



MANAGEMENT PLAN FOR THE BARRE CITY COW PASTURE

Barre City, Vermont

2017 - 2027

Prepared by Emily Brodsky, Consulting Ecologist

For the Barre City Cow Pasture Stewardship Committee

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Introduction

Management Plan Purpose

The purpose of this document is to describe the stewardship strategy and management actions for the Barre City Cow Pasture property. The property is owned by the City of Barre, and the volunteer-run Barre City Cow Pasture Stewardship Committee (“the Committee”) guides its management.

The primary goals of this plan are to:

- 1) Maintain the Cow Pasture property as a community resource for open space, recreation and aesthetic enjoyment.
- 2) Support the property’s ecological integrity and biodiversity.

The plan is intended to guide management efforts in the project area for the next ten years (2017-2027), and to be used as the foundation for a process of adaptive management. The natural resources and infrastructure on the property should be monitored throughout this period to evaluate the outcomes of implemented strategies, and management should be adjusted to reflect unexpected results or changing conditions. At the end of the ten-year period, the effectiveness of the entire plan should be evaluated, the management objectives and strategies should be revised accordingly, and the document should be updated (see Evaluation and Assessment of Proposed Actions on p. 36).

Barre City Cow Pasture Stewardship Committee

The Barre City Cow Pasture Committee was established in 2013 for the dedicated purpose of guiding management of the Cow Pasture property. The Committee is a volunteer-run community group that operates under administrative oversight from the City of Barre, and in-kind labor from the City Street Crew.

Committee Mission Statement:

To connect people to the place in ways that allow recreation, exploration, collaboration, and stewardship of the Cow Pasture.

Committee Vision Statement:

The Barre City Cow Pasture is an undeveloped natural area with ecological importance, historical significance and outdoor recreational opportunities.

Site Description

The Cow Pasture is a 67-acre municipally-owned undeveloped property in Barre City. The parcel is long and rectangular, and is bounded by private undeveloped property to the north, limited residential development and undeveloped land to the east, a residential neighborhood to the south, and by Route 14 and Hope Cemetery to the west. Originally pasture for the City's work horses in the late 1800s, the property is now a popular destination for hiking, dog-walking, and other outdoor recreation year-round.

The Cow Pasture contains an extensive trail network, ranging from wide, mowed paths to single-track wooded trails. A small parking area at the end of Maplewood Avenue 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 Barre City has a particularly extensive trail network that many people use to access the Cow Pasture property, and which includes a popular scenic overlook. A steep VAST connector trail just east of the Maplewood entrance is used infrequently as a snowmobile connector trail to the VAST trail network and doubles as a sledding hill.

The Cow Pasture contains a mosaic of natural communities and historically managed lands that provide diverse habitat for plants and wildlife. Deer, moose, bear, fox, porcupine, and various birds have been spotted on the property and adjacent lands, along with evidence of bobcat. Unique features such as springs and seeps, calcium-rich ledges, and immense sugar maples provide ecological and scenic value. Rich Northern Hardwood forests, both within the property and along connecting trails through abutting properties, boast a diverse array of spring wildflowers. An unnamed stream enters the property along the eastern boundary, and flows through a steep and rocky channel before entering a small wetland near the Maplewood Avenue entrance. This stream flows into Gunners Brook, which runs through the City of Barre. Historic use of the site is recorded in the landscape features, including overgrown pastures, apple trees, softwood plantations, spring-fed wells, ancient roads, stone walls and old barbed wire fencing. Blackberry and raspberry patches are prevalent along trail edges, and in meadows and thickets; these were historically and continue to be a popular attraction.

For detailed descriptions of the land use history and natural resources on the property, see the Barre City Cow Pasture Inventory, Assessment, and Recommendations Report developed by Kristen Sharpless in 2013.

Management Goals and Objectives

Goal 1: Maintain the Cow Pasture property as a community resource for open space, recreation and aesthetic enjoyment.

Objectives:

1. Provide and maintain accessible entry points from surrounding neighborhoods to support walking access, minimizing the need for parking and parking area maintenance.
2. Manage the trail system to support allowed recreational uses including walking and running, bird-watching, dog walking, cross-country skiing, snowshoeing, sledding, and snowmobile access to the VAST trail.
3. Support accessibility and user safety by actively maintaining the trail system, and by informing visitors of hazards and removing them where possible.
4. Collaborate with neighbors to protect and maintain existing trails on abutting lands that provide exceptional recreational, aesthetic, and/or ecological value.
5. Maintain aesthetics, privacy, and space for quiet solitude.
6. Provide and maintain signage to inform visitors of trail locations, property boundaries, allowed, restricted, and prohibited uses, and Leave No Trace ethics.
7. Involve community members in stewardship through partnerships with local schools, scout groups, other community groups and individual volunteers.
8. Deliver guided walks and other educational opportunities for the public to learn about and experience the property.

Goal 2: Support the ecological integrity and biodiversity of the Cow Pasture property and surrounding ecosystem.

Objectives:

1. Protect the riparian corridor and wetland from loss of native vegetation and/or soil disturbance to minimize flood and erosion hazards.
2. Protect water quality and aquatic habitats through ongoing trail restoration and maintenance, erosion control measures, and protection of wetlands and riparian zones.
3. Support native biodiversity by monitoring and controlling populations of non-native invasive species.
4. Apply sustainable forestry practices that support wildlife habitat and connectivity, and that protect and enhance overall ecosystem function and health.
5. Protect ecological and cultural features of special value, such as springs, riparian zones, wetlands, important wildlife habitat, and uncommon natural communities.
6. Identify and clearly demarcate property boundaries to ensure stewardship throughout the property and to avoid encroachment by development, forestry, and other land uses on abutting properties.
7. Monitor and respond to ecological changes through an adaptive management approach.

Goal 3: Generate and maintain the resources and administrative support required to achieve Goals 1 and 2 over the long term.

1. Change the zoning designation of the property from Residential to Conservation.
2. Add property usage and policies to the Barre City Bylaws.
3. Continue the work of the Cow Pasture Stewardship Committee.
4. Recruit new Committee members as needed and promote retention (for example, by designating member roles).
5. Obtain funding to support specific projects and ongoing management of the property.

Property Usage Policies

Recreational Use

The Cow Pasture is managed as a public open space for low-impact recreation and aesthetic enjoyment.

Allowed Uses

The following uses are currently allowed on the property. Allowed uses will be monitored and reassessed if compatibility issues arise.

- Hiking
- Dog-walking¹

¹Domestic animals shall be permitted within park boundaries provided they are under control of and attended by a responsible person. "Under the control of owner" means that the animal must stop and come to the owner upon command and that the animal is prevented at all times from causing injury, damage disturbance or annoyance to others. Dog droppings shall be immediately removed from the path and the right of way by the person responsible for the dog. (Note: adopted from Colchester Leash Law/Animal Ordinances Sec. 9-38(a) and Sec. 9-39).

- Running
- Cross-country skiing
- Snowshoeing
- Sledding
- Berry-picking
- Snowmobiling (on the designated VAST connector trail only; see map on p. 38).

Prohibited Uses

The following activities are prohibited to sustain the ecological and social values of the Cow Pasture property and to protect human safety.

- ATVs Dirt bikes and motorized wheeled vehicles (except for wheelchairs)
- Equestrian use
- Camping
- Fires
- Hunting or trapping
- Trail management activities (for example, mowing, brush-hogging, pruning, clearing or modifying water bars, creating new trails, etc.) without authorization from the Committee and/or City Council

Educational Use

The City of Barre supports educational use of the property by the public and by educational institutions and organizations. See Public Outreach, Education and Volunteer Activities on p. 25 for more information.

Zoning, Ordinances, and Regulations

Bylaws

To be officially instated, the Cow Pasture property usage policies must be added to the Barre City Bylaws.

Zoning

The Cow Pasture property is currently zoned as residential land. The Committee has proposed to City Council that the property be re-zoned as open conserved land, which would be more appropriate given its use as a public open space. According to the City of Barre Municipal Plan (2014), the property is intended to remain as public open space; however, a shift in leadership could lead to changes in use. Re-zoning is critical to allow some degree of protection, as a future shift from open conserved land to residential would again require the City to go through the re-zoning process. A conservation easement is recommended to protect the land from development in perpetuity.

Tree Ordinance

The City Tree Warden is responsible for inspecting and developing an annually updated plan for the care, preservation, pruning, planting, removal or disposition of trees and shrubs in parks and other public areas. The Cow Pasture Committee shall notify the City Tree Warden in advance of any activities that will result in the damage or removal of trees or shrubs on the Cow Pasture property, and after any observed damages resulting from management of the site or visitor activities. Additionally, the Committee shall notify the City Tree Warden about nuisance trees or shrubs requiring pruning or

removal. Nuisance trees and shrubs are those with an infectious disease or insect problem; dead or dying trees; a tree or limb(s) that obstruct street lights, traffic signs, the free passage of pedestrians or vehicles, or that poses a threat to safety. In the Cow Pasture, dead or dying trees shall be allowed to remain standing as snags to provide habitat for wildlife, unless they pose a threat to human safety (i.e. those immediately adjacent to trails or in other high traffic areas) or harbor a non-native invasive pest. City Officials or a Committee member shall immediately notify the Tree Warden of hazard trees or significant damages. Tree cutting and other forest management activities shall be implemented by or in consult with the Tree Warden. Refer to Barre City Ordinances, Chapter 20 (available at <http://www.barrecity.org/charter-and-ordinance.html>).

Stream and Wetland Regulations

Activities and structures that would affect the stream channel require approval from City Council (City of Barre Flood Hazard Regulations 2010), and may require a permit from the Vermont Agency of Natural Resources Watershed Management Division. Regulated activities including installation of culverts and bridges, and stream bank stabilization. Any management activities occurring within the wetland or its 50-foot buffer zone require a wetland conditional use determination (wetland permit) from the Watershed Management Division. Application of pesticides or herbicides within 50 feet of the stream or wetland requires a Water Quality Permit from the State. See the State of Vermont Watershed Management Division website for permitting information (available at <http://dec.vermont.gov/watershed/permits>).

Current Infrastructure

Trails, Access Points, and Parking

One official public access point with designated parking for up to 4 cars is located at the end of Maplewood Avenue in Barre City. Another public access point, with no available parking, is located on VT Route 14/Maple Ave., across from the Hope Cemetery and just north of the cemetery maintenance building. The trail that leads into the property from this entrance is currently unmaintained.

Two paper streets lead into the Cow Pasture. They are currently wooded walking paths but could be developed as roads in the future. The first of these two paper streets, Mead Avenue, begins on Johnson Street, and is currently being used as a residential driveway. Mead Ave. then passes between two undeveloped subdivisions owned by Frederic & Marilyn Ford² to the east of Maplewood Ave. The second paper street, Duffy Avenue, begins at the end of Sheridan Street, and abuts the backyards of several residences along Maplewood Ave. and three undeveloped parcels owned by the Fords to the east. To the west it abuts an undeveloped subdivision owned by the City of Barre. A third paper street, the Johnson Street Extension, runs from Maplewood Ave. to Sheridan St., forming a T-intersection with Duffy Ave. Abutting landowners Jeff and Holly Friot were granted a ten-year license (2013-2013) to fence off and utilize a portion of the Johnson Street Extension right-of-way. Currently, the paper street is enclosed by a fence.

² These parcels are currently for sale, along with another subdivided parcel owned by Ford on the west side of Maplewood Ave. Because of a possible change in ownership, protecting these lands and the paper street is a high priority (see Future Acquisition Opportunities/Adjacent Lands on p.31).

Several unofficial access points exist in local neighborhoods, and cross through privately owned lands abutting the Cow Pasture. No designated parking exists in these neighborhoods for Cow Pasture access, but on-street parking is available. Currently the use of these trails seems to be limited to local residents³.

1. The trail system on the Perrin parcel provides unofficial access to the Cow Pasture via trails originating on Hall Street, Park Street and Winter Meadow in Barre City, and Maplewood Ave. in Barre Town (not to be confused with the Maplewood Ave. in Barre City, where the main entrance to the property is located). The Barre Town Maplewood Ave. trail is overgrown and has been used for ATV access in the past.
2. A trail from Quinlan Drive connects to the property by way of the Aines and Quinlan parcels.
3. Two trails begin along Valley View Circle in Barre Town and converge on a dirt road passing through the Martin sugarbush, eventually leading into the Cow Pasture.

Two small trail spurs lead to private lands owned by Lunde and White, but do not connect to local neighborhoods. An unmaintained, overgrown spur trail connects to the Ibrahimovic parcel.

Signage

A wooden kiosk with a bench is present at the main entrance on Maplewood Ave, and displays interpretive signage including a trail map, historical information about the property, and Leave No Trace (LNT) principles. The interpretive materials are protected with plexiglass⁴.

No Hunting signs are currently posted on side trails to indicate property boundaries. Signs with trail maps are posted on the kiosk at the Maplewood Avenue entrance and at the boundary of the Martin parcel (M2-3/S16-1) and the Perrin parcel (M3/S5). (see Trails, Access Points and Parking map on p. 39).

The Committee shall maintain existing signs as needed. Current needs are to:

1. Remove the sign at S8, which does not clearly mark the boundary and is on an overgrown side trail (no longer in active use and not recommended to be maintained).
2. Update the existing trail maps including the Maplewood Ave. kiosk.
3. Install a trail map at the M4-1 entrance after forestry treatments and trail improvements are completed (see p. 22).

Neighbor Relations

The Cow Pasture abuts several privately-owned parcels (see map index on p. 38). The Committee shall seek permission from neighboring landowners before conducting any management activities that would impact abutting lands (e.g. invasive species management along side trails, installation of trail maps and other signage at boundaries, spraying of herbicides, etc.). Maintaining friendly relationships with neighboring landowners is in the best interest of the Committee, to encourage continued public access and compatible land management on abutting lands.

³ The Committee wishes to emphasize local neighborhood usage of the property, to encourage walking access, minimize the need for parking and avoid any conflict with neighbors and residents on Maplewood Avenue.

⁴ The plexiglass was broken (suspected vandalism) in October 2016 and was replaced by the Committee.

Management of Trails and Infrastructure

The Cow Pasture contains a network of trails totaling over 2 miles in length, and ranging from narrow wooded foot paths to wide old road beds and grassy paths through open meadows. The trail system on the property also connects to abutting lands via a series of side trails, which vary widely in condition. This section of the management plan describes the current trail system, and presents the results of a trail condition assessment conducted in the summer of 2016. Based on this assessment, a list of projects is provided to improve and maintain the trail system over the next ten years. Many of the trail management actions could be implemented by the Vermont Youth Conservation Corps. Others may be better suited for implementation by the Committee and contractors, as noted in Table 8. Projects Appropriate for Volunteers or Service-Learning (p. 25).

Trail Descriptions

The trails are grouped into the following three categories: Main Trails (M), Connector Trails (C), and Side Trails to or on Abutting Properties (S). Descriptions of trails from each category are presented in the three tables below. The trails are listed below with ID codes that comprise the category of trail (M, C, or S), a trail number, and in some cases a segment number. The Trail ID codes correspond to the Trails, Access Points, and Parking map on p. 39 and the Trail Assessment and Management Priorities map on p. 40. The codes are also referenced throughout this document. Please note that the list of trails has been updated and the Trail ID codes do not correspond to the codes provided in the 2013 inventory report by Kristen Sharpless.

Table 1. Main Trails

Trail ID	Characteristics	Uses	Condition	Notes
M1-1	Old farm road; clear; gentle slope	Foot, cross-country skiing, VAST connector trail	Fair	Begins at Maplewood Ave. entrance. Eroded with gully at top of hill leading to M1-2. Unsafe footing when icy or muddy.
M1-2	Old farm road; clear; variable slope; stream crossing	Foot, cross-country skiing, VAST connector	Fair	Stream crossing with steep grade on each side; waterbar maintenance needed. Recent improvement at stream crossing (stabilized with gravel and rock slabs).
M1-3	Old farm road; clear; gentle slope	Foot, cross-country skiing.	Good	Mowed path through meadow. Trail is severely eroded at its junction with M2-3. The Committee intends to close and reroute this trail section to a level area.
M2-1	Old farm road; clear; gentle slope	Foot, cross-country skiing	Good	Follows stone wall
M2-2	Old farm road; clear; variable slope; stream crossing	Foot, cross-country skiing	Fair	Open/unvegetated area with stream crossing and old stone well. Recent improvement at stream crossing (waterbars and rock steps installed). Erosion is still a concern.
M2-3	Old farm road; clear; gentle slope	Foot, cross-country skiing, VAST connector	Good	Follows stone wall; leads to Martin sugarbush road

Table 1. Main Trails (Continued)

Trail ID	Characteristics	Uses	Condition	Notes
M3	Old farm road; clear; wide path; very steep	Foot, cross-country skiing, VAST connector, sledging	Good	Leads east from Maplewood Ave. to M3 and Perrin land (S5). Trail was restored a few years ago, and seeded with a low growing grass mix that does not require mowing. Erosion is a problem around the junction with S1, and some of the grass has been lost.
M4-1	Old farm road; semi-clear; moderate slope	Foot	Fair	Leads to Route 14 across from Hope Cemetery.
M4-2	Single-track; semiclear; flat	Foot, cross-country skiing	Fair	M4 entrance from M1. Narrow path through dense vegetation.

Table 2. Connector Trails

Trail ID	Characteristics	Uses	Condition	Notes
C1	Old farm road; clear; flat	Foot, cross-country skiing, VAST connector	Good	Connects M1 and M2 trails
C2	Mowed path through meadow	Foot, bike, cross-country skiing	Good	Connects C1 and M2 trails
C3	Single-track; very steep	Closed	Closed	Regenerating after closure; Eroded gulley needs to be restored (see projects)
C4	Path through wetland; gentle slope	Closed	Closed	Closed because of sensitivity to disturbance, and high ecological and water quality value.
C5	Single-track; semiclear; gentle slope	Foot, cross-country skiing	Fair	Connects M1 and M4 trails. Partially overgrown; needs maintenance if increased use of M4 is desired. Alternatively, consider closing because M4-2 also connects to M1.
C6-1	Single-track; clear; variable slope	Foot, cross-country skiing	Good	Trail through white-Scotch pine stand
C6-2	Single-track; semiclear; gentle slope	Foot, cross-country skiing	Fair	Entrance to C6 from M1. Partially overgrown; needs maintenance.
C7	Single-track; clear; gentle slope	Foot, cross-country skiing	Good	Short wooded loop from S4 to M1.
C8	Single-track; clear; moderate slope with switchbacks	Foot, cross-country skiing	Good	Trail created by VYCC in 2015
C9	Single-track; semiclear; gentle slope	Foot, cross-country skiing	Poor	Leads from C6 to M2-3. Partially overgrown. Close and maintain C6 entrance to M1-3 instead.

Table 3. Side Trails to or on Abutting Properties

Trail ID	Characteristics	Uses	Condition	Notes
S1	Old farm road; clear; gently sloping	Foot, cross-country skiing	Good	Trail follows Mead Ave. (paper street east of Maplewood Ave., beginning on Johnson St.)
S2	Single-track; clear; gently sloping	Foot, cross-country skiing	Good	Connects to Lunde property; no outlet (leads into backyard). Begins on Cow Pasture land and crosses into private property.
S3	Single-track; clear; moderate slope	Foot, cross-country skiing	Fair	Follows Duffy Ave. (paper street west of Maplewood Ave., beginning on Sheridan Ave.)
S4	Old farm road; clear; very steep	Foot	Fair	Connects to Quinlan Drive via Aines and Quinlan parcels. Begins on Cow Pasture land and crosses into private property.
S5	Mowed path; clear; gentle slope	Foot, cross-country skiing, VAST connector	Good	Leads from M3 into Perrin Farm trails and to overlook. Begins on Cow Pasture land and crosses into private property.
S6	Mowed path; clear; gentle slope	Foot, cross-country skiing	Good	Main trail through Perrin Farm, leading from M3 to overlook and Park Street. Begins on Cow Pasture land and crosses into private property.
S7	Old farm road; semiclear; flat	Foot, cross-country skiing	Fair	Path along stone wall on Perrin land, links to M2. Recently used for emergency vehicle to transport injured hiker. Trail is on private property.
S8	Old farm road; semiclear; flat	Foot, cross-country skiing	Poor	Short spur from M2 to Perrin land along stone wall. Mostly overgrown; sign down; erosion/muddy section where it meets M2. Begins on Cow Pasture land and crosses into private property.
S9	Mapped from aerial photo; not assessed	Foot, cross-country skiing	Fair	Mapped from aerial photo (not assessed). Leads from S7 to Maplewood Ave. in Barre Town. Trail is on private property.
S10	Mapped from aerial photo; not assessed	Foot, cross-country skiing	Fair	Mapped from aerial photo (not assessed). Leads through Perrin land from Maplewood Ave. in Barre Town to overlook. Trail is on private property.
S11	Mowed path; clear; gentle slope	Foot, cross-country skiing	Unknown (not assessed)	Mapped from aerial photo (not assessed). Leads from S7 trail to Hall Street. Trail is on private property.
S12	Mowed path; clear; gentle slope;	Foot, cross-country skiing	Unknown (not assessed)	Mapped from aerial photo (not assessed). Short spur trail from S7 to Hall Street (forms loop with S12). Trail is on private property.
S13	Mowed path; clear; gentle slope	Foot, cross-country skiing	Good	Spur from S7 to Winter Meadow homes. Trail is on private property.

Table 3. Side Trails to or on Abutting Properties (Continued)

Trail ID	Characteristics	Uses	Condition	Notes
S14	Single track; semiclear; gentle slope	Foot, cross-country skiing	Fair	Follows stonewall on abutting land (Ford, Perrin). Partially overgrown; does not appear to be used frequently. Trail is on private property.
S15	Spur; semiclear; moderate slope	Foot, cross-country skiing	Fair	Spur to White property (single house). Begins on Cow Pasture land and crosses into private property.
S16-1	Dirt road; clear; gentle slope	Foot, cross-country skiing, VAST connector	Fair	Road through Martin land (sugarbush); motorized vehicle barrier with removable wooden posts to allow seasonal groomer access and signage. Some erosion along road. Begins on Cow Pasture land and crosses into private property.
S16-2	Single-track; clear; moderate slope	Foot, cross-country skiing	Good	Spur trail from Martin sugarbush road to houses on Valley View Circle. Trail is on private property.
S17	Single-track; clear; moderate slope	Foot, cross-country skiing, VAST connector	Good	Spur trail from Martin sugarbush road to houses on Valley View Circle. Trail is on private property.
S18	Spur; overgrown; flat	Closed	Closed	Small spur into Ibrahimovic land. Begins on Cow Pasture land and crosses into private property.

Entrance Design

The Maplewood Ave. entrance is currently blocked to vehicles by guard rails, which need to be removed to permit access for emergency and maintenance vehicles. Some of the trail maintenance projects will require heavy machinery, and a suitable access route is currently unavailable. An injured hiker was recently evacuated by a rescue vehicle via the M3 and S7 trails (the S7 trail is on the Perrin property). Evacuation from other areas of the property would require rescuers to carry a litter over a long distance – a time-consuming process requiring numerous people, and potentially threatening the safety of rescuers. A locked gate could be installed to prevent unauthorized motor vehicle access.

In the entrance area there are two cement slabs, which were originally placed in the ground as platforms for benches; however, the granite benches were removed due to safety concerns associated with the sledding hill. Removing the slabs is a high priority for aesthetic reasons.

The Committee is considering installation of a stone wall at the entrance to improve its aesthetic value, similar to the stone wall entrance at the La Platte Headwaters Town Forest parking lot on Lewis Creek Road (Addison County). Construction of the wall could be accomplished by VYCC as a staff training exercise, and possibly coordinated with an instructor from the Stone Art School.

Equipment Access

The Cow Pasture has historically been brush-hogged and mowed by neighboring landowners, who accessed the site from their private land. Allowing residents to use their personal equipment on City

property presents a liability issue. Use of personal equipment must be authorized by the Committee and/or City Council (see Prohibited Uses on p. 4). Continued management by the City and hired contractors will require at least one official access point. Ideally, access would be possible from both the northern and southern sections of the property to avoid crossing the stream; otherwise, a temporary bridge or frozen conditions will be required. Options are described below.

1. Southern Access

Main Trailhead: Maplewood Ave., Barre City

The guard rails that currently block motorized vehicles from entering the property would need to be removed, and replaced with a gate to prevent unauthorized access. This provides good access to the M1-1 trail segment, but continuing down the slope to the M1-2 trail segment would be difficult, and may not be feasible if box steps are installed. This is a good option for the initial trail projects on M1; however, if box steps are installed, access beyond the top of the M1 slope toward the river may no longer be feasible. The M1 trail restoration should maintain access to the property from the Maplewood Avenue access and allow the snowmobile groomer to navigate the trail in the winter months.

2. Northern Access

Martin property driveway and sugarbush road: Valley View Circle, Barre Town

Currently, landowner equipment access for the sugarbush is through the driveway leading to the residence, through a mowed path in the backyard, and to a dirt road through the sugarbush. The road leads into the northeastern corner of the Cow Pasture, and is currently blocked off with wooden posts because of previous problems with unauthorized ATV access. The posts were designed by VYCC staff to be lockable (padlock) and removable for winter grooming. The design has been problematic and the posts will be redesigned and replaced in the spring of 2017. A right-of-way would need to be obtained from the landowner if this access is to be used as a Cow Pasture equipment access point. This is the best route to the section of the property north of the stream.

Trail and Infrastructure Projects

The projects listed below are based on the summer 2016 trail assessment and discussions with Vermont Youth Conservation Corps (VYCC) staff and Cow Pasture Committee members.

Table 4. Trail and Infrastructure Projects

Point on Map	Trail ID	Description	Priority Level
1	M1-1	Fill gully at top of slope with surrounding substrate (level out). Apply gravel/crushed stone where grade is <10%.	High
1	M1-1	Install box steps with fill along steeper slope toward M2/stream crossing, if determined to be compatible with snow groomer and brush-hog equipment. If not compatible, an alternative restoration plan is needed. The previous M1-1 action (leveling out gully) should be implemented regardless of box step decision.	Medium
2	M1-2	Restore/maintain waterbars south of stream. Hardened section at stream crossing is effective.	High
3	M1-2	Maintain existing waterbars north of stream and add new ones if necessary; trail from junction is widening.	High
3	M1-2	Woody debris pile - use material to close C4 and spread the rest out within the forest.	High
4	M1-3	Close/re-route trail or install steps to restore gully at M2 junction.	Medium
5	M2-1	Remove roll of barbed wire south of trail; consider filling in hole north of trail and removing woody debris from fort constructed by kids	Low
6	M2-1	Install signage with use restrictions and LNT	High
6	M2-1	Fix steps, improve/add/maintain waterbars as needed to restore eroded area	High
7	M3	Erosion along trail, especially around S1 trail junction; install waterbars	Medium
7	M3	Move sign at S5 junction to location that clearly indicates trail direction	Low
8	M4-2	Clear access to/from M1 to M4	Low
9	M1-3, C1, C2 (optional)	Mow/clearly demarcate paths through brush-hogged area	High
10	C3	Restore steep gully; improve closure/disguise trail at both ends	Medium
11	C4	Improve trail closure; disguise with logs and other woody debris	High
12	C8	Add waterbars at switchbacks	Medium
13	N/A; see map	Close cistern in northwestern quadrant of property. The open cistern presents a safety hazard.	High
14	Maple Wood Ave. Entrance	Remove guardrails; replace with gate to permit equipment access	High
14	Maple Wood Ave. Entrance	Remove cement slabs	Medium

Table 4. Trail and Infrastructure Projects (Continued)

Point on Map	Trail ID	Description	Priority Level
15*	S1*	Remove log in trail	Low
16*	S1*	Drainage from well and incision below; install waterbar	Low
17*	S2*	Steep/eroding trail segment along stream; add waterbars	Medium
18*	S3*	Steep section; install waterbars (paper street/City-owned land)	Medium
19*	S4*	Steep section; install waterbars or other erosion control features	Medium
20*	S8*	Old trail, not actively used. Remove signage and close trail.	Low
21*	S18*	Trail closure; disguise with debris and allow to revegetate.	Medium

*Trails are on private land, and these projects would require collaboration with landowners.

Future Considerations

Mountain biking is currently an infrequent use, and impacts to the trails from this activity are minimal. If biking becomes a conflicting use that results in trail damage, impacts water quality, or becomes a safety concern for trail users, the Committee will consider limiting this activity to certain trails or prohibiting the activity.

Three trail maps are installed on the property, and maps are also available for download on the City website. Installation of additional trail maps and directional signage has been proposed; however, the Committee prefers to keep signage on the property minimal to avoid detracting from the natural setting. Vandalism of the existing signs has been an issue and the Committee's desire is to keep the property low maintenance.

Non-Native Invasive Species Management⁵

Non-native invasive species (NNIS) are plants, animals, or other organisms that have been introduced to an ecosystem by humans, intentionally or otherwise, and that cause or are likely to cause harm to the environment, economy, or human health (US Executive Order 13112 1999). NNIS cause harm by outcompeting and displacing native plants, and thereby altering the species composition and physical structure of native ecosystems. Impacts may include reduced biodiversity and loss of native plant and animal populations, alteration of ecological processes such as nutrient and water cycles, reduced aesthetic and recreational value, and human health threats such as skin rashes and enhanced habitat for ticks that carry Lyme Disease.

⁵ This section of the management plan was developed using available research and guidance from Vermont Invasives, a cooperative initiative of the Vermont Agency of Natural Resources, University of Vermont Extension, and The Nature Conservancy. Parts of this section were extracted and/or adapted with permission from the Nature Conservancy's Invasive Species Management Plan Template (available at <http://vtinvasives.org/plants/prevention-and-management/tools-resources>).

NNIS Inventory Results

Thirteen non-native invasive plant species have been identified on the property (see Table on p. 14). Woody NNIS are widely distributed throughout the property, and the infestations are most severe along the main trails, at trail junctions, and in areas of early successional hardwood forest, shrub thicket, and open meadow. The stream corridor west of the downstream crossing is also severely infested (S2 trail), as is the M4 path leading to Route 14. The shrub thickets throughout the Perrin parcel consist primarily of NNIS, and include mature examples of all the woody species found within in the Cow Pasture. The individuals on the Perrin property serve as a seed source for the Cow Pasture, and the area bordering the Perrin property is severely infested and has the highest diversity of NNIS species. The only herbaceous NNIS found on the property were dame's rocket and goutweed, which are limited to a small area near the Maplewood Avenue entrance. Management of these species is not a high priority except to keep them out of the nearby wetland.

Mature hardwood and softwood forest stands are less severely infested than other areas of the property and abutting lands. The heavy shade of the canopy limits growth of NNIS, and the intact layer of leaf litter on the forest floor reduces germination of their seeds. Although some of the more shade-tolerant species such as Japanese barberry are present in these stands, the plants are generally small and their current ecological impact is minimal. Any disturbance within both the softwood and mature hardwood stands invites a more severe infestation, however, and these stands should be monitored closely -- especially in forest gaps -- and treated for NNIS prior to any tree cutting or trail construction.

Table 5. Non-native Invasive Plant Species in the Cow Pasture

Species	Threat	Distribution/Abundance
Amur Maple <i>(Acer ginnala)</i>	An escaped ornamental tree that displaces native shrubs and understory trees in open woods, and shades out herbaceous plants in more open habitats. Extremely hardy and tolerates a wide range of conditions.	Large patches in areas with open sunlight, such as the wetland and open meadow/shrub areas, and along forest edges and main trails.
Asiatic Bittersweet <i>(Celastrus orbiculatus)</i>	Woody vine; forms dense mats that shade understory vegetation. Vines become so large that they girdle and uproot trees and shrubs. Displaces the native American bittersweet. Produces abundant, bird-dispersed seeds, allowing for rapid and long-distance dispersal.	Small infestations of mature individuals and seedlings in a few distinct areas (see map).
Autumn Olive <i>(Elaeagnus umbellata)</i>	Shrub producing abundant fruits dispersed over long distances by birds and small mammals. Competes with and displaces native vegetation in open woodlands. Fixes nitrogen and alters the nitrogen cycle.	Isolated mature individuals and small patches (see map).

Table 5. Non-native Invasive Plant Species in the Cow Pasture (Continued)

Species	Threat	Distribution/Abundance
Burning Bush <i>(Euonymus alatus)</i>	Escaped ornamental shrub. Displaces native shrubs and other understory vegetation. Tolerates a wide range of conditions including closed canopy forests. Prolific seed producer; spreads quickly.	One isolated mature individual found on M2-1 trail (see map)
Common Barberry <i>(Berberis vulgaris)</i>	Arching shrub that crowds out native vegetation. Alters soil chemistry, affecting native plant communities. Provides habitat for Lyme-carrying ticks and mice.	Scattered individuals and clumps throughout property (less than 5% cover), mostly in areas with abundant sunlight, (e.g. along trails, forest edges, open habitats).
Common Buckthorn <i>(Rhamnus cathartica)</i>	Longer growing season than native woody species; outcompetes for sunlight and other resources. Poor nutritive quality for wildlife. May alter soil chemistry (nitrogen content). Grows best in rich soils; threat to Rich Northern Hardwood Forests. Spreads rapidly and over long distances through abundant animal-dispersed seeds. Can root sprout after cutting.	Mature individuals and saplings abundant along the boundary abutting Perrin and Pope lands. Mature patches also along wetland edges, and in open meadow/shrub areas. Scattered seedlings and saplings in forest understory along trails.
Dame's Rocket <i>(Hesperis matronalis)</i>	Showy flowering herbaceous plant; competes with native vegetation and may inhibit regeneration. Sometimes present in ornamental seed mixes.	Limited to area around Maplewood Ave. parking area, trailhead and kiosk.
Glossy Buckthorn <i>(Frangula alnus)</i>	Longer growing season than native woody species; outcompetes for sunlight and other resources. Poor nutritive quality for wildlife. May alter soil chemistry (nitrogen content). Grows best in rich soils, and tolerates wet conditions; threat to Rich Northern Hardwood Forests and wetland. Spreads rapidly and over long distances through abundant animal-dispersed seeds. Can root sprout after cutting.	A few patches were found throughout the property, on M2-1 trail not far from M3 junction; on S18 trail (now closed), near northeast corner of property; and on M1-2 trail, near C1 junction. More are likely to be present.
Goutweed <i>(Aegopodium podagraria)</i>	Aggressive herbaceous groundcover plant. Difficult to eradicate because it produces abundant seed and sprouts from root fragments. Displaces native plants and prevents regeneration. Tolerates shade and wetland soils.	Extremely dense infestation with distribution limited to area around Maplewood Ave. parking and trailhead and along C4 trail leading toward wetland.

Table 5. Non-native Invasive Plant Species in the Cow Pasture (Continued)

Species	Threat	Distribution/Abundance
Honeysuckles (<i>Lonicera spp.</i>)	Aggressive shrub; forms dense thickets, inhibiting forest regeneration. Spreads rapidly and over long distances through bird-dispersed seeds. Reduces songbird nest success through increased predation; low nutritive quality of berries.	Small and large patches throughout property. Densest in open areas, including along main trails and in wetland. Less dense along forested trails (<5% cover). A few mature individuals within stream corridor.
Japanese Barberry (<i>Berberis thunbergii</i>)	Similar threats to common barberry (see above) but to a greater degree, because of more sprawling growth form and aggressiveness.	Widespread. Dense, mature infestations (up to 50% cover) along stream west of downstream crossing, and along some trails. Small individuals and clumps scattered throughout most hardwood forest areas (<5% cover).
Multiflora Rose (<i>Rosa multiflora</i>)	Multi-stemmed, thorny, sprawling perennial shrub. Historically used as "living fence. Forms dense and impenetrable thickets and crowds out native species. Extremely difficult to eradicate once established. Prolific seed producer; seeds stay dormant up to 20 years in soil. Sprouts from existing roots and through layering (stem tips take root).	A single mature clump along the C4 trail, just north of the kiosk on the west side of the trail.
Norway Maple (<i>Acer platanoides</i>)	Escaped ornamental tree. Displaces native trees, particularly maples. Hosts few native caterpillars, which are important food for birds. Native mammals avoid the seeds. Provides desirable habitat for the invasive Asian long-horned beetle.	A few individuals found along M4-1 and M2-2 trails.

Prioritization

Most NNIS will not be feasible to eliminate entirely from the site, owing to their high density and abundance within the Cow Pasture and in abutting parcels. The goal of NNIS management on this site is to reduce the impact of NNIS on the site's ecological integrity and recreational value to the degree possible based on available resources. The following factors were considered in prioritizing NNIS management strategies at the Cow Pasture, to achieve the greatest ecological and social benefit while minimizing the total long-term workload and project costs.

Ecological priorities: The Cow Pasture and surrounding lands contain important natural features including a stream with a forested riparian buffer, a wetland, and areas of Rich Northern Hardwood Forest, a natural community that supports a diverse array of native flora. Controlling NNIS in these areas is a high priority to support the valuable ecological functions they provide.

Threat level: Some NNIS species pose a greater risk than others, and some pose a greater risk in certain habitat types or at particular stages of growth.

Severity of infestation: Controlling NNIS that are present as small, isolated infestations is cost-effective and prevents these species from reaching unmanageable levels. Early detection and immediate eradication of NNIS that are new to the site (“Early Detection, Rapid Response” or EDRR) is critical. Some NNIS (e.g. shrub honeysuckles) are already well established on the property, and at this point, the only cost-effective control measure is to prevent them from spreading into sensitive areas.

Abutting properties: The Cow Pasture is surrounded by roads, undeveloped private land, and residential development. Realistic management priorities for the Cow Pasture were identified in recognition that abutting properties will continue to serve as pathways for NNIS reintroduction. Most of the NNIS within the Cow Pasture are escaped ornamentals that are still commonly present in gardens and landscaping. One aspect of controlling the NNIS in the Cow Pasture is to educate local landowners about the importance of removing exotic ornamental plants on their properties and planting native species.

Recreational land uses: The Cow Pasture is a popular site for outdoor recreation and aesthetic enjoyment. Roads, parking areas, and trails serve as pathways for NNIS, and infestation is inevitable to some degree in such a popular site within a densely populated area. Restoring the site to a “pristine” condition is an unrealistic goal. Instead, control efforts should aim to prevent the spread of NNIS into areas with high ecological value, and maintain the site’s aesthetic value for visitors. For most visitors, NNIS do not seem to interfere with aesthetic or recreational value.

Treatment techniques: A number of techniques are available for controlling NNIS, and some are more effective than others. It is important to make management decisions based on the ability to control one or more species, the techniques available at a specific site, and concerns for impact to native species, water quality, and human health and safety.

Treatment Techniques

Once established, NNIS can be very difficult and costly to control. The most effective treatments should be selected based on size, maturity, density, and abundance of infestations, along with their locations; for example, treatments that leave standing dead trees are undesirable along trails, and those that require herbicides should be avoided along the stream channel and wetland. Each species may require multiple treatment options in different areas of the property and/or at different times. For additional techniques and more detailed descriptions of those included here, see VT Invasives Tool 4: Invasive Plant Treatment Methods⁶.

Herbicide application within 50 feet of wetlands or streams requires a permit through the Vermont Watershed Management Division. The wetland boundaries in the Cow Pasture property have not been delineated, which is a requirement for permitting and which must be done by a hired contractor.

⁶ Available at http://www.vtinvasives.org/sites/default/files/tool_4_treatmentmethods_final_2_.pdf

Table 6. Mechanical Treatments

Hand-Pulling or Grubbing	Effective for small individuals and clumps of woody species, and certain herbaceous species (e.g. dame's rocket; not recommended for goutweed, which spreads through small root fragments). Implement any time of year when ground is soft. Be sure to pull entire plant, including root system and runners. Weed Wrench or similar tool may be used. Small individuals of most species may be hung upside down in crotch of a tree to dry out and prevent re-rooting. For large or flowering/fruited individuals, take off site in a contractor bag to burn. Species that spread through fragments (e.g. Asiatic Bittersweet) should be carried off site for disposal in a landfill. Be sure to check the specifications for each species.
Weed-whacking, Mowing, or Brush-hogging	<p>For open meadows with scattered woody plants: Remove undesired trees and shrubs (this may also include native species; see forest management section for more details). Brush-hog every 2-3 years after August 1st to avoid destroying grassland bird nests.</p> <p>Dame's Rocket: Cut before plants set seed (by dead-heading individual flowers or mowing/weed-whacking). The plant flowers continuously throughout the growing season and cutting must be done repeatedly.</p> <p>Goutweed: Either cover entire infested area with black plastic in early spring or mow/weed-whack in late summer and then cover in black plastic. Make sure plastic is larger than infestation, and secure plastic edges with sandbags or ground staples. Leave in place for a full year (plants should die from heat). Alternatively, cut repeatedly through the growing season (before seed sets) for 3-5 years. Cutting will slow the spread but not eradicate the infestation.</p>
Cutting	<p>Cut large individuals or clumps and tie stumps tightly with burlap or black plastic. Remove branches, roots, and flowering parts and burn off-site. Burn trunks and large stems off-site or leave as woody debris. Pull seedlings around mature plants immediately (especially important for burningbush). Monitor later in growing season and cut new growth. For Asiatic Bittersweet, cut large individuals near the root collar every two weeks throughout the growing season and carry off site in a contractor bag for disposal in a landfill.</p> <p>Treat in fall through winter (November through April): Amur Maple, Asiatic Bittersweet, Barberries, Honeysuckles, Norway Maple.</p> <p>Treat in late summer to fall (August-October): Autumn Olive, Burning Bush, Common Buckthorn.</p>

Table 7. Chemical Treatments

Cut Stump	<p>Cut trees and shrubs, and treat cut stumps with herbicide within 1 hour of cutting (glyphosate for all but Asiatic Bittersweet, which requires the stronger herbicide triclopyr). Implement in fall, when plants are transporting resources to their root systems. Branches, roots, and flowering parts should be taken off site and burned. Trunks and large stems may be burned off-site or left as woody debris. Seedlings may be present around mature individuals and should be pulled immediately (this is especially important for burning bush). Monitor later in the growing season and cut any new growth.</p> <p>Tip: Pour herbicide into a bingo dauber (retaining some of the ink in the dauber) and apply to the cut stump. This is an easy method that makes the treated area visible and prevents impacts to native vegetation.</p>
Foliar Spray	<p>Hire a contractor to spray severe/dense infestations of either woody or herbaceous plants with herbicide (glyphosate solution) when fully leafed out. This should be done in early spring or late fall, when most native plants are dormant.</p>

Ongoing Management Activities

The activities presented here are essential aspects of a successful NNIS management program. They are shown in the management schedule along with specific NNIS treatments.

Early Detection, Rapid Response

Invasive plants will likely continue to be introduced and/or persist in the Barre City Cow Pasture. In order to prevent the further spread of existing invasive plants into uninfested areas, and to manage the likely introduction of new species, it will be important to regularly monitor the site for new invasions. Individuals involved in monitoring the site should become familiar with the species described in Appendix 6 (p. 44), and should learn how to identify them using an appropriate field guide and/or online source. These species are not currently present in the Cow Pasture (with the exception of burning bush), but may be introduced in the near future. The descriptions include areas of the property to monitor for each species. Additional NNIS may appear in Vermont in future years, and the Cow Pasture Stewardship Committee should visit the VTInvasives.org website annually to stay abreast of new invasions.

Monitoring

NNIS control is an ongoing process, and monitoring is critical to ensure treatments are effective and to prevent regeneration and further spread of NNIS. After initial treatments applied in the spring or summer, mature plants must be checked for new growth later in the same growing season and re-treated. Areas treated in previous growing seasons must be checked each year for new growth (both stump sprouts and seedlings) until the plants are confirmed to be dead. Any new growth should be removed as soon as possible, using the recommended techniques for the species. In addition to previously treated areas, sensitive natural communities and high-quality areas should be monitored regularly to identify new or spreading infestations. The work plan should be adjusted regularly to reflect any changes.

Forestry Pre- and Post-Treatments

One of the objectives of this management plan is to apply sustainable forestry practices that support wildlife habitat and connectivity, and that protect and enhance overall ecosystem function and health.

Trees will need to be cut in certain stands to encourage regeneration of native tree species, and to promote healthy forest structure. Removing trees creates canopy gaps and disturbs the soil surface, creating ideal conditions for infestation by NNIS. To ensure native plants get a foothold, NNIS treatment must be implemented before and after cutting.

NNIS Management Work Plan

The following management actions have been identified for controlling infestations of NNIS in the Cow Pasture. See the Non-Native Invasive Species Priorities map on p. 41 for treatment locations. The public shall be notified prior to and throughout any spraying or other chemical treatment, by placing signage at main access points and at treatment sites. The public shall also be notified with signage prior to and throughout tree cutting or other mechanical treatments that may present safety hazards or significant aesthetic changes along trails. The actions below are listed in order of priority.

1. Remove isolated infestations of woody NNIS with high threat level. (*Phase 1*)
2. Remove isolated infestations of woody NNIS with lower threat level. (*Phase 2*)
3. Remove large-diameter woody NNIS in the open area that lies between M1-3, M2-3, and C1 and brush-hog the entire area⁷ (see Forest Stands and Management Priorities on p. 42 for location of area to be brush-hogged). Repeat every 2-3 years. The boundaries of the brush-hog area must be clearly delineated, and the trees to leave must be determined by the Committee prior to brush-hogging. (*Phase 3*)
4. Control woody NNIS along M4 and within the red pine stand prior to cutting the trees (see p. 22 for recommended forestry treatment). *Phase 4 (lower priority). Red pine stand treatment and timing are contingent upon available resources.*

Ongoing:

1. Monitor previously treated and sensitive areas annually and treat as needed.
2. Brush-hog the open area between M1-3, M2-3 and C1 every 2-3 years².
3. Treat NNIS before and after active forest management, trail maintenance, and any other activities that may cause soil disturbance or open canopy gaps.
4. Monitor trails at least once each growing season for Early Detection, Rapid Response (EDRR; see definition on p. 19).
5. Inform the public about NNIS introduction and their role in prevention and management through outreach materials and signage.

Sustainable Forest Management

The goals of forest management at the Cow Pasture are to support wildlife habitat and connectivity, protect and enhance overall ecosystem function and health, and protect user safety. Because resources are limited, forest management objectives have been prioritized to achieve the greatest ecological and social benefit while minimizing the total long-term workload and project costs.

Forest Stands

The property contains four forest stands, which were mapped in 2013 by Russ Barrett, the former Washington County Forester. Stands are discrete areas of forest that are delineated for management

⁷ Brush-hogging should be done after August 1st to protect nesting birds.

purposes based on species composition, age, vertical structure, and other characteristics. Summary descriptions of each stand are provided below. See Appendix 3: Forest Stand Descriptions (p. 48) for complete descriptions. Equipment access to each of these stands is needed to support management (see Equipment Access on p. 10). Operability within all stands is good, with no significant obstacles.

Stand 1: Pioneer Hardwoods

This 26-acre stand consists of even-aged, pole-sized timber with poor structural diversity. Tree species are mostly early successional, including aspen, paper birch, red maple, and white pine. The understory and midstory layers consist mostly of non-native invasive shrubs. Snags and downed deadwood are present in some areas, providing nesting, foraging, and perching habitat for birds and other wildlife. Enriched pockets exist where calcium-rich bedrock is close to the surface, supporting native wildflowers and ferns along with large, old white ash and sugar maple trees. Deer browsing pressure and the closed canopy seem to be limiting regeneration and structural diversity in the pioneer hardwoods stand. Similar stands extend beyond the Cow Pasture into the adjacent Ford, City of Barre, and Lunde parcels. The natural community⁸ is classified as a Northern Hardwood Forest with pockets of Rich Northern Hardwood Forest (see Thompson & Sorenson 2005 for descriptions of Vermont natural community types).

Stand 2: Pioneer Softwood Mix

This 25-acre stand consists mostly of white and Scotch pine trees that were planted or regenerated in the open, along with some sugar maple and Norway spruce. This stand also includes a small red pine plantation on the slope above VT-14/Maple Avenue, across from Hope Cemetery. The understory and midstory layers are sparse, except for patches of non-native invasive shrubs, which are most severe along trails and in canopy gaps. The white and Scotch pines are malformed from infestation by the white pine weevil (common in open-grown pines), and some individuals of all three species of pine and Norway spruce are infected with white pine blister rust.

Stand 3: Semi-Open

This 16-acre stand is an abandoned pasture, and contains open meadow with patches of trees and shrubs. Woody species are early-successional, and include red pine, white pine, sugar maple, aspen, Norway spruce, cherries, apples, and staghorn sumac, along with non-native invasive species such as common and glossy buckthorn and Amur maple. Raspberry and blackberry patches are present in some areas. Some areas of this stand are dominated by meadow herbs such as asters, goldenrods, and milkweed, and have probably been brush-hogged occasionally by a neighbor.

Management Priorities

Refer to the Forest Management Map on p. 42.

Stand 1: No active forest management at this time.

Justification: Forest structure in this stand is poor, and regeneration cutting could improve wildlife habitat value and forest health; however, because of the cost and time commitment, this has been deemed a low priority by the Cow Pasture Committee at this time.

⁸ A natural community is “an interacting assemblage of organisms, their physical environment, and the natural processes that affect them (Thompson & Sorenson 2005).”

Considerations: The Committee may want to assess community interest in harvesting firewood. Some of the pole-sized trees in this stand could be removed for firewood to reduce the density of trees and improve forest structure.

Stand 2:

Option 1: Cut the entire red pine plantation. No other active forest management at this time.

Justification: This management strategy will promote forest regeneration, improve forest structure, and protect public safety. The red pines are tall and spindly, and some are beginning to fall, posing a potential hazard for the City-owned building bordering the plantation, along Maple Ave., as well as the M4 trail. The wildlife habitat value and overall ecological health is extremely low because of a lack of structural and biological diversity. The trees are too old for thinning to improve their growth, and any trees left standing would continue to present a safety hazard. Many of the white pines, Scotch pines, and Norway spruces are malformed and infected with white pine blister rust; however, the large size of the stand and widespread distribution of these trees would make removing them and otherwise improving the condition of this forest expensive. The habitat value of this stand is low, but the malformed trees and shaded canopy make this site aesthetically interesting.

Considerations: Consult with the City Tree Warden to plan and implement cutting. The regeneration (next cohort of trees and shrubs) consists of invasive shrubs, ash, and beech, none of which are desirable as dominant growth. With the dense, mature infestation of NNIS along the path, these are likely to spread into the canopy gaps. As for native species, ash is expected to be impacted by emerald ash borer. Beech is currently impacted by beech bark disease, and grows as dense rhizomatic understory growth, limiting regeneration of other species. NNIS must be controlled along the M4 trail and within the red pine stand prior to cutting. After cutting, plant conservation seed mix on the slope, and monitor/treat NNIS. The timber may be sold as pulpwood and possibly as utility poles, as determined by the Tree Warden.

Option 2: No active forest management at this time.

Justification: Cutting the red pine stand was discussed amongst the Committee and City officials, and the cost is beyond the current budget for managing the Cow Pasture. According to Russ Barrett (personal communication, 2017), similar red pine stands exist in many areas that experience regular recreation use (golf courses, state and town forests, cross-country ski areas, rest and picnic areas), and Barrett expects that the danger to recreation users is quite low. Because the pines have such small crowns they tend to do little damage to other forest vegetation.

Considerations: Although the hazard risk is currently low, the trees will fall over a long period of time. As more trees fall, the hazard becomes greater (they will be sensitive to windthrow without shelter of neighboring trees). If the Committee decides to leave the stand alone for now, it should be monitored periodically to visually assess any changes and adjust management accordingly. The Barre City Tree Warden (see Table 9. Community Resources and Possible Partners, p. 27) should be consulted.

Stand 3: Remove large-diameter trees and shrubs (except apples and sumac at northern end), and brush-hog every 2-3 years to maintain as open meadow.

Justification: Maintaining this area as open meadow will provide aesthetic, recreational, and educational value. It will provide wildlife habitat value, including suitable nesting habitat for grassland birds such as bobolinks and meadowlarks.

Considerations: Keeping up with brush-hogging will be critical to avoid the area reverting to an NNIS-dominated shrubland.

Water Resources Management

The Cow Pasture is located within the Stevens Branch Watershed. An unnamed stream within the property flows into Gunners Brook, one of nine tributaries of the Stevens Branch, which flows into the Winooski River. The Stevens Branch Watershed encompasses about 115 square miles of land in Washington and Orange Counties. The river flows about 14 miles from its headwaters in Williamstown to its confluence with the Winooski upstream of Montpelier (McLane et al 2009). Like most rivers in Vermont, Stevens Branch has been straightened and channelized, and development of roads and other infrastructure have cut off or reduced the river's access to its floodplain in many places. The resulting changes to the river's corridor and flow patterns has left it prone to flooding, particularly in Barre City, which is the most developed portion of the watershed. Severe flooding has impacted the City repeatedly over the past century, causing major damage to private property and public infrastructure, and in at least one case – the 1927 flood – loss of life (Barg 2014). Tributaries capture water from higher elevations of the watershed along with eroded sediment and deposit these into the Stevens Branch. Maintaining forested riparian buffers and wetlands along tributary streams is critical for mitigating flooding and erosion hazards downstream. Forests and wetlands provide important ecosystem services⁹, including temporary storage and reduction of stream velocity during floods, soil stabilization, and protection of aquatic habitat and water quality downstream.

The unnamed stream flows about one-third of a mile from its headwaters in an open field south of Grandview Farm Road in Barre Town to its confluence with Gunners Brook. The first third or so of the unnamed stream's corridor crosses through an open field with small patches of woody vegetation along the banks. After leaving the field, the corridor flows through dense forest within the Pope and Perrin parcels, the Cow Pasture, and the Lunde parcel. The channel is steep and rocky on the east side of the Cow Pasture, and levels out before reaching the M1 trail near the western boundary. Within this fairly flat area of the Cow Pasture is a wetland, which includes mossy seeps along the channel, a swampy area with wetland herbs and scattered trees and shrubs, and deeper pockets of sedge and cattail marsh. Downstream of the Lunde parcel the stream crosses Maple Ave/Route 14 into Barre City neighborhoods with very little open space or natural vegetation. The lack of forested riparian buffer upstream and

⁹ "An ecosystem is a dynamic complex of plant, animal, and microorganism communities and the nonliving environment, interacting as a functional unit. Humans are an integral part of ecosystems. Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth (Millennium Assessment Board 2005)."

downstream of the Cow Pasture makes these landscape features within the property particularly valuable.

To support the services that this ecosystem provides, a minimum of 50 feet of forested riparian buffer is recommended on each side of the stream, beginning at the top of the bank. The condition of the riparian corridor within the Cow Pasture is currently good, with well over the recommended minimum of 50 feet of forested buffer. The forest is in fairly good health, particularly along the high-gradient section, where mature hemlocks, sugar maples, and other native trees line the banks. The only sections of the stream that lack a vegetated riparian buffer are the two stream crossings. Erosion and increased surface runoff are problematic around the upstream crossing (M2), because it covers a fairly large area, including a stone well, and because the stream gradient is high in this section. The downstream crossing (M1) has also experienced erosion problems in the recent past; however, the installation of rock slabs, boulders, and gravel to harden the banks at the narrow crossing seem to have resolved the issue for now. Strategies for managing the stream crossings are described in the Management of Trails and Infrastructure section, on p. 7. The C3 and C4 trails used to cross the wetland have been closed and removed from all maps to avoid disturbance. No new trails or infrastructure should be constructed within the 50-foot riparian buffer or wetland. If any trail or infrastructure were to be constructed, a Conditional Use Determination from the Vermont Watershed Management Division would be required.

Controlling NNIS within the riparian buffer and wetland is important, because these plants can alter hydrology and soil stability, thereby impacting the ecosystem services provided by these landscape features. NNIS along the unnamed stream corridor include mature honeysuckles near the base of the steep slope downstream of the M2 trail crossing, and a dense infestation of Japanese and common barberry downstream of the M1 trail crossing and continuing into the Lunde parcel. These areas have been given higher priority for NNIS management than the surrounding forest, because of their sensitivity and high ecological and social value. See the NNIS Management section of the plan on p. 13 for strategies to control NNIS within the riparian buffer and wetland.

Any management activities that may disturb soil and/or vegetation must be done with extra care within the 50-foot riparian buffer and wetland. *Vermont's Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont* (Vermont Department of Forests, Parks and Recreation 2016) is a helpful resource for learning about management considerations in these sensitive areas. Any management activities requiring equipment (including transporting equipment through the wetland and/or riparian buffer) should be done in winter, when the ground is frozen. Any areas where vegetation is removed should be restored by planting native vegetation. Chemical treatment of NNIS should be avoided within these areas, and if done requires a permit as noted earlier.

The stream crosses through the Pope, Perrin, and Lunde parcels, and the Committee should encourage abutting landowners to maintain a 50-foot riparian buffer on their land. Any loss of vegetation or soil on the upstream parcels could increase flooding and erosion hazards within the Cow Pasture. The severe Japanese and common barberry infestation extends beyond the Cow Pasture boundary into the Lunde parcel, and the effectiveness of control efforts within the Cow Pasture will be limited without also treating the infestation on the abutting land. If the Committee treats this infestation, collaboration with the abutting landowner is recommended.

Public Outreach, Education, and Volunteer Activities

The Cow Pasture Committee will continue to collaborate with the North Branch Nature Center and other local community groups and individuals to offer bird walks and other guided educational activities for the public. The Committee will seek out opportunities to collaborate with area schools (K-12 through college), scout groups, and other educational entities by providing service-learning projects¹⁰ and welcoming students and classes to visit the property for educational purposes. Engaging local groups and individuals in service-learning and volunteer activities will be essential to increase the capacity of the Committee in achieving the goals of this management plan, and will promote a culture of stewardship among community members and Cow Pasture user groups. Community volunteers may be recruited through education and outreach programs (for example, by including a blurb about volunteering on pamphlets and on the kiosk, and providing an email list sign-up sheet at educational programs and events). Public outreach in the form of interpretive signage and print materials will continue to be important mechanisms for educating the public about the natural and cultural resources on the site, and providing information about usage policies and considerations, education and volunteer opportunities, and management activities. Online correspondence (emails, Front Porch Forum, web/social media postings, etc.) could also be used by the Committee to provide important announcements, such as upcoming field walks or volunteer opportunities. The Committee should designate members to play the roles of Public Outreach and Education Coordinator and Volunteer Coordinator (see Committee Member Roles on p. 32).

Below are some public outreach topics and ideas.

1. Create laminated cards on rings, with pictures of local plants and wildlife, to hang at the kiosk.
2. Provide a self-guided tour using GPS points, available for download on the City website.
3. Develop interpretive materials (signage, pamphlets) for local landowners about the threat of NNIS in the Cow Pasture and the role they can play in management, including:
 - Replacing NNIS in their gardens and landscaping with native species, and of using native weed-free seed mixes.
 - Properly disposing of yard waste.
 - Removing plant material from mountain bikes and footwear after use.

Below is a list of potential service-learning and volunteer activities. See Community Resources and Possible Partners (Table 9) for contact information for each of the possible partners listed here.

Table 8. Projects Appropriate for Volunteers or Service-Learning

Project	Possible Partners
Improve trails (e.g., re-open overgrown trails, clear water bars).	Barre Middle School, Central Vermont Career Center, Girl and Boy Scouts, Spaulding High School, VYCC
Create educational signs, posters, pamphlets etc. (see public outreach ideas above).	Central Vermont Career Center, Rubenstein School of Environment & Natural Resources (University of Vermont), Spaulding High School

¹⁰ Service-learning is "a form of experiential education in which students engage in activities that address human and community needs together with structured opportunities for reflection designed to achieve desired learning outcomes (Jacoby 1996).

Table 8. Projects Appropriate for Volunteers or Service-Learning (Continued)

Project	Possible Partners
Create interpretive materials for the kiosk.	Girl and Boy Scouts, Central Vermont Career Center, Rubenstein School of Environment & Natural Resources (University of Vermont)
Monitor and map occurrences of invasive species.	Girl and Boy Scouts, Central Vermont Career Center, Rubenstein School of Environment & Natural Resources (University of Vermont), Spaulding High School
Assist with invasive species treatment and control measures.	Barre Middle School, Central Vermont Career Center, Girl and Boy Scouts, Rubenstein School of Environment & Natural Resources (University of Vermont), Spaulding High School, VYCC, local community members
Conduct bird monitoring and enter observations into e-bird.	Audubon Vermont, Central Vermont Career Center, Girl and Boy Scouts, North Branch Nature Center, Rubenstein School of Environment & Natural Resources (University of Vermont), Spaulding High School, VYCC, local community members
Plant red oak acorns near existing oaks.	Barre Elementary School, Girl and Boy Scouts, local community members/families
Collect water quality data at the stream.	Barre Elementary and Middle School, Central Vermont Career Center, Girl and Boy Scouts, Rubenstein School of Environment & Natural Resources (University of Vermont), Spaulding High School
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.	Central Vermont Career Center, Rubenstein School of Environment & Natural Resources (University of Vermont), Spaulding High School
Adopt a trail segment or section of woods for regular invasive species monitoring and control.	Girl and Boy Scouts, Central Vermont Career Center, Rubenstein School of Environment & Natural Resources (University of Vermont), Spaulding High School
Build a deer enclosure to demonstrate the impact deer browse is having on tree regeneration.	Girl and Boy Scouts, Central Vermont Career Center, Rubenstein School of Environment & Natural Resources (University of Vermont), Spaulding High School
Pick up trash and recycling (continue Green-Up Day activities).	Local community members

Table 8. Projects Appropriate for Volunteers or Service-Learning (Continued)

Project	Possible Partners
Build stone wall at entrance	VYCC, Stone Arts School
Assist with restoration plantings (e.g., in disturbed areas of the riparian buffer or where NNIS are removed).	Barre Elementary and Middle School, Central Vermont Career Center, Girl and Boy Scouts, Rubenstein School of Environment & Natural Resources (University of Vermont), Spaulding High School, VYCC, local community members
Lead natural and cultural history walks.	Central Vermont Career Center, North Branch Nature Center, Rubenstein School of Environment & Natural Resources (University of Vermont)
Monitor wildlife use of the property through tracking, game cameras, and field observation.	Barre Elementary and Middle School, Central Vermont Career Center, Girl and Boy Scouts, Rubenstein School of Environment & Natural Resources (University of Vermont), Spaulding High School, VYCC, local community members

Community Resources and Partnership Opportunities

This section lists community groups, schools, government agencies, and individuals with whom the Committee may collaborate to achieve the goals and objectives of the management plan.

Table 9. Community Resources and Possible Partners

Name	Contact
Audubon Vermont	Kim Guertin Center Director kguertin@audubon.org General contact info: (802) 434-3068 vermont@audubon.org
Barre City Elementary and Middle School	School Phone Number: (802) 476-6541 James Taffel Principal PK-4 jtaffbce@u61.net Jacquelyn Ramsay-Tolman Principal 5-8 jtolmbce@u61.net
Barre City Buildings & Community Services Department, Barre City Tree Warden	Jeff Bergeron Director of Building and Community Service & Tree Warden (802) 476-0256 Cemeteries@barrecity.org

Table 9. Community Resources and Possible Partners (Continued)

Name	Contact
Barre City Planning, Permitting, and Assessing Services Department	Janet E. Shatney Planning Director Office: (802) 477-1465 Cell: (802) 522-6029 jshatney@barrecity.org
Barre Sno-Bees	Mike Perrigo President (<i>also a Cow Pasture Stewardship Committee Member</i>) president@snopees.com
Central Vermont Career Center	Amanda Garland Natural Resources and Sustainability Instructor (802) 476-6237 ext. 2124 agarlcvcc@u61.net
Downstreet Housing & Community Development (Formerly Central Vermont Community Land Trust)	General Contact Info: (802) 476-4493 or (877)-320-0663
Girl Scouts of the Green and White Mountains	Barre Troop (ages 5-8) Brigitte Kalat bbcouture2000@hotmail.com
Green Mountain Council (Scouting) Long Trail District	Troop 714 Scoutmaster-Joby Feccia (802) 476-0784 jfeccia@gmail.com Troop 795 Scoutmaster-Joe Aldsworth (802) 479-3542 aldsy@hotmail.com
North Branch Nature Center	Ken Benton Teacher Naturalist (<i>also a Cow Pasture Stewardship Committee Member</i>) (802) 229-6206 ken@northbranchnaturecenter.org
Rubenstein School of Environment & Natural Resources, University of Vermont	Margaret Burke Coordinator of Educational Innovation 802-656-1326 Margaret.Burke@uvm.edu
Vermont Youth Conservation Corps	Patrick Pfeiffer Operations Manager (802) 434.3969, ext. 141 patrick.pfeifer@vycc.org John Woodward Community Programs Manager (802) 434.3969, ext. 131 john.woodward@vycc.org

Table 9. Community Resources and Possible Partners (Continued)

Name	Contact
Spaulding High School	School Phone Number: (802) 476-4811 Brenda Waterhouse Principal ext. 1190 bwateshs@u61.net Gerald Desmarais Department Chair, History & Social Sciences ext. 1188 gdesmshs@u61.net Shannon Lessley Department Chair, Science ext. 1191 slessshs@u61.net
Stone Arts School	General Contact Info: 802-476-4605 info@vtgranitemuseum.org

Future acquisition opportunities/adjacent lands

The Cow Pasture itself has only one designated entrance, at the end of Maplewood Ave. in Barre City, along with an infrequently used entrance with no parking on Maple Ave./Route 14. The remaining access points (see Trails, Access Points, and Parking on p. 5) cross through privately owned abutting lands. In a public survey of Cow Pasture users by Sharpless (2013), about a third of respondents indicated that they access the Cow Pasture via trails originating on neighboring private property. Another 20% were unaware of which trails are on private property, City right of ways (paper streets) or are on the Cow Pasture, suggesting that the percentage of users who access the site via private land is likely to be higher. Keeping these trails open for public use is important for providing access to the Cow Pasture from local neighborhoods. None of the parcels are currently posted, but changing ownership could threaten public access in the future.

The abutting lands are also important for their ecological value. The Cow Pasture is part of a broader ecosystem that includes these surrounding lands. Most of the wildlife species that inhabit the Cow Pasture rely on resources throughout this broader ecosystem, and their populations within the Cow Pasture would be impacted by development or changes in land cover on neighboring parcels. The stream that flows through the Cow Pasture originates in an undeveloped parcel to the east, and flows into a forested parcel to the west that shares its border with the Cow Pasture. Any changes to either of these parcels could impact stream and riparian buffer conditions on the Cow Pasture. Non-native invasive plant species (NNIS) spread their seeds into the Cow Pasture from the surrounding landscape. Minimizing disturbance to the forests adjacent to the Cow Pasture protects from additional NNIS infestations and improves the efficacy of control efforts.

To support continued public access and ecosystem health, the Cow Pasture Committee will investigate opportunities to conserve existing trails on abutting lands that provide access from local neighborhoods,

and parcels that provide exceptional recreational, aesthetic, and/or ecological value. Options for protection include:

- 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
(Vermont Trails and Greenway Council 2005, cited in Sharpless 2013)

Another option for undeveloped lands is:

- Re-zoning from Residential to Conservation: Safeguards against certain types of development (refer to Zoning Regulations, City of Barre, 2010) but does not ensure continued access.

Some of the abutting lands are located outside the City limits in Barre Town. Several respondents to the survey mentioned above live in Barre Town (Sharpless 2013), and these individuals are likely to access the property through trails originating in Barre Town neighborhoods. The Committee may want to collaborate with Barre Town planning staff to consider land conservation options for the applicable parcels (noted in the table below).

Table 10. Conservation Priorities on Abutting Lands

Landowner	Important Features	Risk of Development and/or Loss of Public Access	Conservation Approach(es)	Priority
Aines	A trail crosses through this parcel to Quinlan Drive (S4). Home built on western edge of parcel; eastern edge (bordering Cow Pasture) is high-quality Rich Northern Hardwood Forest, important for wildlife connectivity with Cow Pasture and buffer for NNIS spread and other disturbance (high ecological value); aesthetic value (e.g. spring wildflowers, large sugar maples, bedrock ledges)	Private residential parcel. Home already built on property; forested section unlikely to be developed unless property is subdivided in future (for example, if Duffy Ave. is developed, providing road access). Changing ownership could lead to posting of land and loss of public access.	<ul style="list-style-type: none"> • Handshake or license agreement • Trail easement (if property goes on the market) 	Medium

Table 10. Conservation Priorities on Abutting Lands (Continued)

Landowner	Important Features	Risk of Development and/or Loss of Public Access	Conservation Approach(es)	Priority
City of Barre	Three paper streets (Duffy Ave., Mead Ave., and Johnson St. Extension). Duffy Ave. and Mead. Ave both provide access to the Cow Pasture via wooded trails. A portion of Johnson Street Extension is under a 10-year license (2013-2023) for private use by abutting landowners Jeff and Holly Friot, and is currently fenced off. The City owns a subdivision with several undeveloped residential parcels west of Duffy Ave, bordering the S3 trail. Protecting this land as a natural corridor is a high priority.	The paper streets are all at high risk for road development. The subdivision west of Duffy Ave. currently serves as a natural corridor, which would be interrupted and could be compromised with fencing, dumping of yard debris, introduction of NNIS, etc. if segments are sold.	<ul style="list-style-type: none"> Collaborate with City Planning, Permitting, and Assessing Services Department to identify options. 	High
Ford	Three undeveloped parcels west of Maplewood Ave. abutting Duffy Ave., a paper street that provides access from Sheridan St. Several undeveloped parcels (subdivision) east of Maplewood Ave. on both sides of Mead Ave., another paper street providing access from Johnson St. Land east of Maplewood Ave. also contains connector trail to Perrin trail system (S14). High-quality Rich Northern Hardwood Forests on all parcels; important for wildlife connectivity with Cow Pasture and buffer for NNIS spread and other disturbance (high ecological value); aesthetic value (e.g. spring wildflowers, large sugar maples, bedrock ledges); historic/cultural features (stone walls, old well).	Both parcels are currently on the market and are zoned residential; roads could be built on the paper streets along with residential development on the parcels.	<ul style="list-style-type: none"> Re-zoning Trail easements Make sure S1 trail stays within paper street boundary (City land) to protect public access. 	High
Gherardi*	No significant conservation value in relation to the Cow Pasture at this time.	N/A	N/A	Low

*Parcel located in Barre Town

Table 10. Conservation Priorities on Abutting Lands (Continued)

Landowner	Important Features	Risk of Development and/or Loss of Public Access	Conservation Approach(es)	Priority
Ibrahimovic*	Contains an overgrown trail that has been used by ATVs in the past (S18). This trail will be closed within the Cow Pasture and allowed to revegetate, and has been removed from the official trail map (p. 38). No significant conservation value in relation to the Cow Pasture at this time.	N/A	<ul style="list-style-type: none"> Seek handshake or license agreement to discontinue use of the S18 trail into the Cow Pasture and allow it to revegetate 	Medium
Lunde	The parcel contains a trail that leads not to a neighborhood but to a single-family home. The trail is not a high priority for conservation for public access; however, the stream flows from the Cow Pasture into this parcel and maintaining the forested riparian buffer is important. Loss of the buffer would change the environmental conditions of the buffer within the Cow Pasture by creating “edge effects” – increased sunlight and temperature, change in species composition, etc. A large infestation of NNIS (mostly Japanese barberry) is present within the riparian buffer in the Lunde property and extending into the Cow Pasture. The effectiveness of control efforts in the Cow Pasture will be minimal without simultaneous control on the adjacent land.	The current landowners are Cow Pasture Stewardship Committee members, and changes in land use/cover are unlikely at this time.	<ul style="list-style-type: none"> Handshake agreement Participation in NNIS control/riparian buffer maintenance by current landowners 	Medium
Martin*	Currently managed as a sugarbush. Contains a road (S16-1) that diverges and leads to two spur trails behind houses on Valley View Circle in Barre Town (S16-2 and S17). S16-1 and S17 are VAST connector trails.	Risk of development or loss of access is currently low. Zoning is medium density residential. Property could be posted or developed if ownership changes.	<ul style="list-style-type: none"> Handshake or license agreement Trail easement (if property goes on the market) 	Low

*Parcel located in Barre Town

Table 10. Conservation Priorities on Abutting Lands (Continued)

Landowner	Important Features	Risk of Development and/or Loss of Public Access	Conservation Approach(es)	Priority
Morse	No significant conservation value in relation to the Cow Pasture at this time.	N/A	N/A	Low
O'Hara	No significant conservation value in relation to the Cow Pasture at this time.	N/A	N/A	Low
Perrin*	Treated as an extension of the Cow Pasture. Contains a popular scenic overlook, and a trail system with access points on Winter Meadow (S13), Park Street (S6), Hall Street (S11), and the Maplewood Ave. in Barre Town (S9 and S10), allowing access to the Cow Pasture from several neighborhoods.	Risk of development or loss of access is currently unknown. Zoning is high density residential. Could be posted, developed, and/or subdivided if ownership changes.	<ul style="list-style-type: none"> Trail easement Donation of land Re-zoning 	High
Pope*	Large tract of mostly undeveloped land. Contains headwaters of the unnamed stream that flows through the Cow Pasture. Forested riparian buffer present on southwestern corner of the property; open land and possibly straightened channel toward headwaters.	Risk of development or loss of access is currently unknown. Zoning is medium density residential. Could be posted, developed and/or subdivided if ownership changes.	<ul style="list-style-type: none"> Handshake or license agreement Encourage landowner to maintain a 50-foot riparian buffer (keep unmowed; possibly plant trees and shrubs) 	Medium
Quinlan	Parcels provide access from Quinlan Drive, via a trail that crosses through them and the Aines parcel (S4). High-quality Rich Northern Hardwood Forest; important for wildlife connectivity with Cow Pasture and buffer for NNIS spread and other disturbance (high ecological value); aesthetic value (e.g. spring wildflowers, large sugar maples, ledges)	Undeveloped residential parcel, currently on the market. Forested section with trail is steep and unlikely to be developed. Changing ownership could lead to posting of land and loss of public access.	<ul style="list-style-type: none"> Trail easement 	High
White*	No significant conservation value in relation to the Cow Pasture at this time.	N/A	N/A	Low

*Parcel located in Barre Town

Committee Member Roles

Designating roles with clear responsibilities would allow the Committee to operate more efficiently. The following roles are recommended; suggested responsibilities are listed for each role. These are intended as leadership roles, and the individuals fulfilling them may choose to delegate some of their responsibilities to other Committee members.

Chair

- Chair Committee meetings and ensure they run efficiently and effectively;
- Serve as the Committee's signatory for all legal and financial purposes;
- Act as the spokesperson for the Committee at City Council meetings, in correspondence with the City Manager, and as otherwise needed;
- Consult with other Committee Members for updates on progress and needs, and to help each Committee Member optimize his/her contribution;
- Support the Committee in prioritizing and implementing management activities.
- Ensure that a succession plan is in place when members leave the Committee, and take the lead on recruiting new members as needed.

Secretary

- Receive and distribute correspondence to and from the Committee;
- Prepare and send out monthly meeting minutes;
- Prepare and distribute the monthly meeting agenda;
- Keep track of print documents and digital files (reports, management plan, GIS data, etc.)

Fundraising Coordinator/Treasurer

- Identify grant opportunities and take the lead on contacting funders and developing grant proposals;
- Explore and pursue other fundraising opportunities such as individual donations, online fundraising campaigns, and events;
- Collaborate with other members to identify funding needs and priorities;
- Maintain a budget for Cow Pasture management.

Volunteer Coordinator

- Collaborate with the Natural Resources Management Coordinator and Recreation Coordinator (see below) to identify needs and appropriate volunteer activities;
- Schedule community volunteer days;
- Recruit volunteers, and send emails/post on Front Porch Forum to inform community members about volunteer opportunities;
- Collaborate with partners to organize service activities for groups;
- Gather materials required for service projects;
- Meet with groups, orient them to the site, and introduce the service projects;
- Maintain a volunteer contact list;
- Compile and send out periodic updates about volunteer accomplishments.

Public Outreach and Education Coordinator

- Identify public outreach needs and opportunities;
- Collaborate with partners to develop interpretive materials;
- Serve as the point person for questions from community members;
- Reach out to teachers and be the point person for school groups visiting the site;
- Collaborate with North Branch Nature Center and other groups and individuals to offer natural history field walks and other educational activities;
- Collaborate with the Volunteer Coordinator to develop and coordinate service-learning projects in partnership with schools.

Natural Resources Management Coordinator

- Oversee NNIS control and monitoring;
- Obtain an herbicide applicator license and supervise groups such as VYCC during chemical NNIS treatments;
- Coordinate management activities assigned to the Tree Warden and other City staff such as cutting the red pine stand, identifying and removing hazard trees as needed, and brush-hogging the meadow;
- Keep a record of natural resources management activities on the property;
- Take the lead in evaluating the success of those management activities, and adapt management approaches accordingly;
- Periodically visit the wetland and walk the stream corridor to identify new social trails (unofficial trails developed by users) and other management concerns in these areas;
- Collaborate with the Volunteer and Public Outreach and Education Coordinators to engage volunteer/service groups in this work.

Recreation (or Trails and Infrastructure) Coordinator

- Oversee the management and monitoring of trails and other recreation infrastructure on the property (benches, kiosk, signage, parking, etc.);
- Ensure that waterbars are cleaned each year;
- Work closely with VYCC and other partners in developing projects;
- Collaborate with the Volunteer and Public Outreach and Education Coordinators to engage volunteer and service groups in trail and infrastructure projects;
- Keep a record of all trail and infrastructure projects;
- Update trail maps as needed;
- Take the lead on evaluating the success of recreation management activities, and adapt management approaches accordingly;
- Identify new trail and infrastructure management needs;
- Monitor unauthorized use of the property and support enforcement (informing police or other City officials, for example).

City of Barre Roles and Responsibilities

The Barre City Buildings & Community Services Department will provide equipment and human resources as necessary for implementation of management activities, including brush-hogging every 2-3

years (see Forest Management - Stand 3, p. 21). The City Tree Warden will plan and implement forest management activities requiring removal of trees. The Planning Director and other staff of the Barre City Planning, Permitting, and Assessing Services Department will provide guidance on zoning regulations, ordinances, and permitting. The City will provide meeting space for the Cow Pasture Committee each month or as otherwise scheduled. The City will also collaborate with the Committee to refresh boundary markers as needed.

Procedures

Evaluation and Assessment of Proposed Actions

This plan is intended to guide management efforts in the project area for the next ten years (2017-2027), and to be used as the foundation for a process of adaptive management. The natural resources and infrastructure on the property should be monitored throughout this period to evaluate the outcomes of implemented strategies, and management should be adjusted to reflect unexpected results or changing conditions. At the end of the ten-year period, the effectiveness of the entire plan should be evaluated, and the management objectives and strategies should be revised accordingly.

The Committee Members designated as the Natural Resources Management Coordinator and the Recreation (or Trails and Infrastructure) Coordinator should coordinate and oversee monitoring activities. The Volunteer Coordinator should recruit volunteers to assist with monitoring activities, and provide support in scheduling and volunteer management.

The following monitoring activities should occur at least once per year; ideally, they should be done twice per year, in late spring and late summer/early fall.

- Walk all trails and visually assess changes in their condition. Make necessary updates to the Trail Descriptions tables (p. 7) and maps (p. 38-44), and Table 4. Trail and Infrastructure Projects (p. 12)12;
- Walk NNIS priority areas to locate new infestations and/or changes in the density and/or extent of existing infestations. Make necessary updates to Table 5. Non-native Invasive Plant Species in the Cow Pasture (p. 14), Non-Native Invasive Species Management Priorities (p. 41), and the NNIS Management Work Plan (p. 20);
- Visually assess each forest stand for new management concerns or changing conditions. Make necessary updates to Forest Stands and Management Priorities (p. 42) and Sustainable Forest Management Priorities (p. 21);
- Visually assess the riparian buffer and wetland for new management concerns (unauthorized use, trash, erosion, NNIS) and/or changing conditions. Refer to Water Resources (p. 43). Make necessary changes to Table 4. Trail and Infrastructure Projects (p. 12), NNIS Management Work Plan (p. 20) and other sections of the management plan as appropriate.

Amendments and Updates

After each year's monitoring is completed, the appropriate management plan sections and tables/maps (noted above) should be updated or amended as needed. Any updates or amendments must be reviewed and approved by the Committee.

After the ten-year period of this management plan (in 2027), the entire document should be updated as needed, with written approval by the Committee and City Council.

References

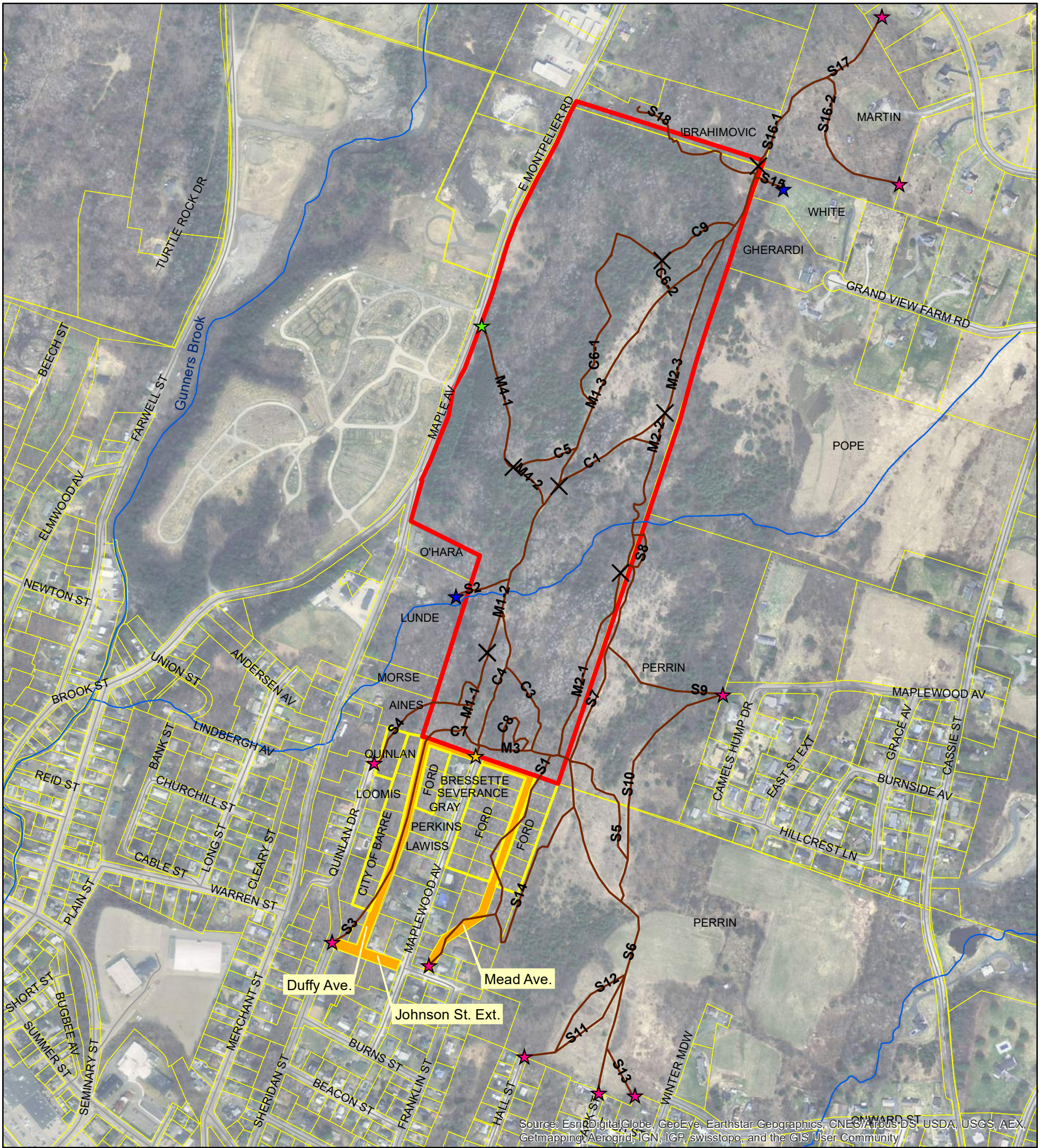
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Appendix 1: Maps

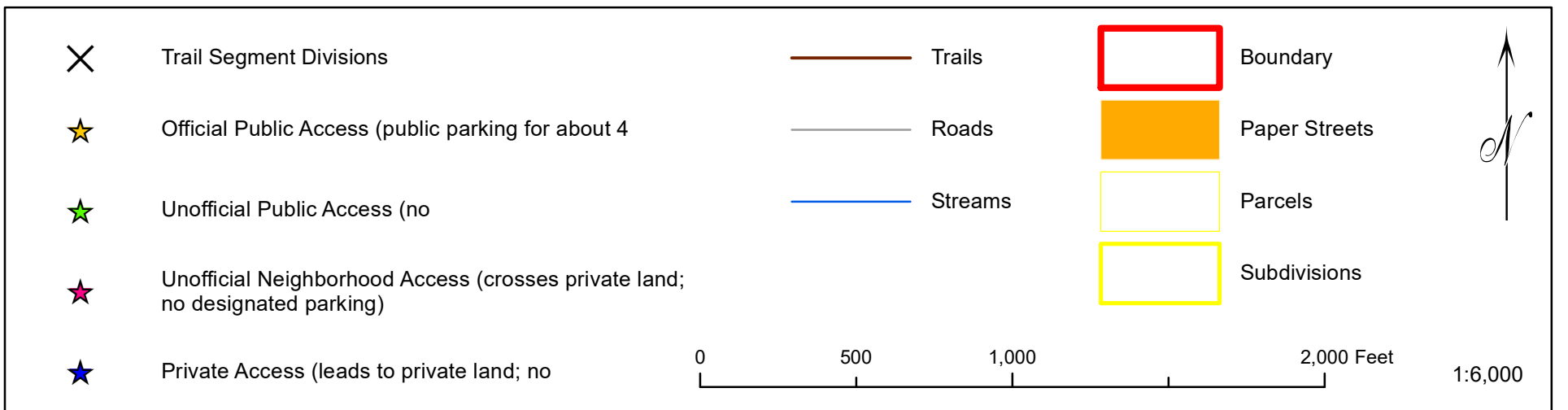
1. Trails, Access Points, and Parking
2. Trail Assessment and Management Priorities
3. Non-Native Invasive Species Management Priorities
4. Forest Stands and Management Priorities
5. Water Resources
6. Official Trail Map (for public use)

Barre City Cow Pasture

Trails, Access Points, and Parking



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



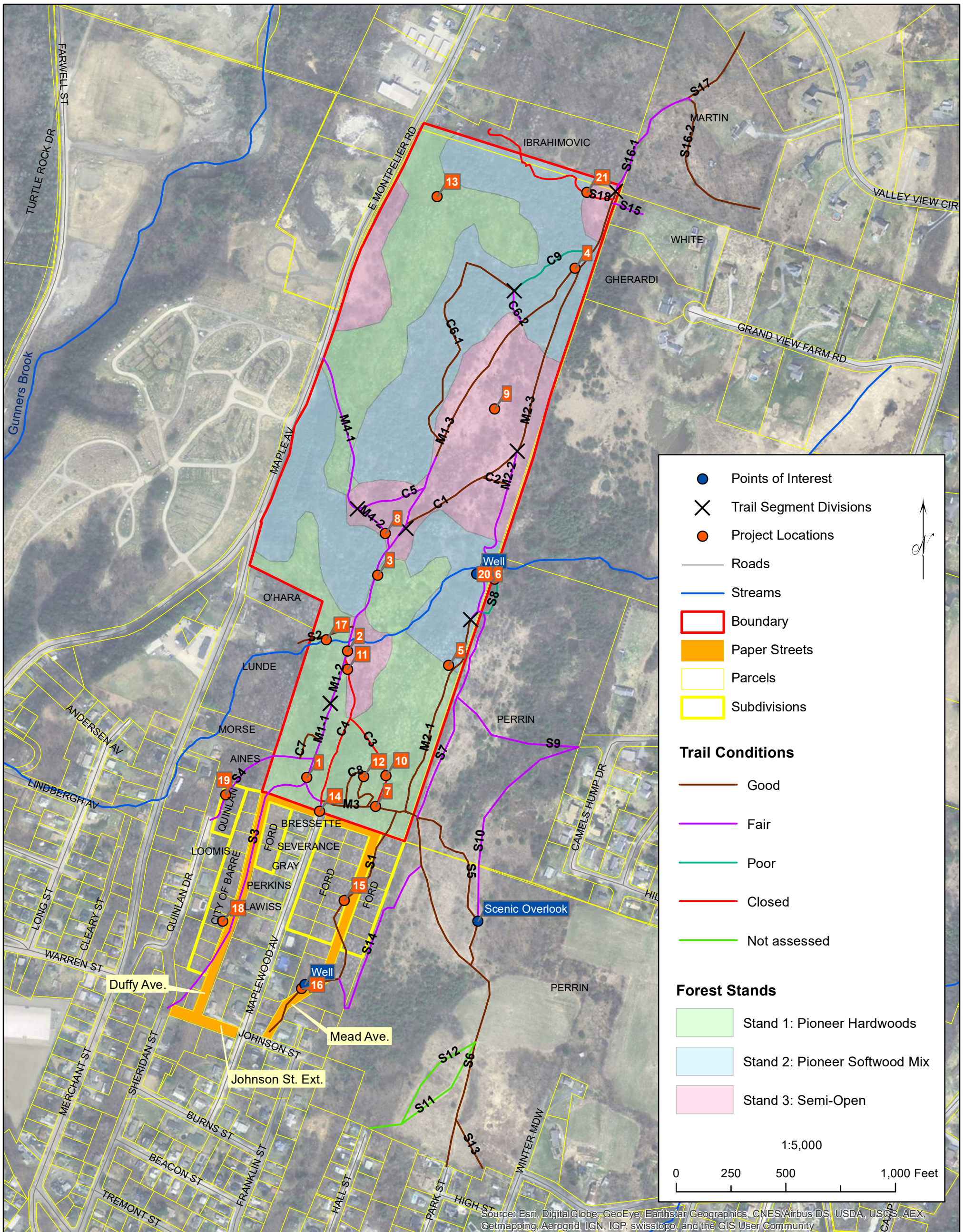
Map created by Emily Brodsky, February 2017. Data Sources: VCGI, City of Barre, ESRI, Sharpless Ecologic LLC, Emily Brodsky

Disclaimers:

Trails beyond the Cow Pasture property boundary are on private property. Please be aware that permission to access these trails may be revoked at any time. Please observe and respect posted signs and trail closures. Map is not intended for survey purposes.

Barre City Cow Pasture

Trail Assessment and Management Priorities



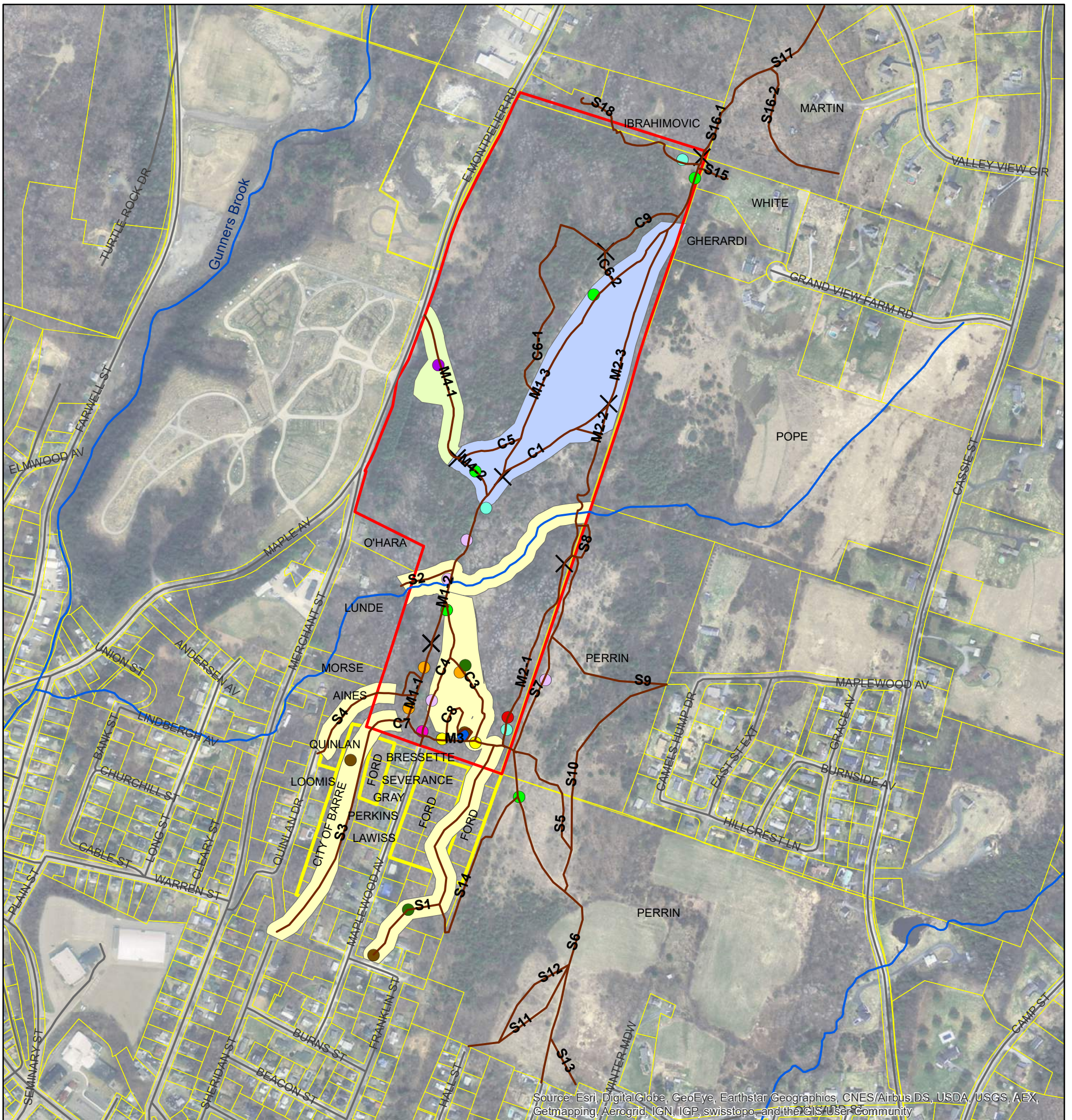
Map created by Emily Brodsky, February 2017. Data Sources: VCGI, City of Barre, ESRI, Sharpless Ecologic LLC, Emily Brodsky

Disclaimers:

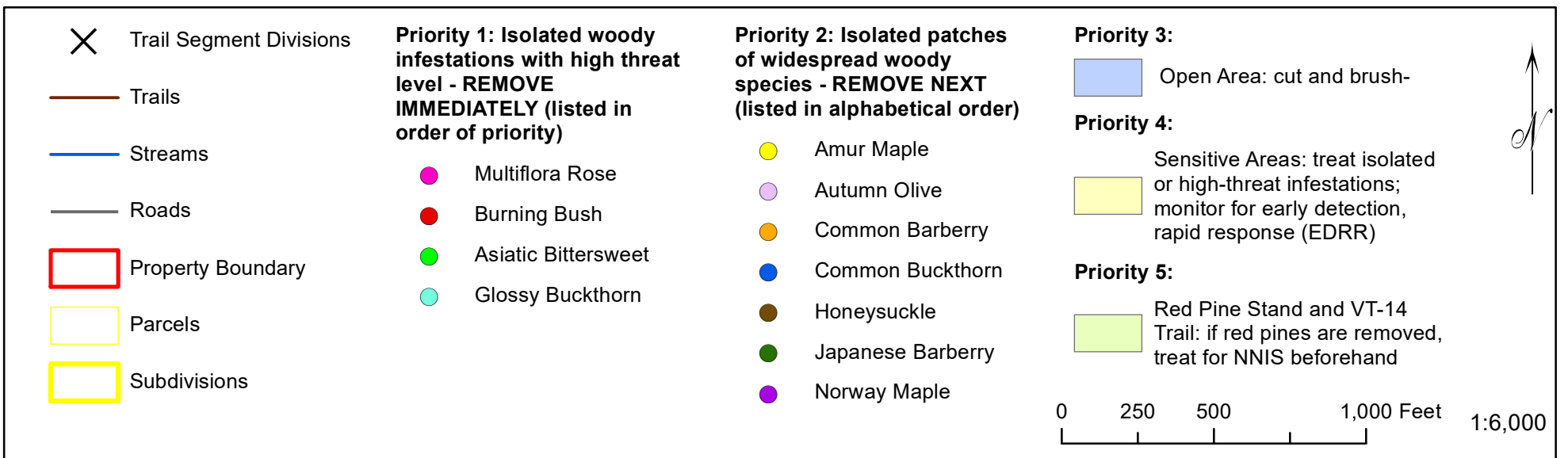
Trails beyond the Cow Pasture property boundary are on private property. Please be aware that permission to access these trails may be revoked at any time. Please observe and respect posted signs and trail closures. Map is not intended for survey purposes.

Barre City Cow Pasture

Non-Native Invasive Species Management Priorities



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



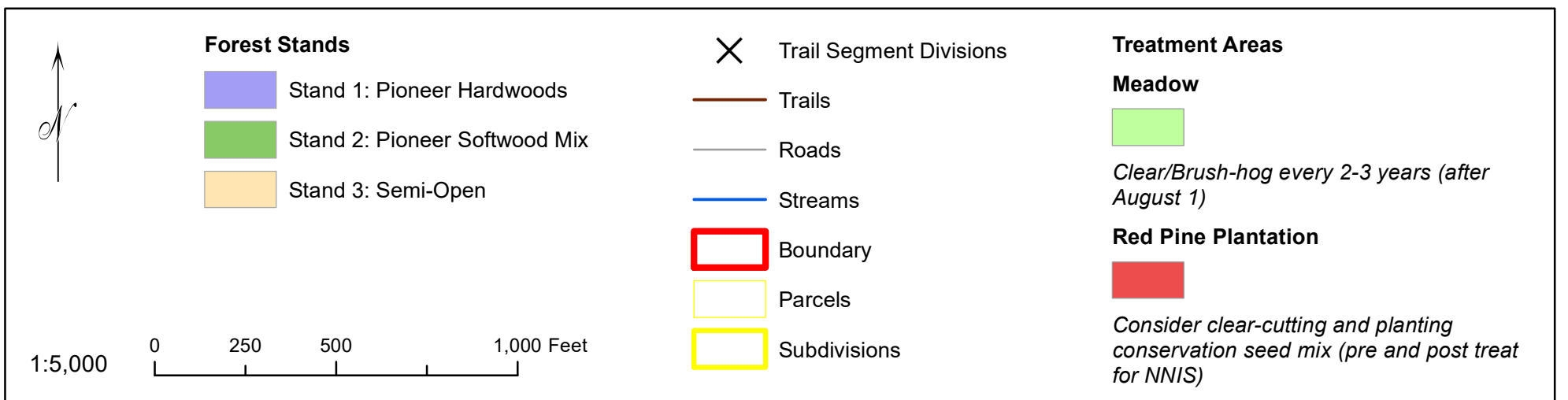
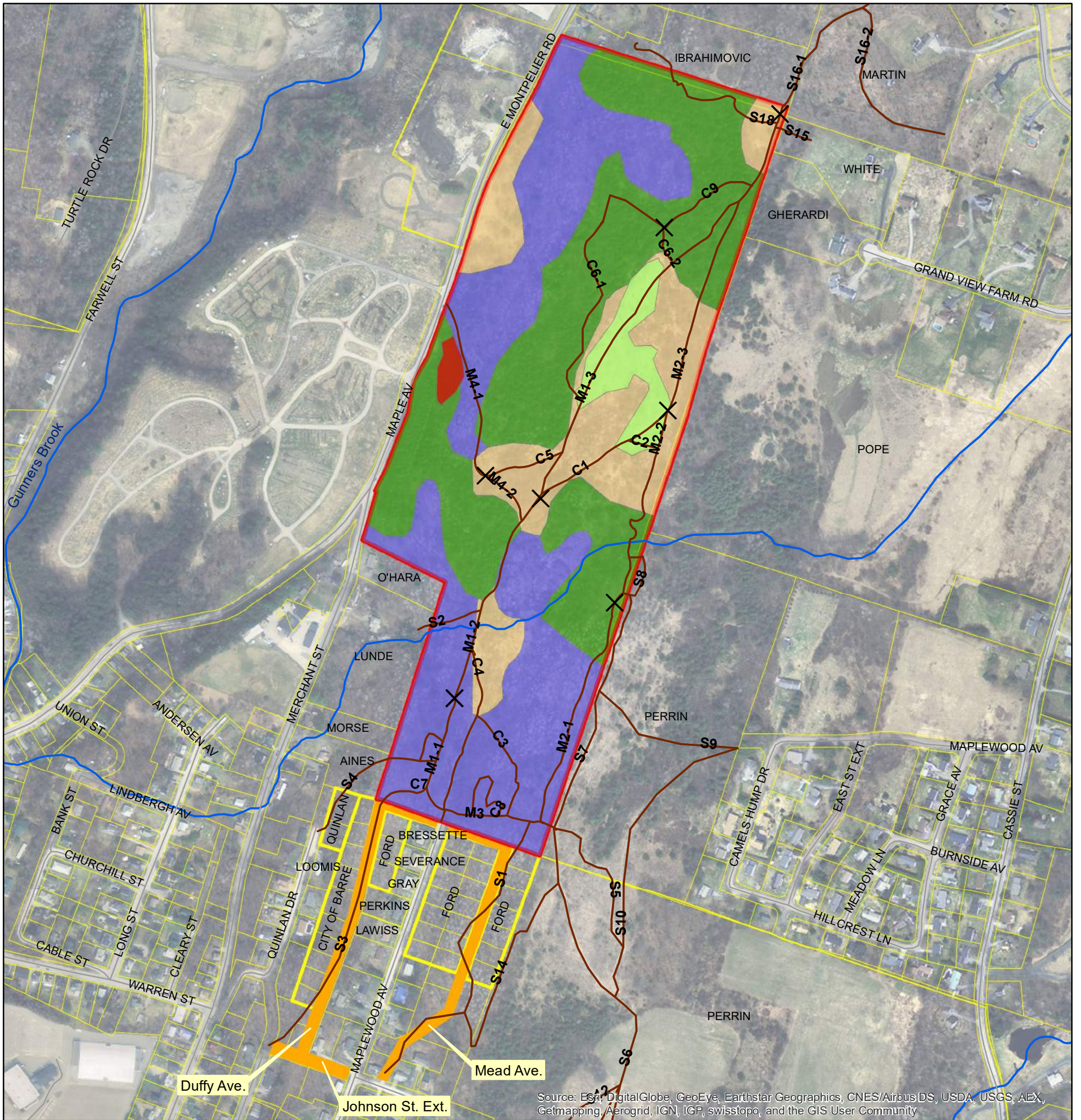
Map created by Emily Brodsky, February 2017. Data Sources: VCGI, City of Barre, ESRI, Sharpless Ecologic LLC, Emily Brodsky

Disclaimers:

Trails beyond the Cow Pasture property boundary are on private property. Please be aware that permission to access these trails may be revoked at any time. Please observe and respect posted signs and trail closures. Map is not intended for survey purposes.

Barre City Cow Pasture

Forest Stands and Stewardship Priorities



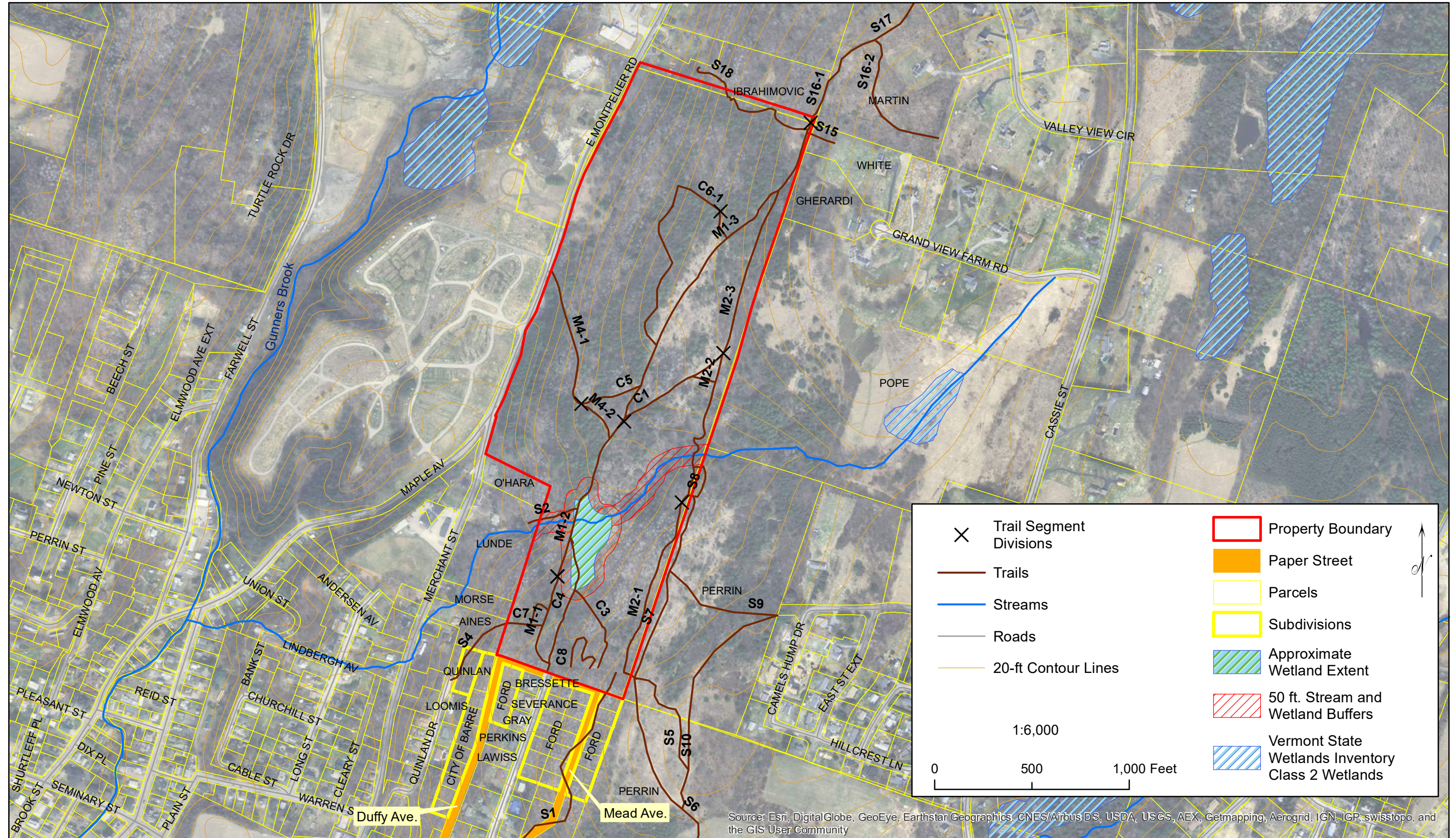
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Water Resources

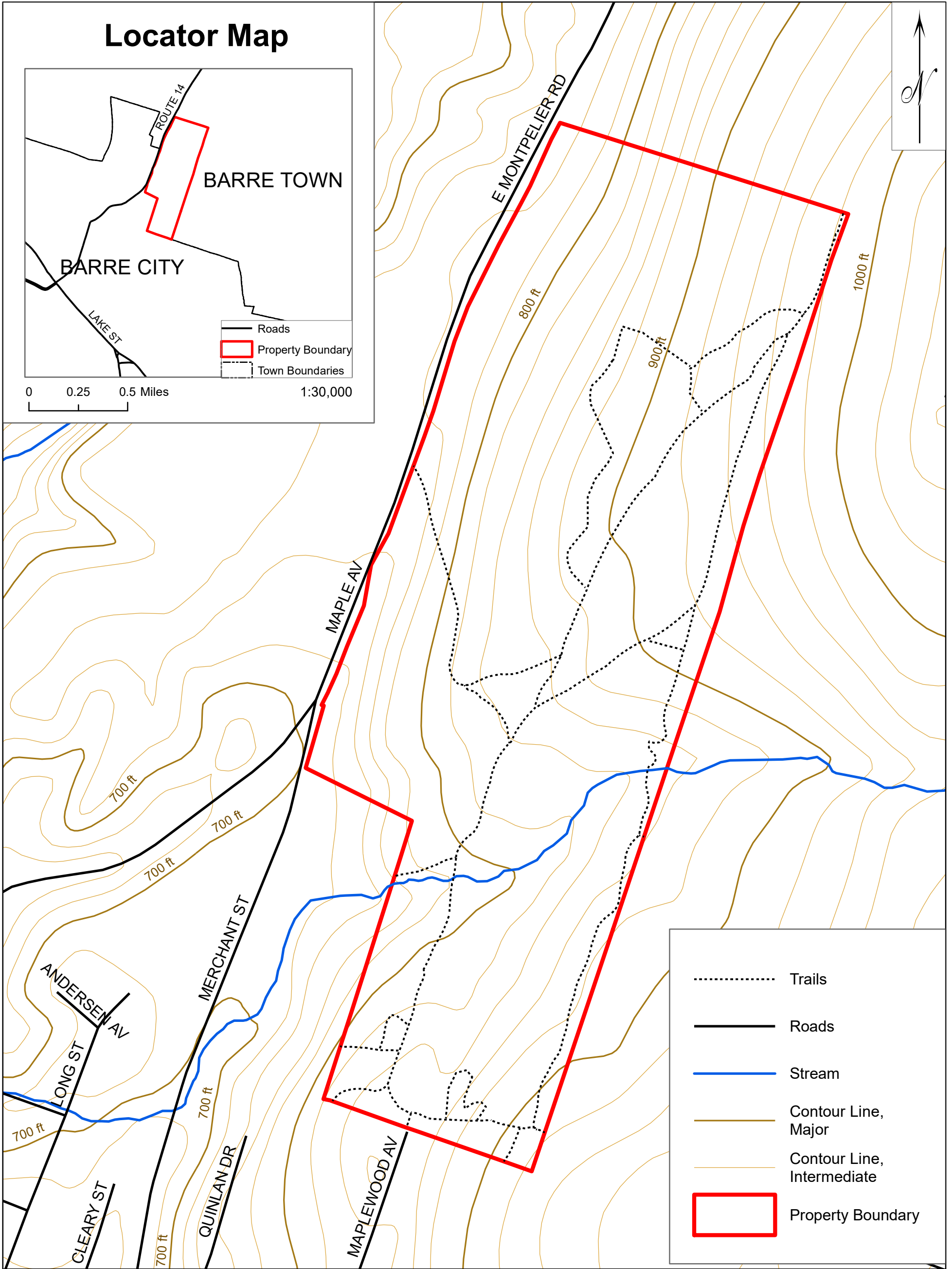


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Barre City Cow Pasture Trail Map



0 250 500 1,000 Feet

Map created January 2017
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Appendix 2: Non-Native Invasive Species Watch List for Early Detection and Rapid Response

Black Swallow-wort (*Cynanchum louiseae*)

This vine invades open areas such as meadows and roadsides, climbing on other vegetation and forming dense, tangled thickets. It blocks out sunlight for other plants, and can completely overtake old fields dominated by goldenrods and grasses, such as those in the Cow Pasture. The change in physical structure may negatively impact nesting birds. Additionally, black swallow-wort is in the milkweed family, and monarch butterflies sometimes lay their eggs on the seed pods; however, the plant is toxic to monarchs and the larvae die. This is a major concern, as the global monarch population has been in decline.

Where to look: Open areas, including the parking area, edges of main trails, and areas of open meadow and shrub thickets.

Burning Bush (*Euonymus alatus*)

This ornamental shrub spreads from yards into natural landscapes, including fields, forests, and woodlands. It can form dense thickets, displacing native vegetation. It tolerates some shade, which makes it particularly threatening to forested areas such as the Cow Pasture property. A single mature individual was found along the stone wall trail (M5). Its large size indicates that this shrub has probably been present for several years, as burning bush grows much more slowly than many of the other woody NNIS. Although no others were found, the shrub is a prolific seed producer and others are very likely present in the area.

Where to look: The stone wall trail (M5) and in forest edges adjacent to the other main trails. Keep an eye out for it in the forest interior (along single-track trails and off-trail).

Giant Hogweed (*Heracleum mantegazzianum*)

This plant poses a human health threat; it has a light-sensitive sap that can cause severe burns if it comes in contact with the skin, and can cause blindness if it gets into the eyes. It can also cause respiratory problems if inhaled. It can invade a variety of habitats, because it grows well in partial shade and in rich soils; however, it most commonly grows in disturbed soils along riverbanks and in ditches. The seeds are transported by water, allowing it to spread along waterways. Giant hogweed is widespread in Vermont, but not abundant.

Where to look: Along the stream corridor.

Wild Parsnip (*Pastinaca sativa*)

This plant is closely related to Giant Hogweed and can also produce burns, though not as severe. It grows in open fields, and spreads rapidly once established. It can become the dominant vegetation, displacing native plants such as goldenrods and grasses. Mowing after the plant has set seed can facilitate dispersal, exacerbating and spreading an infestation.

Where to look: Open areas, including the meadow and wetland habitats within the Cow Pasture, and at the Maplewood Avenue entrance.

Hardy Kiwi (*Actinidia arguda*)

This twining, woody vine can germinate and grow under a closed canopy, and each vine can grow over 20 feet per year. It climbs on other vegetation, forming mats so dense that they kill the host trees. The mats cannot handle the weight of ice and snow, causing the limbs and trunks that support them to snap. As the trees die, the vines continue to spread into adjacent areas, completely altering wide expanses of forest. As its name suggests, the vine can tolerate extremely cold temperatures. The plant has been promoted as a crop because of its edible fruits and hardiness. In addition to EDRR, education is needed to inform local gardeners about the threat and assist them in identifying alternatives.

Where to look: Along forest edges, especially near the Maplewood Avenue entrance, and along the main trails.

Glossy Buckthorn (*Frangula alnus*)

Like common buckthorn, glossy buckthorn forms dense thickets in woodlands and open areas, and displaces native vegetation. The berries are eaten by birds and mammals, who disperse the seeds; however, the berries contain a natural laxative that prevents the animals from fully digesting them, and therefore does not provide them with the nutrition they need. Common buckthorn tends to be limited to upland habitats, while glossy buckthorn tolerates wet soils. It has become a problem in sensitive wetland ecosystems, and is also found in various upland habitat types.

Where to look: Along trails, especially the main trails, the stone wall trail and entrance into the Perrin land, and the trail leading to Route 14/Hope Cemetery. Also, around the Maplewood Ave. entrance and in the wetland.

Japanese Knotweed (*Polygonum cuspidatum*)

This plant forms dense, nearly impenetrable thickets that displace native vegetation and alter habitat structure. It grows along riverbanks and in floodplains, and its root system is less able to stabilize the soil than native plant communities. It can reproduce from fragments of the rhizome or stem, which can be transported downstream to infest new areas. It can also be transported on equipment used for forest management or trail construction activities.

Where to look: Along the stream corridor, and in any areas where equipment has been used for forest management or trail construction.

Japanese Stiltgrass (*Microstegium vimineum*)

This grass is shade-tolerant, and can form dense patches on the forest floor underneath a closed canopy. It also grows in open fields, woodlands, and wetlands. By covering the forest floor, the plant interferes with forest regeneration and reduces the habitat quality for ground-nesting birds. Where they are abundant, white-tailed deer may facilitate invasion by feeding on native plants instead of the stiltgrass. The seeds remain viable in the soil for 3-5 years, and can be transported on footwear.

Where to look: At trailheads and along trails, especially the well-traveled main trails.

Multiflora Rose (*Rosa multiflora*)

This thorny shrub forms impenetrable thickets that displace native vegetation. Once established, this plant is very difficult to control and requires long-term management. It tolerates shade, allowing it to thrive in a wide range of habitat types (dense forests, woodlands, open fields, streambanks, roadsides). Its arching canes can take root when they reach the ground and form new plants, and its seeds remain viable for 10-20 years.

Where to look: Because this plant is dispersed by birds and can grow in almost any habitat type, it could turn up almost anywhere within the Cow Pasture. The most likely places are near the Perrin land, in the open meadow and shrub thicket areas in the center of the Cow Pasture and near the wetland, along forest edges bordering the main trails, at the trailhead on Route 14 across from Hope Cemetery, and around the Maplewood Ave. entrance.

Purple Loosestrife (*Lythrum salicaria*)

Purple loosestrife grows in wetlands, and displaces native sedges and other wetland vegetation. Wetlands provide numerous important functions that benefit humans and the environment, including water storage and flood control, water quality protection, and erosion control. Some plants and animals can only live in wetland habitat, and invasive plants threaten their populations. Purple loosestrife may look beautiful (like many NNIS, it was originally introduced as an ornamental plant), but it threatens all of these important wetland functions and values. Each plant can produce up to 1 million seeds, 97% of which are viable; this allows it to spread extremely quickly and overtake native plant communities.

Where to look: In the wetland and along the stream corridor.

Wild Chervil (*Anthriscus sylvestris*)

This herbaceous plant is closely related to giant hogweed and wild parsnip, and also produces a light-sensitive sap that causes burns on the skin. The plant spreads extremely quickly; it produces abundant seeds that are dispersed by wind, animals, and on mowers and other equipment, and it reproduces vegetatively by producing 5-10 crowns per plant. It grows in open meadows and pastures, and displaces native grasses and wildflowers. It also grows along roadsides and trails. Wild chervil is extremely difficult to control once it has become established. The best solution is to catch it before that happens through EDRR.

Where to look: Trailheads, especially around the Maplewood Ave. entrance, and in the open meadow and wetland habitats within the Cow Pasture. Also, any areas where mowers or other equipment have been used. *All equipment should be cleaned before and after transporting to new areas.*

Yellow Iris (*Iris pseudocorus*)

This plant produces attractive yellow flowers, similar in form to our native blue flag iris. It grows along waterways and in wetlands, and its roots and rhizomes create a dense mat that excludes other plants.

Where to look: Along the stream corridor where the terrain is fairly level, and in the wetland.

Appendix 3: Forest Stand Descriptions

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 3: 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.