

# **Natural Communities of the LaPlatte River Marsh Natural Area**

**Shelburne, Vermont**



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**for**

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## **Background**

The LaPlatte River Marsh has long been recognized as a natural treasure. The natural area is diverse and includes much more than an outstanding marsh complex; it also includes floodplain forests, buttonbush swamps, rare forest types, rare species of plants and animals, and excellent wildlife habitat. Standing on the levee shoreline of the LaPlatte River under an arching canopy of silver maple it is easy to imagine being in a remote and wild location, even though a highly developed portion of Chittenden County surrounds the natural area.

The LaPlatte River emerges from Lake Iroquois and flows northwest 16 miles to Lake Champlain. The LaPlatte River Marsh is located in a low-lying area where the LaPlatte River flows into the lake. Annual spring river and lake flooding of the marsh allows only water tolerant species such as black willow, green ash and silver maple to thrive (LaPlatte Trail Guide).

The LaPlatte River Marsh complex stretches from Shelburne Bay south and east along the LaPlatte River to Shelburne Falls (See Figure 1). Much of the lower reaches of the LaPlatte River and McCabes Brook and the surrounding marshes, floodplain and upland forests are included in the LaPlatte River Marsh Natural Area, owned and managed by The Nature Conservancy. The Town of Shelburne and Audubon Vermont also own conservation holdings in the area.

The LaPlatte River Marsh was possibly first recognized for its natural values in the classic and influential publication “Vermont Natural Areas” (Vogelmann, 1969). Many ecologists, biologists, botanists, and naturalists have studied the marsh over the years. The Natural History of the LaPlatte River Marsh, Shelburne, Vermont (Fastie, 1985) provides an excellent and detailed description of this natural area.

## **Project Purpose**

The purpose of this project is to map, describe, and determine significance ranks for the natural communities of the LaPlatte River Marsh. Mapping was conducted using standard Natural Heritage Inventory/NatureServe methodology. Natural communities that meet the criteria for state significance will be tracked in the Vermont Fish and Wildlife Department’s Natural Heritage Inventory database. This data is used for conservation planning by VT Fish and Wildlife Department and The Nature Conservancy. An additional purpose was simply to add to the already abundant information on the ecological significance of the LaPlatte River Marshes.

## Physical Setting

### Location

The LaPlatte River Marsh is located at the mouth of the LaPlatte River, which drains into Shelburne Bay in Shelburne (Figure 1).

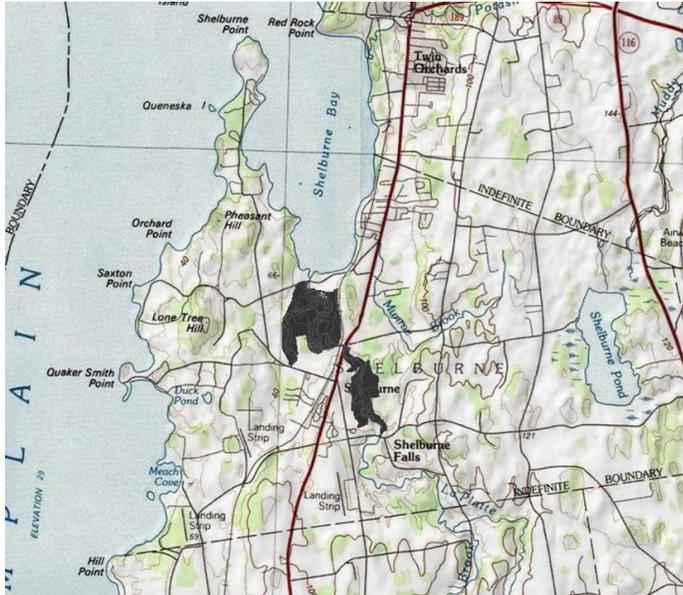


Figure 1: Location map of the LaPlatte River Marsh Natural Area in Shelburne, VT.

The natural community mapping area includes the wetland complex and adjacent upland forests from Bay Street at the mouth of the LaPlatte River upstream to Falls Road in Shelburne Falls. Site work was focused on lands owned by The Nature Conservancy and the Town of Shelburne.

### Bedrock Geology

Only four types of bedrock are mapped in the LaPlatte River Marsh study area (Figure 2) based on the Bedrock Geologic Map of Vermont (Ratcliffe et al., 2011). The entire LaPlatte River Marsh Natural Area west of Route 7 has Monkton Quartzite as the dominant bedrock. Bedrock geology strongly influences the distribution of plant species and natural communities, especially in the case of calcium-rich bedrock such as is found in the LaPlatte River Marsh vicinity. However, in most of the study area west of Route 7 there are deep deposits of glacial-lacustrine and alluvial silt, sand, and clay that cover the underlying bedrock and mask its influence on surface vegetation. Bedrock outcrops, cliffs, and shallow till soils are dominant on the east side of the LaPlatte River south of Route 7 and in these areas the calcium-rich Winooski Dolostone and Danby Formation rock have a strong influence on vegetation and natural communities.

Table 1: The four bedrock types found in the LaPlatte River Marsh vicinity.

Code on Map	Bedrock Formation Name	Acres on Map	Bedrock Description
Cm	Monkton Quartzite	331	Reddish-brown, pebbly, thin- to thick-bedded sandstone, orangey-gray- and buff-weathering well-bedded dolostone, and reddish-brown-weathering dolomitic quartzite
Cd	Danby Formation	46	Thin, light-gray beds of vitreous quartzite and crossbedded sandy dolostone. Unit discontinuous in southern Vermont
Cw	Winooski Dolostone	110	Well-bedded dolostone weathering beige, cream, and buff, with green, red, or gray phyllite, siliceous partings, and thin beds of blue-quartz-pebble conglomerate and quartzite
Csp	Clarendon Springs Formation	1	Steel-gray-weathering, light-gray, massive calcitic dolostone grading upward into darker, more fissile calcitic dolostone containing white quartz knots near top

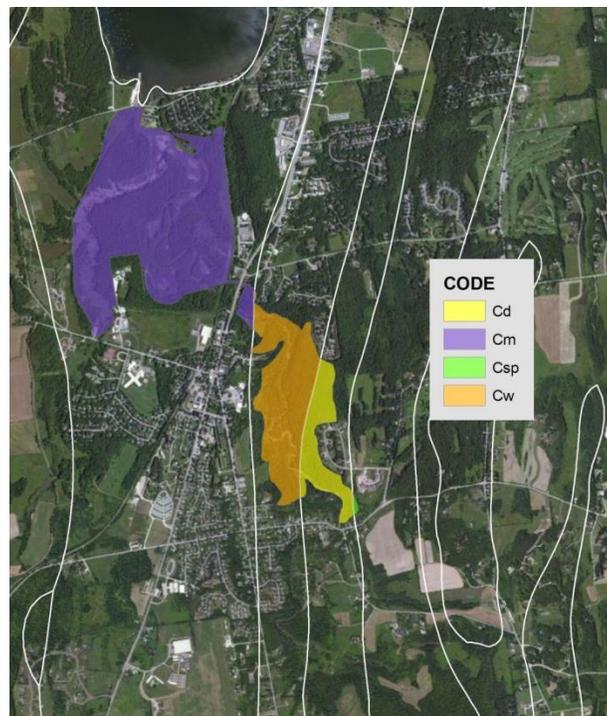


Figure 2: Map of bedrock types in the LaPlatte River Marsh study area. The white lines show the full extent of the bedrock types with colored areas indicating extent of the type in the study area.

## Surficial Geology and Soils

Like geology, soils have significant effects on the distribution of plants and natural communities. The most abundant soil type in the mapping area is Covington Silty Clay, which covers 21.6% of the LaPlatte River Marsh study area. This clay is found in the northwestern portion of the study area and supports mostly Mesic Clayplain Forests. Almost as abundant are Enosburg and Whately soils, which cover 19.9% of the study area, including the peninsula between McCabes Brook and the LaPlatte River. This area mainly supports the rare Sand-Over-Clay Forest natural community. Adams and Windsor loamy sands comprise 13.7% of the study area, including most of the northeastern portion of the mapping area. These soils are closely associated with the rare Pine-Oak-Heath Sandplain Forest, but only a very early successional example of this rare natural community was observed, probably due to past agricultural use and the early successional state of this area forests. The Farmington extremely rocky loam is found in the southern portion of the study area, and includes natural community types associated with bedrock exposure and shallow glacial till. Winooski, Hinesburg, and Duane soils are all closely associated with floodplain forests, though portions of the Winooski soils were also cleared for agricultural use in the southern portion of the study area.

**Table 2: The major soil types in the LaPlatte River Marsh vicinity\*. Information on soils from the Natural Resources Conservation Service.**

Soil Type	Acreage	Percent Cover of LaPlatte
Covington silty clay	105	21.6%
Enosburg and Whately soils	97	19.9%
Adams and Windsor loamy sands	67	13.7%
Water	50	10.3%
Farmington extremely rocky loam	33	6.8%
Winooski very fine sandy loam	26	5.3%
Farmington extremely rocky loam	25	5.1%

\*The other soils types present each made up less than 5% of the LaPlatte River vicinity.

# Major Soil Types LaPlatte Marsh

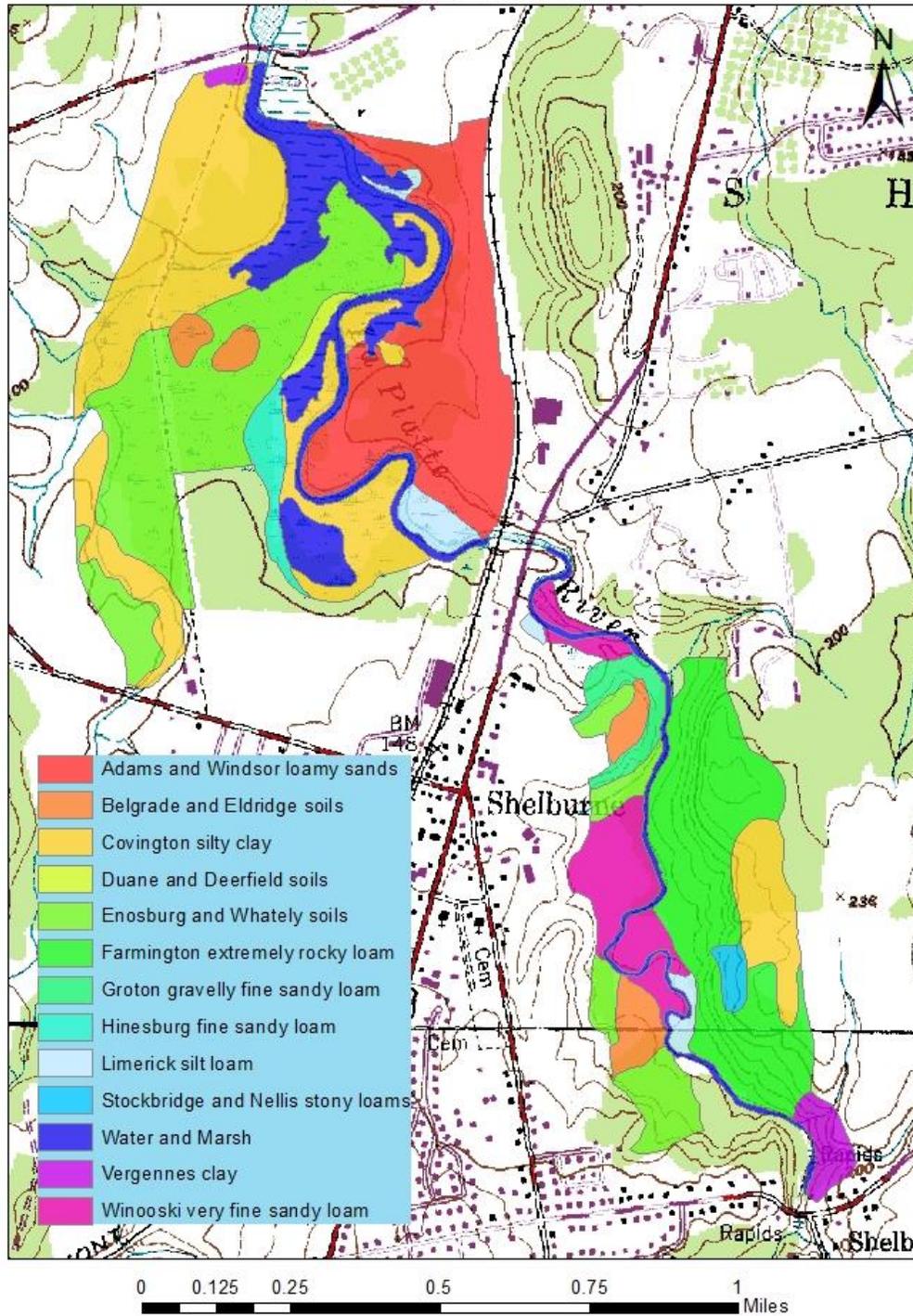


Figure 3: The major soil types of the LaPlatte River Marsh study area (from Natural Resources Conservation Service data).

## Surface Waters

The LaPlatte River watershed occupies 53 square miles and includes drainage from Lake Iroquois in St. George through Patrick Brook, the LaPlatte River headwaters in eastern Hinesburg, and Mud Hollow Brook in Charlotte. McCabes Brook is also within the watershed, drains areas west of Route 7, and flows into the LaPlatte River only 500 feet upstream of Shelburne Bay. Most of the wetland natural communities are affected by the fluctuating water levels of the LaPlatte River, which results in spring and fall flooding, deposition of soils in the floodplain, and also erosion of the river shoreline. In addition, high water levels in Lake Champlain affect most of the wetland natural communities at least as far upstream as the Route 7 bridge. The effect from Lake Champlain is typically much longer duration flooding in the spring than would occur as a result of flooding from the LaPlatte River alone.

## Land Use History

During the 19<sup>th</sup> century the LaPlatte River delta area was primarily used as a pasture (LaPlatte River Marsh Natural Area Trail Guide). The majority of the forest had regenerated by the 1930s and these forests were logged several times. Most of the floodplain forests were still used as pasture as late as 1942 (Fastie, 1985). Throughout most of Vermont, floodplain forests were converted for agricultural use, since their moist, fertile soils without large rocks made farming easy and productive (Johnson 1980). Although the forests have grown back in the LaPlatte Marsh and in some other floodplain areas, floodplain forests in particular still face new threats in the form of invasive species shrub species, especially Common Buckthorn (*Rhamnus cathartica*) and Morrow's Honeysuckle (*Lonicera morrowii*).

## Natural Community Inventory

### Methods

Site visits to the natural communities of the LaPlatte River Marsh were conducted by Eric Sorenson in 2006 and 2011. Additional site visits were conducted by Avery Shawler and Bill Hegman in 2012. Information collected include GPS points, species lists and relative abundance of species, soil profile description, hydrology, and natural community condition. Initial natural community mapping was conducted by Eric Sorenson, with revisions and refinements by Charlie Hohn based on field notes, GPS data, Bing Bird's Eye imagery, and high resolution aerial photography.

Standard Natural Heritage methods were used to:

- Group nearby natural community polygons of the same type into Element Occurrences based on separation distances and barriers.
- Rank each natural community occurrence based on the size of the element occurrence, its current condition, and the landscape context.
- All state-significant natural community occurrences were entered into the Natural Heritage Inventory database.

### **Summary of Natural Community Mapping Results**

The mapping area included approximately 525 acres of wetland and upland habitat in or adjacent to the LaPlatte River Marsh. Twenty one natural community types were observed and mapped and are listed in Table 3. Of these, 14 natural community element occurrences of 12 natural community types were identified that meet the Vermont Natural Heritage Inventory criteria for state-significant natural communities (Table 4). Six land cover types were also identified and are included on the map for areas that are not recognized natural community types, because they are open water or because they are early successional areas and natural community types are not yet apparent. Table 4 summarizes the 13 natural community element occurrences identified and mapped.

Table 3: Natural community types mapped in LaPlatte River Marsh study area.

Natural Community Type	State Significant?	Total Acres
<b>Wetland</b>		
Alder Swamp	No	1
Black Ash Seepage Swamp	No	<1
Buttonbush Swamp	Yes	5
Cattail Marsh	No	10
Deep Bulrush Marsh	Yes	28
Lakeside Floodplain Forest	Yes	24
River Mud Shore	Yes	2
Sedge Meadow	No	21
Seep	No	0.5
Shallow Emergent Marsh	No	3
Silver Maple-Sensitive Fern Riverine Floodplain Forest	Yes	62
Sugar Maple-Ostrich Fern Riverine Floodplain Forest	Yes	2
Vernal Pool	Unknown	<1
Wet Clayplain Forest	Yes	13
Wet Sand Over Clay Forest	Yes	10
<b>Upland</b>		
Hemlock Forest	No	<1
Limestone Bluff Cedar-Pine Forest	No	2
Mesic Clayplain Forest	Yes	62
Pine-Oak-Heath Sandplain Forest	No	46
Sand-Over-Clay Forest	Yes	95
Temperate Calcareous Cliff	Yes	1
Transition Hardwoods Limestone Forest	Yes	29

Table 4: Summary of state-significant natural community element occurrences mapped at LaPlatte River Marsh.

Natural Community Type	Acres	Current Condition	Landscape Context	Size Rank	Element Occurrence Rank
Buttonbush Swamp	5.0	A	AB	A	A
Deep Bulrush Marsh	28.0	B	B	B	B
Lakeside Floodplain Forest	23.8	AB	B	A	A
Mesic Clayplain Forest	35.3	C	C	C	C
Mesic Clayplain Forest	27.2	AB	C	C	B
River Mud Shore	1.7	A	B	A	A
Sand-Over-Clay Forest	95.2	B	BC	B	B
Sand-Over-Clay Forest	11.3	B	CD	C	C
Silver Maple-Sensitive Fern Riverine Floodplain Forest	62.3	B	BC	A	B
Sugar Maple-Ostrich Fern Riverine Floodplain Forest	2.1	A	B	C	B
Temperate Calcareous Cliff	1.1*	A	BC	C	B
Transition Hardwoods Limestone Forest	29.2	B	C	A	B
Wet Clayplain Forest	12.6	BC	BC	C	C
Wet Sand Over Clay Forest	9.8	B	BC	C	B

\* Temperate Calcareous Cliff comprises around 54,000 vertical square feet.

The map below shows the distribution of natural communities mapped at the LaPlatte River Marsh study area.

# Natural Community Types LaPlatte Marsh

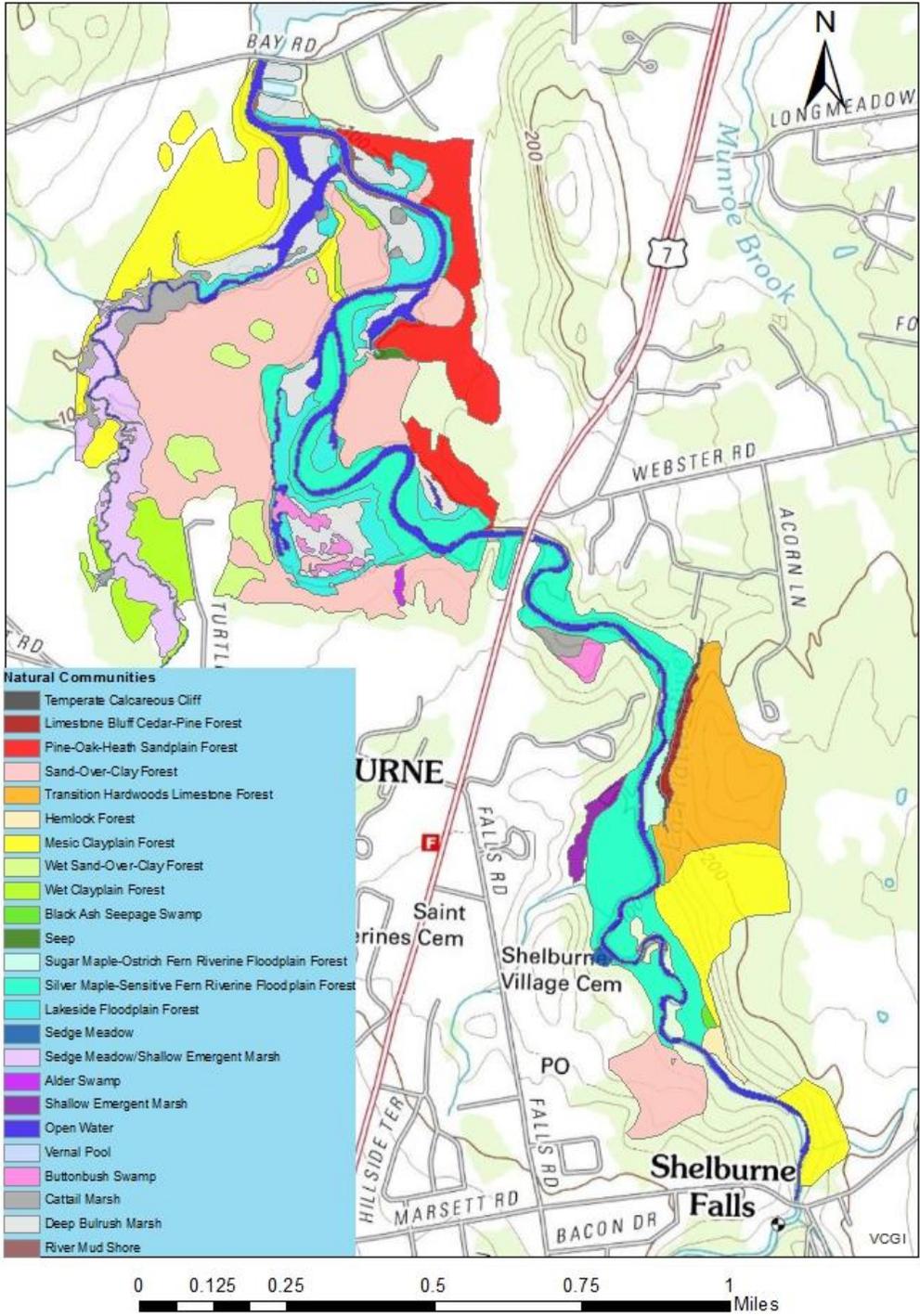


Figure 4: Natural communities map of LaPlatte Marsh area.

## Natural Community Descriptions

### Wetland Natural Communities

#### Alder Swamp

**Significance:** *One small locally significant example of this widespread (S4) natural community.*

A small (0.5 acre) example of Alder Swamp is located in a valley between clayplain terraces south of the river and west of the Route 7 bridge. This small example of a common (S4) natural community is not considered state significant, though it does add to landscape-level diversity of the wetland complex.

The Alder Swamp is dominated by Speckled Alder (*Alnus incana*). A few shrubby Green Ash (*Fraxinus pennsylvanica*) are present. The herb layer is dense (90% cover) and includes Slender Mannagrass (*Glyceria melicaria*), Clearweed (*Pilea pumila*), Spinulose Wood Fern (*Dryopteris carthusiana*), Spotted Touch-Me-Not (*Impatiens capensis*), Sensitive Fern (*Onoclea sensibilis*), and Cinnamon Fern (*Osmundastrum cinnamomeum*). The soils consist of up to 30 cm of organic matter over saturated sand. Abundant seeps feed this wetland, indicating a layer of clay under the sand that obstructs downward water movement in the soil.

#### Buttonbush Swamp

**Significance:** *A-ranked example of this rare (S2) natural community type.*

Several patches of Buttonbush Swamp, making up one element occurrence, are located in the mapping area. These are primarily at the southern end of the main wetland complex west of Route 7, with a patch east of Route 7 also present. This fairly large (5 acre) example of a rare (S2) natural community is considered state significant.

As is often the case with this natural community, Common Buttonbush (*Cephalanthus occidentalis*) is very strongly dominant, with 90% cover. Other species present in low abundance include Spotted Water-hemlock (*Cicuta maculata*), Bulblet Water-hemlock (*Cicuta bulbifera*), the uncommon Yellow Water-crowfoot (*Ranunculus flabellaris*), Water Smartweed (*Polygonum amphibium*), and Climbing Nightshade (*Solanum dulcamara*).

Buttonbush Swamp provides excellent waterfowl habitat.



Figure 5: Buttonbush Swamp south of the LaPlatte River and west of route 7. (Obs. Pt. 012, 9/8/2006)

### Cattail Marsh

**Significance:** *Small, locally significant examples of a widespread (S4) natural community type.*

Two areas of Cattail Marsh, totaling about 10 acres, occur in the mapping area. The main patch occurs along McCabe Brook. The smaller patch occurs just east of Route 7. These examples are relatively small for the Champlain Valley and are considered locally significant but not state significant.

The Cattail Marsh is strongly dominated by cattails (*Typha* spp.) including Broad-Leaved Cat-Tail (*Typha latifolia*), and intergrades with Deep Bulrush Marsh in its wettest sections and Sedge Meadow as it stretches upstream along McCabes Brook and becomes relatively drier.

Historic air photos from the 1960s indicate that some of the western portion of this marsh was once forested wetland – perhaps a swamp supporting silver maple and green ash – so it is possible this natural community may transition eventually back to a forested swamp if not prevented from doing so by high lake levels.



Figure 6: Cattail Marsh (9/28/2011)

### Deep Bulrush Marsh

**Significance:** *B-ranked example of a widespread (S4) natural community type.*

Deep Bulrush Marsh occupies 28 acres in the deeper water stretches along the lower section of the LaPlatte River and McCabes Brook. This sizable example of a relatively common (S4) natural community is considered to be state significant.

Deep Bulrush Marsh occurs in deep water, and is dominated by River Bulrush (*Bolboschoenus fluviatilis*). Cattails (*Typha* spp.) are also present with duckweed (*Lemna* sp.) forming a floating mat on the water surface. In the mapping area, Deep Bulrush Marsh intergrades with Deep Broadleaf Marsh and Cattail Marsh, and some of the area delineated as being part of the Deep Bulrush Marsh may be more similar to Deep Broadleaf Marsh and support significant amounts of Giant Bur-reed (*Sparganium eurycarpum*) and Water Smartweed (*Polygonum amphibium*). The 1984 Zika survey found areas of Giant Bur-Reed as well as Canada Reed Grass (*Calamagrostis canadensis*) and on the wetland margins the invasive Flowering-Rush (*Butomus umbellatus*).



Figure 7: Deep Bulrush Marsh and mixed marsh along McCabes Brook, with a patch of Cattail Marsh behind the scattered silver maples (Obs. Pt. 018., 9/8/2006).



Figure 8: Deep Bulrush Marsh dominated by river bulrush, surrounded by floodplain forest on the eastern side of the LaPlatte River (Obs. Pt. 055, 10/13/2006).

### Lakeside Floodplain Forest

**Significance:** *B-ranked example of an uncommon (S3) natural community type.*

The moderate sized (24 acre) undisturbed Lakeside Floodplain Forest is one of its most significant natural communities in the LaPlatte Marsh. This uncommon (S3) natural community has been largely fragmented along much of its original range by lakeside development, but the example in the LaPlatte River Marsh still experiences a natural flood regime and occurs surrounded by other natural communities in a relatively natural setting.

This Lakeside Floodplain Forest supports a canopy dominated by Silver Maple (*Acer saccharinum*), Green Ash (*Fraxinus pennsylvanica*), and Swamp White Oak (*Quercus bicolor*). The 1983 Zika study also noted canopy American Elm (*Ulmus americana*) – these canopy trees presumably have since succumbed to Dutch Elm Disease. Silver maples up to 80 feet tall and 30 inch diameter at breast height (dbh) were observed in 2013, with even larger 100 foot tall silver maples noted in the 1998 Sorenson report. Winterberry (*Ilex verticillata*) is sometimes present in the shrub layer. The herb layer is mostly bare, but in some areas Sensitive Fern (*Onoclea sensibilis*), Creeping Yellow-Loosestrife (*Lysimachia nummularia*), Royal Fern (*Osmunda regalis*),

and Marsh Fern (*Thelypteris palustris*) are abundant. There are also carpets of silver maple seedlings in some areas that appear not to survive more than a year or two. The sparse groundcover is the result of longer duration flooding in the Lakeside Floodplain Forest which is a foot or two lower in elevation than the riverine floodplain forest that occurs on the levees adjacent to the LaPlatte River.



**Figure 9: A narrow band of Lakeside Floodplain Forest (middle ground, bare of herbs) with Silver Maple-Sensitive Fern Riverine Floodplain Forest on the narrow natural levee adjacent to the LaPlatte River.**



Figure 10: Lakeside Floodplain Forest with swamp white oak (foreground) and silver maple (background) and a wetter depression with Deep Bulrush Marsh. (Near Obs. Pt. 055, 10/13/2006)

### Red Maple-Black Ash Seepage Swamp

**Significance:** a locally significant example of a widespread (S4) natural community type.

A very small (less than 0.5 acre) patch of Red Maple-Black Ash Seepage Swamp occurs to the east of the river downstream (north) of Shelburne Falls.

This small swamp supports an overstory dominated by Black Ash (*Fraxinus nigra*), with Basswood (*Tilia americana*), Yellow Birch (*Betula alleghaniensis*), and American Hornbeam (*Carpinus caroliniana*) also present. Hemlock (*Tsuga canadensis*) occurs on hummocks. Speckled Alder (*Alnus incana*) dominates the shrub layer, with the invasive species European Buckthorn (*Rhamnus cathartica*) and Morrow's Honeysuckle (*Lonicera morrowii*) also present. The herb layer includes Lakeside Sedge (*Carex lacustris*), Large-leaved Aster (*Eurybia macrophylla*), Wood Horsetail (*Equisetum sylvaticum*), and Crested Wood Fern (*Dryopteris cristata*). Soils are peat overlaying clay.

## River Mud Shore

**Significance:** An A-ranked example of an uncommon (S3) natural community type.

An area of River Mud Shore stretches intermittently along approximately 0.65 miles of shore along the LaPlatte River. This natural community consists of mud shores along the river that are only exposed during times of low water, when they are colonized by annual herbaceous plants. This is considered a state significant example of this uncommon natural community.

This natural community consisted mostly of exposed, unvegetated mud at the time it was observed. Scattered plants include Rice Cut Grass (*Leersia oryzoides*), Cardinal Flower (*Lobelia cardinalis*), Giant Bur-reed (*Sparganium eurycarpum*), and Nodding Beggar-Ticks (*Bidens cernua*).

River Mud Shore offers feeding habitat for Great Blue Heron and many other shorebirds.



Figure 11: A narrow band of River Mud Shore on the bank opposite the photo location. During times of lower water a wider area of mud would be exposed. (09/02/2006)

### Sedge Meadow

**Significance:** *Locally significant examples of a widespread (S4) natural community type. Excellent waterfowl and marsh bird habitat.*

Sedge Meadow makes up 21 acres of wetland in the study area, including a small 1 acre patch upstream from the Route 7 bridge along the LaPlatte River and a much larger 20 acre patch along McCabes Brook. The McCabes Brook wetland is intermediate between Sedge Meadow and Shallow Emergent Marsh. Neither of these natural communities are considered state significant, as they are somewhat disturbed examples of a widespread (S4) natural community type.

The large western occurrence is dominated by Lakeside Sedge (*Carex lacustris*), with scattered Broad-Leaved Cattail (*Typha latifolia*), goldenrod (*Solidago* sp.), Reed Canary Grass (*Phalaris arundinacea*), nettle (*Urtica* sp.), Spotted Touch-Me-Not (*Impatiens capensis*), and Giant Bur-reed (*Sparganium eurycarpum*) also present. A few seedlings of Green Ash (*Fraxinus pennsylvanica*) were also observed. Historic air photos from the 1960s indicate that some of the northern portion of this meadow was once forested wetland, and the 1985 Fastie report mention a “Flooded Silver Maple Forest” here, so it is possible this natural community may eventually transition back to a forested swamp or floodplain forest if not prevented from doing so by higher lake levels than those present historically.

### Shallow Emergent Marsh

**Significance:** *Locally significant examples of a widespread (S4) natural community type.*

A relatively small (3 acre) area of disturbed shallow emergent marsh is present east of Route 7 and west of the LaPlatte River. Limited information about this natural community is available, but because of its small size and disturbed condition it is not a state significant natural community.

Additional patches of Shallow Emergent Marsh are present within the large area along McCabe Brook that is mapped as Sedge Meadow.

### Silver Maple-Sensitive Fern Riverine Floodplain Forest

**Significance:** *An A-ranked example of an uncommon (S3) natural community type.*

An large (62 acre) and high quality example of Silver Maple-Sensitive Fern Riverine Floodplain Forest stretches along the LaPlatte River from near Shelburne Falls to just upstream from the confluence of McCabes Brook. This uncommon (S3) natural community is found primarily on natural levees adjacent to the river. As with other floodplain forests, most examples of this natural community in Vermont have been converted to agricultural land, and this excellent example of intact floodplain forest is one of the most significant natural communities of the LaPlatte River Marsh study area.

This natural community is generally dominated by Silver Maple (*Acer saccharinum*), with Green Ash (*Fraxinus pennsylvanica*) also present to locally dominant (Marshall and Matti, 1990).

Younger portions of the floodplain forest, especially upstream from Route 7, also contain significant amounts of Box Elder (*Acer negundo*). Cottonwood (*Populus deltoides*), Swamp White Oak (*Quercus bicolor*), and Basswood (*Tilia americana*) are scattered through the natural community, with American Elm (*Ulmus americana*) present, mainly in the understory. The shrub layer contains patchy Morrow's Honeysuckle (*Lonicera morrowii*) and European Buckthorn (*Rhamnus cathartica*), both invasive species, with the latter mostly on higher ground of natural levees. Common Winterberry (*Ilex verticillata*) is also sometimes present. Vines are abundant and include Virginia Virgin's-Bower (*Clematis virginiana*), Wild Cucumber (*Echinocystis lobata*), Common Ground-Nut (*Apios americana*), American Hog-Peanut (*Amphicarpaea bracteata*), and River Grape (*Vitis riparia*). The herb layer is diverse and includes Sensitive Fern (*Onoclea sensibilis*), Tall Meadow-Rue (*Thalictrum pubescens*), Jack-In-The-Pulpit (*Arisaema triphyllum*), Creeping Yellow-Loosestrife (*Lysimachia nummularia*), White Cut Grass (*Leersia virginica*), Eastern Riverbank Wild-Rye (*Elymus riparius*), and Tussock Sedge (*Carex stricta*), with Small-Spiked False Nettle (*Boehmeria cylindrica*) on natural levees, and some invasive Garlic Mustard (*Alliaria petiolata*) especially upstream from Route 7.



Figure 12: A Silver Maple-Sensitive Fern Riverine Floodplain Forest with Winterberry visible in foreground. (9/28/2011)

### Sugar Maple-Ostrich Fern Riverine Floodplain Forest

**Significance:** *A B-ranked example of a rare (S2) natural community.*

A small (2 acre) example of Sugar Maple-Ostrich Fern Riverine Floodplain Forest is present upstream from Route 7 in an area of floodplain protected from heavy flood scouring by a small rise and enriched by the calcareous cliff towering above. While small, this is an excellent, state significant example of this rare (S2) natural community, with some very large trees.

The Sugar Maple-Ostrich Fern Riverine Floodplain Forest supports a canopy dominated by Sugar Maple (*Acer saccharum*) and Basswood (*Tilia americana*), with Common Hackberry (*Celtis occidentalis*) also present, including an immense (possibly state champion) hackberry with a DBH of 59 cm! Herbs include Ostrich Fern (*Matteuccia struthiopteris*) and Wild Leek (*Allium tricoccum*). This is a discrete and unique area of floodplain protected from heavy flood scouring by a small rise and enriched by the calcareous cliff towering above. While small, this is an excellent example of this rare natural community, with some very large trees.

### Vernal Pool

**Significance:** *This example of an uncommon (S3) natural community may be state significant, depending on the level of amphibian breeding behavior.*

A small vernal pool is present on a small bench southwest of the LaPlatte River near the southern end of the mapping area. This vernal pool measures approximately 50 by 40 feet, and was observed to have 6 to 8 inches of standing water in November 2006. It is uncertain if this pool is state significant, because amphibian breeding status, which is used for ranking vernal pools, was not discernible at the time of survey. Speckled Alder (*Alnus incana*) is present in the area, and the vernal pool shares some characteristics with Alder Swamp. The surrounding forest is a Sand-Over-Clay Forest supporting hemlock and hardwoods.

### Wet Clayplain Forest

**Significance:** *A C ranked example of a rare (S2) natural community.*

Several patches of Wet Clayplain Forest, making up one occurrence, are present along McCabe Brook and between McCabe Brook and the LaPlatte River. These patches together make up around 12.5 acres. The northeastern, smaller patches are in excellent condition, and the larger southwestern patches are young, disturbed forest. This is a state significant occurrence of this rare (S2) natural community.

The northeastern portion of this occurrence occurs in a narrow depression between two areas of Sand-Over-Clay forest. The wet clayplain supports a fairly dense (60% cover) canopy of Red Maple (*Acer rubrum*), Green Ash (*Fraxinus pennsylvanica*), Eastern Hemlock (*Tsuga canadensis*), and Swamp White Oak (*Quercus bicolor*). Many trees are of 30-40 cm dbh and a hemlock was found to be 146 years old. The understory supports trees and saplings of hemlock, red maple, and green ash, along with American Hornbeam (*Carpinus caroliniana*). Shrubs include Common Winterberry (*Ilex verticillata*) and Common Blackberry (*Rubus allegheniensis*), and shrub cover

makes up a total of 20% cover in two layers. Virginia-Creeper (*Parthenocissus quinquefolia*) is present as a vine. Herb cover is well-developed (30% cover) and very diverse (25 species observed in the plot). Some of the more common species include White Cut Grass (*Leersia virginica*), Small-Spiked False Nettle (*Boehmeria cylindrica*), Mad Dog Skullcap (*Scutellaria lateriflora*), Devil's Beggar-Ticks (*Bidens frondosa*), Sensitive Fern (*Onoclea sensibilis*), and Marsh Fern (*Thelypteris palustris*). Areas of bare understory offered evidence of the presence of standing water at some times of year. Several wind-tipped green ash trees were observed. A small wet patch with Sphagnum moss was present.

The younger southern area of Wet Clayplain Forest supports a young but diverse forest of Swamp White Oak (*Quercus bicolor*), Red Maple, Sugar Maple (*Acer saccharum*), Green Ash, American Elm, Shagbark Hickory (*Carya ovata*), and Paper Birch (*Betula papyrifera*). Invasive Morrow's Honeysuckle and European Buckthorn are abundant in the shrub layer, along with willows (*Salix* sp.), Highbush-Cranberry (*Viburnum opulus*), Poison-Ivy (*Toxicodendron radicans*), and introduced apple trees (*Malus* sp.) which indicate the area was previously a field or apple orchard. Virginia-Creeper (*Parthenocissus quinquefolia*) occurs as a vine. The herb layer supports a sedge *Carex* cf. *gracilescens*, aster (*Aster* sp.) and Common Wrinkle-Leaved Goldenrod (*Solidago rugosa*).



Figure 13: Tip-up in the shallow soil of Wet Clayplain Forest.

### **Wet Sand Over Clay Forest**

**Significance:** *C-ranked example of a rare (S2) natural community*

Many pockets of Wet Sand-Over-Clay Forest occur in depressions and low-lying areas around 1 to 2 feet below the main ground level within the larger Sand Over Clay Forest west of the LaPlatte River. Tree species here include Eastern Hemlock (*Tsuga canadensis*), Red Maple (*Acer rubrum*), Yellow Birch (*Betula alleghaniensis*), Eastern White Oak (*Quercus alba*), Swamp White Oak (*Quercus bicolor*), Green Ash (*Fraxinus pennsylvanica*), and Black Cherry (*Prunus serotina*). American Hornbeam (*Carpinus caroliniana*) and Common Winterberry (*Ilex verticillata*) are present in the understory, with Three-Leaved Goldthread (*Coptis trifolia*), Cinnamon Fern (*Osmundastrum cinnamomeum*), and Sensitive Fern (*Onoclea sensibilis*) in the herb layer. Collectively, these patches comprise a state significant occurrence of this rare (S2) natural community.

## **Upland Natural Communities**

### **Hemlock Forest**

**Significance:** *A locally significant example of a widespread (S4) natural community type*

A small (1.5 acre) area of Hemlock Forest occurs on a terrace northeast of the LaPlatte River, just downstream from Shelburne Falls. This area was not surveyed in detail, but was observed to be dominated by Eastern Hemlock (*Tsuga canadensis*) with Eastern White Pine (*Pinus strobus*) and scattered hardwoods also present. Along with the forest of dense white pine to its northeast, this Hemlock Forest may provide wintering habitat for white-tailed deer.

### **Limestone Bluff Cedar-Pine Forest**

**Significance:** *A locally significant example of a rare (S2) natural community.*

A narrow band of Limestone Bluff Cedar-Pine Forest extends along the rim of a cliff stretching along the east side of the LaPlatte River floodplain, southeast of the Route 7 bridge. This natural community is estimated to cover approximately two acres. This natural community was not surveyed in enough detail to determine if it meets the criteria for state significance. Northern White-Cedar (*Thuja occidentalis*) and Eastern White Pine (*Pinus strobus*) occur in this natural community, and Eastern Hemlock (*Tsuga canadensis*) and Red Pine (*Pinus resinosa*) may also be present.

### **Mesic Clayplain Forest**

**Significance:** *a C-ranked example of a rare (S2) natural community.*

Mesic Clayplain Forest occurs in two occurrences in the mapping area, totaling over 60 acres and occurring both in the northwestern and southeastern portions of the mapping area. This natural community, which occurs in areas of clay soil, was once very common in the Champlain Valley but has largely been cleared for agriculture. This natural community is considered to be area (S2 ranked) in Vermont, and both examples in the mapping area are considered to be state significant.

The best example of Mesic Clayplain Forest in the mapping area is found on the western portion of the southeastern occurrence. This forest supports large examples of Eastern Hemlock (*Tsuga canadensis*), Northern Red Oak (*Quercus rubra*), Basswood (*Tilia americana*), Shagbark Hickory (*Carya ovata*), and Sugar Maple (*Acer saccharum*), with one hemlock measured as having a 46 cm DBH and an age of approximately 280 years. Scattered Green Ash (*Fraxinus pennsylvanica*) and Eastern White Oak (*Quercus alba*) are also present. American Beech (*Fagus grandifolia*) and Hop-Hornbeam (*Ostrya virginiana*) are abundant in the understory. Shrubs include American Witch-Hazel (*Hamamelis virginiana*), and herbs include Christmas Fern (*Polystichum acrostichoides*), Tall Scouring-Rush (*Equisetum hyemale*), Zig-Zag Goldenrod (*Solidago flexicaulis*), Broad-Leaved Sedge (*Carex platyphylla*), Southern Long-Awned Wood Grass (*Brachyelytrum erectum*), and Northern Maidenhair Fern (*Adiantum pedatum*). The eastern portion of this occurrence consists of similar but younger forest.

The northwestern occurrence of Mesic Clayplain Forest is significantly younger and more disturbed than the southeastern occurrence. In the western portion of this forest, open grown Eastern White Pine (*Pinus strobus*), Red Maple (*Acer rubrum*), Green Ash (*Fraxinus pennsylvanica*), and Swamp White Oak (*Quercus bicolor*) dominate the overstory, with a significant shrub layer dominated by invasive Morrow's Honeysuckle (*Lonicera morrowii*). Herbs include Partridge-Berry (*Mitchella repens*) and White Cut Grass (*Leersia virginica*). In the center of the occurrence, there is much less honeysuckle, and Eastern Hemlock (*Tsuga canadensis*) is also present in the overstory. American Hornbeam (*Carpinus caroliniana*) and American Elm (*Ulmus americana*) are present in the understory here, with Prickly Ash (*Zanthoxylum americanum*) present in the shrub layer as well as a few invasive honeysuckle (*Lonicera* cf. *morrowii*) and Buckthorn (*Rhamnus* sp.). Canada Wood-Nettle (*Laportea canadensis*) and Jack-In-The-Pulpit (*Arisaema triphyllum*) are present in the herb layer.



Figure 14: Mesic Clayplain Forest. Notice the shallow roots on ash tree in foreground.

### Pine-Oak Heath Sandplain Forest

**Significance:** *A locally significant example of a very rare (S1) natural community.*

A large (46 acre) area north and east of the main marsh complex has been mapped as Pine-Oak Heath Sandplain Forest. The area is currently occupied by a disturbed and mostly young forest, and was mapped as this type because it contains Adams-Windsor Soils that are strongly associated with Pine-Oak-Heath Sandplain Forest. At the current time it supports young Eastern Hemlock (*Tsuga canadensis*), American Beech (*Fagus grandifolia*), Eastern White Pine (*Pinus strobus*), Red Maple (*Acer rubrum*), and Yellow Birch (*Betula alleghaniensis*). A few large mature beech trees are also present. Two invasive shrubs - honeysuckle (*Lonicera sp.*) and buckthorn (*Rhamnus sp.*) - are present in the area. Over time this natural community may develop back into Pine-Oak-Heath Sandplain Forest similar to one that probably initially occupied the site, but this may not be possible without a natural fire regime.

## Sand-Over-Clay Forest

**Significance:** B-ranked example of a rare (S2) natural community.

Two areas of Sand-Over-Clay Forest were documented in the mapping area. This unique natural community occurs when a layer of sand overlies a layer of clay, here on Enosburg and Whately soils. The sand is well-drained and usually low in nutrients, but the clay below blocks drainage and leads to both more water and more nutrient availability than other forests growing on sand. The larger of the two Sand-Over-Clay Forests covers much of the area between the LaPlatte River and McCabes Brook, with a few patches of older forest east of the river as well; and the smaller of the two is in the far southern portion of the mapping area. Both examples of this rare (S2) natural community are considered state significant.

The large northern area of Sand-Over-Clay Forest includes a large area of good-condition forest west of the LaPlatte River and a smaller area of good- to excellent-condition forest east of the river. The forest occurs on a very deep (over 100 cm) sand deposit, with clay below this depth. Much of the forest is on a flat surficial glacial terrace, but small variations in topography create a mosaic, with areas lying 1 to 2 feet lower than the adjacent forest supporting patches of Wet Sand-Over-Clay Forest, especially in the large patch west of the river. The overstory is also correspondingly variable. Eastern Hemlock (*Tsuga canadensis*) and Red Maple (*Acer rubrum*) are each locally dominant. In addition to red maple and hemlock, American Beech (*Fagus grandifolia*), Yellow Birch (*Betula alleghaniensis*), Eastern White Pine (*Pinus strobus*), Black Cherry (*Prunus serotina*), scattered large White Oak (*Quercus alba*) and Swamp White Oak (*Quercus bicolor*), Paper Birch (*Betula papyrifera*), Black Birch (*Betula lenta*), American Elm (*Ulmus americana*), and Sugar Maple (*Acer saccharum*) are present. The canopy cover tends to be quite high, and was noted at 80% in one hemlock-dominated area. The understory tree layer includes hemlock, Shagbark Hickory (*Carya ovata*), American Hornbeam (*Carpinus caroliniana*), American beech, and Green Ash (*Fraxinus pennsylvanica*). Shrubs include American Witch-Hazel (*Hamamelis virginiana*), Maple-Leaved Viburnum (*Viburnum acerifolium*), and a few scattered invasive European Buckthorn (*Rhamnus cathartica*). The shrub layer is relatively sparse, especially east of the river. The herb layer is diverse and includes New York Fern (*Thelypteris noveboracensis*), Three-Leaved Goldthread (*Coptis trifolia*), Cinnamon Fern (*Osmundastrum cinnamomeum*), Northern Lady Fern (*Athyrium filix-femina*), Red Baneberry (*Actaea rubra*), Wild Sarsaparilla (*Aralia nudicaulis*), Interrupted Fern (*Osmunda claytoniana*), Evergreen Wood Fern (*Dryopteris intermedia*), Sensitive Fern (*Onoclea sensibilis*), Eastern Hay-Scented Fern (*Dennstaedtia punctilobula*), Round-Leaved Violet (*Viola rotundifolia*), Canada-Mayflower (*Maianthemum canadense*), American Lop-Seed (*Phryma leptostachya*), Common Speedwell (*Veronica officinalis*), and Indian Cucumber Root (*Medeola virginiana*). Diversity is highest in areas of groundwater seepage which provides water and nutrients and allows for the presence of calciphile shrubs. Herb cover and diversity is very low under hemlock canopies. The bryophyte layer is negligible.

Most areas west of the river support good-condition forest – a hemlock of 54 cm DBH was observed to be 94 years old. Some evidence of past logging was observed, but no exotics were observed in the central area. Much of this forest east of the river is in excellent condition. A 52 cm dbh hemlock here was found to be 172 years old with moderate growth increasing to fast growth later in the life of the tree. Other large trees include an 84 cm dbh red maple and a

massive lone Basswood (*Tilia americana*) tree of 110 cm dbh offering evidence of localized soil enrichment. No cut stumps were observed in this area, and the only human disturbance visible consists of a very old woods road and a few scattered buckthorn shrubs. The soil here consists of deep fine sand with a gray Ae horizon, perhaps a testament to long-standing hemlock canopy on the site.

A very small area of the northern occurrence supports an unusual example of a Dry Oak Forest within a wetland complex. This natural community occurs on a natural sand berm "island" and thus is well drained and much drier than its surroundings. The dominant species in this small patch of forest is Northern Red Oak (*Quercus rubra*), with white oak and red maple also present. Shrubs include American Witch-Hazel and Velvet-Leaved Blueberry (*Vaccinium myrtilloides*), and herbs include Eastern Spicy-Wintergreen (*Gaultheria procumbens*), Bracken Fern (*Pteridium aquilinum*), Poverty Oatgrass (*Danthonia spicata*), and Ribbed Sedge (*Carex virescens*). Because of its small size and sandy soils it was mapped as part of the Sand-Over-Clay Forest.

The smaller southern Sand-Over-Clay Forest supports a diverse canopy of American Beech (*Fagus grandifolia*), Black Birch (*Betula lenta*), Red Maple (*Acer rubrum*), Eastern Hemlock (*Tsuga canadensis*), Big-Toothed Aspen (*Populus grandidentata*), Eastern White Pine (*Pinus strobus*), Yellow Birch (*Betula alleghaniensis*), and Northern Red Oak (*Quercus rubra*). The understory includes saplings of American beech, White Ash (*Fraxinus americana*), and Sugar Maple (*Acer saccharum*) as well as invasive Morrow's Honeysuckle (*Lonicera morrowii*). Herbs include Evergreen Wood Fern (*Dryopteris intermedia*), Marginal Wood Fern (*Dryopteris marginalis*), and White Wood Aster (*Aster divaricatus*). The soil consists of fine sand to at least 60 cm of depth.



Figure 15: Soil profile in Sand-Over-Clay Forest.



Figure 16: Sand-Over-Clay Forest

**Temperate Calcareous Cliff**

**Significance:** *B-ranked example of this uncommon (S3) natural community.*

An impressive Temperate Calcareous Cliff extends from north to south along the eastern edge of the Lamoille River Floodplain southeast of Route 7. This cliff extends for more than 1800 feet, averages around 30 feet tall, and is composed of dolostone and phyllite. These rocks contain high amounts of calcium and confer enrichment and reduced acidity both to the cliff face and the natural community below it. This sizable example of a rare (S3) natural community is considered state significant.

Not surprisingly, there is limited vegetation on the sheer cliff face, However it does support Goldie's Wood Fern (*Dryopteris goldiana*), Wall-Rue Spleenwort (*Asplenium ruta-muraria*), American Yew (*Taxus canadensis*), and Mountain Crane's-Bill (*Geranium robertianum*).



Figure 17: The Temperate Calcareous Cliff rises abruptly from the LaPlatte River floodplain forests.

#### Transition Hardwood Limestone Forest

**Significance:** *B-ranked example of this uncommon (S3) natural community.*

A sizable (29 acre) area of Transition Hardwood Limestone Forest is present in the southeastern portion of the mapping area. This is considered a state significant example of this rare (S3) natural community.

This Transition Hardwoods Limestone Forest supports an overstory dominated by Sugar Maple (*Acer saccharum*), with Green Ash (*Fraxinus pennsylvanica*), Basswood (*Tilia americana*), Northern Red Oak (*Quercus rubra*), and Bitternut Hickory (*Carya cordiformis*) also present. Areas with exposed rock ledges also support Eastern Hemlock (*Tsuga canadensis*). The invasive shrub Morrow's Honeysuckle (*Lonicera morrowii*) is present in the shrub layer in some areas, along with currant (*Ribes* sp.). The herb layer is diverse and includes Marginal Wood Fern (*Dryopteris marginalis*), Sharp-lobed Hepatica (*Hepatica acutiloba*), Broad-leaved Ricegrass (*Oryzopsis racemosa*), Blue-Stem Goldenrod (*Solidago caesia*), and Forest Licorice Bedstraw (*Galium circaezans*).

## References Cited

Fastie, C.L. 1985. The Natural History of the LaPlatte River Marsh, Shelburne, Vermont. M.S. report, University of Vermont.

Johnson, C.W. 1980. The Nature of Vermont. Introduction and guide to the New England Environment. Lebanon (NH): University Press of New England.

Marshall, E. and L. Matti. 1990. Field visits to LaPlatte River Cliffs, Shelburne, Vermont on 17, 22, and 28 July 1990. Vermont Nongame and Natural Heritage Program, Montpelier, Vermont.

Ratcliffe, N.M., Stanley, R.S, Gale, M.H., Thompson, P.J., and Walsh, G.J., 2011, Bedrock Geologic Map of Vermont: [U.S. Geological Survey Scientific Investigations Map 3184](#), 3 sheets, scale 1:100,000.

Sorenson, E. et al. 1998. Floodplain Forests of Vermont, Some Sites of Ecological Significance. Prepared for the Vermont Natural Heritage Inventory.

The Nature Conservancy. LaPlatte River Marsh Natural Area Trail Guide. Undated. Available from:

[http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/vermont/placesweprotect/laplatte\\_trail\\_brochure.pdf](http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/vermont/placesweprotect/laplatte_trail_brochure.pdf)

Thompson, E.H., and Sorenson, E.R. 2005. *Wetland, Wildland, and Woodland: A Guide to the Natural Communities of Vermont*. Middlebury Bicentennial Series in Environmental Studies, Middlebury, Vermont.

Vogelmann, H.W. 1969. Vermont Natural Areas. Report 2. Central Office and Interagency Committee on Natural Resources. State Office Building, Montpelier, Vermont.

Zika, P. 1984. Report on La Platte River Floodplain. The Nature Conservancy, Montpelier Vermont.