into a typical Northern Hardwood Forest on the top of the slope. This site is considered locally significant.

*Management Recommendations:* There is a hiking/biking trail that passes through this site. This offers the public a wonderful opportunity to explore this interesting community. It could also provide a good place to conduct interpretive nature walks. Logging should be excluded from this site because of the public use, the steep slopes and thin, fragile soils.

Upland Unit # 19. This 6.8-acre site sits on a very steep (approximately 30%) east-facing slope. Only part of the site was accessed for this survey. The colluvial nature of the site and the rich bedrock create a very rich community with a high diversity of plant species. Bedrock outcrops are common at this site. The canopy is dominated by sugar maple with lesser amounts of white ash and butternut. Occasional ironwood shrubs dominate the shrub layer and the herbaceous layer is a diverse mix of wild onion (*Allium tricoccum*), blue cohosh, intermediate wood fern (*Dryopteris intermedia*) and bloodroot (*Sanguinaria canadense*). Two small populations of the uncommon glade fern (*Diplazium pycnocarpon*) were found at this site (see Section 3.4 on Rare Elements below). Other rare or uncommon species may also exist on the unsurveyed portion of this community.

*Management Recommendations:* Given the steep slopes and the subsequent fragile soils at this site, logging should not take place here. If conducted, a logging operation should only be conducted on the less steep slopes and with a deep snow pack and frozen soils. The movement of heavy equipment in this site should be kept to a minimum.

### White Pine-Northern Hardwood Forest

This community in Montpelier is very similar to, and sometimes considered a variant of,

the Northern Hardwood Forest. In this region, white pine (*Pinus strobus*) generally colonizes areas that were historically under agricultural use. The presence of white pine in most of these forests in Montpelier is a testament to the agricultural past of the area. This community is floristically very similar to the Northern Hardwood Forest community except for the presence of white pine in the canopy. Where white pine is locally abundant, the understory shrub and herb layers may be sparse. This type often occupies large stands in the City and is generally successional to the Northern Hardwood Forest.

### **3.3 Wildlife Habitat**

Twenty-four (24) Wildlife Units have been identified in the Montpelier study area. These units comprise approximately 5.4 square miles of the study area. The wildlife habitat in Montpelier offers a home to a wide-variety of wildlife. Larger expanses of forested wildlife habitat are found mainly to the north of the downtown area, located to the east and west of Route 12. Within the Urban Core the woodlots are smaller and scattered throughout the City.

The Urban Core wildlife benefits from the presence of oak trees, as well as a lot of structure such as brush piles, old dumps, and rubbish piles. These areas provide refuge for the City wildlife. Within the Urban Core we find the occasional deer and fox, but more often the presence of gray squirrels, skunks, ground hogs, raccoons, and probably cottontail rabbits. Some areas provide habitat for songbirds.

At the margins of downtown Montpelier we have areas such as Hubbard Park, the Terrace Street Wildlife Unit #11 as well as Sabin's Pasture. These areas harbor coyote, fox, deer, hawks, and most likely the occasional fisher or bobcat. These areas are large enough to support a diversity of habitats and associated wildlife. In addition, these areas may be important in supporting the wildlife habitats of the Urban Core. Some of these areas have more open and younger forest which likely support prey populations that lure predators close to the Urban Core. Mid-sized Wildlife Units (generally 50-250 acres) located throughout Montpelier often contain one or more wildlife habitat elements (such as young forest, or breeding habitat for grouse) that are essential to the overall maintenance of wildlife populations.

To the north of the Urban Core are large contiguous wildlife habitats that extend for many hundreds of acres and often for large areas outside of the boundaries of Montpelier. Flanking Route 12 to the east and west are forested regions large enough to contain deep forest interior habitats where songbirds such as the red-eyed vireo, and mammals such as the black bear find some measure of habitat. These areas are often the center of breeding populations for certain wildlife (such as the bobcat, moose, ovenbird, or pileated woodpecker) and these animal's populations may be dependent upon large forested habitats remaining relatively intact.

There were no significant American beech tree stands located within the City of Montpelier that bears may develop a fidelity to and return to on a regular basis. Black bears may come into the City to seek out berries or wetlands during other seasons. Over time, resources that bears seek out, such as stands of healthy beech trees of reproductive age, could possibly develop within the City boundaries and attract more bears.

The results of the wildlife assessments are summarized in Table 3 in the Attachment. Select wildlife units are discussed below.

### **Wildlife Habitat Unit #s 2-4, 11**

Each of these Wildlife Units is greater than 300 acres in area and represents the City's largest intact habitats. These areas contain either mapped or field observed deer wintering areas and are large enough to support wildlife species such as black bear, fisher, bobcat and other wide-ranging predators. These Units are of sufficient size to contain interior, deep forest habitat where song birds such as the ovenbird, red-eyed vireo, owls, forest hawks, and other bird life may find breeding habitat. All of these areas consist of a variety of hardwood and coniferous forest patches and this diversity contributes to the diversity of bird life that lives on the resources of the area. Much of the forest area in Montpelier (outside of the urban core) is conifer-dominated and the presence and diversity of warblers in the City would be expected to be high.

Many of these larger Wildlife Units contain small (<2 acres), isolated wetlands often situated at the low spots between surrounding hills. Most of these wetlands provide excellent cover (most often coniferous trees), water, and food resources. Many wildlife tracks were observed in these wetlands during winter tracking exercises. These wetlands add diversity and increase the overall quality of the wildlife habitat in Montpelier.

Wildlife Unit #s 2, 4, and possibly 11 all have wilder lands that are directly adjacent to the larger tributaries of the Winooski River (or the River itself). These areas are often corridors for coyotes and fox. Tracks of fox were observed along the River in North Branch Park. In addition, these water bodies are large enough to contain otter, mink, and muskrat along their shorelines. Waterfowl, shorebirds, and riparian species such as raccoons and kingfishers probably use these sites at least seasonally.

Most, if not all, of these larger areas have edge habitat where they interface with roads, railroad tracks, old fields and hay fields. These edge areas often have wildlife and some degree of functioning habitat as well. In fact, many species of wildlife such as deer, and ruffed grouse, and sometimes even predators on the prowl for small mammals, can be found there. Old fields and brushy type habitats are used extensively by rabbit and snowshoe hare, fox, deer, and even species such as bobcats in search of prey. These edge, or transitional communities can be very productive wildlife habitats.

Wildlife Unit #3 (~850 acres) is the largest core wildlife habitat area and probably the most significant area for wildlife within the City. The Unit extends from the far northern edge of the City south to Hubbard Park, with a raised plateau that facilitates wildlife passage. This area remains remote and more than likely serves as a north-south movement corridor facilitating seasonal and yearly wildlife movements throughout the City.

The Unit contains extensive areas of mapped and field observed deer-wintering yards, and contains evidence of use by bear, bobcat, fisher, coyote, and fox. Ledge habitats are contained within the Unit that are occupied by raccoons, porcupines, and likely fisher and bobcats. While bear sign was observed in the Unit, there were no significant beech stands found that bears might develop a fidelity to and return to on a regular basis. Seep habitats were identified in the Unit, including the relatively large (>1 acre)

Wetland Unit #63. Seeps such as this, as well as the more remote wetlands, are sought after by many species of wildlife including black bear, turkey and deer. Many small streams originate in the higher elevations of the Unit and provide habitat for salamanders and other amphibians. Within the larger brooks, minnow-like small fish such as dace, slimy sculpin and brook trout are likely present.

Forest management activities in Wildlife Unit #3 have created openings in an otherwise largely unbroken expanses of hemlock and conifer cover. These openings will, as time progresses, develop into thickets of young hardwood and softwood cover. As time goes by, species such as woodcock are likely to be associated with these young forest associations and thickets of alder. Songbirds such as the very and red-breasted grosbeak will likely come to live in these areas. These young growth areas are in some cases already providing food (shrubby hardwoods) for deer and moose, and cover for small mammals. Predators, ruffed grouse, and other species likely use these areas for finding prey and in the case of the grouse--for avoiding avian predators such as the goshawk.

Wildlife Unit #11 (~480 acres) is the second largest core habitat area in the City. This Unit is contiguous to expansive forests in the neighboring town making its overall area much greater than recorded in this survey. The total area of Unit #11 is estimated to be greater than 1000 acres, about half of which is in the town of Middlesex. Extensive areas of mapped deer-wintering areas are contained in this Unit. This area is large enough to support wildlife species such as black bear, fisher, bobcat and other wide-ranging predators and contains a relatively large (>15 acre) softwood swamp as well as marsh habitat (Wetland Unit #s 14 and 1). Some beaver activity is also present within the swamp. These areas likely attract deer, moose, fisher, as well as aquatic mammals, amphibians, and possibly fish.

Wildlife Unit #4 encompasses the area of North Branch Park and contains a wide range of wildlife habitats: small streams with salamander and amphibian habitat, fruit trees which attract deer and possibly bear, several sections of floodplain habitat that attract species such as fox, raccoon, and mink and water-dependent bird life, and an emergent marsh wetland. The Park also has areas of early successional forest that likely provide habitat for woodcock and grouse. Unit #4 has an emergent marsh that serves as habitat for birds such as waterfowl and red-winged blackbirds, as well as, for muskrat, amphibians, and predators such as the fox and mink. Bear sign was observed in this Unit during field investigation. The bear use in Wildlife Unit 4 was apparently to gain access to apple trees on the eastern side of the unit. Evidence of deer wintering use was observed in the Unit, these areas were most often within eastern hemlock forests. Many small streams originate in the Unit's higher elevations providing habitat for salamanders and other amphibians. Within its larger brooks, minnow-like small fish such as dace, slimy sculpin and brook trout are likely present.

Management Recommendations: The larger forested blocks within Montpelier contain special qualities of wildness and space that allow predators to roam, and species of all kinds to breed. Many species depend upon unbroken forest habitat, or specific habitat elements (such as beech trees, ledge, or riparian forests) at some time within the year. Fragmentation of these habitats, as a result of new roads, houses, and other developments, could reduce the overall diversity of wildlife in the City. These habitat elements need to be accessible and connected to broader wildlands for some species to remain within Montpelier.

## **Wildlife Unit #s 12-17**

Wildlife habitat south of Interstate 89 is broken into mid-sized units (~12 to 177 acres in size) resulting in a moderate degree of habitat fragmentation. Wildlife Unit #s 12, 14, 15, and 17 are the largest continuous wildlife habitats in this area, at 141 acres, 153 acres, 82 acres, and 177 acres, respectively. Unit #s 12-17, including the smaller Unit #s 13 and 16 all are likely seasonal habitat for fox, coyote, deer, ground hogs, songbirds, and the wild turkey.

Wildlife Unit #15 is important as it extends into larger forest areas in the south, including some areas that are adjacent to mapped deer wintering areas. Wildlife Unit #s 14 and 15 had sign of winter use by deer and these units may be critical to the winter survival or movement of white-tailed deer within, as well as in and out, of the southern City limits. Wildlife Unit #15 might play an especially important role in the seasonal movements of deer, as they move in and out of wintering habitat south of the City. Wildlife Unit #14 has some structure present and could potentially provide denning and resting habitat for predators, especially bobcat and fisher. Wildlife Unit #17 may be large enough to contain moose, deer, fox, coyote, and songbirds although species such as moose generally require larger areas for yearlong residence.

## **Wildlife Unit #s 7-10, and 18**

These Wildlife Units form the eastern edge of wildlife habitat in the City and are situated in close proximity to the Urban Core. Wildlife Unit #s 10 and 18 are over 200 acres in size and contain a mix of hardwood, conifer, and early successional forests. In addition, field and other open type environments are found interspersed within Unit #18, also known as Sabin's Pasture. Sabin's Pasture is one of the larger wildlife habitats in close proximity to many of the Urban Core woodlands. It likely serves as a source area for certain species of wildlife that enter into the Urban Core or surrounding area. Wildlife Unit #s 10 and 18 comprise a nearly continuous expanse of approximately 500 acres of wildlife habitat. Unit #18 contains some beaver-influenced wetlands that potentially offer habitat to aquatic wildlife.

Unit #s 9 and 11 are also adjacent to the Urban Core and may help maintain wildlife populations within the more urbanized regions of Montpelier. Unit #8 is contiguous to larger forested regions outside of Montpelier that may positively influence wildlife populations within the City. Wildlife Unit #s 7 and 9 contain swamps dominated by alder thickets. These swamps may be used by woodcock as well as predators such as bobcat in search of small mammals.

## **Urban Core: Wildlife Unit #s 1, 6, 19-24**

Wildlife Unit #s 1, 6, and 19-24, were all investigated in the field. All of these Urban Core habitats are located to the north of the Winooski River. These small but significant patches of forested habitat within the urban core are some of the more important habitats within Montpelier. These areas consist of small woodlots, tree lines and clumps of trees that offer denning, resting, feeding, and escape habitats within the core urban center. These sites provide the urban core residents with natural communities, harboring plant and animal species, to see and interact with on a regular basis. All of the small woodlots within the urban core of Montpelier are dominated by edge and

disturbed forest community habitat. These areas contain wildlife typical of more open, drier habitats, such as mice, voles, skunks, raccoons, squirrels and groundhogs. More common songbirds such as the American robin and the black-capped chickadee are present.

Unit #s 1 and 24 offer mast (hickory nuts and red oak acorns) that is apparently utilized by gray squirrels. Nut-bearing trees scattered around the Urban Core are also important in providing food and maintaining the squirrel population in the downtown region. Stands of conifers in the Urban Core may support red squirrel populations although none were observed. Sign of raccoons living in old dead trees (snags) were located in Unit #s 1, 2, and 20 (where silver maple trees grow to very large diameters). Groundhog dens were located in Unit #s 6, 19, and 20 and are probably located throughout the City. No fox dens were located in Urban Core woodlots, although some areas are big enough for their dens (especially Unit #s 19 and 6). Fox prefer sandy soils for digging dens, and any area larger than a few acres that contains these coarse soils may be appropriate for this species.

Many bird species have been found nesting within the Urban Core woodlots. Most of the City's woodlots have some larger sized dead trees that are required for cavity nesting species. Bird diversity within woodlots is often greater when there are several different types of plant communities and a diversity of plant life. Bird species diversity tends to increase with an increase in the number of different layers of vegetation in the forest.

Wildlife Unit #s 1, 19, 21, and 24 have habitat features that suggest that a diversity of bird species live and nest in these areas. The greatest diversity of bird observations within the Urban Core (assessed in autumn only) was in Unit #24. This relatively small woodlot has the hilliest terrain, the largest mast producing oak and hickory trees, ledge habitat (mainly habitat for small mammals) and probably one of the highest nesting densities for squirrels within the Urban Core.

White-tailed deer are scattered throughout the City. Outside of Hubbard Park, there is very limited deer wintering habitat within the Urban Core. Summer use by deer within the Urban Core, however, is quite common. Most deer in the downtown area probably come from larger woodlots on the edges of the Urban Core. Unit #18 and areas south of the Winooski River such as Unit #s 3, 4, 8, 11-14 are likely "source" areas for Urban Core wildlife with larger home range requirements, such as white-tailed deer, moose, fox, snowshoe hare and fisher.

Amphibians and reptiles are most often associated with moist habitats such as streams, ravines, vernal pools and other wetlands. Small wetlands, seeps and small drainages were most common in Unit #s 19 and 20. Wildlife Unit 23 also had a small drainage within it. These drainages are likely home to frogs, a variety of salamanders, turtles and snakes. No vernal pools were located within the Urban Core of the City of Montpelier.

*Management Recommendations:* Within the Montpelier Urban Core, wildlife habitat can be enhanced by the following measures: 1. allowing forested areas to remain forested, and encouraging the growth of additional wildlands where possible, 2. planting mast bearing trees such as hickory, oak, and American beech along the roads, in front and backyards, and public places within the downtown, 3. planting fruit-bearing shrubs within the City, 4. allowing dead standing and fallen trees to remain in place when safety

considerations allow, 5. protecting and buffering streams and wet areas within the Urban Core, and 6. protecting the water quality of the small streams, as well as the Winooski River and its tributaries.

### 3.4 Rare Elements

There were 3 occurrences of rare, threatened, endangered or "tracked" species reported from Montpelier prior to this study. "Tracked" species are those species that are not on the state Endangered Species list but are considered to be in peril in the state by the Vermont Natural Heritage Program (NNHP). Each site was revisited during this survey as landowner permission allowed. Each of the historical and current rare element occurrences is described below.

#### *Diphasiastrum sabinifolium* Ground-fir

This is a small clubmoss that generally grows in conifer forests at varying elevations under conifer and mixed woods. It is listed as S2/S3 in the state which means this species status is not fully known but it is rare to uncommon. There was an historical record from 1912 of this plant from the north east side of the National Life hill. Permission to visit this site was denied for this study. However, Elizabeth Thompson conducted a through survey of this site for *Diphasiastrum sabinifolium* in 1985 and failed to relocate the population. During the present inventory, appropriate habitat in the surrounding area was surveyed for this species but no populations were discovered. Without a more recent survey, it can only be assumed that the population has been extirpated.

#### *Margaritifera margaritifera* Eastern Pearshell

This freshwater mussel is ranked S2 in the state. This ranking indicates that the species is rare and there are fewer than 20 occurrences. It most often grows in streams with sand, gravel or cobble substrate. In 1985, about 12 abandoned shells were collected in the Winooski River just down from Main Street and High Bridge. No live specimens were found. This site was resurveyed during this study and no live or abandoned shells were discovered. There is a large population of this species in Plainfield and in the Kingsbury Branch in East Montpelier. A canoe survey along the North Branch River from Gould Hill Road to Vine Street also revealed no populations of this species. In all sites surveyed, the very similar Eastern Elliptio (*Elliptio complanata*) was very common.

#### *Polygonum achoreum* Blue Knotweed

An historical population of this rare knotweed was reported from the railroad yard between the Winooski River and Barre Street in Montpelier. This site was surveyed during this inventory and no plants of this species were found. A similar species, *Polygonum aviculare*, was found at this site. Since there is no herbarium voucher specimen for the original occurrence, it is not possible to verify the identification. It is possible that the original collection was mis-identified. In any case, this species does not currently appear to be present at this site.

#### *Dichanthelium depauperatum* Depauperate Panic Grass

A small population of this uncommon grass was found during this inventory in the railroad yard between the Winooski River and Barre Street. It was found on the north side of the tracks that are abandoned with bent grass (*Agrostis hyemalis*), panic grass (*Panicum scabriusculum*) and Canada goldenrod (*Solidago canadensis*). A small population of about eight (8) individuals was found here, all plants were in fruit. The plants are difficult to see in this location because they are short and scattered among all of the other vegetation. There may be more individuals here that were not seen. This plant is ranked S3 by the NNHP and considered uncommon in the state.

*Juncus ensifolius*

Sword-Leaved Rush

Two small populations of this species were found along the shores of the North Branch River south of Gould Hill Road. This is a species that is common in Western North America but has only one other known station in the east (in eastern New York). This is the first record of this species in Vermont and New England. Given its current and historical distribution, however, it is thought that this species has been introduced in the east. This species is currently unranked by the NNHP.

*Diplazium pycnocarpon*

Glade Fern

This species of fern is uncommon in the state and is listed as S3 by the NNHP. A small population of this species was found on the steep slopes of the Rich Northern Hardwood Forest in the south part of the City (Upland Natural Community Unit # 19). Though only a few individuals were found, most of the site could not be inventoried due to lack of landowner permission. It is likely that the population of Glade Fern at this site is well established and fairly stable.

#### **4.0 Resource Maps**

Individual ArcView shapefiles were created for the three resource groupings: wetlands, wildlife habitats and upland natural communities. The GIS platform provides a versatile tool for ongoing analysis of the resource areas. Resource maps are provided in the Attachment. ArcView shapefiles are provided in digital form on the CD-Rom included with this report.

#### **5.0 Citizen Training Workshop**

A field-training component was incorporated into the project. This field training was to assist Montpelier residents in continuing on into the future with the assessments of wildlife, wetland, and natural communities. An introduction to the methods (including where appropriate, field forms) developed and used by Arrowwood Environmental were discussed and applied in a field setting within Montpelier in February 2002.

#### **6.0 Conclusions**

The Natural Resources Inventory conducted by Arrowwood Environmental for the City of Montpelier has identified many significant and interesting resources within the City. Seventy-six different wetlands were identified, including Shallow Emergent Marshes, Shrub Swamps, Floodplain Forests, Seeps, a hardwood swamp and a potential conifer dominated swamp. These wetlands represent a wide range of plant and animal habitats

and exhibit a diversity of functions and values. Some of the most significant wetlands in the town are those associated with the North Branch of the Winooski River. These include the Silver Maple-Ostrich Fern Riverine Floodplain Forest, Alluvial Shrub Swamps and many interesting Emergent Marshes. The wetlands in the City exhibit a wide range of functions and values and provide vital habitat for many species of wildlife.

There were eight (8) upland natural community types identified during this inventory of the City. The largest acreage in the City is occupied by the White Pine – Northern Hardwood Forest, the Northern Hardwood Forest and the Mixed Conifer – Northern Hardwood Forest. These communities often intergrade and form the matrix communities in the City. The City also contains some locally significant examples of a Red Oak – Northern Hardwood Forest, a Hemlock Forest and Rich Northern Hardwood Forests. Taken together, these communities provide habitats for a fair amount of plant diversity. Overall, this mixture of upland communities forms an interesting and important mosaic on the landscape. These communities are important not only for the people that live and work in them, but also for the ecological roles that they play in the larger landscape.

There were twenty-four wildlife habitat units identified in this survey, providing the City with a rich legacy of wildlife within its borders. The wildlife habitat in Montpelier offers a home to a wide-variety of wildlife. Larger expanses of forested wildlife habitat are found mainly to the north of the downtown area, located to the east and west of Route 12. Within the Urban Core the woodlots are smaller and scattered throughout the City. Key habitats, such as ledge, deer wintering yards, deep forest habitat, shorelines, forest seeps and wetlands, as well as the potential wildlife corridors have all been identified within the City.

The attached Resource Maps are based on remote sources (1996 orthophoto interpretation, color infra red photograph interpretation, NRCS soils surveys, etc.), with limited field verification. Therefore, the Resource Maps must be considered a baseline from which further work can build. These resource maps are an important step in the inventory process and include some very interesting and important resources. Because of limitations in fieldwork, many more resources likely remain to be documented in the City. This process of adding to and refining the resource maps is an important undertaking that can be carried out by interested towns-people, local naturalists, and knowledgeable landowners. Updating and refining the resource maps will result in the maintenance of this valuable planning tool into the future.

**Natural Resources Inventory  
City of Montpelier, Vermont**

**Table 3: Wildlife Habitat Summary Data**

Unit ID*	Location	Size (acres)	HabitatDescription (Urban Core/ NonUrban Core)	Forest Type	Foliage Height Diversity (L/M/H)	Horizontal Diversity (L/M/H)	General Cover (L/M/H)	Structure	Rivers	Wetlands (1 or more)	Standing Dead Trees	Deer Yard (Field Identified)	Deer Yard (State Mapped)	Woody Debris	LandUse	Parkland	Special Habitats	Observed Wildlife Sign
1	Barre Street	2.35	Urban Core	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2	Guild Hill	382.66	NonUrban	softwood	L-M	H	L	R	Y	Y	L-M	Y	N	M	forest	N	P,D,M	M,D,P,H,C
3	Hubbarb Park and North	851.90	NonUrban	softwood	L-M	L-M	M-H	R,H	Y	Y	H	Y	Y	H	forest	Hbbrd_Park	BB,AB,R,PD,P,RFS,D,T	BB, FI, BCT,P,RF,SH,R,M,D,S,PWP
4	Elm Street	341.73	NonUrban	mix	M	M	L-M	V,R	Y	Y	M	Y	Y	M	forest,farm,roads	N_Brnch_Pk	LV,FP,T,P,D,BB	BB,FI,P,RF,C,SH,M,D,PWP,M,R,RG,SaI,RS
5	North Street	99.33	NonUrban	softwood	L-M	L-M	L-M	SW,RL	Y	Y	L-M	Y	N	L	roads,houses,forest	N	RFD,F,P,RS	RF,D,Wsl,P,RS,PWP
6	Towne Street	12.63	Urban Core	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
7	Main Street	41.95	NonUrban	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
8	Chestnut Hill Road	48.50	NonUrban	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
9	Bliss Road	67.98	NonUrban	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
10	Gallison Hill Road	267.25	NonUrban	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
11	Terrace Street	480.51	NonUrban	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
12	National Life Drive	140.74	NonUrban	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
13	Memorial Drive	52.09	NonUrban	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
14	Northfield Street	153.18	NonUrban	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
15	Hill Street	81.58	NonUrban	hardwood	L	M	L	R,L	N	N	L-M	Y	N	L-M	roads,houses,forest	N	RFS,D	Trk, D, Brds
16	Hersey Road	11.64	NonUrban	softwood	L	L	L	N	Y	Y	M	Y	N	L	forest,roads	N	RFS,D,F	
17	River Street	176.67	NonUrban	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
18	Sabin Pasture	235.59	NonUrban	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
19	Harrison Avenue	10.75	Urban Core	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
20	Marvin Street	8.11	Urban Core	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
21	City Hall Woods	3.12	Urban Core	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
22	Ewing Street	2.66	Urban Core	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
23	Liberty Street	3.34	Urban Core	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
24	Ridge Street	1.19	Urban Core	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U

**Notes:**

- \*: Unit ID corresponds to ArcView Shapefile polygon Ids.
- Y/N: Yes/No
- U: Unknown
- NA: Not Applicable
- L/M/H: Low/Moderate/High
- Code for Structural Attributes:
  - R: Rocky
  - H: Hilly
  - V: Valley
  - L: Ledge
  - SW: Stone Wall
  - RL: Rolling
- Code for Special Habitats:
  - BB: Presence of bear sign
  - PD= Porcupine Den
  - AB: American Beech Stand
  - Or: Orchard
  - Pt: Peatland
  - RS : Rich, or limy forest sites
  - P: Plantation of trees
  - FP: Presence of floodplain forest
  - T: Trails
  - LV: Varved Clay
  - R: Rocky
  - RFD: Red Fox Den
- Code for Wildlife Sign:
  - BB: Black Bear
  - D: White-Tail Deer
  - M: Moose
  - Bv: Beaver
  - Rc: Raccoon
  - Pp: Porcupine
  - Wc: Woodcock
  - F: Fish
  - H: Hawk
  - SH: Snowshoe Hare
  - Wsl: Weasel
  - RG: Ruffed Grouse
  - WP: Woodpecker
  - Fi: Fisher
  - O: Otter
  - Mk: Mink
  - Bct: Bobcat
  - Fo: Fox
  - C: Coyote
  - TD: American Toad
  - Sal: Salamander
  - PWD: Pileated Woodpecker
  - Brds: Other Birds
  - WF: Waterfowl
  - RF: Red Fox
  - Trk: Turkey

**Natural Resources Inventory  
City of Montpelier, Vermont**

**Table 2: Upland Natural Communities Summary Data**

Unit ID*	Natural Community Classification	Size (Acres)	Comments
1	White Pine - Northern Hardwood Forest	10.49	
2	Pine plantation	6.78	
3	Red Spruce - Northern Hardwood Forest	182.51	inclusions of White Pine and Hemlock Forests
4	White Pine - Northern Hardwood Forest	92.61	
5	Hemlock Forest	8.72	
6	Northern Hardwood Forest	33.20	
7	Northern Hardwood Forest	7.04	
8	White Pine - Northern Hardwood Forest	155.46	
9	Northern Hardwood Forest	8.53	
10	White Pine - Northern Hardwood Forest	24.87	
11	Red Pine Plantation	11.89	
12	Red Oak - Northern Hardwood Forest	10.31	
13	Northern Hardwood Forest	39.62	
14	White Pine Plantation	6.66	includes Red Pine
15	Hemlock Forest	3.53	
16	Rich Northern Hardwood Forest	11.53	
17	Northern Hardwood Forest	34.04	
18	Northern Hardwood Forest	4.61	
19	Rich Northern Hardwood Forest	6.80	
20	White Pine - Northern Hardwood Forest	14.21	
21	Northern Hardwood Forest	40.67	
22	White Pine - Northern Hardwood Forest	10.87	
23	White Pine - Northern Hardwood Forest	28.82	Includes Old Field
24	White Pine - Northern Hardwood Forest	4.36	
25	Northern Hardwood Forest	5.15	
26	White Pine - Northern Hardwood Forest	19.21	
27	Northern Hardwood Forest	50.26	
28	White Pine - Northern Hardwood Forest	103.93	inclusions of Hemlock Forest
29	Northern Hardwood Forest	14.53	
30	White Pine - Northern Hardwood Forest	14.00	
31	Hemlock - Northern Hardwood Forest	11.20	
32	White Pine - Northern Hardwood Forest	12.60	
33	Northern Hardwood Forest	6.98	
34	White Pine - Northern Hardwood Forest	14.26	
35	Northern Hardwood Forest	3.31	
36	Northern Hardwood Forest	4.86	
37	Red Spruce - Northern Hardwood Forest	1.15	
38	White Pine Plantation	5.54	
39	White Pine - Northern Hardwood Forest	319.57	
40	Hemlock Forest	17.30	steep slopes
41	White Pine - Northern Hardwood Forest	195.74	may contain inclusions of wetlands
42	Red Spruce - Northern Hardwood Forest	20.22	
43	White Pine Plantation	6.76	
44	White Pine Plantation	3.14	
45	Hemlock Forest	2.82	
46	White Pine - Northern Hardwood Forest	62.10	young forest, steep slopes
47	White Pine - Northern Hardwood Forest	82.02	
48	Northern Hardwood Forest	40.82	
49	Northern Hardwood Forest	13.15	
50	White Pine - Northern Hardwood Forest	33.01	
51	Hemlock Forest	52.71	
52	Red Pine Plantation	3.51	
53	Northern Hardwood Forest	5.59	
54	Northern Hardwood Forest	79.68	
55	Northern Hardwood Forest	18.22	
56	Mixed Conifer - Northern Hardwood Forest	746.96	A mosaic of White Pine, Red Spruce and Hemlock with Northern Hardwoods
57	White Pine - Northern Hardwood Forest	15.40	
58	White Pine - Northern Hardwood Forest	9.14	
59	Mixed Conifer - Northern Hardwood Forest	163.90	A mosaic of White Pine, Red Spruce and Hemlock with Northern Hardwoods
60	Northern Hardwood Forest	237.94	inclusions of mixed conifers
61	White Pine - Northern Hardwood Forest	15.00	
62	Northern Hardwood Forest	15.27	
63	Red Spruce - Northern Hardwood Forest	30.08	
64	Northern Hardwood Forest	11.38	
65	White Pine - Northern Hardwood Forest	80.84	
66	Norway Spruce Plantation	1.21	
67	Northern Hardwood Forest	162.02	

Notes:

\*: Unit ID corresponds to ArcView Shapefile polygon Ids.

**Natural Resources Inventory  
City of Montpelier, Vermont**

Table 1: Wetlands Summary Data

Unit ID*	Natural Community Classification	Size (Acres)	Wetland Classification	Comments
1	Emergent Marsh	4.62	Class II	old oxbow; beaver influenced
2	Alder Swamp	1.33	Class II	
3	Emergent Marsh	2.68	Class II	
4	Old Field	1.64	Class III	may be inclusions of Emergent Marsh or Alder Swamp
5	Emergent Marsh	2.07	Class III	fen vegetation; created by construction of dam
6	Pond	0.80	Class III	manmade pond
7	Alluvial Shrub Swamp	0.70	Class III	riverine
8	Alluvial Shrub Swamp	3.25	Class II	riverine
9	Emergent Marsh	0.99	Class III	riverine
10	Silver Maple - Ostrich Fern Floodplain Forest	17.00	Class II	
11	Emergent Marsh	4.99	Class III	old field; needs verification
12	Old Field	10.41	Class III	includes drainages
13	Old Field	2.35	Class III	field drainage; may contain Emergent Marsh
14	Spruce-Fir-Tamarack Swamp	18.84	Class II	beaver pond inclusion
15	Emergent Marsh	8.84	Class II	beaver meadows
16	Pond	0.79	Class II	natural pond, though may be impacted by road; includes Emergent Marsh
17	Agricultural Field	4.58	Class III	in floodplain
18	Emergent Marsh	2.15	Class II	beaver meadow and pond
19	Old Field	0.09	Class III	drainage into Pond
20	Old Field	8.70	Class III	
21	Emergent Marsh	1.05	Class III	
22	Emergent Marsh	1.19	Class II	includes pond
23	Pond	0.41	Class II	agricultural pond
24	Pond	0.55	Class III	manmade pond
25	Silver Maple - Ostrich Fern Floodplain Forest	0.94	Class III	remnant
26	Old Field	2.08	Class II	
27	Old Field	5.20	Class III	drainage; needs verification
28	Alder Swamp	4.00	Class III	
29	Pond	0.08	Class III	manmade
30	Silver Maple - Ostrich Fern Floodplain Forest	4.37	Class II	
31	Seep	0.64	Class III	
32	Pond	0.01	Class III	
33	Pond	0.24	Class III	
34	Pond	0.15	Class III	
35	Emergent Marsh	2.89	Class III	old oxbow; includes Alder Swamp
36	Silver Maple - Ostrich Fern Floodplain Forest	1.73	Class III	
37	Silver Maple - Ostrich Fern Floodplain Forest	2.71	Class III	
38	Old Field	1.64	Class II	may include Emergent Marsh or Alder Swamp
39	Seep	0.04	Class III	
40	Alluvial Shrub Swamp	14.20	Class II	may be inclusions of Emergent Marsh & open water; needs verification
41	Emergent Marsh	0.59	Class II	needs verification; may be swamp
42	Pond	0.12	Class III	agricultural pond
43	Alluvial Shrub Swamp	1.03	Class III	
44	Alder Swamp	0.67	Class II	old field; needs verification
45	Emergent Marsh	3.43	Class III	old field; needs verification
46	Pond	0.09	Class II	agricultural pond
47	Pond	0.26	Class III	manmade pond
48	Agricultural Field	15.18	Class III	
49	Agricultural Field	2.50	Class III	Emergent Marsh in drainage; needs verification
50	White Pine - Northern Hardwood Forest	38.41	Class III	hydric soils; may contain wetlands; needs verification
51	Emergent marsh	0.23	Class III	
52	Agricultural Field	2.23	Class III	
53	Seep	0.11	Class III	Forested Seep; interesting example of type
54	Red Maple-Black Ash Swamp	2.46	Class II	backwater swamp; boundaries uncertain
55	Emergent Marsh	0.56	Class III	includes Alder Swamp
56	Emergent Marsh	0.82	Class III	hillside drainage
57	Alluvial Shrub Swamp	1.32	Class III	
58	Agricultural Field	0.86	Class III	field drainage
59	Seep	0.14	Class III	small Alder Swamp inclusion
60	Agricultural Field	2.29	Class III	drainage in field; includes pond; needs verification
61	Alder Swamp	0.41	Class III	inclusions of Emergent Marsh
62	Emergent Marsh	0.74	Class II	small drainage; includes Alder Swamp
63	Seep	1.85	Class III	
64	Vernal Pool	0.01	Class III	
65	Emergent Marsh	0.42	Class II	in powerline
66	Agricultural Field	18.66	Class III	hydric soils
67	Pond	0.017	Class III	
68	Pond	0.039	Class III	
69	Pond	0.056	Class III	
70	Pond	0.136	Class III	
71	Pond	0.017	Class III	
72	Pond	0.125	Class III	
73	Pond	0.096	Class III	
74	Pond	0.059	Class III	
75	Pond	0.093	Class III	
76	Pond	0.117	Class III	

Notes: \*: Unit ID corresponds to ArcView Shapefile polygon Ids.