

Barre City Cow Pasture

Inventory, Assessment, and Recommendations



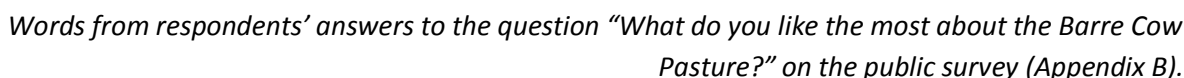
Prepared for
The City of Barre

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Good stewardship leaves the land in better condition than it was found. In many cases, simply letting nature take its course without intervention allows conditions to improve over time. However, opportunities to improve timber value, native species diversity, recreation opportunities, water quality, and habitat value through active management usually exist. Taking advantage of these opportunities can improve the future value of the land and build community knowledge of, connection to, and investment in the land.

Land use and stewardship should work with natural processes whenever possible. Wind and ice storms, pest outbreaks, and flooding are natural parts of the environment in the northeast. Working with, rather than against these processes, is an important part of successful land stewardship.

Diverse ecosystems are more resilient to stress and environmental change. Maintaining native species, genetic, and population diversity is important for ensuring the long-term viability of natural systems.

Stewardship planning should consider the landscape context. Wildlife and other organisms do not observe property boundaries. To be effective, stewardship needs to consider the availability, configuration, and connectivity of different types of habitats and ecosystems nearby.

PURPOSE OF THIS REPORT

The purposes of this report are to help the City of Barre:

1. Provide information about the property and its recreation and ecological resources.
2. Assess the current condition, as well as the ecological and recreation value of the property.
3. Provide recommendations and options for how to best steward the property.
4. Summarize initial public input on values and goals for the property.

All activities in this report are proposed or recommended – not finalized – and are intended as a starting point for planning. Activities should be adjusted and finalized after a vision and goals are defined, further public input is received, and based on what is practical given available time and resources. Additional consultation, inventory, and planning may be required to carry out some activities.

METHODS

Information in this report is based on:

1. Previous studies of the property including:
 - Forest Bird Habitat Assessment by Audubon Vermont, 2013
 - Forest inventory by Washington County Forester, Russ Barrett, 2013
 - Ecological Assessment by State Ecologist Leif Richardson, 2007
 - Draft trail and management plan by planner Josh Schwartz, 2008
2. Conversations with City Planner & Department Director, Michael Miller; Barre City resident and volunteer, Chris Russo-Fraysier; VYCC Operations Director, Keegan Tierney; Washington County Forester, Russ Barrett; VT FP&R Recreation Trails Program Administrator, Sherry Winnie; as well as other neighbors, experts, and users of the property.
3. Public input from a 10-question online survey administered for two weeks in June 2013.
4. Limited field work.
5. Analysis of aerial imagery and GIS data

Property Description



Trail passing through Norway spruces (left); looking west toward the Cow Pasture property from the neighboring Perrin Farm (right)

GENERAL DESCRIPTION

The Cow Pasture is a 67-acre municipally-owned undeveloped property in Barre City (Map 1). Originally pasture for the City's work horses in the late 1800s, the property is now a popular destination for walking, cross country skiing, and other public trail uses. Most of the old pasture has grown up into forest, although some meadows and shrubby thickets persist, including raspberry patches that are popular berry picking spots. A diversity of birds, mammals, and other wildlife live and pass through the property. A small, headwater stream runs through the property and springs, seeps, and a small wetland are located along its banks. The property is bounded by private undeveloped property to the north, limited residential development and undeveloped land to the east, residential neighborhood to the south, and by Route 14 and the Hope Cemetery to the west.

CURRENT USES AND ACCESS

As municipally-owned open space, the Cow Pasture property is open to the public. Since it is within easy walking or short driving distance for all City residents, the property is a popular destination for dog walking, hiking, running, and snowshoeing. Mountain biking, ATV-ing, and dirt biking are less popular occasional uses. The Vermont Association of Snow Travelers (VAST) maintains and uses the widest trails that cross the property from north to southeast providing linkages from the Cow Pasture to a regional network of seasonal trails. Evidence of homeless encampments (sleeping bags, tents, food etc.) also exist on the property, and it is occasionally used as a partying spot (fire rings, beer cans etc.).

There is a small parking area at the end of Maplewood Avenue that allows visitors to access the trail network from the south. In addition, several trails connect to the Cow Pasture property from adjacent properties; the Perrin Farm to the east in Barre Town and City has a particularly extensive trail network that many people use to access the Cow Pasture property.

Aside from some recent trail and stream restoration work, the City has not organized any active management on the property for a long time.

HISTORY AND PAST LAND USE

Located on the northern edge of Barre City, the 67-acre Cow Pasture property has been under municipal ownership since 1895. In the early 1900's the property served as pasture for City workhorses, which pulled plows for street clearing in winter, and cows owned by local farmers. For a short period after the flood of 1927 the property was leased to the Meadow Brook Golf Club to occupy and use said premises in a "good husband-like manner" (according to 1928 lease agreement).

Florence Perrin grew up on the Perrin Farm which is adjacent to the Cow Pasture property in Barre Town (Map 5). For her, the Cow Pasture was a "daily place to be." She remembers that families who heated with wood during the 1930s were allowed to cut firewood off the City's land. She also remembers that neighborhood boys picked up golf balls from the course and that families went to the Cow Pasture to pick blackberries, raspberries, gooseberries, and blueberries as they still do today.

With technological advances, the City is longer dependent on keeping livestock or providing putting greens on the property. However the forests have been slow to regenerate and much of the property was still open as late as the mid-1970s (see photo below). Although most of the property is now forested, signs of past land use are evident. Along the stream stonework encircles natural springs, which were likely important water sources for nearby residents. An old cement wellhead is located in the northwest portion of the property close to the road. What may be the foundation of an old water-powered mill is located just west of the property where the stream gradient increases dramatically. Large, open-grown, wolf trees stand majestic amongst the young forest and the remnants of stonewalls can still be found along the north, east, and portions of the western property boundaries.



1910 Sanborn Map showing the Cow Pasture property was once the City Farm, Vermont Society Archive (left); 1974 aerial photo showing that most of the property was still open at that time (middle); stonework around a spring near the stream (right).

LANDSCAPE CONTEXT

The City of Barre is the tenth largest community in Vermont and is located on the eastern edge of Washington County. It is bounded by Barre Town to the north, east and south and shares its western boundary with the Town of Berlin. Located within the Winooski Watershed, Barre City covers 4.02 squares miles. Residential neighborhoods surround the downtown core, which is nestled at the confluence of two river valleys; the Steven Branch and the Jail Branch Rivers. Like many New England Towns the downtown core, located within the floodplain, is already built-out and a majority of new development is occurring outside of the floodplain in the residential neighborhoods.

According to the City of Barre Municipal Plan, the valley floor is at approximately 600 feet above sea level and ranges from one-half to one mile in width. Rising above the valley floor are flat-topped, gently rolling to steep hills approximately 400 feet above the valley floor. The City is bisected by Route 302 running east to west and by Route 14 running north to south.

The Cow Pasture property is unique as the largest piece of undeveloped, municipally-owned land within the City limits.

Adjacent land use

The Cow Pasture property is bounded by private forestland to the north that is managed as a sugarbush, limited residential development and open land to the east (Pope Property and Perrin Farm), dense residential neighborhood to the south, and by Route 14 and the Hope Cemetery to the west (Map 5).

Horizontal diversity

Since the Cow Pasture property is within the Barre City limits, the 2500 acre landscape that includes and surrounds the Cow Pasture property is dominated by residential and city development (approximately 50%). The rest of the landscape is forest (approximately 30%) and a mix of agricultural and open land as well as wetlands (approximately 20%). This allocation of cover types and land uses is representative of the property's position at a transition between the urban residential landscape of Barre City and the rural landscape of Barre Town.

Habitat block size

The property is part of a small (114 acre) habitat block that has been mapped by the Vermont Fish and Wildlife Department and extends to the north and east (see map below). Blocks are mapped and ranked based on several criteria including extent of forest cover and distance of roads and development. In Vermont, large (250+ acres) blocks of roadless forest have high value for wide-ranging wildlife species, such as moose, black bear, and some forest songbirds such as wood thrush and black-throated blue warbler. These species need remote habitats at least 200-300 feet away from human development and large openings for survival and successful reproduction. This block is considered to be too small and close to development to be of state-wide significance. However, smaller (<250 acres) patches of forest like this one that are distributed across a landscape function as reserves and parts of travel corridors allowing animals to move between and repopulate large forest blocks. In addition, the Cow Pasture property is locally significant because it is a relatively large, parcel of open land within the City limits.



The 114-acre habitat block (light red) that includes the property (dark red) is locally significant wildlife habitat. Map source: Vermont Natural Resource Atlas, Vermont Agency of Natural Resources.

Physical Features

BIOPHYSICAL REGION

Barre City and the Cow Pasture property are located in the Northern Vermont Piedmont region which is characterized by a moderate to cool climate, rolling hills, numerous rivers, and rich soils formed from calcareous bedrock.

TOPOGRAPHY

The terrain of the Cow Pasture property is generally gently sloping. However, the land does rise steeply to the east from the western boundary along Route 14 for a short distance before leveling out and rising gradually to 975 feet in elevation in northeastern corner of property.

GEOLOGY

Although Barre is known for its granite, the bedrock that underlies the Cow Pasture property is a combination of metamorphosed ancient limestones, mudstones, and volcanic rocks. These rocks are part of the Giles Mountain Formation, which is calcareous and raises the pH and richness of associated soils. On the Cow Pasture property, the bedrock is deeply buried under surficial geology deposits. Glacial till – unsorted glacial sediments deposited by retreating glaciers at the end of the last ice age – covers most of the property.



Map of Barre's bedrock geology (blue: Giles Mountain Formation; red: granite). Map Source: Bedrock Geologic Map of Vermont, 2011.

The property is located at what was once the edge of Glacial Lake Winooski – a lake that filled the Winooski River Valley over 14,000 year ago when the current northern drainage of the river was dammed by the retreating ice sheet. Sandy glacial lake and river deposits that were associated with this

glacial lakeshore cover the steep hill on the western portion of the boundary. Although Glacial Lake Winooski rose to 915 feet in elevation and may have at one time covered most of the property, the lakeshore level fluctuated and the sediments associated with that transition zone are most evident at this sharp change in slope.

The main trail leading northwest from the parking area at the end of Maplewood Avenue travels down a ridge that may be a small esker to the stream. An esker is a ridge of glacial deposits that gradually filled a river of melt water that ran through a tunnel under the glacial ice. The ridge of deposits was left behind when the glacier melted. This small feature may mirror the larger discontinuous esker formation that extends along parts of the Stevens Branch valley from Williamstown to Barre and from there north to East Montpelier. The big gravel pit located northwest of the property in the valley is located on segments of this esker.

SOILS

The soils covering most of the property are rocky complexes derived from the underlying glacial till (Map 2). However, the steep western slopes of the property are sands and fine sandy loams that were deposited by glacial lakes and rivers. These soils are considered productive for both agricultural and forestry.

Soil Type	Parent Material	Hydric	Prime Ag Soil
Salmon very fine sandy loam	Glacial lake deposits	N	Y
Adams loamy fine sand	Glacial river deposits	N	N
Glover-Vershire complex, very rocky	Glacial till	N	N
Vershire-Dummerston complex, rocky	Glacial till	N	N
Cabot silt loam	Glacial till	Y	Y

Forests and Old Pasture



Young mixedwood forest (left); red pine plantation (right)

DESCRIPTION

Although historically and recently mostly non-forested, the Cow Pasture property has regenerated to more than 75% forest cover. These forests are still quite young, so have not yet developed the full biological or structural diversity of mature, complex forest ecosystems. The hardwood forests (Stand 1; see Appendix A for detailed description) are dominated by early-successional species including aspen, paper birch, and red maple as well as scattered white pine. The softwood forests (Stand 2) were planted or regenerated in the open and include white pine, Scotch pine, Norway spruce, small red pine, as well as some sugar maple. In general, the understory and midstory forest layers have not yet developed, except where non-native, invasive shrubs have established. The least forested portions of the property (Stand 4, see Map 3) are a patchy mix of old pasture, young forest, and scattered larger trees. Areas dominated by raspberries, aster, goldenrod, and other herbaceous plants have probably been brush hogged occasionally by a neighbor.

Forest stands are units that are categorized for the purposes of management based on tree species composition, forest age, access, and/or other characteristics. In this case, Russ Barrett, Washington County Forester, mapped three forest stands referenced above on the property after completing a systematic forest inventory in April 2013. Additional stand information that should be part of a forest management plan is found in Appendix A.

PLANT SPECIES

The Cow Pasture property supports a diversity of tree and shrub species characteristic of early- and mid-successional hardwood and mixedwood forests, as well as a few non-native softwood plantation species. The open and riparian areas add to the flowering plant diversity on the property. The following are a sampling of plants observed by ecologist, Leif Richardson, during a visit in 2007 and by Kristen Sharpless in 2013:

Trees

Sugar maple (*Acer saccharum*)
 White ash (*Fraxinus Americana*)
 Yellow birch (*Betula allegheniensis*)
 American beech (*Fagus grandifolia*)
 Basswood (*Tilia Americana*)
 Hophornbeam (*Ostrya virginiana*)
 Paper birch (*Betula papyrifera*)
 Quaking aspen (*Populus tremuloides*)
 Apple (*Malus spp.*)
 Eastern hemlock (*Tsuga Canadensis*)
 Norway spruce (*Picea abies*)
 Scots pine (*Pinus sylvestris*)
 Red pine (*Pinus resinosa*)
 Red oak (*Quercus rubra*)

Shrubs

Alternate-leaved dogwood (*Cornus alternifolia*)
 Glossy buckthorn (*Rhamnus cathartica*) ¥
 Japanese barberry (*Berberis thunbergii*) ¥
 Morrow's Honeysuckle (*Lonicera morrowii*) ¥
 Leatherwood (*Dirca L.*)
 Amur maple (*Acer ginnala*) ¥

Flowering Perennials

Liverwort (*Hepatica acutiloba*)
 Speedwell (*Veronica officinale*)
 Waterleaf (*Hydrophyllum appendiculatum*)
 Wild strawberry (*Fragaria Canadensis*)
 Marsh marigold (*Caltha palustris*)
 Blue cohosh (*Caulophyllum thalictroides*)
 Jack-in-the-pulpit (*Arisaema triphyllum*)
 Purple trillium (*Trillium erectum*)
 Hair grass (*Deschampsia flexuosa*)
 Silver rod (*Solidago bicolor*)
 Gray goldenrod (*Solidago nemoralis*)
 Many-flowered aster (*Aster ericoides*)

Ferns

Christmas fern (*Polystichum achrostichoides*)
 Intermediate woodfern (*Dryopteris intermedia*)
 Maidenhair fern (*Adiantum pedatum*)
 Sensitive fern (*Onoclea sensibilis*)

¥ = Non-native invasive

ASSESSMENT

Native plant species diversity

Condition: Good, but threatened

A moderate diversity of native tree and plant species currently exist on the property. Native species diversity is generally lower in young forests than in older, mature forests. As the younger forests on the property mature, plant species diversity may increase. However, non-native, invasive shrubs – bush honeysuckle, Japanese barberry, glossy buckthorn, and amur maple - are growing throughout and adjacent to the property. In the old pasture/young forest portion of the property (Stand 4), as well as along the eastern boundary and the wider trails, the infestation is severe and is a threat to future native species diversity, forest health and resilience, and habitat value if it continues to spread. Infestation under the closed forest canopy is lighter; hand pulling and regular monitoring would help infestations from worsening in these areas. Since the seeds of these plants are primarily spread to forests by foraging birds from landscaping around houses, any effort to control invasive plants on the property would also need to include working with neighbors to eliminate seed sources.

The old pasture portions of the property that are still open and are dominated by a mix of raspberry, aster, goldenrod, milkweed, and a variety of other flowering and fruiting plants – rather than non-native, invasives – add greatly to the native plant diversity on the property.



Non-native, invasive shrubs found on the property: Glossy buckthorn (www.uwgb.edu) (left); Japanese barberry (www.bamlog.com) (right)

Tree health and vigor

Condition: Variable

No specific disease or pest issues were noted, although many of the pines in the old softwood plantations are showing signs of decline as are many of the short-lived early-successional trees that are being crowded out of the maturing forests. In general, where present, the new generation of small-diameter sugar maples and other hardwood species in these areas are more vigorous and healthy than those in the canopy. Overall tree vigor could be improved in places through management, but these time and resource-intensive practices may not be practical or desirable until a weed plan is in place to ensure invasive plants do not take over the understory when the canopy is opened.

Hemlock wooly adelgid (HWA) and emerald ash borer (EAB) are two non-native, invasive insect pests that kill eastern hemlock and ash species respectively. HWA has been found in southern Vermont, and EAB has not yet been detected in Vermont, but has been found in New York and New Hampshire. Since both of these tree species occur on the property, visitors should be on the look-out for these insects and should report any potential sitings to the Washington County Forester.



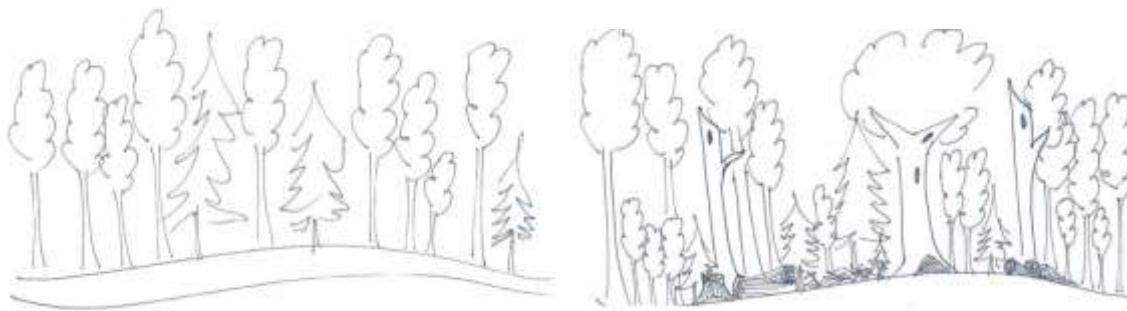
Non-native, invasive insects to look out for: Hemlock wooly adelgid (NY Department of Environmental Conservation) (left); Adult emerald ash borer (www.emeraldashborer.info) (right)

Forest structure

Condition: Vertical – Poor; Horizontal - Good

Vertical structural features in the forests on the property including understory, midstory, snags, cavity trees, downed dead wood, and canopy gaps are generally lacking throughout the forests due to their young age. Complex structure adds to the habitat value of a forest, and makes it more resilient to stresses, such as those associated with climate change. The forests' structure will likely naturally improve as they age. However, deer browse pressure appears to be quite high in places, which is suppressing the growth of new tree seedlings. In combination with the presence and competitive edge of non-native, invasive shrubs, the over-browsing might prevent a new generation of native trees from establishing as they would usually in the progression of forest succession.

Although vertical structure – as described above – is lacking on the property, horizontal structure (variety and distribution of cover types over the landscape) is better developed due to the presence of the stream and associated riparian areas, as well as the old pasture and young forest (Stand 4).



Simple vs. complex forest structure: A structurally simple forest in which most trees are the same size and an understory, midstory, canopy gaps, snags, and logs are lacking (left); a structurally complex forest with trees of many different sizes and other structural features (right).

Dead wood, snags, and cavity trees

Condition: Good

The forests have some standing and downed dead trees, most of which are aspen and paper birch in the hardwood forest (Stand 1), and are used by a variety of wildlife for nesting, perching, drumming, and feeding. The scattered, large white pine and maple trees have particularly high-value as cavity and stick nest sites for large birds including owls and pileated woodpeckers.

Timber and Forest Products

Condition: Poor

The timber value of most of the trees on the property is currently generally low due to many trees' poor form (e.g. multiple stems, seams and forks in trunks, cankers etc.); the small diameter of commercial species, such as sugar maple; and the low market value of some of the largest and best-formed trees (e.g. eastern hemlock). Although there are some sawlog-sized, well-formed trees on the property, the

total volume and value of the wood is so low that it would make a commercial sale challenging to accomplish in the near future. A very intensive harvest that would remove most of the poorest quality trees and leave the most vigorous stems to grow might be possible (Source: Russ Barrett, Washington County Forester), but is not advisable until the invasive plant problem is addressed. A series of less intensive tending treatments could slowly increase the future value of the timber on the property, but would be non-commercial and occur at a cost to the City (Source: Russ Barrett, Washington County Forester). In addition, even opening the forest canopy a little bit would likely stimulate the spread of invasive plants, unless carefully controlled in combination with addressing the deer browse pressure.

Although it would be ideal to be able to offset management expenses for the property with revenue from timber management, this is not likely to be feasible in the near-term.

An alternative approach to commercial timber management would be to accomplish some tending of the forest stands through a community firewood program where groups of trees are marked by a forester and community members in need of firewood are allowed to fell the trees and/or collect the wood for home heating use – similar to the community firewood harvesting Mrs. Perrin recalled occurring on the property during the 1930s .

Water



Small wetland (left); stream meandering through a small floodplain (middle); the improved stream crossing (right)

STREAMS, SEEPS, AND SPRINGS

The first order stream on the property originates from a wetland and pond on a property to the east in Barre Town currently owned by Allan Moore and Jane Irwin (Map 5). The stream traverses the Cow Pasture property running southwest and feeds into Gunner's Brook at Route 14 and Brook Street. In several places, the underlying mineral-rich bedrock of the Giles Mountain formation is exposed in the stream bed creating beautiful pools and cascades. The riparian zone along the stream is generally forested – except for a small floodplain along portions of the channel. Several seeps and springs are located along the hillsides above the stream (Map 1). Collectively, these water features greatly add to the ecological and habitat diversity and value of the property.



Marsh marigolds growing along the stream (left); a seep along the forested hillside above the stream (right).

Assessment

Condition: Good - Excellent

Overall, the stream channel and riparian zones appear to be in good condition; there is little evidence of erosion, the channel is able to meander and access its floodplain, and the surrounding forest shades the channel, stabilizes the banks, and contributes logs, branches, and dead leaves to the channel over time. An exception is where the main trail crosses the stream on the western portion of the property. The crossing has recently been improved and stabilized, but there is evidence of past erosion and the forest canopy is open at this point. After the trail improvement was made, snowmobile trail users added branches and other material to the crossing causing erosion and widening of the channel during the spring melt. The material was removed by trail walkers in the spring (Source: public survey). Putting anything into a stream that causes a discharge is illegal in Vermont and compromises water quality; the City needs to resolve this issue moving forward.

In addition to protecting water quality and providing aquatic habitat, the stream and its riparian zones create an important travel corridor for animals such as salamanders, foxes, bear and other species that may move off or through the property at various points in their life cycles.

WETLAND

The small wetland (~ 1 acre) adjacent to the stream is best characterized as a seepage forest since soils are likely saturated year round by groundwater, but scattered trees – mostly paper birch and aspen - are growing on the site. Scattered willow, apples, spirea, pine, red spruce, cattails, red-osier dogwood are also present, along with extensive sensitive fern cover. This area could provide good feeding and cover habitat for American woodcock, as well as for flycatchers and raptors that would hunt from high perches. Well-worn white-tail deer trails are also present.



Apple trees are also growing and blooming the wetland; great for bees in the spring!

Assessment

Condition: Good

ATV use had rutted soils in the wetland, but a VYCC crew repaired the ruts and revegetated exposed soil. There were no signs of disturbance during the field visit in May 2013. Scattered non-native, invasive

plants including bush honeysuckle are present; these plants are a high priority for removal in order to keep the invasive from getting worse.

Wildlife



Bear claw marks(left); ruffed grouse or partridge (right).

BIRDS OBSERVED

There are likely many wildlife species that use the property throughout the seasons. The following birds and/or their signs were observed by Kristen Sharpless in May, 2013:

- American crow
- American goldfinch
- Black and white warbler
- Black-capped chickadee
- Black-throated green warbler*
- Blue jay
- Chestnut-sided warbler*
- Downy woodpecker
- Eastern phoebe
- Golden-crowned kinglet
- Hairy woodpecker
- Hermit thrush
- Northern Cardinal
- Ovenbird*
- Pileated woodpecker
- Ruffed grouse*
- Song sparrow
- White-breasted nuthatch
- White-throated sparrow*
- Yellow-bellied sapsucker*
- Yellow-rumped warbler

**Audubon Vermont priority forest bird species*

HABITAT TYPES

For its size, the property has a variety of habitat types. Although several of these habitats are very small (e.g. seep), they add significantly to the overall value of the property for wildlife.

Habitat Type	Associated Species	Observations
Mature Forest	Hermit thrush, black-throated green warbler, red-backed salamander	Deer may be using the softwood plantations as wintering yards, but are not finding high-quality habitat here.
Young Forest	American woodcock, white-throated sparrow, rabbit, deer, mouse	The old pasture/young forest in combination with the open, seepy areas around the stream provides ideal woodcock habitat.

Old Pasture	Song sparrow, yellow-rumped warbler, red fox, deer, vole, insects and butterflies	Raspberries, apple trees, and other fruiting plants in this area provide important food for a diversity of wildlife in late summer.
Stream and seeps	Brook trout, spotted salamander	No aquatic wildlife was observed during visit, but forested portion of the stream is in excellent condition and is likely being used.

FOOD

- ☒ Soft mast: raspberry, blackberry, chokecherry, dogwood, elderberry, apples
- ☒ Hard mast: oak, American beech, hickory
- ☒ Perch sites for hunting

- ☒ Insects
- ☒ Nectar – native, flowing plants

Assessment

Condition: Good

There are good sources of soft mast throughout the old pasture and young forest areas including apples, pin cherry, dogwood, and raspberries that attract insects, deer, other mammals, and birds. These areas are also likely good hunting grounds for raptors, foxes, and coyotes searching for small mammals and birds. A few scattered red oak were observed along the eastern boundary and are excellent nut sources for small mammals, bears, foxes, and other wildlife.

SHELTER

- ☐ Deer wintering area
- ☒ Softwood cover
- ☒ Dense shrubs/Thickets

- ☐ Brush piles
- ☒ Downed logs
- ☒ Rock piles/stone wall

Assessment

Condition: Variable

Low softwood cover is especially important in the winter. Although the old pine plantations may be being used as deer wintering yards, the habitat is not high-quality. The stone walls on the property provide cover for species like short-tailed weasels, chipmunks, and mice. Additional brush and log piles in and at the edges of the forest would provide additional cover for birds and small mammals.

PLACES TO RAISE YOUNG

- ☒ Large, mature trees
- ☐ Nesting box/platform
- ☒ Wetland
- ☒ Host plants for caterpillars

- ☒ Snags and cavity trees
- ☒ Dense shrubs/Thickets
- ☒ Pond/Stream
- ☐ Quiet spaces away from people and pets

Assessment

Condition: Fair

The variety of habitats on the property naturally provides a variety of places for birds, mammals, amphibians, and other wildlife to raise their young – although nesting habitat quality for many mature forest birds is limited due to the lack of understory and midstory in Stands 1 and 2. The greatest stress on these breeding wildlife is likely human and associated domestic dog and cat activity. Pets are not only potential predators; their presence also elicits alarm and stress responses in many birds and other wildlife which diverts scarce resources away from protecting and feeding young.

TRANSITIONS AND CONNECTIONS

The forested riparian area along the stream and the continuous forest cover to the north provide the best places for wildlife to travel to and from the property unhindered. Paved roads are a barrier for amphibians and other wildlife such as moose and bear that may migrate between upland forests on nearby properties and wetlands on adjacent properties.

The transitions between forest and old pasture on the property are generally gradual which is preferred over abrupt, linear transitions.



Wildlife likely travel with relative ease to and from the property from the north and east (yellow arrows), but roads and residential development make travel to and from the south and west more challenging (straight yellow lines). Riparian areas: blue; wetlands: light green. Map Source: BioFinder, Vermont Agency for Natural Resources.

Trails and Access



Discussing a plan for rerouting the steep and eroded Killer Hill trail.

TRAILS

Most people who visit the Cow Pasture property come to enjoy the trails (Appendix B). The trail network on the property is extensive; it is made up of more than two miles of single- and double-tracks of various types and conditions. Trails are informal; they were established and continue to be used based on the location of old farm roads and logical routes that lead to and from adjacent properties. Foot traffic including dog walking, hiking, running, and snowshoeing appear to make up the bulk of the trail use, although mountain biking, ATV-ing, and dirt biking are also occasional uses. In addition, the Vermont Association of Snow Travelers (VAST) maintains and uses the widest trails that cross the property from north to southeast providing linkages from the Cow Pasture property to a regional network of seasonal trails.

Assessment

Condition: Good, but informal

Although informal, the conditions of the trails are generally good with a few exceptions. Trail users have done maintenance over the years, including brush cutting and mowing, although several mapped trails have become overgrown and are currently difficult to locate. A few serious erosion problems were addressed by VYCC crews in 2012 with funding from a State of Vermont Ecosystem Restoration Grant. The crew installed water bars on the approaches to the two stream crossings on the main trail to divert runoff and sediment from the stream and created a hardened stream crossing in trail section M2 where had widened and eroded and materials had been added to the stream to improve footing (cinder blocks, pallets) adding to the degradation of the streambed and banks. However, after the trail improvement was made, snowmobile trail users added branches and other material to the crossing which caused erosion and widened of the channel during the spring melt. The material was removed by trail walkers in the spring (Source: public survey). The use, construction, and maintenance of this trail and crossing needs to be addressed going forward and was one of the most common suggestions for improvement in the public survey (Appendix B).

A second phase of the project is being completed this summer with funding from a Vermont Recreation and Trails Grant which is covering the cost for another VYCC crew to re-route the steep and eroded Killer Hill Trail (section M7). Although these trail improvement address immediate water quality and trail quality issues, a more cohesive recreation and trail plan for the property is needed to coordinate uses, improve user experiences, avoid inappropriate uses, and plan for needed maintenance and improvements.

The following table summarizes and describes current character and condition of the existing segments of the mapped trail network (Map 4):

Trail ID	Characteristics	Uses	Condition	Notes
Main Trail				
M1	Old farm road; clear; gentle slope	Multiple - VAST	Good	
M2	Old farm road; clear; gentle slope	Multiple - VAST	Fair	Recent improvement at stream crossing, but needs more work – future bridge?
M3	Old farm road; clear; gentle slope	Multiple – VAST	Good	
M4	Old farm road; clear; gentle slope	Multiple – VAST	Good	
M5	Single-track; clear; steep slope at stream	Foot, bike	Good	Recent improvement at and approaching brook crossing
M6	Old farm road; clear; very steep	Foot, bike	Poor	Eroded; plan to close and reroute has been marked
M7	Old farm road; clear; gentle slope	Foot, bike	Good	
Connector Trail				
C1	Old farm road; clear; flat	Multiple – VAST	Good	
C2	Old farm road; clear; flat	Foot, bike	Good	
C3	Overgrown			
C4	Overgrown		Poor	Goes through wetland – should be closed
C5	Overgrown			
C6	Old farm road; overgrown; flat	Foot, bike	Fair	Hard to find
C7	Single-track; semi-clear; variable slope	Foot, bike	Fair	Hard to find
C8	Overgrown			Hard to find
C9	Overgrown			
C10	Overgrown			
Side Trail to Private Property				
S1	Single-track; clear;	Foot, bike	Good	Connects to property to the

Trail ID	Characteristics	Uses	Condition	Notes
	gently sloping			southeast
S2	Old farm road; semi-clear; variable slope	Foot, bike	Fair	Connects to property to the north; overgrown
S3	Overgrown			Couldn't find
S4	Old farm road; semi-clear; moderate slope	Foot, bike	Fair	Connects to Route 14 across from Cemetery; overgrown, but no erosion
S5	Single-track; clear; gently sloping	Foot	Good	Connects to property to the west
S6	Overgrown			Connects to property to the southwest
S7	Old farm road; clear; flat	Foot, bike	Good	Connects to Perrin Farm trails to the east

ACCESS

The property is easily accessed by foot paths from all directions, although none of the trails entering from neighboring properties are formalized or conserved. The most heavily-used access appears to be from the south at the end of Maplewood Avenue. Motorized vehicles, including snowmobiles, dirt bikes, and ATVs also occasionally access the property from this point.

Access for mechanized equipment (e.g. tractors, mowers, skidders) is possible from the south as well as from the west. Crossing the stream without causing damage would require a temporary bridge or frozen conditions, but could be avoided.

Assessment

Condition: Excellent, but informal

Keeping access from the Perrin Farm will be very important to provide access to and from other neighborhoods (Map 5). The VAST trail is maintained by the snowmobiler association and provides access from this point to a wider network, but no formal agreement with the City exists. The lack of formal agreements and/or deeded access puts future access from the east and north at risk.

Recommendations

The following activities are recommended to help the City steward and plan for the future of the property:

CHOOSE A VISION.

What is the identity and vision for the future of the Cow Pasture property? Making a purposeful choice about these questions is essential for guiding stewardship decisions for the property.

Define an identity.

The Cow Pasture property is highly-valued by Barre City residents for its trails, natural beauty and views, and as an accessible, undeveloped, green oasis within the city limits (Appendix B). It is clearly a unique and well-loved and –used recreational resource for the City. Although it does not support any state-significant ecological features, at a local scale, it is also a significant ecological resource for the City; it supports a diversity of ecosystems and native species, functions to protect surface water quality, and likely serves as a travel corridor for native wildlife.

However, currently, the property’s name and zoning designation (currently “Residential”) do not fully reflect these values. Assuming that the City wants to protect these values, I suggest creating a new common identity for the property. There are many options to choose among. Models include, but are not limited to, the following:

Type of Open Space	Primary Purposes	Examples
Natural Area	Ecosystem protection, city greenspace, trails	Centennial Woods, Burlington
Wildlife Sanctuary	Wildlife habitat protection	Charlotte Wildlife Park Geparg’s Park, Hinesburg
City Forest	Multiple, balanced uses including forestry	Similar to Town Forest model
Nature Reserve	Preserve biodiversity	
City Park	Recreation; green space for city residents	Hubbard Park, Montpelier

“Natural Area” may be an especially good fit since the public survey reflected that respondents would like to see the natural, undeveloped character of the Cow Pasture maintained; many indicated that they don’t want to see too many improvements to the property and like it just as it is (Appendix B).

“Nature Reserve” and “Public Forest” were relatively popular choices on the survey; in contrast, “City Park” was not.

Write a vision statement.

The vision statement should communicate what the identity of the property is, what is valued about it, and how it will be used. The vision should be used as a long-term (20-50+ years) guide for stewardship, but be adaptable order to allow for changes in environment, science, knowledge, and the community.

Example: *The LaPlatte Headwaters Town Forest (LHTF) is a special place where we come to enjoy, learn from, and care for the land, its forests, streams, wetlands, and inhabitants. We will observe natural processes at work and model management activities to reflect these processes. We will monitor changes and adapt our future management in response to what we learn. All of us will have opportunities to explore the LHTF's unique and diverse natural systems and our place within them.*

Create stewardship goals.

Goals are the big-picture statements of what the City will do to achieve the vision. The goals guide – do not prescribe – any future decisions that need to be made.

Examples:

- Protect forest and tree health.
- Conserve native biodiversity and control non-native invasives.
- Protect and improve wildlife habitat.
- Protect water quality and aquatic habitats.
- Maintain aesthetics, privacy, and space for quiet solitude.
- Promote educational and community uses that are compatible with other management goals.
- Promote and manage recreational uses that are compatible with other management goals.
- Demonstrate sustainable forestry practices that protect and enhance ecosystem function and health.
- Monitor and respond to ecological changes.

Consider a new name.

Consider giving the property a new name that reflects its unique natural features and current community values and uses. Ask residents – including children – to contribute ideas!

Example: Bissonette Farm → LaPlatte Headwaters Town Forest

CREATE A STEWARDSHIP COMMITTEE.

City planning and management staff do not have the capacity to closely oversee the stewardship of the property. A few city residents have been volunteering in an informal capacity to help with acquiring grants, securing access, and improve trails, but a more sustainable model for cohesive management is likely needed. Example roles and responsibilities for a committee are: assist with creating/implementing a management plan, grant writing, organizing volunteer work days, monitoring trails and use, and communicating with the public and neighbors.

Examples:

- Conservation Commission (City-wide)
- City Parks/Natural Area Committee (city parks-specific)
- Friends of the Cow Pasture (property-specific).

CREATE A WEED PLAN.

The most pressing and important step for protecting and improving biodiversity, wildlife habitat, and human health on the property is to proactively address the severe non-native, invasives plant problem. In addition, the property is likely a source of seed and contributing to the spread of invasives onto other properties. A coordinator and committed group of volunteers (e.g. Stewardship Committee), as well as some City resources, will likely be needed to make invasives control on the property successful. A weed plan should:

1. Start by creating a map showing the location and type of invasives on the property and in the surrounding area.
2. Prioritize Early Detection and Rapid Response (EDRR).
3. Be realistic given available resources.
4. Be adaptable.
5. Prescribe an integrated approach that uses best practices for controlling different species and severities of infestations.
6. Include a timeline.
7. Include a plan for public outreach and education, as well as engaging volunteers.

Although creating a weed plan is a high priority, the City and residents should not wait to begin some control and outreach activities. Suggestions for relatively simple, high-impact activities include:

- Post informational signs at trailheads that ask visitors to hand-pull small non-native invasive plants along trails. Include information on identification, how the plants spread, and how to dispose of the plants.
- Start monitoring and hand-pulling small plants in areas where infestations are not yet severe to prevent spreading (EDRR approach). The wetland and riparian areas are especially high priorities because of their particular ecological value and sensitivity.
- Start reading and learning about invasives, weed plans, resources, and potential funding sources at www.vtinvasives.org.

PROTECT STREAM AND WETLAND.

The stream, riparian area, and associated wetland are the most ecologically valuable and sensitive features on the property. Identify a riparian management zone – typically 50-100 feet on either side of the channel and around the wetland – in which no management or new trail development should occur

except for conservation actions such as invasives species control. The overgrown trail that runs through the wetland should be closed, since this is not a sustainable location for a trail.

Talk and coordinate with neighboring landowners whose properties include the stream headwaters, as well as upstream and downstream sections about how to best steward and protect the full length of the stream (Map 5). If future opportunities arise for the City to expand its ownership, prioritize acquiring adjacent land that includes portions of the stream.

Dog waste has been shown to be major contributor to water quality problems in some watersheds in Vermont. Given dog walking is one of the most popular activities on the property (Appendix B), it would be a good idea to post signs along the trail approaches to the stream to educate users about this problem, letting them know that they are entering a water-protection zone, and reminding them to pick up after their dogs.

MAINTAIN SOME OPEN LAND.

The areas of old pasture that are still open (Stand 4, see Map 3) add plant and wildlife habitat diversity to the property and are part of the property's character enjoyed by visitors. Keep the largest, most open areas open using one or a combination of the following techniques:

- **Brushhog** meadows, raspberry patches, and places where small trees and shrubs (<5' tall) have established once every 2-3 years. Mowing every year is not recommended, since this frequency of mowing favors grass over a diversity of flowering plants.
- **Use targeted grazing** – ideally goats – to keep land open and serve as a strategy for controlling invasive shrubs. Check out the NY Department of Conservation's handbook *Targeted Grazing: A Natural Approach to Vegetation Management and Landscape Enhancement* (available online) for details and more information.

Regardless of the technique used, retain scattered individual and groups of native trees and shrubs, especially those that are fruit-bearing because of their high wildlife value. Make clear (preferably written) agreements with whoever will be in charge of brush hogging and/or grazing.

FORMALIZE RECREATIONAL USE AND ACCESS.

This step is important, but likely to be time-intensive since recreation is the issue about which residents are likely to feel the most strongly.

Decide on permitted and prohibited uses.

The current trail network is most well-suited to **pedestrian and mountain bike use**. Pedestrian use of trails for walking in general and dog walking in particular was the most popular current use among those who completed the public survey (Appendix B). Most respondents said trail walking and running, snowshoeing, and cross-country skiing should continue to be allowed in the future. Respondents were

generally in favor of allowing mountain biking as well (77%), but more people indicated they either weren't sure this use should be allowed or thought that it should be prohibited than did for pedestrian trail use.

ATVs and dirt bikes are much more high-impact and require more intensive and expensive trail building and management to be sustainable. When these users go off-trail – as happened in the wetland – they can be very destructive. No public survey respondents indicate that they currently use the property for these activities, and most respondents (84%) think that they should be prohibited in the future (Appendix B).

Although motorized, **snowmobiles** are typically lower impact since they travel over frozen conditions. Public support for this activity on the property going forward was mixed: survey results indicated that 44% think it should be prohibited, 37% would like to see it allowed, and 19% were not sure (Appendix B). With the exception of the stream crossing, the snowmobile use on the wide, gently-sloping trails is sustainable. However, if this use is permitted, the City should require that VAST obtain permission to use the trails, create a formal MOU for what role the organization will play in maintaining them and specifically address how VAST will help make the stream crossing appropriate for snowmobile use.

Dog walking is a popular current use and 95% of survey respondents indicated they would like to see it continue to be allowed in the future (Appendix B). If the City would like to permit dog walking on the property, rules about controlling and picking up after dogs should be created and clearly communicated; unleashed and aggressive dogs were concerns raised by survey respondents and dog waste near the stream can create water quality problems. It may be appropriate to designate a portion of the property or a trail loop as dog-free since there are users who do not like to encounter dogs.

Berry picking, sledding, and bird/wildlife watching were all supported by most respondents as uses that should be allowed in the future (Appendix B). The opposite was true of **hunting**; 74% of respondents indicated that they would like to see this use prohibited.

Create a trail plan.

Better trail maintenance and marking was the most common suggestion for improving the Cow Pasture property (Appendix B). Once permitted uses are established and before investing significant resources in upgrading existing trails or creating new trails, create a trail plan by doing the following:

- Conduct a more detailed assessment of existing trails.
- Decide which trails to close or rehabilitate (e.g. those along fall lines, trails through wetland soils).
- Identify new trail connections for enhanced user group experience/enjoyment.
- Identify needed repairs to existing trails.
- Design trail enhancements (e.g. markers, signage, interpretive information, benches/rest points, etc.).
- Define a process for creating and maintaining trails (e.g. who is responsible and what type of agreement is required if a non-city group takes responsibility).

- Assess parking needs and consider improvements and/or expansion.

Formalize access from Perrin Farm.

Keeping this access point open is very important for providing access to and from other neighborhoods. About a third of public survey respondents indicate that they access the Cow Pasture by walking on trails that originate on neighboring private property; this percentage is likely higher since another 20% indicated that they don't know which trails are on the Cow Pasture property (Appendix B).

Talk with the Perrin family about options for formalizing an agreement for public access and/or permanent conservation of their property since it adds greatly to the recreational and ecological value of the Cow Pasture property. Options to consider for formalizing trail access include (Source: Vermont Trails and Greenway Manual, 2007):

- **Handshake agreement:** Easy and flexible, but not permanent
- **License agreement:** Clear written agreement, but not permanent (can change as ownership changes)
- **Trail easement:** Permanent and can provide tax advantages to the landowner if part of a larger land conservation project, but can be less effective if not carefully written and monitored
- **Donation of land:** Can have tax benefits for landowner, but can be expensive and complicated for trail organization/new owner
- **Option or right of first refusal:** Safeguards against losing trail access if the property changes hands, but when land is offered need to raise funds to purchase land on short notice
- **Purchase of trail corridor/land:** More straightforward and ensures better control over trail, but can be expensive

Since some of the Perrin Farm is outside the City limits, it may make sense to work in partnership with Barre Town to consider these options or others. Several of the survey respondents indicate that they live in Barre Town (Appendix B), so it is likely that the Cow Pasture, as well as the Perrin Farm, have value for Barre Town residents as well as those in Barre City. Access from other adjacent properties is also important, but a lower priority than working with the Perrins.

EDUCATE AND ENGAGE PUBLIC.

Post trail map and rules.

Currently, there is no way for visitors to know that they are entering or leaving city-owned land. 20% of public survey respondents were not aware that the City owns the Cow Pasture (Appendix B). Providing the public with more information about the property was one of the most common suggestions for improvements from the survey. Posting some basic information at the trailhead at the end of Maplewood Avenue and/or at other points where visitors enter the property will help educate users. Post these resources on the City website as well.

Example:

Enjoy your visit and please observe the following:

- Respect wildlife, nature, and other visitors.
- Leave no trace; carry in and carry out trash and waste.
- Observe appropriate use of trails:
 - Limit trail use during mud seasons.
 - Non-motorized use only (except for snowmobiles in winter).
 - No cutting or creation of new trails.
 - Observe trail closures and reroutes.
- No fires or camping.
- No alcohol or firearms.
- Dogs must be under control. Please pick up after your dogs.

Get students and volunteers involved.

Develop a list of projects that are appropriate for students, community groups, and/or scouts to do on the property. Suggestions include:

- Trail improvements (e.g. re-opening overgrown trails, clearing water bars, filling in new hardened stream crossing with small stone)
- Build a kiosk.
- Create educational signs, posters etc.
- Put up and maintain trail markers.
- Map occurrences of invasives species.
- Invasives species control.
- Conduct bird monitoring and enter observations into e-bird.
- Plant red oak acorns near existing oaks.
- Collect water quality data at the stream.
- Conduct a survey of users to find more about how people use the property, what their concerns are, and what they would like to see happen for its future.
- Refresh boundary markings (with supervision).
- Adopt a trail segment or section of woods for regular invasives monitoring and control.
- Build a deer exclosure to demonstrate the impact deer browse is having on tree regeneration.



Example of a deer exclosure.

CONSIDER PERMANENT CONSERVATION

The Cow Pasture property is not permanently conserved; the City could develop or sell the property at any time. If the City wants to see this remain as a natural area in perpetuity, look into the possibility of a conservation easement. Documenting the value and intended use of the property in the City Plan and re-zoning the property as a conservation area would also be appropriate steps to take if the City wants to communicate its intent to maintain the Cow Pasture as undeveloped public open space.

Glossary

Acre: A standard unit of area measure. One acre equals: 43,560 square feet; 4840square yards; 10 square chains.

Advance regeneration: Natural regeneration that has established prior to a timber harvest.

Age Class: One of the intervals, commonly 10-20 years, into which the age range of trees are divided for classification.

Basal Area: The area of (1) a cross-section of at tree trunk at its base or (2) a given section of land that is occupied by the cross-section of tree trunks and stems at their bases.

Biodiversity: The variety of genes, species, and ecosystems in an area.

Browse: Buds, leaves, and twigs of seedling and sapling regeneration that are utilized as a food resource by wildlife.

Canopy: The combined cover of individual tree crowns.

Coarse woody material (CWM): Downed logs and branches >4 inches diameter.

Crown: The branches and twigs of the upper part of a tree.

Diameter at Breast Height (dbh): The diameter of a standing tree measured at 4.5 feet above the ground and expressed in inches.

Dominant: Trees with well-developed crowns which are above the canopy and receive direct sunlight from above and partially from the side.

Early-Successional Habitat: An area – usually larger than 1 acre in size - dominated by a high-density of shrubs and pioneer species seedlings and saplings. Regenerating forest and brushy, overgrown fields are two of the most common types of early-successional habitat. These conditions are temporal; generally lasting for 15-20 years in regenerating forest area, longer on old fields.

Edge: The boundary between forest and open land, such as a field or backyard.

Fine woody material (FWM): Limbs and branches <4 inches diameter including slash.

Floodplain: The portion of land along a waterway that often or occasionally floods during high water.

Forest Type: A natural group or association of different species of trees which commonly occur together over a large area. Forest types are defined by one or more of the dominant species of trees in the type.

Forestry: The art, science, logistics, and business of growing and managing forests for the sustainable use of their resources.

Fragmented Forest: Forest that is broken into small, unconnected patches primarily due to some form of development (e.g. residential, commercial, or major roads).

Girdle: To destroy the conductive tissue of a tree in a ring around the trunk.

Habitat: The place where a plant or animal can live and maintain itself.

Hardwoods: Broad-leaved trees which lose their leaves in the fall.

Harvest: A silvicultural treatment that is intended to establish regeneration. A harvest is generally a higher level of cutting intensity than a thinning.

Headwater stream: A stream that is at the top of the watershed.

High-grading: A liquidation cut in which only the best quality, highest value trees are removed. Cuts of this nature are short sighted and exploitative and result in the degradation of the forest ecosystem.

Horizontal structure: The arrangement of different habitat types across the landscape. A landscape with mature and young forest habitats, open fields, and wetlands would be rich in horizontal diversity. Landscapes with greater horizontal diversity support a greater diversity of breeding forest birds and other wildlife.

Interior forest: Forest condition that occurs with increasing distance from a forest edge.

Intolerant species: Trees unable to grow and develop in the shade of other species. Intolerant commercial species in Vermont include: paper birch and aspen.

Invasive plant: A plant that is able to establish on many sites, grow quickly, and spread to the point of disrupting native ecosystems. Often non-native.

Landing: Any place where logs are assembled for further transport.

Leaf litter: Dead plant material such as leaves, bark, and twigs that has fallen to the ground.

Mast: Nuts, berries, and seeds utilized by wildlife as a food resource. Soft mast are soft fruits, such as blackberries, raspberries, and cherries.

Midstory: Live, woody vegetation in the 6-30 foot height range including trees and shrubs.

Natural Community: An interacting assemblage of plants and animals, their physical environment, and the natural processes that affect them in a particular place.

Old forest: A forest with 100+-year-old trees in which human disturbance has been minimal and natural disturbance has been limited to small-scale windthrow events or natural death of trees.

Outcrop: A portion of bedrock that is exposed and protruding through the soil layer.

Overstory: Those trees making up the main canopy. The overstory is usually referenced as the larger trees in the forest.

Pioneer: Shade intolerant, short-lived, and fast-growing species that are the first trees to develop in an area after a large scale disturbance or after the abandonment of a field. Pioneer species include aspen, gray birch, pin cherry, and paper birch.

Pole or pole timber: A tree or trees greater than 4.0 inches dbh and less than 10.0 inches dbh.

Quadratic Mean Diameter: The diameter corresponding to the mean basal area of a group of trees.

Release: The freeing of well-established seedlings or saplings from surrounding growth.

Residual: Trees that are left to grow in a stand after a silvicultural treatment.

Riparian area: The portion of land along the shores of a water way or body of water.

Salvage cut: The removal of dead, dying and damaged trees after a natural disaster or insect or disease infestation to utilize the wood before it loses all of its commercial value.

Sapling: Trees taller than 4.5 feet but less than 5.0 inches dbh.

Sawlog: A log considered suitable in size and quality for producing lumber.

Sawtimber: Trees that have obtained a minimum diameter at breast height that can be felled and processed into sawlogs. Typical minimum size limits for commercial species in Vermont are 8 inches dbh for softwoods and 12 inches dbh for hardwoods.

Seedling: Tree that is less than 4.5 feet tall.

Seep: A small wetland found in forests formed where groundwater rises to the surface.

Shade tolerance: The ability of trees to grow and reproduce in the shade of other trees. Tolerance ratings are very tolerant, tolerant, intermediate, intolerant, and very intolerant.

Shrub: A multiple-stemmed or low-branching woody plant generally less than 20 feet tall at maturity.

Silviculture: The art and science of tending forest stands to control establishment, growth, composition, and form.

Site Class: A classification of forestland in terms of its inherent capacity to grow crops of industrial wood (Site 1 = highest capacity).

Skid trail: Any path in the woods over which loads of logs are hauled, usually by a skidder or tractor. Primary skid trails are the main pathways that enter the landing.

Skidder: A four wheel drive, tractor-like vehicle, articulated in the middle for maneuverability, with a cable or grapple on the back end designed to bring logs or whole trees to the landing once that they have been felled.

Slope: A relative measure of steepness of the ground.

Snag: A standing, dead tree.

Softwood: Coniferous trees, usually “evergreen” (the exception being tamarack), with needles or scale-like leaves.

Stand: A community of trees possessing sufficient uniformity in regard to composition, constitution, age, spatial arrangement or condition to be distinguishable from adjacent communities.

Succession: The orderly and predictable replacement of one plant community by another over time in the absence of disturbance.

Suppressed: Trees with crowns entirely below the general level of the forest canopy that receive no direct sunlight from above or the sides.

Swale: A wet, marshy depression.

Thinning: A silvicultural treatment that reduces stand density to allow the best trees to grow with less competition. There are three kinds of thinning: crown thinning, low thinning, and free thinning.

Timber: Wood prepared for use in building and carpentry (e.g., lumber, beams, and veneer).

Tolerant species: Trees that can grow satisfactorily in the shade of other trees. Tolerant species of commercial importance in Vermont include sugar maple, beech, red spruce, and hemlock.

Understory: Live vegetation in the 1-5 foot height range, including tree seedlings and saplings, shrubs, and herbaceous vegetation.

Vernal pool: A small, temporary body of water that occurs in a forest depression.

Vertical structure: The complexity of vegetation and other structures as they are vertically arranged in the forest. A forest with a well-developed understory, midstory, and canopy exhibits complex or diverse vertical structure. Non-living features, such as coarse woody material and the microtopography of the forest floor, add to the complexity of vertical structure as well.

Vigor: The health and vitality of a tree. Vigor can most accurately be assessed by observations of foliage (density, width and color) and percent live crown.

Windthrow: A tree or trees that have been toppled by high winds. A common phenomena along the edge of strip cuts and clearcuts.

Resources

Books and Publications

The Northern Forest by David Dobbs and Richard Ober, 1996.
Northern Woodlands Magazine. <http://northernwoodlands.org>
The Tree Identification Book by George W.D. Symonds, 1958.
The Sibley Field Guide to Birds of Eastern North America by David Allen Sibley, 2003.
Sibley's Birding Basics by David Allen Sibley, 2002.
New England Wildlife: Habitat History, and Distribution by Richard M. DeGraaf and Mariko Yamasaki.
Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont by Elizabeth H. Thompson & Eric R. Sorenson, 2000.
The Nature of Vermont; Introduction and Guide to a New England Environment by Charles W. Johnson, 1980.
More Than a Woodlot: Getting the Most from Your Family Forest by Stephen Long, 2012. Published by Northern Woodlands.
Working with Your Woodland: A Landowner's Guide by Mollie Beattie, Charles Thompson, and Lynn Levine, 1993, revised edition.
Backyard Wildlife Habitat in Vermont by Steve Parren, 1993. Published by Vermont Fish and Wildlife Department. PDF Available online.
Landowner's Guide to Wildlife Habitat: Forest Management for the New England Region by Richard M. DeGraaf, Mariko Yamasaki, William B. Leak, and Anna M. Lester, 2005.
The Audubon Society Guide to Attracting Birds: Creating Natural Habitats for Properties Large & Small by Stephen W. Kress, 2006.
Trees, Shrubs, & Vines for Attracting Birds by Richard M. DeGraaf, 2002.

Websites

All About Birds – online bird guide – www.allaboutbirds.org
Audubon Vermont – <http://vt.audubon.org>
eBird – online citizen science database – amateurs welcome – www.ebird.org
Sharpless Ecologic, LLC – <http://sharplesslogic.wordpress.com>
Vermont County Foresters - <http://www.vtfpr.org>
Vermont Coverts - www.vtcoverts.org
Vermont Family Forests – <http://familyforests.org>
Vermont Fish and Wildlife Department – www.vtfishandwildlife.com
Vermont Invasives – www.vtinvasives.org
Vermont Natural Resources Conservation Service (NRCS) – EQIP and WHIP financial incentives and cost-share programs - www.vt.nrcs.usda.gov
Vermont Woodlands Association – includes association of consulting foresters - www.vermontwoodlands.org

Apps for Smart Phones

Audubon Guides – electronic guides to birds, plants, and more – www.audubonguides.com
Bugwod Apps – electronic guide to invasive plant identification and control - <http://apps.bugwood.org/>
iBird – electronic bird guides – <http://iBird.com>
Leafsnap – electronic tree identification guide – <http://leafsnap.com>

Appendix A: Forest Stand Summaries

Forest stands are units that are delineated for the purposes of management based on tree species composition, forest age, access, and/or other characteristics. In this case, Russ Barrett, Washington County Forester, mapped three forest stands on the property after completing a systematic forest inventory in April 2013. The metrics and information provided here are standard components of a forest management plan and are commonly understood and meaningful to professional foresters.

STAND 1: PIONEER HARDWOODS

Stand Size: 26 acres

Forest Type: Pioneer hardwoods

Natural Community Type: Northern Hardwood Forest and Rich Northern Hardwood Forest

Description: Evenaged pole stand that is generally lacking in structural diversity. Trees present are primarily early-successional species that include (% by basal area): aspen 32%, paper birch 18%, red maple 15%, white pine 11%. The understory and midstory forest layers are generally lacking, except where non-native, invasive shrubs have established. Where larger and declining quaking aspen are present, snags and downed deadwood are more abundant, which are important nesting, perching, and foraging sites for birds and other wildlife. An enriched portion of the stand that includes large white ash and sugar maple trees as well as rich-site indicator herbs is found a small section of south-facing hillside above the small stream.



Stand Data: The data in the table below describe the average size, density and commercial quality of, as well as the volume of product (e.g. logs for lumber, firewood etc.) in, the trees in this stand. Knowing this information helps foresters decide which silvicultural treatments – if any - would be appropriate for this forest.

Plots: 17

Total Basal Area	126	sq.ft.
Acceptable Basal Area/Acre	67	sq.ft.
Quadratic Mean Diameter	8.9	in.
Trees/Acre	293	
Sawtimber Volume	987	board feet/acre
Cordwood Volume	15	cords/acre

Approximate Stand Age: Up to 50 years.

Invasive Species: Moderate to severe infestation of bush honeysuckle, glossy buckthorn, Japanese barberry, and amur maple. Infestations are most severe within forest edges along trails and openings and where canopy gaps have allowed light to reach the forest floor. Infestations are more moderate under closed canopy, interior forest conditions.

Regeneration: Inadequate. Deer browse pressure appears to be high throughout the property, which is likely contributing to the lack of seeding growth. Closed canopy conditions are also likely suppressing regeneration.

Site Class: II (by soils).

Topography: Generally gently sloping, although slopes steeply down to Maple Avenue along the western property boundary. West and southwest aspects.

Water Quality: A small, first order stream runs through the stand with several seeps and springs along its banks. Water quality and the condition of the channel and riparian corridor appear to be good. The western stream crossing was recently improved, reducing erosion in that area. A small wetland is adjacent to the stand.

History/Previous Activity: Regenerated from old pasture and golf course.

Access and Operability: Good access for machinery (e.g. brush hogging or logging equipment) is available to most of the stand from existing woods roads and trails. Crossing the stream without causing rutting or erosion would require frozen conditions or a skidder bridge, but should not be necessary given the access option from Maple Avenue. Operability within the stand is good with no significant obstacles.

STAND 2: PIONEER SOFTWOOD MIX

Stand Size: 25 acres

Forest Type: Pioneer Softwood Mix

Natural Community Type: Northern Hardwood Forest and Hemlock Hardwood Forest

Description: Evenaged pole stand that is generally lacking in structural diversity. Trees present are primarily softwood species that were planted or regenerated in the open that include (% by BA): white pine 27%, Scotch pine 22%, sugar maple 10%, Norway spruce 8%. A small red pine plantation is also present on the slope above Maple Avenue across from the cemetery. The understory and midstory forest layers are generally lacking, except where non-native, invasive shrubs have established.



Stand Data: The data in the table below describe the average size, density and commercial quality of, as well as the volume of product (e.g. logs for lumber, firewood etc.) in, the trees in this stand. Knowing this information helps foresters decide which silvicultural treatments – if any - would be appropriate for this forest.

Plots: 19

Total Basal Area	131	sq.ft.
Acceptable Basal Area/Acre	52	sq.ft.
Quadratic Mean Diameter	9.8	in.
Trees/Acre	247	
Sawtimber Volume	1600	board feet/acre
Cordwood Volume	8	cords/acre

Approximate Stand Age: Up to 50 years.

Invasive Species: Moderate to severe infestation of bush honeysuckle, glossy buckthorn, Japanese barberry, and amur maple. Infestations are most severe within forest edges along trails and openings and where canopy gaps have allowed light to reach the forest floor. Infestations are more moderate under closed canopy, interior forest conditions.

Regeneration: Inadequate. Deer browse pressure appears to be high throughout the property, which is likely contributing to the lack of seeding growth. Closed canopy conditions are also likely suppressing regeneration.

Site Class: II (by soils).

Topography: Generally gently sloping, although slopes steeply down to Maple Avenue along the western property boundary. West and southwest aspects.

Water Quality: A small, first order stream runs through a portion of the stand with several seeps and springs along its banks. Water quality and the condition of the channel and riparian corridor appear to be good. The forest is dominated by eastern hemlock here and this is where the trail crosses the stream.

History/Previous Activity: Regenerated from old pasture and golf course.

Access and Operability: Good access for machinery (e.g. brush hogging or logging equipment) is available to most of the stand from existing woods roads and trails. Crossing the stream without causing rutting or erosion would require frozen conditions or a skidder bridge, but should not be necessary given the access option from Maple Avenue. Operability within the stand is good with no significant obstacles.

STAND 4: SEMI-OPEN

Stand Size: 16 acres

Forest Type: Semi-open – reverting pasture

Natural Community Type: Northern Hardwood Forest and wetland

Description: Least forested area of the property that is still more than 35% open. Patches of and scattered trees present are primarily early-successional and open-grown species including (% by BA): red pine 38%, white pine 17%, sugar maple 12%, aspen and Norway spruce 7%. Dense patches of woody vegetation in understory and midstory layers are present, but many contain a significant non-native, invasives component. Areas dominated by raspberries, aster, goldenrod, and other herbaceous plants have probably been brush hogged occasionally by a neighbor. The small portion of this stand in the northeast corner of the property appear to be mowed annually by the neighbor to the north for use as a turn-around for his tractor during sugaring season.



Stand Data: The data in the table below describe the average size, density and commercial quality of, as well as the volume of product (e.g. logs for lumber, firewood etc.) in, the trees in this stand. Knowing this information helps foresters decide which silvicultural treatments – if any - would be appropriate for this forest.

Plots: 12

Total Basal Area	70	sq.ft.
Acceptable Basal Area/Acre	35	sq.ft.
Quadratic Mean Diameter	8.9	in.
Trees/Acre	163	
Sawtimber Volume	0	board feet/acre
Cordwood Volume	6	cords/acre

Approximate Stand Age: 0-30 years.

Invasive Species: Severe infestation of bush honeysuckle, glossy buckthorn, Japanese barberry, and amur maple.

Regeneration:

Site Class: II (by soils).

Topography: Gently sloping. West and southwest aspects.

Water Quality: Southern-most portion of the stand is an open forested wetland that includes a section of the small stream that runs through the property. The wetland was rutted by ATV use, but restoration work was done last year. Currently, conditions of the wetland, riparian area, and stream in this area appear to be good.

History/Previous Activity: In process of regenerating from old pasture and golf course.

Access and Operability: Good access for machinery (e.g. brush hogging or logging equipment) is available to most of the stand from existing woods roads and trails. Crossing the stream without causing rutting or erosion would require frozen conditions or a skidder bridge, but should not be necessary given the access option from Maple Avenue. Operability within the stand is good with no significant obstacles.

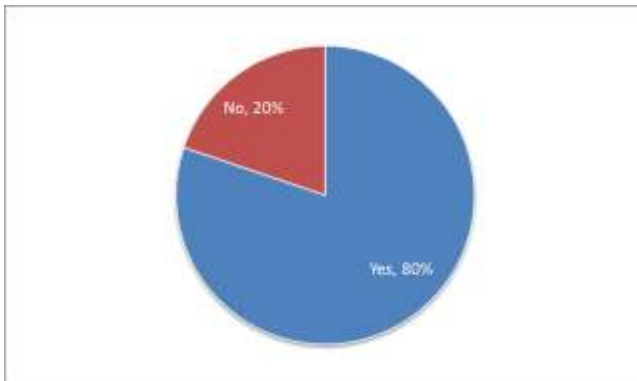
Appendix B: Public Survey Results

In order to gather initial information about Barre City residents' and Cow Pasture users' knowledge, interests, concerns, and ideas for the Cow Pasture, Kristen Sharpless prepared a 10-question public survey that was posted online between June 7 – July 17, 2013. A link to the survey was posted on the Barre City website, hardcopies were distributed to neighbors of the property, and Chris Russo-Fraysier organized spreading the word about the survey through community and neighborhood networks including Front Porch Forum. 129 people completed the survey. The following is a summary of the results:

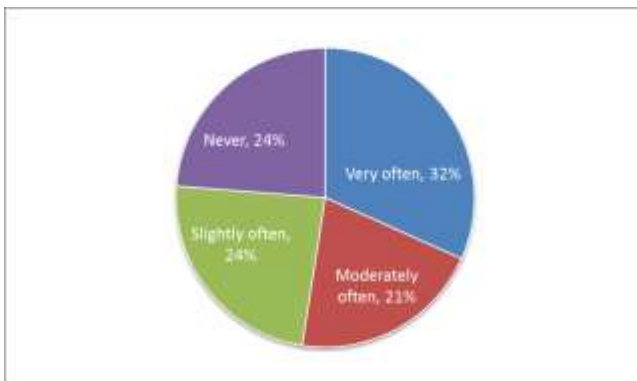
1. In which city/town do you currently live?

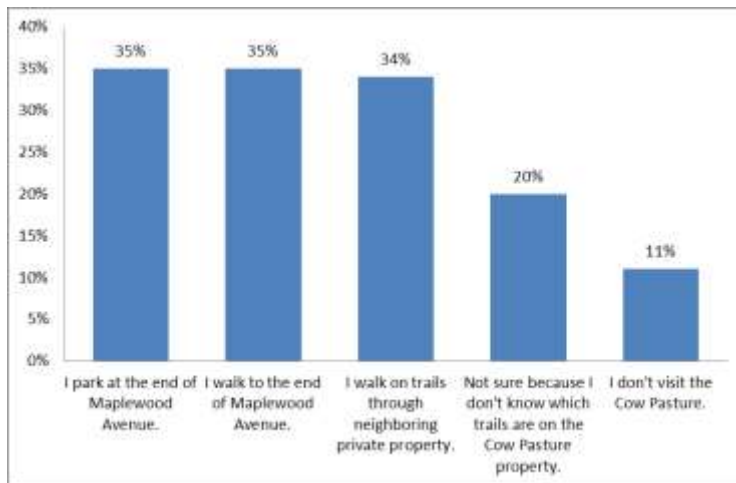
- Barre City 84%
- Other towns: Montpelier, Barre Town, Cabot, Tunbridge, Orange (some work and/or own property in Barre City), and Tampa, FL.

2. Were you aware that the City owns the Cow Pasture - 67 acres of the undeveloped open space north of downtown and east of Route 14 across from the Hope Cemetery?

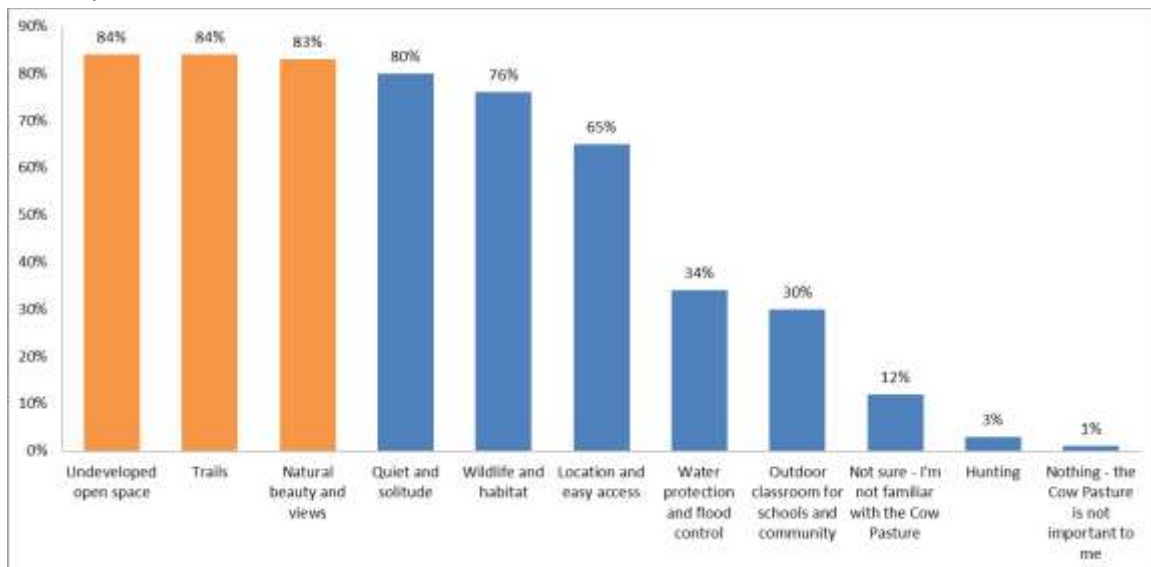


3. How often do you visit the Cow Pasture?



4. How do you access the Cow Pasture? (Check all that apply.)*113 responses***Others responses:**

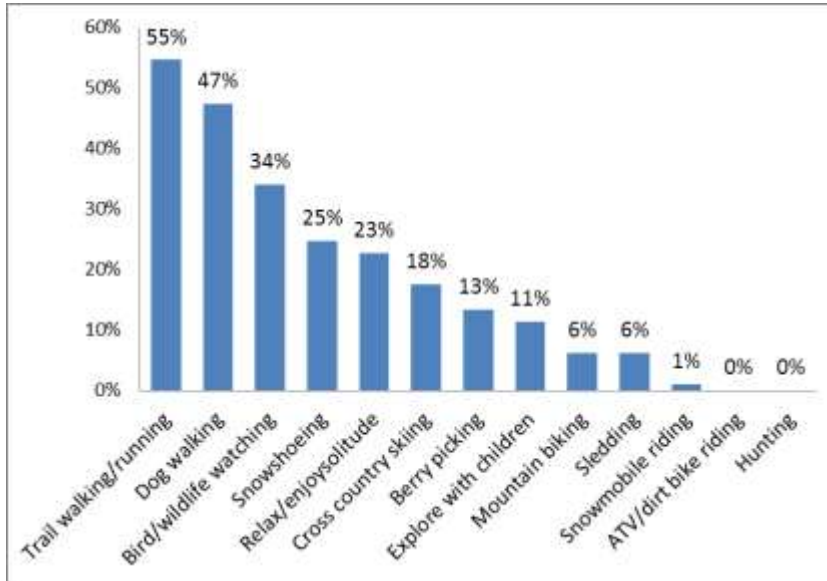
- Walk from work - 2
- Walk up Hall St and cut through the woods there, not often recently though - 1
- Top of Park Street - 4
- Walk to the end of Sheridan - 4
- From Onward St, I think - 1
- Up from cemetery building - 2
- Winter Meadow - 2
- Didn't realize I could go there - 3

5. What do you value about the Cow Pasture? (Check all that apply).*129 responses***Other responses:**

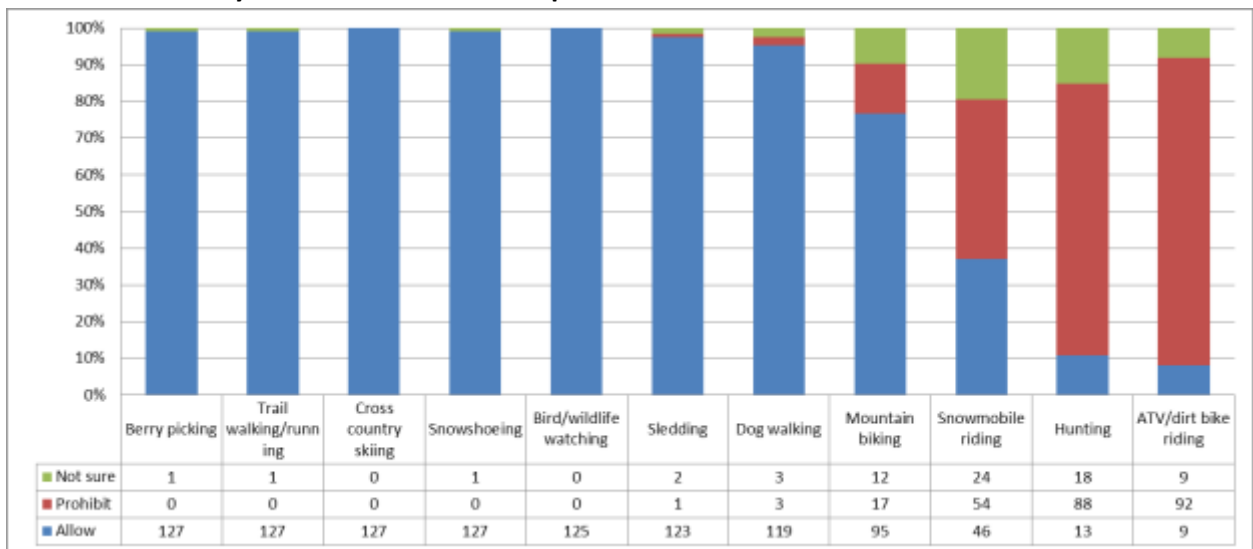
- Dog walking - 4
- Meeting other walkers; gathering with friends - 2
- Nice streams
- I love that Barre Town has a forest
- I played there as a child; it holds many memories.

6. What do you do when you visit the Cow Pasture (e.g. walk dog, snowmobile, watch birds/wildlife, mountain bike)?

105 responses.



7. Which uses would you like to see allowed or prohibited in the future?



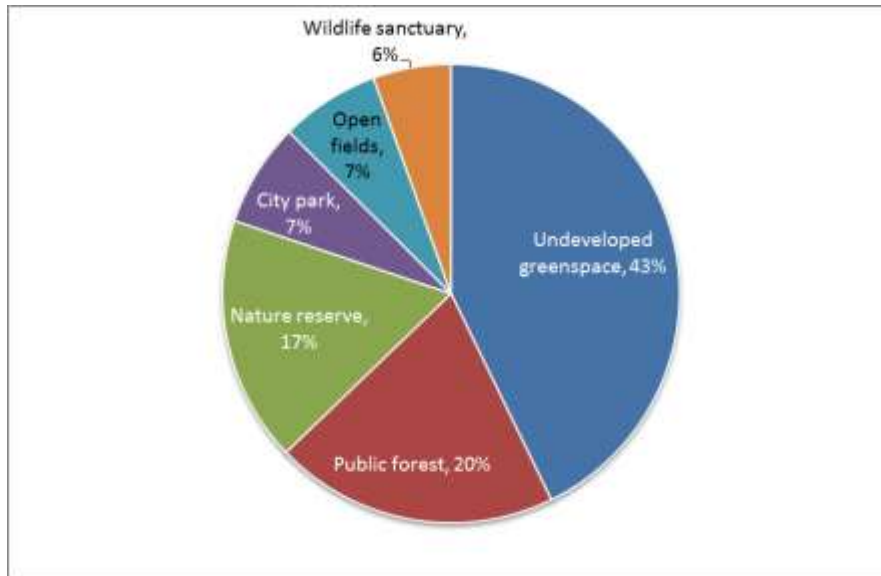
Other responses:

- Dogs need to be leashed/contained - 3
- Visitors must clean up after themselves and their dogs - 3
- Prohibit overnight camping - 1
- No smoking - 1
- Prohibit alcohol - 1
- If ATV/dirt bike allowed, you have to fence the land - 1
- Prohibit dirt bikes during mud season - 1

- ATVs only allowed on upper trails in fields - 1
- A section could be "dog friendly" - 1
- The motorized things might have a trail through, but they destroy habitat and are noisy. We have so little "quiet" - 1
- Maintain apple trees – 1

8. Which term best describes what you would like the Cow Pasture to be in 10 years? (Please choose only one.)

119 responses.



Other responses:

- A mix of the above options - 7
- I'm not sure – need more information - 3
- Just the way it is now – 3
- Wild, open to the public - 2
- Area for kids to play....more walking paths - 1

9. What do you like most about the Cow Pasture?

98 responses

Common Themes

- Wild and undeveloped greenspace within City limits
- Easy to get to
- Trails and walking
- Natural beauty and views
- Free, public access
- Wildlife
- Peaceful, remote feel, quiet

Quotes

It's open space in the city, a quiet area to walk, enjoy the sunset, get out and enjoy nature practically in my back yard.

I like that it is an informal, undeveloped, wild-as-possible natural resource for hiking, hunting and foraging, that is walkable for Barre City residents -- it is amazing to have this wild space so accessible to city-dwellers, and it would be a shame for it to become manicured, over-managed park land (like Hubbard Park, which is wonderful, but pretty barren in comparison.)

As a resident of Maplewood Avenue for 39 years, we've seen lots of changes, however, as my children were growing up, they thought the cow pasture was their own playground. Now that we have grandchildren, I would like them to have the safety and pleasure of playing in the cow pasture as well!

I have met a lot of great people and dogs there. Great wildland experience within the city. Also, have seen some birds that hadn't seen anywhere else- pileated woodpecker up close and great grey owl a few years ago. I have been going there since winter of 2008.

Green space within the city that is fun to explore - it reminds me of Hubbard park in Montpelier and should be treated the same - keep it for the people.

"I LOVE and treasure the Cow Pasture! I treasure the ""wildness"" and quietness of it. The old stone walls and sights and sounds of wildlife. It's a place without too many people, and most people are on foot which keep it quiet and safe. I can go there and, respectfully, do what I want. I will tell you that I do not like the use of ATV's and snowmobiles.

I love the old farm fields, enjoy the history of the area (old stone walls, wells, old fields). Just a great place to get outside for a while and close by.

It is close to home, don't need to drive there. I've seen deer, lots of birds. We need more undeveloped greenspace for Barre residents to enjoy outdoor physical activity. The views of distant mountains and the city are quite nice!

It is not as busy as Hubbard Park; it's wild for the most part. I love how close it is.

It's quiet and beautiful. Birds, plants, water, trees. Nice people walk there. I couldn't stand Barre without it.

It's the country in the city. I like the trails and running into neighbors or meeting like-minded people enjoying the beauty it has to offer the residents of our depressed community.

That it is AVAILABLE in Barre City! Wish my realtor had mentioned it to me so we could have looked at property even closer to it.

The cow pasture is a beautiful open space that I can walk to. I can get exercise without being inside a gym that I might not be able to afford. The beauty of the changing landscape never fails to lift my spirits in all seasons.

The Cow Pasture is the only place in the Barre area where I can let my dogs off leash. It's a lovely group of people who use the Cow Pasture and the majority run their dogs there and do regular clean-up of trash left by too many people.

Open space is a draw for individuals/families considering moving to neighborhoods near the pasture - although many assume that neighboring private property is part of the public property.

We already own it. Let's make it part of the new Barre.

10. What changes would most improve the Cow Pasture?

98 responses

Most Common Suggestions

- Better trail maintenance/markings – 22
- Nothing - leave as is – 16
- Better publicity and information for the public (e.g. signs, maps) – 12
- Ban or restrict ATVs and dirt bikes - 10
- Improve stream crossing - 8
- Better access - 7

Other Suggestions

- More/improved parking - 6
- Keep mix of habitats; maintain views - 6
- Keep wild feel – 5
- Tree pruning - 4
- Post clear rules about permitted and prohibited uses - 3
- Purchase adjoining undeveloped property when available to add more open space – 2
- Restore sledding hill - 2
- Keep clean; pick up litter – 3
- Control ticks - 1
- New fence as you go in on the Maplewood Ave - 1
- Forest management – 1
- Assure it is protected – 1
- Address homeless encampments - 1
- Monitor abuse of the nature – 1
- Organize public hikes/walks – 1
- Grooming some trails - 1

Quotes

If it turns into more of a public space I think Hubbard Park is a good model.

More easily accessible and make it more developed as a park with some modest infrastructure developed such as parking, signage, trail maintenance, etc. There really ought to be public parking and access via Maple Ave/E. Montpelier Rd.

Recreational vehicle use such as atv, utv. And camping sites.

Securing public access through private property to provide walking access from surrounding neighborhoods. Purchase the frog pond and "high" spot that offers panoramic views.

Without damaging natural habit, I would make it more accessible for community members. Maybe more points of access, maybe small public parking areas near those points of access, maybe some seating (benches or picnic tables), maybe a small gathering spot (similar to the area at the bottom of the hill to BCEMS near the playground). People need to be able to use the area, but should not be allowed to destroy it. No littering, cleaning up after themselves and their dogs, etc. There is almost 100 acres here, and close to downtown - so much could be done with this space. There is room for city maintained trails, forested places, and even a large park where families could gather. The city could also develop the land for houses and businesses (all dependent on the status of the nature that resides there).

If the city got involved the trails could possibly be kept up by them in winter and summer. Besides that the cow pasture has puttered along for so many years without management that I don't see why it can't continue to do so.

I like it just like it is. If you promote it too much or develop it like Hubbard Park it will ruin it. It's too small of an area and too much activity will drive off the wildlife.

I would like to suggest planting fruit/nut bearing trees and bushes, as well as fresh herbs, produce (peas, tomatoes, etc.) and allow the reap to be freely taken by residents that use the park.

Take down the posted signs that are not legit, please.

Signage such as some simple, state-park-like wood signs that indicate when entering the Cow Pasture at trails and accessible boundaries, indication of rules (e.g., allowable vehicles, animals), dates of hunting seasons and safety precautions. Trail maps.

Agreements with private land owners to allow use of trails that connect with their properties would be great.

Multi-use guidelines for a series of maintained trails that allow for walking, mountain biking, and motorized sports individually, or together.

Maps

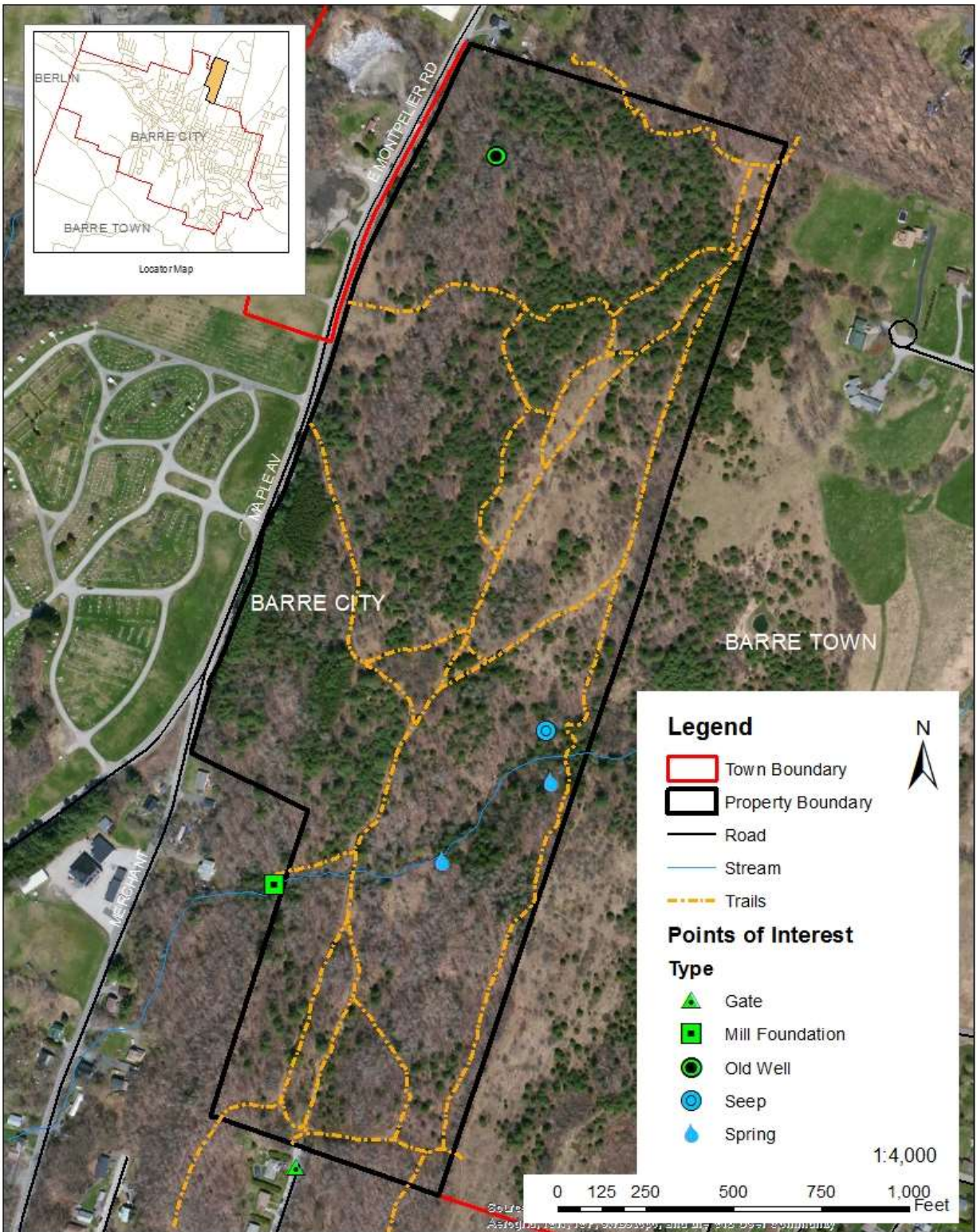
Map 1 – Property Map

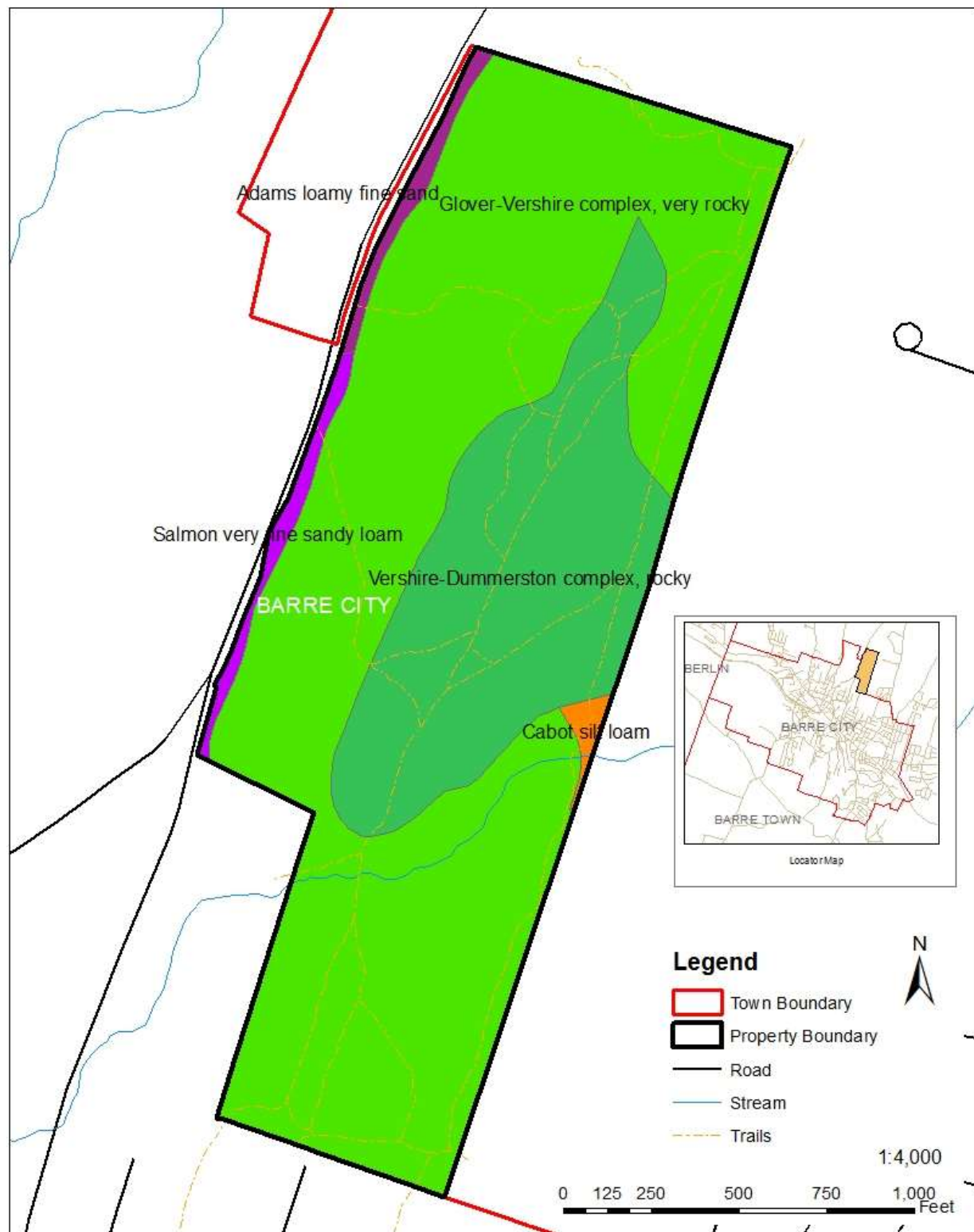
Map 2 – Soils

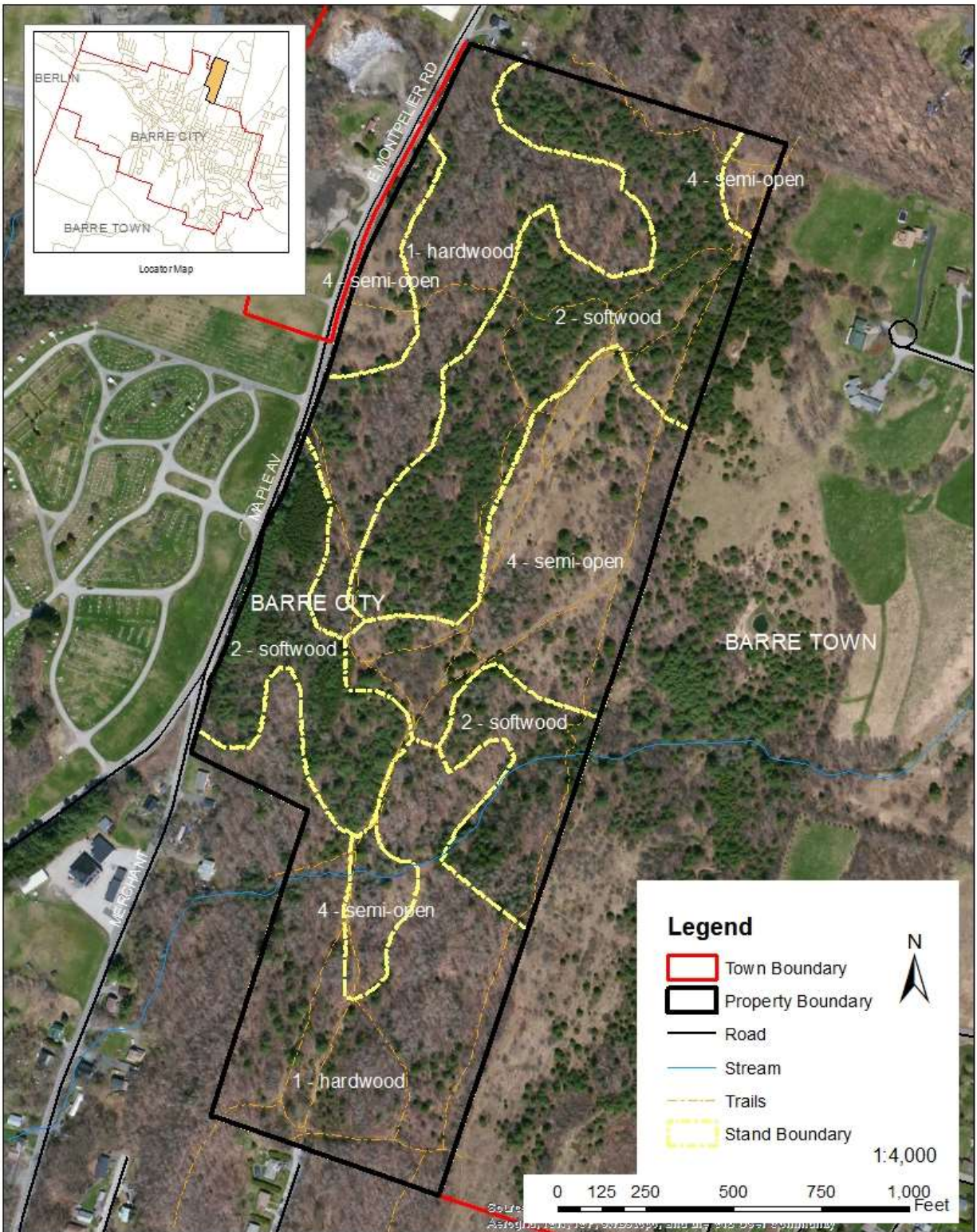
Map 3 – Forest Stands

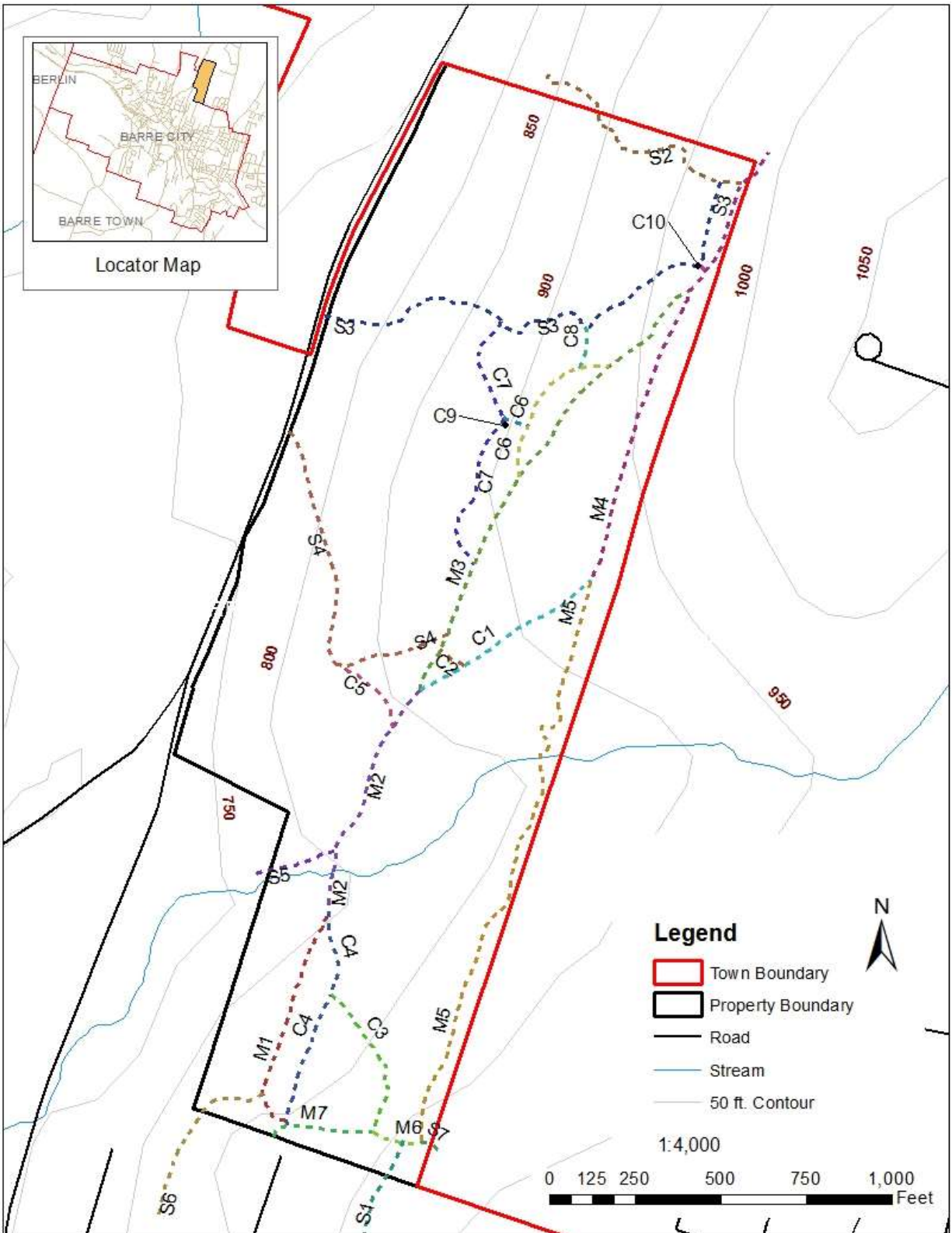
Map 4 – Trail Segments

Map 5 – Abutting Properties

MAP 1 – PROPERTY MAP

MAP 2 - SOILS

MAP 3 - FOREST STANDS

MAP 4 - TRAIL SECTIONS

MAP 5 – ABUTTING PROPERTIES

