

Natural Community and Wildlife Habitat Inventory  
of Whitney Hill and Muddy Pond in Ashburnham and  
Westminster, Mass.

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For the

Nashua River Watershed Association &  
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By the



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## Site

The Whitney Hill and Muddy Pond study area is located on the Westminster-Ashburnham boundary in the northwestern corner of the Nashua River Watershed (Figure 1, 2a, 2b). It is part of the small area of the watershed which lies within the Worcester Plateau ecoregion. The eastern half of the study area is identified as BioMap Supporting Natural Landscape and is along the route of the Midstate Trail. The site was visited on August 14<sup>th</sup> and October 2<sup>nd</sup>, 2001, with efforts focused on the eastern side (Figure 3).

## Geology

Whitney Hill lies on a contact between the Littleton Formation's 350-400 million year old metamorphosed sandstones and mudstones to the west and 350 million year old Fitchburg Complex granites to the east. The long, north-south trending slope on the east side of Whitney Hill marks this contact.

The sediment-derived metamorphosed mudstones and sandstones on the west side of this contact outcrop along the north-south slope. These rocks initially formed from marine deposits which included a component of calcium carbonate. As these rocks weather into the soil, the calcium carbonate acts to buffer natural soil acidity, creating a moderately enriched soil.

Surficial geology is dominated by till, with bedrock outcrops common along the eastern slope. Organic deposits ring Muddy Pond and underlie the hemlock wetland north of Muddy Pond. Sand and gravel deposits are found on the very northeast side of the study area, along Phillips Brook, and on the southwest side, along Whitman River.

## Soils

Soils on Whitney Hill, nearly all derived from glacial till, are mostly well-drained, stony, fine sandy loams. The dominant type is the Peru-Marlow Association. The Peru component is moderately well drained; water is removed somewhat slowly during some periods, surface stones limit cultivation or use of equipment. Depth to bedrock is greater than 60 inches. A seasonal high water table is normally between 1.5 and 2.5 feet below the surface from November through May.

The Marlow component is well drained; water is removed readily, but not rapidly. Surface stones limit cultivation or use of equipment, and depth to bedrock is greater than 60 inches. A firm layer at about 24 inches impedes the vertical movement of water. A seasonal high water table is normally between 2 and 3.5 feet below the surface from March through April.

Similar associations, but steep and extremely stony, are found on the slopes. Areas around Muddy Pond and to the northwest of Muddy Pond include Bucksport and Wonsqueak Mucks – very poorly drained organic soils with standing water typical for much of the year.

## **Topography**

Topography is primarily influenced by bedrock (Figure 4). The body of Whitney Hill with its gently sloping southwest side and steep northeast side, is a sheet of metamorphosed sedimentary rock which has been tilted and thrust up in relation to bedrock lying to the east. The bedrock tilts upward to the east; thus the gentle slope of the western side is the top of these sedimentary beds and the steep eastern side is where these beds are exposed in section and have eroded away. The flat top section collects water, as in Muddy Pond, the west side drains in small rivers, and the east side drains rapidly in intermittent streams.

Whitney Hill is part of a ridge reaching southeast from the Upper Worcester Plateau which lies to the west and lies right on the boundary of the Worcester Plateau and Lower New England Coastal Hills and Plains ecoregions. These ridges reach off the Worcester Plateau like fingers, hosting more northerly plants and plant communities and acting as corridors for larger animals moving out of the Worcester ecoregion.

## **Hydrology**

Whitney Hill is drained by six mapped drainage basins. The center of the study area, the northwestern corner, and the very southern end all drain toward the west into the Whitman River. The northern and eastern slope drain east to Phillips Brook. Both the Whitman River and Phillips Brook run to the North Nashua River just west of Fitchburg center.

Muddy Pond is the center of a diverse wetland community including the open pond, floating bog mats, shallow marsh, and flooded beaver meadow. A larger, hemlock-dominated swamp extends north from Muddy Pond across Bragg Hill Road. Another shallow marsh/beaver meadow is located at the northern end of the study area, along Phillips Brook above Factory Village Pond, and a shrub swamp/red maple swamp is located east of Cowees Hill in the southeast corner of the study area. The relatively steep slopes of Whitney Hill and well-drained nature of the soils limit the size of streams draining the site, especially the eastern and northern sides which have only intermittent streams.



## Natural Communities

### Transition Hardwood Forest

The east-facing slope which runs north-south the length of the study area hosts a transition forest type with oaks and white pine dominant throughout most of the canopy, but including sections of hemlock- and beech-dominated canopy with more northerly sub-canopy species such as yellow birch, and shrubs such as striped maple and hobblebush (Figure 5). The canopy is most commonly 20 meters, reaching 25 meters in places, and in sections is as dense as 90% cover. The shrub layer is sparse, except in patches of mountain laurel, and the ground is generally open, to 30% cover.

The most common stands here have red oak, black oak, and white pine in the canopy – white pine ranging from sparse to dominant; with red maple, black birch, white birch, white ash, and black cherry in the subcanopy. Sections of this community have been managed for timber, creating some areas with more open canopies and a more dense understory including white birch, yellow birch, black birch, red maple, pin cherry, and trembling aspen.

More northerly tree species such as American beech, sugar maple, American basswood, and yellow birch, along with hemlock, occur throughout this forest type, and in places become dominant. Very large American beech (90 cm stem diameter at breast height (dbh)), basswood (70 cm dbh), sugar maple (120 cm dbh), and hemlock (150 cm dbh) can be found. These species more typical of the Northern Hardwood Forests indicate a cool microclimate on this slope, and the prominence of hophornbeam (10-15 cm dbh) and sugar maple in the understory indicate soil enrichment from bedrock outcrops.

The shrub layer ranges from very open with occasional striped maple and witch hazel, to very dense mountain laurel. Canada yew is abundant in the northern section. Low bush blueberry, Canada mayflower, New York fern, wild oats, starflower, partridgeberry, winterberry, rock polypody, Downy rattlesnake plantain, ground pine, and wild sarsaparilla most common in the ground layer. The eastern slope of Cowees Hill in the southwest of the study area shows rich site indicators including white baneberry.

White pine-dominated areas, as on the small Westminster State Forest parcel northeast of Muddy Pond, have a tall, moderately open canopy (20 meters; 60% cover) with black birch, red maple, and some beech in the understory; sparse shrubs; and moderately dense ground cover (50% cover) with low bush blueberry and bracken fern.

Occasional hemlock stands have a tall, thick canopy (20 meters; 90% cover) with very little vegetation in the shrub or ground layers. Red oak and American beech grow among the hemlock. Hemlock is also more common in the understory, beneath a red oak-white pine canopy near Muddy Pond. This stand includes mountain laurel, nannyberry, sheep laurel, and maleberry in the shrub layer. There has been recent logging here close to Muddy Pond.

### White Pine- Mixed Oak Forest

The western side of the study area, characterized by gentler slopes than the east and a southwesterly aspect, is dominated by white pines and mixed oaks, with red maple common and the transition hardwood species occurring less frequently. White pine is the dominant canopy species in some areas. The canopy ranges from young and open to tall (30 meters) and rather dense (70%); hemlock and American beech remain as components of the understory.

Landuse history is the major control on forest canopy height and percent cover, with recent logging activity fairly common. The shrub layer is thick with mountain laurel in some areas and more open where the canopy is dense with white pine and oak seedlings, low bush blueberry, and bracken fern.

### Cultural Grasslands

Several agricultural meadows are found within the study area, primarily in the northwestern section. These meadows, at high elevation relative to the entire watershed, provide regional-scale diversity for this community type within the watershed.

### Muddy Pond/Bog/Swamp

The pond includes roughly 21 acres of open water, and twelve acres of bog mat, sedge marsh, and red maple swamp on its northwestern side. The bog section (Figure 1) features floating mats with swamp loosestrife, bog aster, pitcher plant, arrowhead, pondweed, marsh St. Johnswort, sheep laurel, leatherleaf, tamarack, and water lily surrounding.



*Figure 1: Muddy Pond bog mat.*

### Beaver Swamp

East of Cowees Hill lies a beaver-dammed wetland system including shrub swamp and red maple swamp (Figure 2). The shrub swamp lacks a canopy and is dominated by speckled alder, arrowwood, joe-pye weed, sedges, cinnamon fern, and low red maple and gray birch. The trees get taller and the canopy more dense as it transitions to red maple swamp.



*Figure 2: Shrub/red maple swamp.*

## Hemlock Swamp

The area northwest of Muddy Pond is controlled by shallow groundwater pooling on bedrock and impermeable soils. The area is characterized by seasonal standing water, varied micro-topography, and vegetation dominated by cool-site species such as hemlock, American beech, yellow birch, and striped maple. Shallow root systems and multiple tip-ups further indicate the shallow water table. Abundant mountain laurel, hemlock, winterberry, cinnamon fern, sensitive fern, goldthread, and mosses characterize the shrub and ground layers. Occasional canopy openings allow low stands of wild raisin, winterberry, joe-pye weed, speckled alder, and spicebush. The canopy in other small sections is dominated by red maple with a sunnier shrub and ground layer.

## **Habitat**

The eastern half of Whitney Hill, east of Bragg Hill Road, is classified as BioMap Supporting Natural Landscape by the Natural Heritage and Endangered Species Program. According to BioMap, “the Supporting Natural Landscape buffers and connects Core Habitat polygons, which depict the most viable habitat for rare species and natural communities in Massachusetts, and identifies large, naturally vegetated blocks that are relatively free from the impact of roads and other development.”

As with other of the large natural areas on the western side of the Nashua River Watershed, Whitney Hill likely acts as a movement corridor for large mammals making forays off of the Worcester Plateau and out of the little-developed areas to the north. Moose tracks found southwest of Muddy Pond indicate their occasional presence.

## **Recreation**

The Mid-State Trail runs through the study area, roughly four miles from Factory Village Pond, south past Muddy Pond, and southwest to Whitmanville. This 92-mile hiking trail is one of the major long-distance trails in the state, stretching Rhode Island to the New Hampshire border and linking there with the Wapack Trail. A lean-to affords opportunity for camping at Muddy Pond.

## **Connections**

Large areas of BioMap Supporting Natural Landscape lie to the north of the study area, centered on Mt. Hunger, Russell Hill, and Jewel Hill; and northeast along Falulah Brook and Fitchburg State Forest (Figure 6). This system of large, little-disturbed areas provides movement corridors for a variety of wildlife.

Protected land within the study area includes over 500 acres around Muddy Pond owned by the Westminster Conservation Commission, and the 32 acre section of Westminster State Forest lying adjacent to the north. The 2000+ acre High Ridge Wildlife Management Area lies across Whitmanville Reservoir to the southwest. Large areas of open space lead to the north and east, connecting to the Wright Ponds vicinity and beyond to Willard Brook State Forest.



## **Conclusion**

The study area lies within the Worcester Plateau ecoregion and contributes to regional-scale habitat diversity within the Nashua River watershed. These large undeveloped areas on the western side of the watershed are important for protection of tributary streams and wetlands for habitat and flood prevention. The few roads running through the area are little traveled and present minimal barriers to wildlife movement, although additional development along these roads, and clearing of interior parcels would detract from habitat quality.