Rural Road Resilient Right-of-Ways Vegetation Assessment

Town of East Montpelier Action Items and Recommendations
Prepared by Joanne Garton, Vermont Urban & Community Forestry Program
Draft dated Dec. 28, 2018
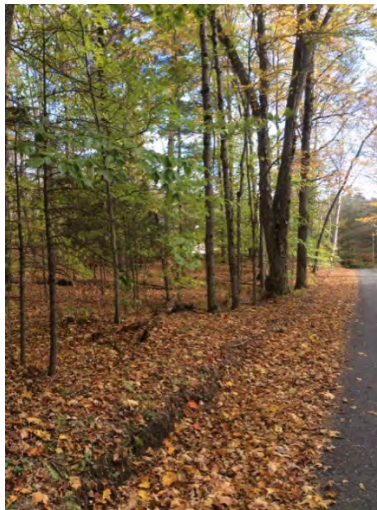Final dated December 30, 2019

FORESTS, PARKS & RECREATION
VERMONT
AGENCY OF NATURAL RESOURCES

PLANT LIVE GROW
VERMONT URBAN & COMMUNITY FORESTRY PROGRAM

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

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Introduction

Although strange in shape and character, roadsides are our public places. Most town right-of-ways span 49.5 feet, or just under 25 feet from the center of the road in each direction. While some roads and their associated cleared zones (ditched or repeatedly cleared areas next to the road) span almost the entire right-of-way width, others are narrow and forested, creating canopy from trees in 12-foot wide strips of publicly managed land.

While many of us never picture picnicking in these bands of trees, shrubs, grasses or even wetlands, we look at them all the time. Driving, bicycling, or walking by, we take in what they are, and as a community, what we have decided our roadsides should be. Some rural roadsides afford beautiful mountain views, others feature century-old maples. Many are a collection of stick-thin trees and shrubs competing for light in what used to be another New England pasture.

Management of town roads is at the discretion of individual road foremen and their partnering selectboards. As such, it is no surprise that towns handle their municipal right-of-ways differently from each other. Some prioritize safe passage at high speeds on only their main thoroughfares while keeping small, residential roads narrow and with low speed limits. Other towns recognize the increasing width of their road machinery and the corresponding infrastructure and turning radius needs the road crew requires. Roads become wider, straighter, and allow faster traffic – characteristics that some residents enjoy, and others resent.

Statewide, towns are becoming more cognizant of stormwater runoff and the role that backroads play in contributing phosphorous and sediment to streams, rivers, lakes and ponds. Backroad repairs often include (sometimes by regulation) ditching, stone work (stone-line ditches, check dams, or stone turn outs), grass-lining or hydroseeding, and culvert repair or replacement. These often come at the expense of roadside trees whose branches, roots, or trunks lie in the way of road infrastructure or are damaged beyond repair during infrastructure improvements. Towns must accept where some roads must lose their tight, shaded rural character in favor of clean water and safe passage, and advocate for roads that can effectively utilize healthy vegetation as green stormwater infrastructure to slow erosion and improve stormwater infiltration. They must also think creatively about where other roads can retain, or restore, their rural character over the long term.

Rural roadside vegetation shapes our towns. It shades our backroads, livens our landscapes, and grows character in our front yards. Planning for healthy and safe vegetation is a cyclical process – thoughtful vegetation growth and maintenance practices reduce knee-jerk reactions to road-tree conflicts and consider both seasonal changes and emergency responses. Additionally, good communication among town selectboard members, road crews, and residents encourages a long-term vision for municipal roads that incorporates short-term changes or setbacks. With this planning, communication, and overarching vision, towns have the capacity to grow utility, beauty, safety and resilience along their roadsides.

1. **Right-of-Way Vegetation Type**

   Displays all planned routes and plot locations recorded during in the Resilient Right-of-Ways field work. Vegetation in the ROW (not on adjacent private land) is each plot is categorized as:

   - <u>Mature Overstory</u>: A tree-lined or forested roadside with overstory composed of mostly mature trees of greater than 6" diameter (at breast height, also called "DBH").
   - <u>Immature Overstory</u>: A tree-lined or forested roadside with overstory composed of mostly immature trees of less than 6" diameter (at breast height, also called "DBH").
   - <u>Emerging Overstory</u>: A shrub or sapling-lined road that exhibits stages of an early forest but does not yet exhibit canopy that shades the road.
   - <u>Wet Area</u>: The ROW itself is a wet ditch, wetland, riparian zone or vegetated lake edge.
   - <u>Mowed</u>: The ROW is either frequently or seasonally mowed.
   - <u>Street Trees</u>: Intentionally planted trees are within the ROW and are surrounded by an established herbaceous layer, mowed grass, or predominantly bare ground.
   - <u>Bare</u>: There is no, or extremely little, vegetation in the ROW and exhibits bare soil or a stone-lined ditch that occupies up the entire ROW not travelled by vehicles.

2. **Manageable Vegetation Width**

   Displays the width of vegetation within the ROW that the town can manage.
   Ranked as <5' wide, 5-10' wide, 10-15', more than 15'.

3. **Roadside Ash Impact**

   Displays the approximate percentage of canopy-level ash trees that, if infested with EAB, would affect the ROW when damaged or dead. Ash trees included in this count are at least 4" diameter (DBH) within the assessed plot ROW, and within an adjacent area (private land) that would fall on the road if diseased or dying.

4. **Agriculture in the Right-of-Way**

   Displays locations where any agriculture occurs within the ROW, including hay and corn fields, animal grazing locations, or other harvestable land uses.

5. **Overhead Utility & Regeneration Opportunity**

   Displays locations where an overhead utility line is within, or affecting, the ROW vegetation. Also noted are locations where the town can consider promoting regeneration of vegetation within the guidelines of the utility company.

6. **Hedgerow Locations**

   Displays locations where trees or emerging forest are part of a hedgerow, here defined as a thin strip of forest existing bordering an agricultural field, lawn, residential areas, or water body.

7. **Softwood Cover**

   Displays locations where tree canopy cover over the road is greater than or less than 25% of all canopy cover.

8. **Overstory Health & Mechanical Damage**

   This map displays co-locations rated with "fair" or "poor" general ROW overstory health (as noted through visual inspection) and "high" or "low" mechanical damage (usually due to plow, mower or vehicle collisions with trees, flail mowing on branches, or excessive root damage from recent ditching). Trees in these locations are in decline and may be monitored by the town.

9. **Historic Tree Location & Health**

   Displays the location and health of historic trees within assessed plots. Historic trees were identified based on their distinctly larger size and shape than surrounding trees (or herbaceous cover) and often by their consistent spacing along roadsides. Historic tree health, rated as either "good", "fair", or "poor", was based on a visual assessment of the trunk and canopy.

10. **Invasive Plant Species (Data Source: iNaturalist)**

    During field assessments, observations of invasive plant species were recorded on iNaturalist[1], a citizen science data collection application. This map displays data about invasive plant species locations as noted by the Resilient ROW project and other iNaturalist users.

11. **Preservation Opportunities**

    While conducting field assessments, the Resilient ROW team made recommendations regarding opportunities to preserve existing vegetation, including "No cut" recommendations where trees should remain (often for the purposes of controlling erosion on slopes) and "Preserve herbaceous buffer" where grasses, herbaceous plants, or low shrubs should not be cleared.

12. **Planting & Regeneration Opportunities in Roadside Communities**

    Displays the land use or landscape of the private land immediately adjacent to the ROW. Classification options are listed in the map legend. Overlaid on this map are recommendations made in the field for:

    - planting opportunities in or near the ROW ("trees" or "other" vegetation, likely shrubs), noting that any planting out of the ROW requires dialog with, and permission from, the private landowner; and
    - opportunities to promote regeneration of vegetation through reduced mowing or other forestry practices that encourage resilient tree growth.

13. **Thinning Opportunities and Mature Short-lived Trees**

    Displays locations where tree removal may encourage growth of selected trees through reduction of competition from less desirable or healthy species. Also displays location of some mature, short-lived trees (such as paper birch or poplars), informing where trees may create a risk to road safety and may be removed individually or when doing other roadwork in the area. There are likely many more mature, short-lived trees in East Montpelier than those in the assessed plot locations.

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[1] More on iNaturalist can be found at https://www.inaturalist.org/.

Resilient Right-of-Ways Project Overview

In the summer of 2017, the town of East Montpelier agreed to work with the Vermont Urban & Community Forestry program as a case study town in the Rural Roads Resilient Right-of-Ways (ROW) project (See Appendix A: Letter of Collaboration). Funded by the US Forest Service, this project has two broad goals:

1. to connect ten Vermont communities with resources that advance understanding of the role of rural roadside vegetation in supporting local environmental, economic, and cultural values; and

2. to use the collected data and feedback from towns to create updated educational material and technical assistance surrounding rural road vegetation management.

The town of East Montpelier formed a Resilient ROW project advisory committee made up of individuals knowledgeable about, and invested in, the future of healthy and resilient roadside vegetation communities. Members of the committee are:

Jeff Cueto
Paul Cate, Tree Warden
Ken Feld
Seth Gardner [note as of 12/30/2019 – Seth no longer serves on the Resilient ROW committee]
Mark Lane
Jack Pauly
Guthrie Perry, Road Foreman
Jean Vissering
Carl Etnier [joined the committee in 2019]

The project advisory committee met on August 8, 2017 to identify priority concerns along town roads and ask key questions about roadside vegetation best practices, threats, risks and relevant legal statutes. The resulting work plan in included in Appendix B: Work Plan. **Project field work collected data that documented common roadside vegetation scenarios in East Montpelier, revealed where conflicting interests may arise, and led to suggestions regarding direct action that the town can take to protect, manage, or restore site-appropriate trees, shrubs, and grasses.** On January 16, 2018, the committee met again to review results of the data collection (as presented in Appendix C: Field Data Results, draft presentation). On May 7, 2018, the committee met on Murray Road to review field recommendations with FPR watershed forester Dave Wilcox, Vermont Department of Environmental Conservation Municipal Roads Program lead Jim Ryan, and Vermont Agency of Transport Better Roads program technician Alan May. The group discussed best practices for roadside vegetation including tree selection and thinning, ditching and road erosion mitigation techniques, and assistance available to towns to meet requirements set in the Municipal Roads General Permit.

Roadside vegetation assessments occurred in late September and October of 2017. Field routes covered approximately 23.5 miles of the 51 miles of unpaved roads in East Montpelier. On unpaved backroads, Joanne Garton (project lead) assessed 100-foot long roadside vegetation plots on both the left and right sides of the road as travelled south-to-north and west-to-east. Data was recorded using the ESRI ArcCollector app and stored in the Agency of Natural Resources ESRI account. Selected plots conveyed a typical representation of the roadside environment at or near that quarter-mile marker. Itemized data fields are outlined in the Town of East Montpelier Work Plan (Appendix B). The assessed routes are drawn in red on Maps 1 through 13. All plot locations are displayed on Map 1: Right-of-Way Vegetation Type.

Process Recommendations

So much of road maintenance is guided by the overarching process that the town develops to meet its roadside maintenance goals within its budget. Recognize that vegetation is a pervasive part of road maintenance activities and that clarifying the processes you use to manage roadside vegetation will lead to functional, thoughtful right-of-ways.

1. Promote diversity of species, age, structure and density

Roadside forests are not your normal forest. Stressed by vehicle traffic, snow plows, mowers, road maintenance equipment, trash, pedestrians, and cyclists, vegetation in the ROW is in a state of perpetual disturbance.

Roadsides are largely unnatural – that is, they feature engineered topography and non-standard plant communities. Restoring roadsides to their most natural state, particularly after construction, promotes greater longevity of native plant species and resilience to typical disturbances.

Roadsides can provide strips of habitat for some species, although generally as temporary cover or food sources rather than as breeding or nesting sites. Some species continue to thrive in the edge habitat created by roadside vegetation, particularly if this vegetation acts as an ecological community not common throughout the region. However, not all wildlife are welcome along rural roads. Many early successional species (birch *Betula spp.,* poplar *Populus spp.* and willow *Salix spp.)* that persist in the continuously disrupted forest edge along roadsides are actually palatable browse for wildlife such as moose. Naturally, safety concerns of road users must be balanced with the risks presented through maintaining roads in rural areas.

Recommendations

- Be intentional about vegetation clearing. Understand that any vegetation regrowth will be all of the same age (called even-age) and, at least initially, will lack the structural diversity that keeps roadsides forests healthy.
- Establish native vegetation in cleared areas, including where invasive plants have been removed. Consider using native seed mixes when planting grass in disturbed roadside areas.
- Consider wildflower mixes along some portions of East Montpelier's scenic roads.
- Understand how trees and other vegetation play a role in controlling erosion and protecting water quality. Understand your town's road erosion risks and the new Municipal Roads General Permit[2]. Review the updated recommendations in the Better Roads Manual[3] (January 2019) and look for places where clean water goals can be met through carefully balanced construction and vegetation preservation.

2. Prepare for emerald ash borer and manage ash tree health

Emerald ash borer (EAB), an invasive beetle that eats and kills all species of ash in North America, was first detected in Vermont in February of 2018. In central Vermont, the insect has been confirmed in Montpelier, Plainfield, Orange, Berlin and Barretown, all near East Montpelier. All Vermont towns are

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[2] Municipal Roads Program. Vermont Department of Environmental Conservation. https://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/municipal-roads-program
[3] Vermont Better Backroads Manual, January 2019: https://vtrans.vermont.gov/sites/aot/files/highway/documents/ltf/Better%20Roads%20Manual%20Final%202019.pdf

encouraged to prepare and manage the impacts of EAB and the upcoming loss of ash trees -- East Montpelier is of particular concern for planning.

A preliminary survey of ash tree counts along East Montpelier's rural roads show that ash trees are common in roadside communities but are dense only in some area (for example, along Guyette Road near Hammett Hill). During a spring 2018 survey of East Montpelier roads by Vermont Forests, Parks and Recreation staff, no signs of EAB were detected. However, the likelihood that EAB is present in East Montpelier remains high. Once present, EAB kills 99% of ash trees (if not chemically treated), including those along public roads.

Recommendations

- East Montpelier is currently within close proximity to the known infested areas[4] in Vermont. Parts of East Montpelier are in the high-risk area. East Montpelier should be preparing for action regarding EAB management.
- Complete an ash inventory and an EAB Management Plan as described on the Vermont Urban & Community Forestry website. Use Map 3: Roadside Ash Impact as a preliminary guide for your ash tree inventory. [Note dated 12/20/2019: East Montpelier finished this task in 2019].
- Apply for an EAB Municipal Planning Grant[5] to help you complete these inventories or plans. Applications are due January 31, 2019. Steve Sinclair, retired Director of Forests and East Montpelier resident, may be able to assist you with this application. [Note dated 12/20/2019: East Montpelier applied for, and received, this grant for $2000. East Montpelier is applying for a $15,000 EAB Management Grant from Vermont UCF due in January 2020.]
- Review the Urban & Community Forestry Program's other on-line resources[6] regarding EAB management.

3. Address hazard trees with the tree warden

East Montpelier's current tree warden, Paul Cate, serves as an advocate for trees in the town's public places and right-of-ways, and as a resource for citizens wanting to know more about when to remove, plant, or treat public trees. One of the most important duties of the tree warden in any town is to address public safety concerns resulting from roadside vegetation. Remember that in order for a tree to be considered a *hazard* tree by the tree warden and be removed without a hearing, the tree itself must be a hazard, not its placement. If a roadside tree is close to the road edge but not damaged or infected, it cannot be deemed a hazard tree by the tree warden.

During the legislative session of 2018, Vermont FPR participated in introducing new legislation that would modernize Vermont's tree warden statues[7]. However, the draft bill did not advance as an official bill and was not considered further that year. As such, the original Vermont Tree Warden Statutes[8]

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[4] Emerald Ash Borer Infested Area in Vermont, Vermont Agency of Natural Resources.
http://vtanr.maps.arcgis.com/apps/PublicInformation/index.html?appid=cfda013ad1464b7b9103a3d7806f0cc5
[5] EAB Municipal Planning Grants on the Vermont Urban & Community Forestry website:
https://vtcommunityforestry.org/community/story/eab-municipal-planning-grants
[6] Emerald Ash Borer Management on the Vermont Urban & Community Forestry Webpage:
https://vtcommunityforestry.org/community-planning/tree-pests
[7] Proposed Tree Warden Statutes Amendments. Vermont Urban & Community Forestry Program.
https://vtcommunityforestry.org/resources/vermont-tree-wardens-0/proposed-tree-warden-statutes-amendments
[8] Vermont Tree Warden Statutes. Title 24, Chapter 033.
http://vtcommunityforestry.org/sites/default/files/pictures/tree_warden_statutes-1.pdf

(last amended in 1969) still apply. They are included in this report in Appendix D: Selected Resources for Tree Wardens.

Recommendations

- Consider a yearly "look-up drive" conducted jointly by the tree warden and the road foreman during which all trees along town roads are observed via a drive-by assessment and view into the canopy. This will give the selectboard, conservation commission, and any interested landowners time to provide input on any hazard trees identified by the tree warden. The selectboard will also be able to allocate a budget for tree removal, ensure that road crew members are properly trained, or subcontract the tree removal work.
- Retain an updated map of hazard trees as identified by the road foreman and tree warden. This could be done on paper or electronically – the Vermont Urban & Community Forestry Program can help with electronic resources if desired.
- Consult the Vermont Urban & Community Forestry Program's Resources for Tree Wardens[9] webpage, including the Guidelines for Public Hearings for Tree Removals

4. Develop a tree ordinance or policy

Well-developed and active tree ordinances are effective tools to aid towns in attaining and supporting healthy and well-managed urban and community trees. When well-crafted, tree ordinances define ambiguous terms with language that reflects the goals and perspectives of each town. They clarify processes regarding tree planting, removal, and maintenance that act as a reference for the entire town, often reducing the number of circumstances requiring a public hearing. They can also address management of specific tree or plant species, including invasive species.

Tree wardens can remove hazardous trees in the ROW without a public hearing but they cannot remove or plant trees on private property. Some communities have enacted tree ordinances that give the municipality the authority to request that the landowner remove a hazard tree that could affect the public ROW. The ordinance can also specify that if the landowner does not remove the tree in a certain amount of time – for example, within 60 days – the municipality can remove the tree and seek payment from the landowner. Like any situation regarding private property and public safety, the town can work with the landowner to assess the level of risk posed by private property.

Recommendation:
- Review the existing tree warden statutes as listed in section 3.
- Learn more about tree ordinances[10] to determine if East Montpelier should develop its own tree ordinance or policy. If you choose to develop a tree ordinance, utilize the Guide to Tree Ordinances and Policies for Vermont Municipalities[11].

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[9] Resources for Tree Wardens. Vermont Urban & Community Forestry Program.
https://vtcommunityforestry.org/resources/vermont-tree-wardens-0/resources-tree-wardens
[10] Public Policy on Vermont Urban & Community Forestry website: https://vtcommunityforestry.org/resources/public-policy
[11] Guide to Tree Ordinances and Policies for Vermont Municipalities. Vermont Urban & Community Forestry Program.
https://vtcommunityforestry.org/sites/default/files/pictures/treeordinanceguide.pdf

5. Develop a mowing policy for the cleared zone

East Montpelier is already aware of its common roadside invasive plants: buckthorn, honeysuckle, Japanese knotweed, barberry, wild chervil, garlic mustard and hogweed. In East Montpelier, the prevalence of active agricultural fields, thin roadside hedgerows, and extensive forest edge creates a landscape prone to spreading invasive species. Roadside construction, maintenance and mowing can carry invasive plant seeds and fragments to other sections of roads. Developing a mowing policy in tandem with updated and improved mowing procedures can reduce the spread of invasive species along roadsides.

Recommendations

- Do not mow invasive plants after seeds have set. Knowing when invasive plants bloom will let you use mowing to your advantage to reduce the spread of invasive seeds. Follow the invasive plant phenology calendar below to learn when invasive plants bloom in East Montpelier.
- In particular, areas infested with wild chervil should be mowed **before the plants bolt and produce flowers (late May, early June)**. The plants are low at this time. Focus mowing on known infested areas to monitor changes over time and clean equipment before leaving infested areas. Wild chervil and poison parsnip will flower after again after mowing – repeat cutting before the plant seeds again to eradicate the plant population.
- Other common invasive species (buckthorn, honeysuckle) should be cut (or mowed) **before they go to seed in mid-July**. Treatment of these species may also include use of herbicide by a licensed pesticide applicator.
- Areas infested with phragmites, Japanese knotweed or purple loosestrife **should not be mowed**. Small root fragments easily resprout in new locations. Chemical treatment is almost always required to eradicate Japanese knotweed.
- **Beware of poison ivy.** It is technically not an invasive species but is certainly problematic for road crews, walkers, and bicyclists. And, it spreads. According to iNaturalist, some incidences of poison ivy have been recorded on Sodom Pond Road, Foster Road, Vincent Flats Road, Brazier Road, the southern portion of Clark Road and on the northern portion of County Road.
- Clean mowing equipment between road segments. Note where there are currently few invasive plant species (Map 9: Invasive Plant Species) and make sure that all mowing equipment is thoroughly cleaned before mowing, digging or ditching in these locations (northern portions of North Road, Horn of the Moon Road, portions of Sodom Pond Road).
- During construction, minimize soil disturbances to avoid future weed control and inspect and wash equipment before moving to another site.
- Consider allowing vegetation to be 10-12" high by the end of the growing season to protect native plants from winter damage[12].
- For more information on the management of specific invasive terrestrial plants, see the VTinvasives website at https://vtinvasives.org/gallery-of-terrestrial-plants.

CALENDAR OF COMMON INVASIVE PLANT SPECIES PHENOLOGY IN VERMONT

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[12] Best Practices Handbook for Roadside Vegetation Management. Minnesota Local Road Research Board. https://www.lrrb.org/pdf/200820.pdf

Name	Apr	May	Jun	Jul	Aug	Sep	Oct
Common barberry (*Berberis vulgaris*)		Flowering	Flowering	Seed Production	Seed Production	Seed Production	Seed Production
		Mow					
Common buckthorn (*Rhamnus cathartica*)		Flowering	Flowering	Seed Production	Seed Production	Seed Production	
		Mow					
Dame's rocket (*Hesperis matronalis*)		Flower & Seed Production	Flower & Seed Production	Flower & Seed Production	Flower & Seed Production		
		Mow	Mow				
Garlic Mustard (*Alliaria Petiolata*)		Flowering	Seed Production	Seed Production			
		Mow					
Glossy buckthorn (*Frangula alnus*)		Flowering	Flowering	Seed Production	Seed Production	Seed Production	Seed Production
		Mow	Mow				
Japanese barberry (*Barberis thunbergii*)	Flowering	Flowering	Flowering	Seed Production	Seed Production	Seed Production	Seed Production
		Mow					
Japanese knotweed (*Fallopia japonica*)					Flower & Seed Production	Flower & Seed Production	
		Mow	Mow	Mow	Mow		
Shrub honeysuckle (*Lonicera spp.*)		Flowering	Flowering	Seed Production	Seed Production	Seed Production	Seed Production
		Mow	Mow	Mow			
Wild chervil or Cow Parsley (*Anthriscus sylvestris*)		Flowering	Flowering	Seed Production	Seed Production		
		Mow	Mow				
Wild parsnip or poison parsnip (*Pastinaca sativa*)		Flowering	Flowering	Seed Production	Seed Production	Seed Production	
		Mow	Mow				

6. Understand the vegetation management goals of your utility companies

The East Montpelier town plan requires that utility companies do not interfere with the scenic quality and land value of towns. The town is served by two electrical utilities, Washington Electric Cooperative (WEC) and Green Mountain Power (GMP).

Recommendations

- Review the vegetation management plans of your local utility companies listed below. Consider if the town should enter into discussion regarding clearing practices in the right-of-way.
    - Green Mountain Power shares both a 2014 Integrated Vegetation Management Plan[13] and a 2013 Transmission Right-of-Way Management Plan[14].
    - Washington Electric Cooperative (WEC) shared their 2006 Vegetation Management Plan with the Vermont Urban & Community Forestry Program – it is included as Appendix E. Dan Weston of WEC also noted that the cooperative is in the process of developing a plan to manage for EAB along their routes. Note that single phase primary and/or secondary conductors are cleared of trees within 15 feet of each side of the pole line center. Three phase primary conductors are cleared within 25 feet each side of the pole line.

7. Understand updated stormwater regulations and standards

Backroad erosions is recognized as a non-point source of sediment and phosphorous pollution in Vermont's waterways. As part of the state's all-in approach to clean water, municipalities will need to complete a Road Stormwater Management Plan by December 31, 2020 that outlines a multi-year plan to correct drainage patterns along eroding roads that are hydrologically connected to streams, ponds,

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[13] The link to the Green Mountain Power 2014 Integrated Vegetation Management Plan is too long to print here. Use a search engine to search the specific title; you will then be able to download the document.

[14] Similarly, the link to the Green Mountain Power 2013 Transmission Right-of-Way Management Plan is too long to print here. Use a search engine to search the specific title; you will then be able to download the document.

and other water bodies. More information on the Municipal Roads General Permit[15] can be found on the Municipal Roads webpage[16] of the Vermont Department of Environmental Conservation.

However, trees and other vegetation play a role in controlling erosion and protecting water quality. Deciduous canopy cover can reduce rainfall intensity by 15-21%[17], coniferous canopy by 21-52%[18]. On rural roads, this translates into a reduced impact of water droplets on dusty roads and less erosive power of running water during rainfall events. Additionally, tree and plant root systems reinforce the shear strength of soil and extract water from the soil for plant growth, reducing soil erosion and its causes. Independent of social and cultural concerns surrounding the desire for or against roadside trees, towns will need to carefully consider whether road widening, straightening and/or ditching at the expense of existing vegetation is the best or most efficient way to reduce the effects of stormwater runoff.

There are many good strategies to direct surface runoff into existing vegetation while retaining trees and plants that may have taken years to establish. Some techniques include stone turnouts (as pictured below from the Better Roads Manual), the filling of incision ditches with gravel and stone armor (also pictured below), the installation of dry wells or French drains to capture or transport runoff, or the use of bioretention areas[19]. The new Town Road and Bridge Standards[20] (released June 2019) outline many construction standards that towns may choose to adopt to reduce stormwater runoff and improve the resiliency of town roads.
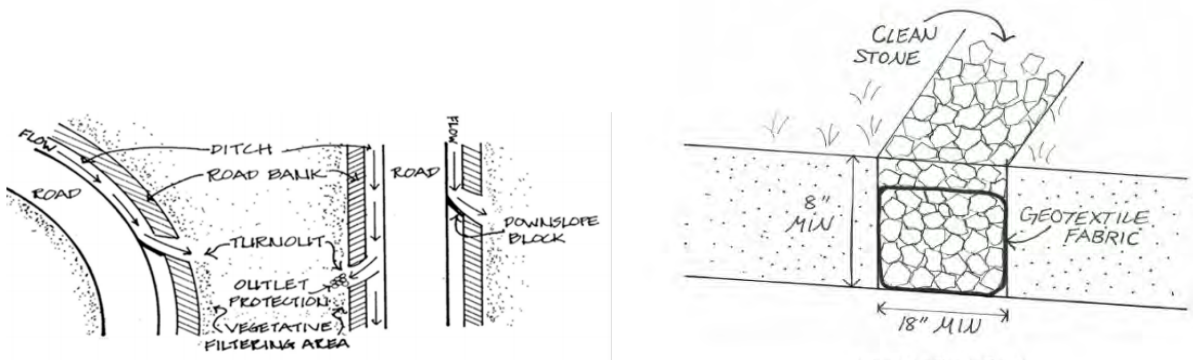
Stone Turnouts and Infiltration Trench. Drawing from p. 33 and p. 21 of the Vermont Better Backroads Manual, 2019. Stone turnouts direct water away from road edges into existing forest cover or other vegetation. Infiltration trenches catch runoff

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[15] Municipal Roads General Permit. https://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/Permitinformation/MunicipalRoads/sw_FinalMRGP.pdf
[16] Municipal Roads Program on the Vermont Department of Environmental Conservation webpage: https://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/municipal-roads-program.
[17] Trimble & Weitzman, 1954. Effect of a hardwood forest canopy on rainfall intensities as referenced in Give Me the Numbers: How Trees and Urban Forests Really Affect Stormwater Runoff. Eric Kuehler, USDA Forest Service. https://www.fs.fed.us/research/docs/webinars/urban-forests/give-me-the-numbers/UFCFeb2017_KuehlerSlides.pdf
[18] Keim and Skaugset, 2003. Modeling effects of forest canopies on slope stability. As referenced in Give Me the Numbers: How Trees and Urban Forests Really Affect Stormwater Runoff. Eric Kuehler, USDA Forest Service. https://www.fs.fed.us/research/docs/webinars/urban-forests/give-me-the-numbers/UFCFeb2017_KuehlerSlides.pdf
[19] The Vermont Rain Garden Manual. Winooski NRCD, UVM Extension, Lake Champlain Sea Grant. http://winooskinrcd.org/wp-content/uploads/VTRainGardenManual.pdf
[20] Town Road and Bridge Standards, Municipality of ___, Vermont (fillable form). Vermont Agency of Transportation, 2019. https://www.vlct.org/news/municipal-road-and-bridge-standards-summary

and allow infiltration before the water travels down the road surface. These trenches should be installed with a vegetative filter strip to reduce clogging of the trench.

The Municipal Roads General permit includes some **waivers** where standard permit regulations do not need to be met as prescribed. These include areas where roadside construction would impact significant environmental and historic resources (including historic landscapes) or landscapes or vegetation within 250 feet or a lakeshore. Review the updated recommendations in the [Better Roads Manual](#)[21] (January 2019) and look for places where clean water goals can be met through carefully balanced construction and vegetation preservation.

8. Maintain backroads and ditches to their specifications

From farmhouses surrounded with sugar maples-lined to pockets of deep woods, Vermont's unpaved roads take us through the unique areas of the state that make Vermont so attractive. While the view from the road changes around each bend, many of the elements of a good road should not. The crown, slope, radius of curves, mowed or cleared zone width, and even speed limits are based on the landscape of the road, the topography it covers, and the traffic it receives. Gravel road construction is an art and science in itself (see the [Vermont Better Roads Manual](#) and the [Vermont State Design Standards for Roads](#)[22] offer views of classic Vermont. Grader berms

- If ditching, an increase in line of site, or road widening is the most viable and effective option along a town road, design clearing to occur on only one side of the road, leaving as many mature trees and native plants as possible. Mature trees provide more stormwater reduction (20 ft^3 per tree) than newly planted trees (10 ft^3 per tree)[23].

- Ensure that clearing work occurs when invasive plants are not in seed and that soil containing invasive plant fragments is not moved to a site that is free of invasive plants.

- Once woody vegetation in a roadside ditch becomes large enough, it may begin to pose a safety or vision hazard to drivers. Brush hogging or mowing the ditch itself may be necessary to maintain the ditch shape or to access and replace the stone within a stone-lined ditch, but the backslope, or uphill slope next to a ditch, should not be cleared -- plant roots in this soil keep the slope in place. Additionally, examine what height of stone in a stone-lined ditch is necessary and revegetate any exposed slope above this minimum height.

- Remove grader berms. These mounds of gravel, dirt, leaves and sticks are left behind after the grader passes and ultimately impede the flow of stormwater into naturally vegetated areas.

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[21] Vermont Better Backroads Manual, January 2019:
https://vtrans.vermont.gov/sites/aot/files/highway/documents/ltf/Better%20Roads%20Manual%20Final%202019.pdf
[22] Vermont State Design Standards 1997. Vermont Agency of Transportation, 1997.
http://54.172.27.91/transportation/standards/VermontStateDesignStandards1997.pdf
[23] Stormwater Management Benefits of Trees. Stone Environmental, 2014.
https://vtcommunityforestry.org/sites/default/files/pictures/waterqualitytreebenefits.pdf
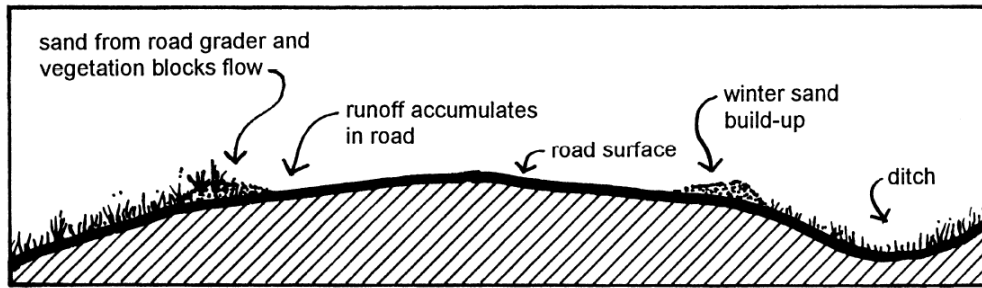
Image from the Gravel Road Maintenance Manual, 2016.
https://www.maine.gov/dep/land/watershed/camp/road/gravel_road_manual.pdf

- Consult the Vermont State Design Standards for minimum widths of lanes and shoulders for Rural Local Roads, including Table 6.3 from the Standards pictured below. Consider carefully if or why a backroad should have a width greater than the minimum before proceeding to widen a road beyond the designed minimum width.

Table 6.3

Minimum Width of Lanes And Shoulders

for Rural Local Roads

Design Traffic Volume	ADT(a) 0-25	ADT 25-50	ADT 50-100	ADT 100-400	ADT 400-1500	ADT 1500-2000	ADT Over 2000
Design Speed (mph)	Width of Lane/Shoulder (ft)						
25	7/0	8/0	9/0	9/2	9/2	10/3	11/3
30	7/0	8/0	9/0	9/2	9/2	10/3	11/3
35	7/0	8/0	9/0	9/2	9/2	10/3	11/3
40	7/0	8/0	9/2	9/2	9/2	10/3	11/3
45	—	—	9/2	9/2	9/2	10/3	11/3
50	—	—	9/2	9/2	10/2	10/3	11/3

(a) Minimum width of 8/0 whenever there is guard rail.

9. Create and maintain a public relations plan

Although the road foreman, road crew, and town Selectboard make many of the decisions regarding road and roadside vegetation maintenance, all people in a town can play a role in deciding how funds are used to manage and maintain their town roads. Raising public awareness about roadside maintenance will help road crews interact positively with the public while conducting roadwork, mowing, pruning, tree clearing, or erosion control.

A successful public relations plan will also outline appropriate channels for submitting and responding to complaints from adjacent landowners and road users. Public hearings surrounding tree removal are one method to manage expectations about roadside canopy. Additionally, a public relations plan should outline how road crews, town officials, and local residents should respond to a crisis such as a downed tree, fuel spill, or road washout.

Lastly, a public relations plan can outline the town's media relations and expected channels of communication regarding upcoming roadwork, dust control, mowing, tree clearing, and other roadside vegetation initiatives. Local media can help share information about reducing the spread of invasive plants, managing ash trees and monitoring for EAB, and identification of both positive and problematic roadside scenarios.

10. Keep abreast of funding opportunities

Grants to support water quality improvements, vegetation planning, road maintenance that benefits water quality, and community and commerce development may benefit Johnson as it moves forward with vegetation planning in public spaces, including in the road right-of-way. Below is a list of key grants that may be available to Johnson, particularly if it has a roadside vegetation plan already in place. To stay current on grant opportunities, subscribe to the Clean Water Grant Opportunities Notification List[24].

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[24] Subscription form for the Vermont Clean Water Grant Opportunities newsletter, Vermont Department of Environmental Conservation: https://us11.list-manage.com/subscribe?u=c6b92b591e58d2c3dcd90daf6&id=78ab4a4b2e.

KEY GRANTS TO SUPPORT MUNICIPALITIES
ROADSIDE VEGETATION MANAGEMENT, ROAD EROSION CONTROL & WATER QUALITY INITIATIVES

VERMONT AGENCY OF NATURAL RESOURCES

GRANT PROGRAM	DESCRIPTION	FUNDING DETAILS	DUE DATE
Caring for the Canopy	Support the development of sustainable urban and community forestry programs at the local level. Grants are currently focused on emerald ash borer municipal planning	Awards change each year. 2020 awardees will receive $1,000 - $5,000 in cost-share grant money.	Annually, January
Vermont Watershed Grant	Support water-related projects that protect or restore fish and wildlife habitats, protect or restore water quality, and shorelines, reduce phosphorus loading and/or sedimentation, enhance recreational use and enjoyment, identify and protect historic and cultural resources; educate people about watershed resources, or monitor fish and wildlife populations and/or water quality.	Awards made up to $10,000, depending on project category type. Category types and the maximum grant amount for each project category type are as follows: • Education and outreach – up to $5,000 • Planning, assessment, inventory, monitoring – up to $3,500 • On-the-ground implementation – up to $10,000	Annually, February
Ecosystem Restoration Program	Design and construction of water pollution abatement and control projects that target nonpoint sources of pollution, including stormwater management, natural resources restoration, road erosion control, and municipal capital equipment projects	Match Requirement: 50% for MS4 stormwater/road projects Capital equipment projects: 50% for large towns (> 5,000 residents) 20% for small towns (< 5,000 residents) Non-MS4/capital equipment projects	Annually, January
Clean Water Initiative Program Grant Opportunities	Construction of clean water improvement projects, administered by statewide partner(s), including stormwater management and natural resources restoration projects	Funding changes annually and depends on the grant in question.	Rolling

VERMONT AGENCY OF TRANSPORTATION

GRANT PROGRAM	DESCRIPTION	FUNDING DETAILS	DUE DATE
Municipal Highway and Stormwater Mitigation	Environmental mitigation activities, including stormwater and water pollution prevention, management, and control related to highway construction or highway runoff	Max. Award: N/A Match Requirement: 20% local	Annually, late summer

GRANT PROGRAM	DESCRIPTION	FUNDING DETAILS	DUE DATE
Better Roads	Municipal roadway improvements that benefit water quality: • Inventories of roadway erosion and/or stormwater management issues and capital budget planning (Category A) • Correction of road related erosion and/or construction of stormwater management projects (Category B) • Correction of streambank and/or slope related problems (Category C) • Roadway structures and culvert upgrades (Category D)	Max. Award: Category A: $8,000 Category B: $20,000 Category C: $40,000 Category D: $40,000 Match Requirement: 20% local	Annually, November or December
Transportation Alternatives Program	• Includes environmental mitigation activities such as stormwater and water pollution prevention, management, and control related to highway construction or highway runoff	Maximum Award: $300,000 Match Requirement: 20% for scoping, design and construction	Annually, fall
VERMONT AGENCY OF COMMERCE AND COMMUNITY DEVELOPMENT			
GRANT PROGRAM	**DESCRIPTION**	**FUNDING DETAILS**	**DUE DATE**
Municipal Planning Grant	Encourages and supports planning and revitalization for local municipalities in Vermont. Since 1998, the MPG program has provided over $12 million to 234 cities and towns across Vermont to help breathe new life into communities, plan for future growth and development, and improve the quality of life.	Maximum Award: $35,000 in 2019 Match Requirement: 10% local	Annually, October
Downtown Transportation Fund	Funds transportation-related capital improvements within or serving a designated downtown district. Past projects include parking facilities, pedestrian and streetscape improvements and utility relocation. New this year – the DTF has clean water funds to support green stormwater infrastructure improvements in coordination with the transportation project.	Maximum Award: $100,000 in 2019 Match Requirement: 50%	Annually, March
Better Connections	A partnership between ACCD and AOT, this grant supports and guides local investments in transportation options through a wide array of planning activities including, downtown and village center master plans, corridor plans and innovative guidelines and bylaws. For a complete list of current and past projects, visit the program's **story map**.	Match Requirement: 10% local	Annually, January
OTHER GRANTING ORGANIZATIONS			
GRANT PROGRAM	**DESCRIPTION**	**FUNDING DETAILS**	**DUE DATE**
Vermont Community Foundation	The scope of grants managed by the Vermont Community Foundation vary by location. See their website for current available grants.	See applicable grant application.	

Roadside Scenarios and Opportunities for Action

The following locations highlight road segments where the town of East Montpelier may consider new or targeted roadside vegetation management. The list of locations is not exclusive or exhaustive – you may find similar roadside scenarios in other parts of town or other scenarios that are not mentioned below. The five scenarios described below discuss an Ash-lined Rural Residential Road (#1), a road with Declining Trees and Creeping Invasive Species (#2), a Farmed Right-of-Way (#3), a Roadside Lawn (#4) and an Unintentional Hedgerow (#5).

1. Ash-lined Rural Residential Road: Sparrow Farm Road near Jacobs Road

Relevant Maps

> 3. Roadside Ash impact
> 10. Invasive Plant Species
> 12. Planting & Regeneration Opportunities

Opportunities

- The high ash density along this section of road may act as a showcase options for ROW vegetation management in the face of EAB and ash tree decline.
- The nature of the ROW vegetation as hedgerows allows for focused efforts to control invasive species neighboring frequently or seasonally mowed areas (lawn or hay fields).

Issues of Concern

- Ash tree death will create safety hazards and will cost money to manage.
- The roadside will change in character, becoming open on the south side. Town residents and the neighboring landowner will have to carefully consider if this change should be permanent or if future tree planting is warranted.
- Wild chervil (*Anthriscus sylvestris*) was detected along portions of Sparrow Farm Road and Jacobs Road.

Recommendations

- Plan to manage ash along this road as part of a town-wide EAB Management Plan. Consider how to remove dead trees or select trees for treatment. Plan to use ash wood locally.
- Work with the neighboring landowner or farmer to anticipate the removal of roadside ash trees. Note the timing of invasive plant flowering and seed set when planning tree removal work.
- Plant trees to improve roadside canopy, reduce road erosion, protect water quality, and increase landowner privacy. The Urban & Community Forestry Program has several examples (from both in-state and out-of-state) of partnership documents between towns and private landowners that arrange funding and care of planted trees planted where ROW planting alone is challenging.
- Monitor the site for invasive plants – some invasive plants (such as chervil) can be pulled from the root during the spring.

Roadside Scenario 1: **Ash-lined Rural Residential Road**

Sparrow Farm Road near the inter   obs Road

Sparrow Farm Road looking west. Trees in this narrow stretch of forested right-of-way are almost en   ely ash.

South side of Sparrow Farm Road looking east towards Jacob Road.

Aerial image of Sparrow Farm Road. Dominant ash cover highlighted in yellow oval. Other scenarios similar to this may exist at several loca   ast Montpelier, such as
e e Road, Brazier Road, and North Street.

2. Declining Trees and Creeping Invasive Species: **North Street** between Montpelier town line and Cummings Road

Relevant Maps

3. Roadside Ash impact
8. Overstory Health & Mechanical Damage
9. Historic Tree Location & Health
13. Opportunities for Thinning

Opportunities

- This highly travelled and populated road offers opportunities for citizen scientists to watch for invasive plants and monitor their spread.
- Two relatively large parcels of land along this section of road may provide opportunity to partner with landowners on a larger scale to encourage resilient roadside vegetation. Smaller landowners may follow suit.

Issues of Concern

- Some portions of the road exhibit medium to high density of ash trees in narrow hedgerow forests. After EAB kills the vast majority of roadside ash, canopy cover from the hedgerow will decrease and invasive plants will have more sunlight and space to grow, crowding out native seedlings and saplings.
- Poor canopy health in some locations is coupled with high mechanical damage from vehicles and road maintenance equipment.
- Some historic trees near the intersection of Cummings Road and North Street are in poor health.
- A utility line crosses the road diagonally, affecting some vegetation in the ROW.

Recommendations

- As in Scenario #1, plan to manage ash along this road as part of a town-wide EAB Management Plan. Consider how to remove dead trees or select trees for treatment. Plan to use ash wood locally.
- Utilize the expertise of the tree warden or another urban forester to plan for targeted and thoughtful tree pruning and/or removal.
- Follow all BMPs related to roadside invasive plants, making sure to clean equipment before and after roadside work. The "Best Management Practices for Roadside Invasive Plants" from the Nature Conservancy is included in this report in Appendix F.
- Utilize best management practices outlined in the recently updated [Better Roads Manual](#)[25] to direct surface runoff off the road in either directed outlets or through ditching that may extend into the existing travel lane. Recommendations about construction of turnouts is included in the Better Roads Manual on page 33.
- Work with utility company that maintains this road to understand their clearing rotation. Identify where town and utility company priorities overlap. Preserve some structurally sound

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[25] Better Backroads Manual. Northern Vermont & George D. Aiken Resource Conservation and Development Councils, updated January 2019.
https://vtrans.vermont.gov/sites/aot/files/highway/documents/ltf/Better%20Roads%20Manual%20Final%202019.pdf

Roadside Scenario 2: **Declining Trees (Including Ash) & Creeping Invasive Species**
North Street near the inter   oad

High numbers of ash trees along
                    eet will be killed
by emerald ash borer, opening the
canopy for invasive species, reducing
privacy for neighboring landowners,
and educing the soil-holding capacity
of roadside vegeta

West side of North Street looking north near
inter   oad.

East side of North Street looking north,
south of Cummings Road.
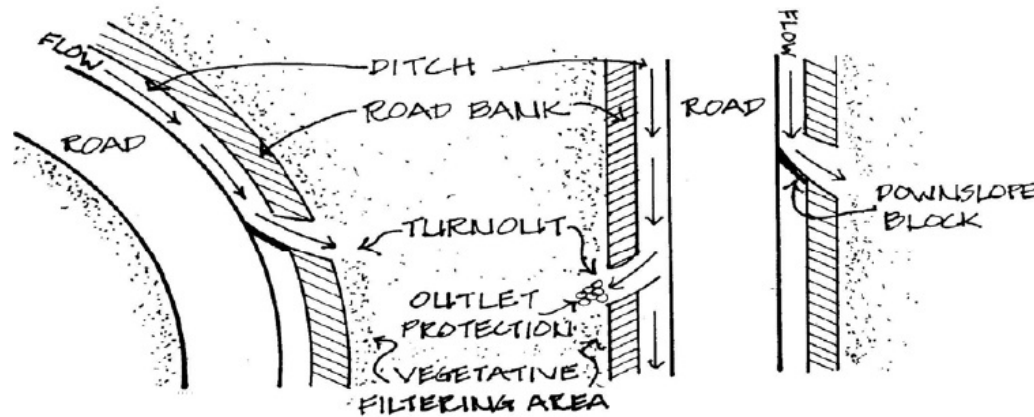
Stone Turnouts. Drawing
from p. 33 of the Vermont
Be er Backroads Manual,
2019. Consider both stone
turnouts and stone-lined
ditches when managing
r   , road erosion,
and roadside vegeta

trees near utility lines, including woody shrubs and small trees such as dogwoods or hophornbeam. Ensure that site-lines remain clear as understory become dense.

- Consider planting along this roadside, particularly where private landowners are willing to partner in the effort. Consult with the Urban & Community Forestry Program for examples of this type of public/private collaboration.

3. Farmed Right-of-Way: Snow Hill Road near Kelton Road

In many towns, agricultural activities or residential footprints often extend into the municipal right-of-way. Corn, hay, or even livestock sometimes extend to within a few feet of the road, likely as result of a historical precedent or a handshake agreement between the landowner and the town

Any person considering alteration of current land use must certainly consider the relationship of the town's governing board with its private landowners (a.k.a. its constituents) and reflect on the "way things are done" over time. However, acknowledging the rights and responsibilities of the town's right-of-ways may improve road conditions, vegetation health, water quality and traffic patterns for all road users.

Relevant Maps

2. Manageable Vegetation Width
4. Agriculture in ROW
5. Overhead Utility
12. Planting & Regeneration Opportunities in Roadside Communities

Opportunities

- There is adequate width of vegetation for town management in the ROW (road width = 24' and clear zone width = 3', leaving ~10ft of manageable land in the ROW).
- Tree planting opportunities may frame views and reduce roadside erosion.
- Affords scenic views looking south and east.
- Roadsides are not impacted by overhead utility lines.

Issues of Concern

- There is no hedgerow or vegetative buffer to reduce snow drifts.
- The slope of the road encourages water to run down the length of the road, not off to the sides. Portions of this road appear as "moderate erosion risks" on East Montpelier's Road Erosion risk map created by the Central Vermont Regional Planning Commission, and are "Hydrologically Connected Road Segments" as identified by the Agency of Natural Resources.
- There is agriculture in the ROW on both sides of the road.

Recommendations

- When mowing the clear zone, consider leaving vegetation at a height of at least 6". Tall grasses act as a natural buffer between the road and agricultural field, infiltrating stormwater runoff, slowing its velocity, and filtering some of the sediment and pollutants in the runoff before it reaches the agricultural field.

ROW vegeta   ers on Snow Hill
Road. Note that data icons ar   set
from the road for illustra   e purposes
only -- data re   egeta
ROW itself (within 25" of the centerline
of the road).

South side of Snow Hill Road looking west.
Road width = 24' and clear zone = 3'.
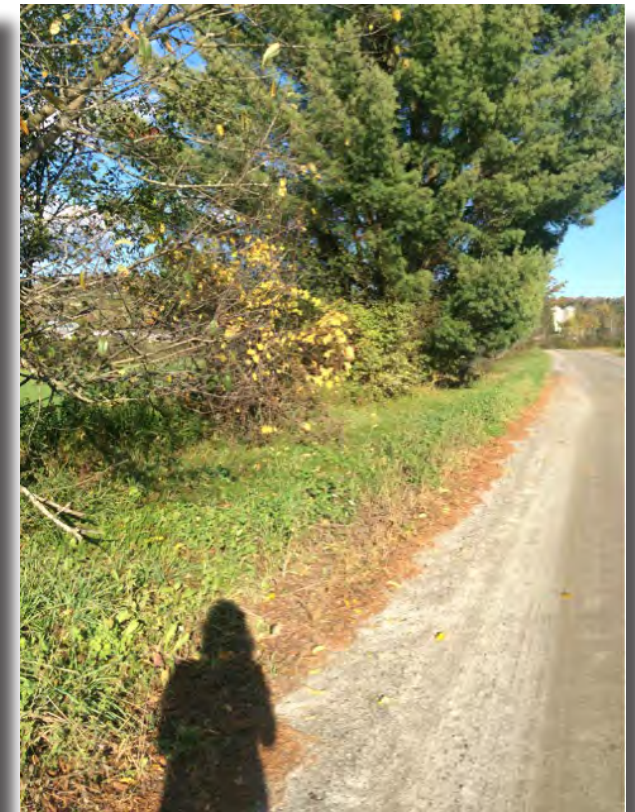
North side of Snow Hill looking east. Hedge-
row vegeta   s delineate the road edge,
block sno   ovide cover for some
wildlife. Invasive species are common.

Excerpt from Map 12: Plan   e-
genera   oadside
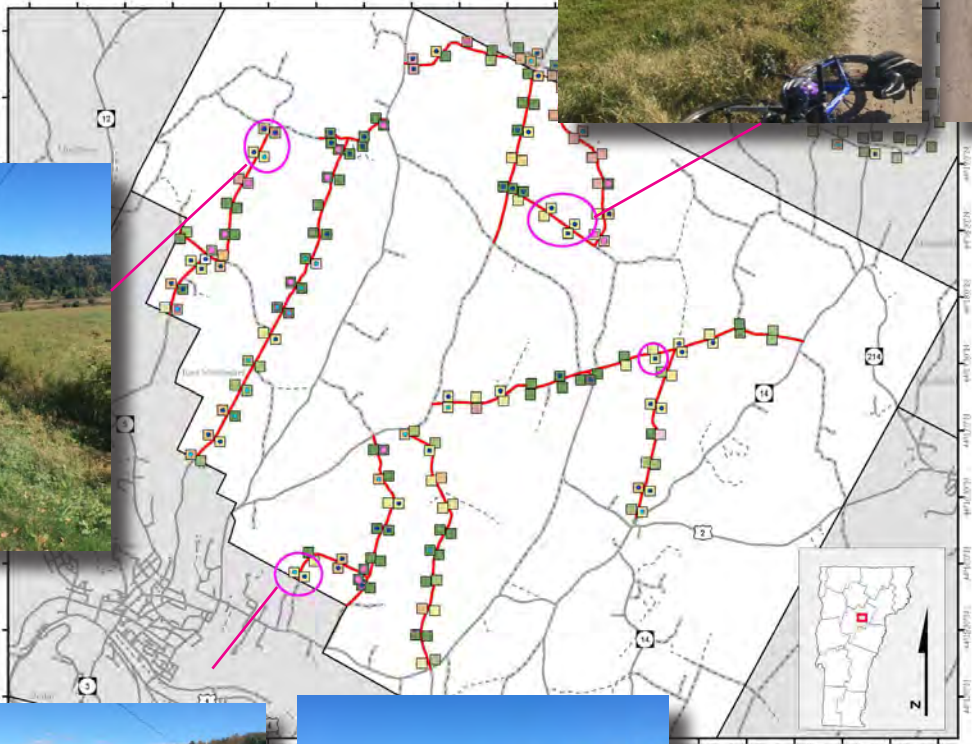
North side (le
south side (right) of
Sibley Road looking
east.
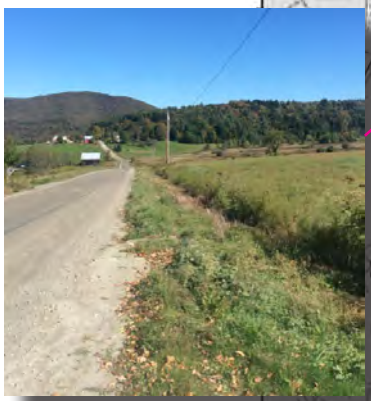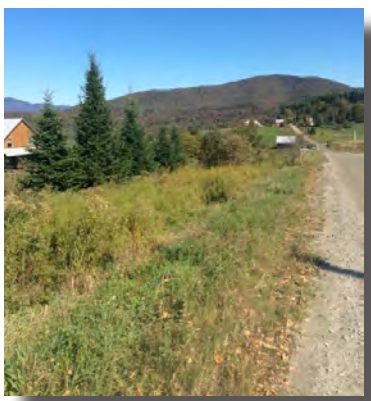
West side (le   t side (right)
of Jacobs Road looking north. There
is opportunity for plan   ees,
low shrubs, or forest regenera
although the east side of the road is
a ected by an ov   .
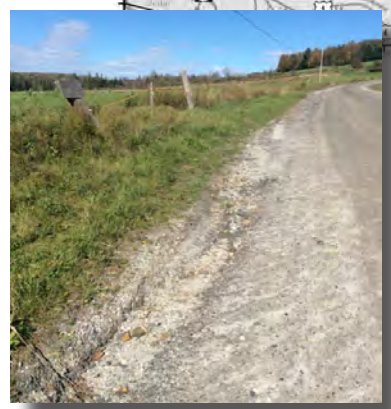
West side (le   t
side (right) of Murray
Road looking north. A
stream lies just south of
these photos.

- Current Required Agricultural Practices[26] issued by the State of Vermont require 10' of non-tillable vegetated buffers between agriculture and ditches. This buffer helps filter and slow stormwater runoff before it reaches ditches. As such, consider a 10' buffer between roads and agricultural fields to allow a place for stormwater from the road to slow before reaching fields. This could include the existing 3' of cleared ROW, grown as tall as the road foreman deems suitable, and a further 3' (or even up to 15' total) of land still within the public right-of-way.
- Manage to reduce the spread of all invasive species, particularly buckthorn, honeysuckle, and wild chervil (*Anthriscus sylvestris*). Pulling out the plant, including the s-shaped taproot, (while wearing protective clothing) is the moderately successful. For larger infestations, mow after peak bloom but before seeds set (likely by late June). Plants will resprout after mowing, so consider 3-5 rounds of targeted mowing each year. Refer to the Nature Conservancy's guide to Wild Chervil treatment[27].
- If snow drift is a problem, consider designing a living snow fence[28] in conjunction with the landowner.
    - Understand the seasonal changes in the ROW and how planted vegetation height will change throughout the year.
    - Snow fences immediately adjacent to the road (i.e. within the municipal ROW) can serve to make the problem worse because of the leeward pattern of snow deposits.
    - Living snow fences work best when planted at least 100 feet from the centerline[29] of the road. However, this distance places the snow fence on private property.
    - Standing corn rows can act as a snow fence. Minnesota DOT pays farmers to leave 12-16 rows of standing corn set back at least 100 feet from the right-of-way.

Other similar locations of this roadside scenario (see Map 12: Planting & Regeneration Opportunities in Roadside Communities)
- Sibley Road west of Sodom Pond Road
- Jacobs Road near Horn of the Moon Road (utility line affects one side of the road – consider targeted shrub regeneration)
- Murray Road north of stream crossing by Montpelier town line

4. Roadside Lawn: Gould Hill Road

As with the Farmed ROW, some private landowners may mow their lawns all the way to the road edge to keep their property neat or because they thought they were responsible for managing this corridor of land. Towns may encourage tree of bush planting or other plant regeneration in the ROW to create buffers, add beauty, delineate the edge of the road, or protect road surfaces. A frequently mowed ROW may also be a place to promote the next generation of historic trees.

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[26] Required Agricultural Practices on the Vermont Agency of Agricultural, Food & Markets website: https://agriculture.vermont.gov/rap
[27] Wild Chervil, *Anthriscus sylvestris*. Vermont chapter of The Nature Conservancy. https://vtinvasives.org/sites/default/files/2016-10/WildChervil_finalTREATMENT.pdf
[28] General information from Minnesota's Best Practices Handbook for Roadside Vegetation Management. The document includes engineering specifications from ESP and the New York DOT: Living Snow Fences Fact Sheet #3: Living Snow Fence Design.
[29] Johnson, Ann M., P.E. Best Practices Handbook for Roadside Vegetation Management. Minnesota Department of Transportation and the Local Road Research Board. July 2008.

Roadside Scenario 4: **Roadside Lawn**
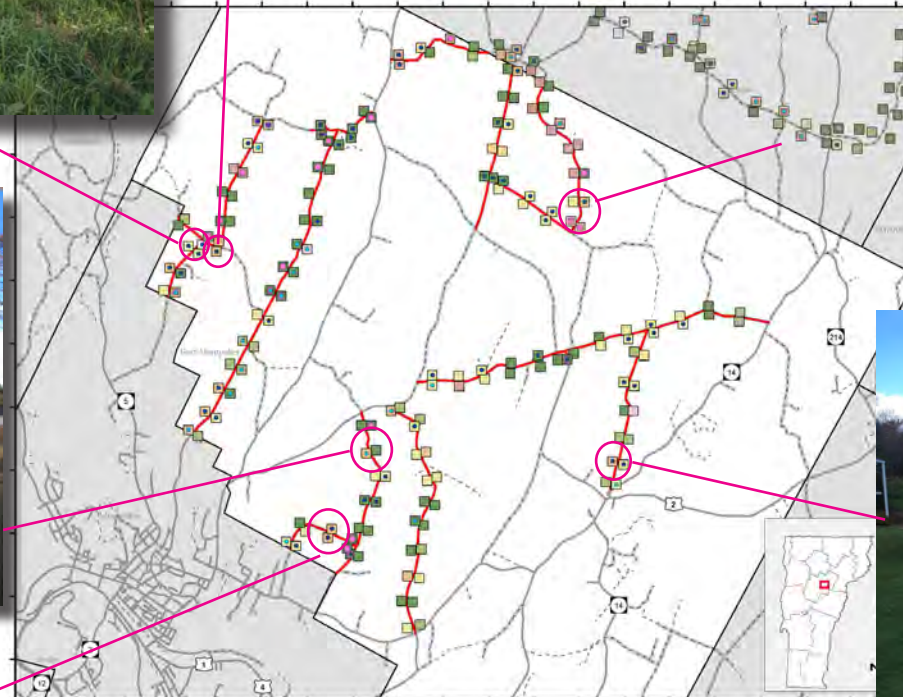Gould Hill Road

South side of Sparrow Farm Road near Jacobs Road. Overstory is primarily ash bordering a lawn.

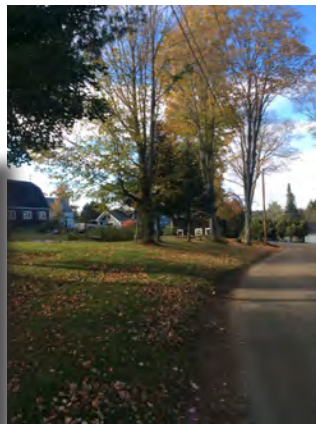West (le   t (right) sides of Gould Hill Road,
looking north.

East side of Sodom Pond Road.

West side of Brazier Road near Center Road.

Excerpt from Map 12: Plan   egenera
R

South side of Murray Road.

West side of Kelton Road.

Relevant Maps

2. Manageable Vegetation Width
10. Invasive Plant Species
12. Planting & Regeneration Opportunities in Roadside Communities

Opportunities

- There is a distinct lack of invasive plant species along this segment of road. This presents an opportunity to promote intentional planting and monitoring (and quick eradication) of invasive plants
- On the east side of Gould Hill Road, there is an existing mature black locust in good health and nearby black locust seedlings (non-native and considered invasive). This presents the town and landowner with a question: does the future desired condition of this roadside forest include black locust?
- There are no overhead utilities affecting this portion of the road.
- The road width and cleared zone width remains relatively narrow; thus, the land width available to manage vegetation still within the ROW is relatively large.

Issues of Concern

- The landowner and road crew should provide input and opinion about how this road functions at present and what the future condition can be.

Recommendations

- Consult the neighboring landowner to understand concerns or expectations regarding ROW vegetation.
- Outline road crew expectations regarding the maximum desired height of roadside grasses. Understand if the landowner can (or should) change his or her mowing practices.
- Consider planting along this road, either trees to form future canopy, a mixture of low trees and brush, or a wildflower mix.

Other similar locations of this roadside scenario

- Murray Road. Existing roadside trees surrounded by lawn are not all in good health. Landowner and town may have good partnership opportunity to plant the next generation of street trees)
- West side of Brazier Road near Center Road
- East side of Sodom Pond Road near Sibley Road
- West side of Kelton Road, southern portion

5. Unintentional Hedgerow: Brazier Road, middle portions

Relevant Maps

3. Roadside Ash Impact
6. Hedgerow Locations
8. Overstory Health & Mechanical Damage
10. Invasive Plant Species
13. Thinning Opportunities and Mature Short-lived Trees

Opportunities

- Views from Brazier Road are often obscured by hedgerows. Selective cutting may increase vegetation health and restore historic views.

Roadside Scenario 5: **Unintentional Hedgerow**
Brazier Road
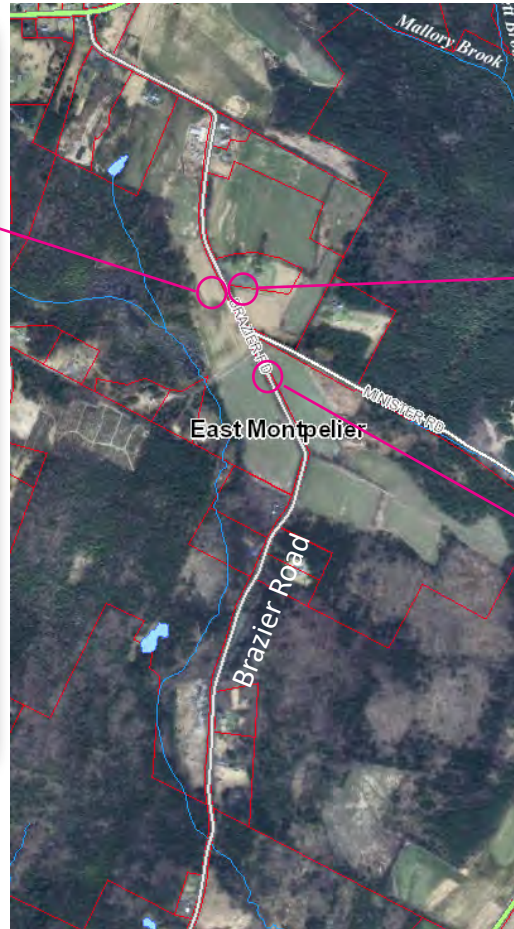
Thick understory along east side of Brazier Road obscures views and inhibits large tree growth.

egeta
side of Brazier Road.
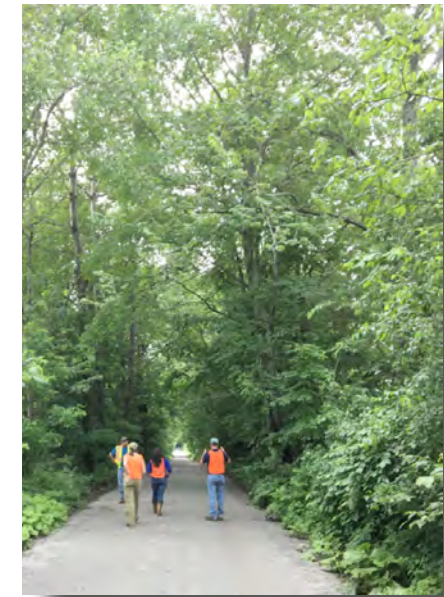
Roadside vegeta   eates
a corridor of canopy looking
south along Brazier Road.

- Rich soil indicator plants such as blue cohosh and false Solomon's seal line the road. Native maples and hawthorn mix with invasive plants and trees.

Issues of Concern

- Mature trees are often surrounded by invasive plants (sometimes very large and the size of surrounding trees) and an understory of early successional and forest edge species such as young beech and dogwoods. Future canopy trees are not well defined.
- Many examples of "fair" overstory health and "low" or "high" mechanical damage indicates that many trees may be in decline.
- Some mature historic trees (sugar maples) are in fair to poor health.
- Pervasive low- to medium-density of ash trees are of concern as emerald ash borer arrives in Montpelier. Ash tree mortality will increase canopy gaps, often favoring growth of invasive species.

Recommendations

- Gradually remove some trees (including ash) according to recommended best practices, taking care to reduce, or even negate, the spread of invasive plants. Preserve desired species of trees while creating a windfirm forest that includes tall and wide trees mixed with shrubs and small trees.
- Work with utility company that maintains this road to understand their clearing rotation. Identify where town and utility company priorities overlap. Preserve some structurally sound trees near utility lines, including woody shrubs and small trees such as dogwoods or hophornbeam. Ensure that site-lines remain clear as understory become dense.
- Promote a vegetated buffer of grasses and bushes. Revegetate disturbed areas with native seed mixtures. The Vermont Department of Environmental Conservation Lakes & Ponds Program is currently researching native wildflower and grass mixtures (more information coming soon
- To reduce road erosion, look for recommendations on ditching from the Better Roads Manual[30] updated in January of 2019.

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[30] Vermont Better Backroads Manual, January 2019:
https://vtrans.vermont.gov/sites/aot/files/highway/documents/ltf/Better%20Roads%20Manual%20Final%202019.pdf

Conclusion

Roadside vegetation management requires a thoughtful, cooperative, and integrated approach. In most towns, there are dozens of stakeholders in rural road vegetation management: road foreman, road crews, selectboard members, conservation commission members, outdoor enthusiasts, landowners, truck and school bus drivers, new residents wishing to build, and farmers, to name a few.

There are also tens of miles of unpaved road in even the smallest Vermont towns, often maintained by three- or four-person crews. Town highway budgets remain limited and towns must keep financial reserves for managing emergency weather events. Furthermore, populations in some small towns are shrinking, limiting towns' tax base to fund important infrastructure changes. Executing and building on existing rural road maintenance practices is no small job.

As such, towns should view vegetation management as an iterative process and take a step-by-step approach to identify, and act upon, roadside vegetation priorities. After reading this report and reviewing the accompanying maps, decide which action items someone in your town may wish to pioneer – like any community process, timing is everything. The Vermont Urban & Community Forestry Program and Vermont Forests, Parks & Recreation can provide resources that help you plan to accomplish your town's top priorities, one piece at a time.

For more information on any topic in this report, contact:

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> Vermont Urban & Community Forestry Program
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> Montpelier, VT 05620-3801
> (802) 249-4217
> joanne.garton@vermont.gov

Additionally, visit our website, vtcommunityforestry.org for resources, ideas, and many examples of urban and community forestry in action.

Resilient Right-of-Ways Project Data East Montpelier, VT

1. Right-of-Way Vegetation Type

Vermont Department of Forests, Parks & Recreation

1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

This map is for illustrative purposes only. The accuracy of the data layers shown on this map are limited by the accuracy of the source materials. No warranty as to the accuracy or the usefulness of the data is expressed or implied.

0   0.25   0.5   1 Miles
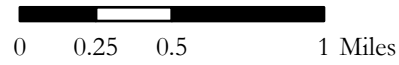
Legend

—— Inventory Roads

Type

- Mature Overstory (>6" dbh)
- Immature Overstory (<6" dbh)
- Emerging Overstory (shrubs&saplings)
- Wet Area
- Mowed
- Street Trees
- Bare

Road Surface

—— Paved

- - - Unpaved

- - - - Other

Middlesex

Haggett Road

Center Road

Sodom Pond Road

Sibley Road

Jacobs Road

Perkins Road

Gould Hill Road

North Street

Hammett Hill Road

Snow Hill Road

Dodge Road

Kelton Road

East Montpelier

Murray Road

Bliss Road

Brazier Road

Montpelier

Berlin

Calais

Marshfield

N
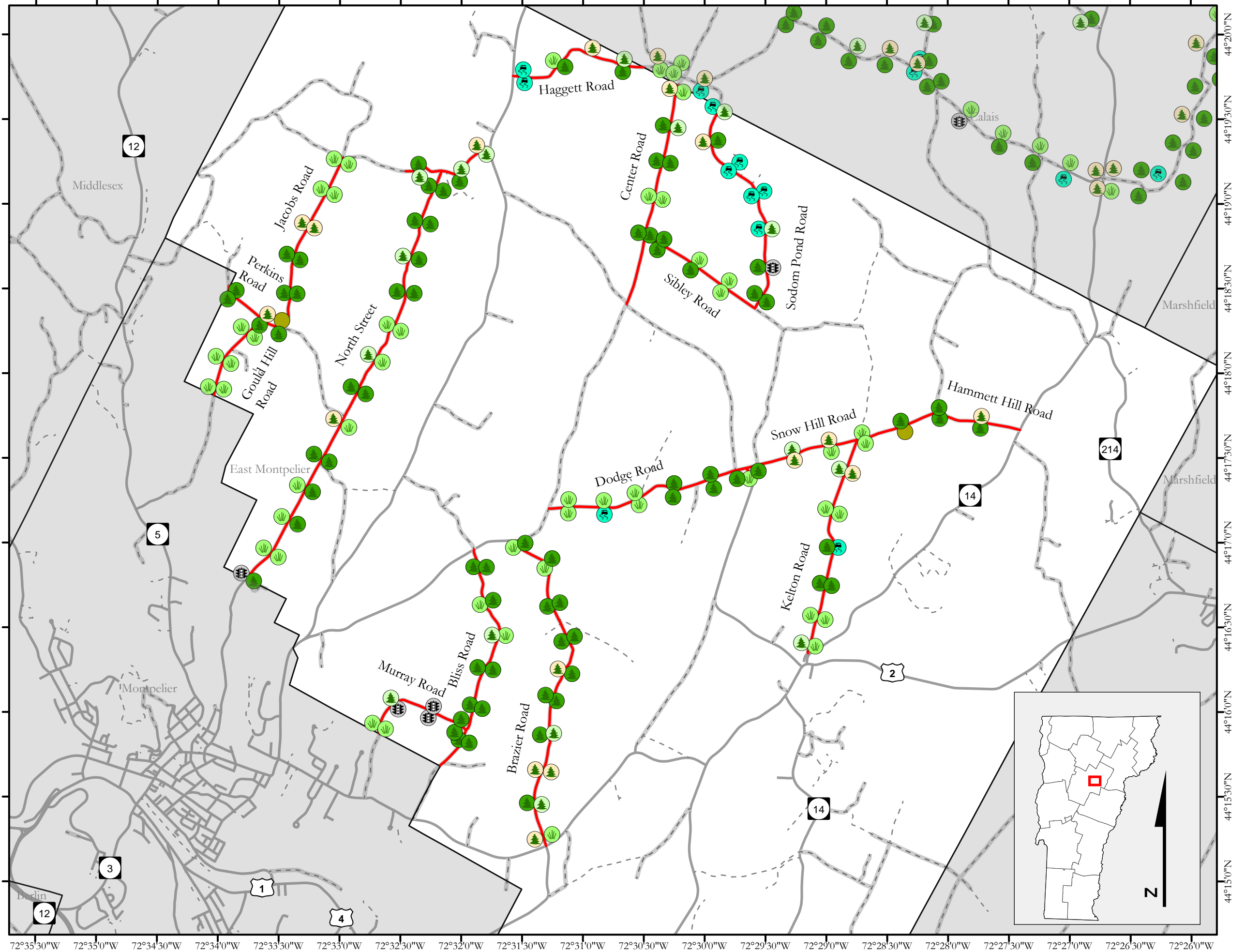
Resilient Right-of-Ways Project Data East Montpelier, VT

2. Manageable Vegetation Width

Vermont Department of
Forests, Parks & Recreation

1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

This map is for illustrative purposes only. The accuracy of the data layers shown on this map are limited by the accuracy of the source materials. No warranty as to the accuracy or the usefulness of the data is expressed or implied.
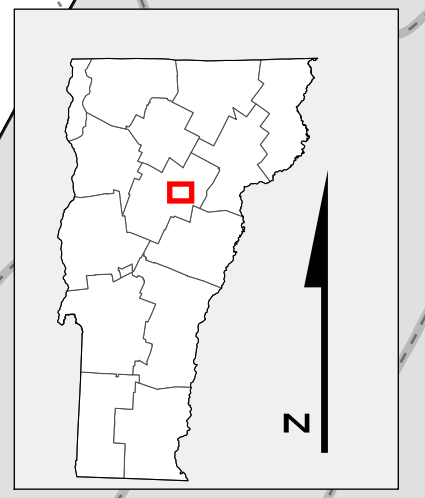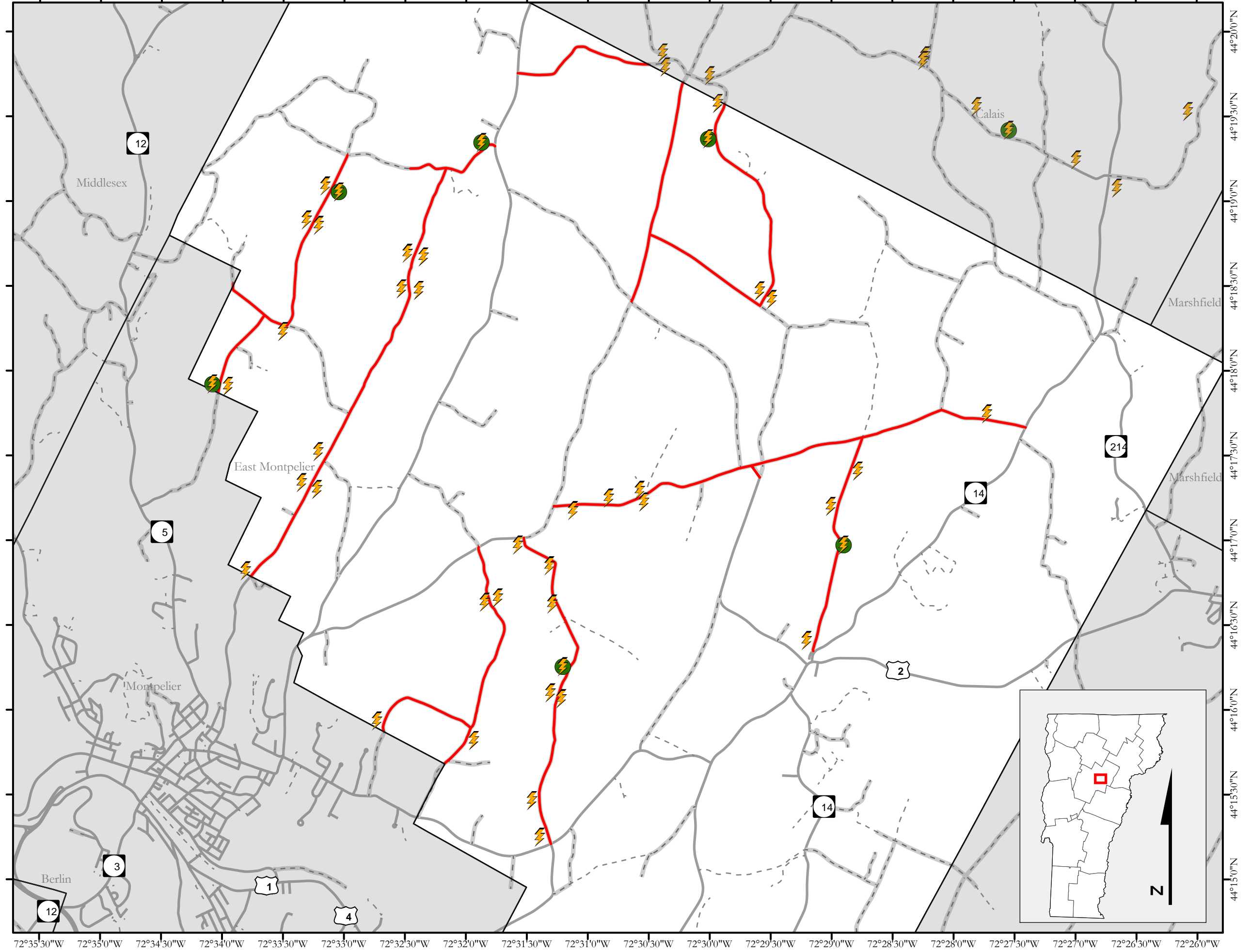
0   0.25   0.5   1 Miles
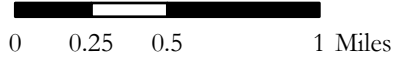
Legend

—— Inventory Roads

Width of Right-of-Way

- <5'
- 5'-10'
- 10'-15'
- >15

Road Surface

—— Paved

- - - Unpaved

- - - - Other
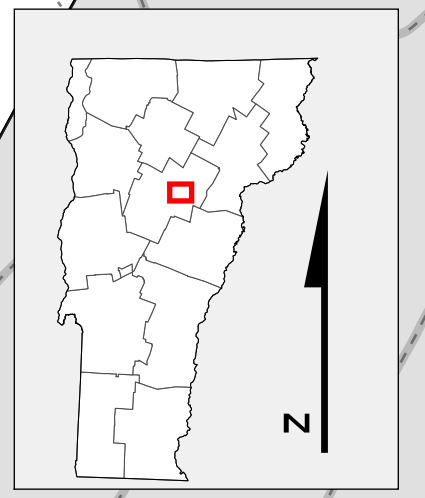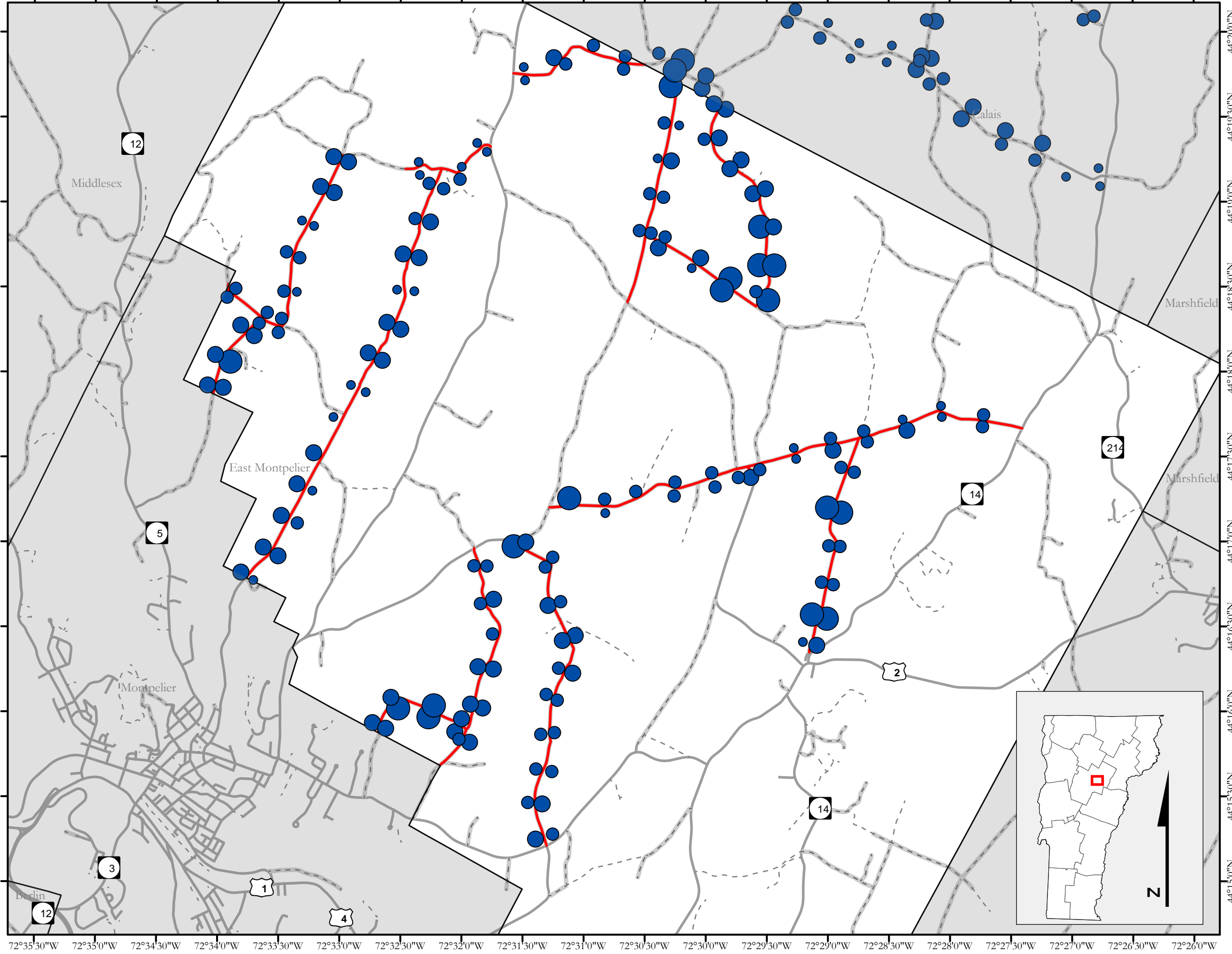
Resilient Right-of-Ways Project Data East Montpelier, VT

3. Roadside Ash Impact
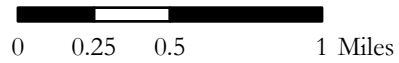
Vermont Department of Forests, Parks & Recreation

1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

This map is for illustrative purposes only. The accuracy of the data layers shown on this map are limited by the accuracy of the source materials. No warranty as to the accuracy or the usefulness of the data is expressed or implied.
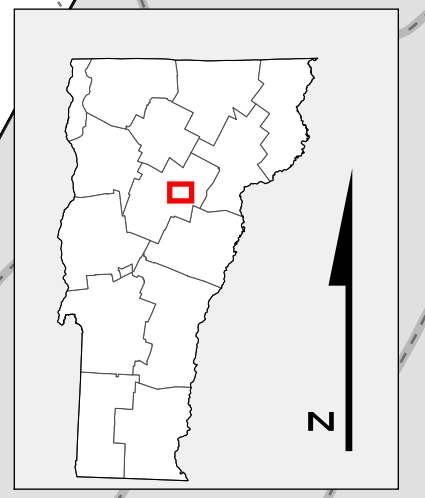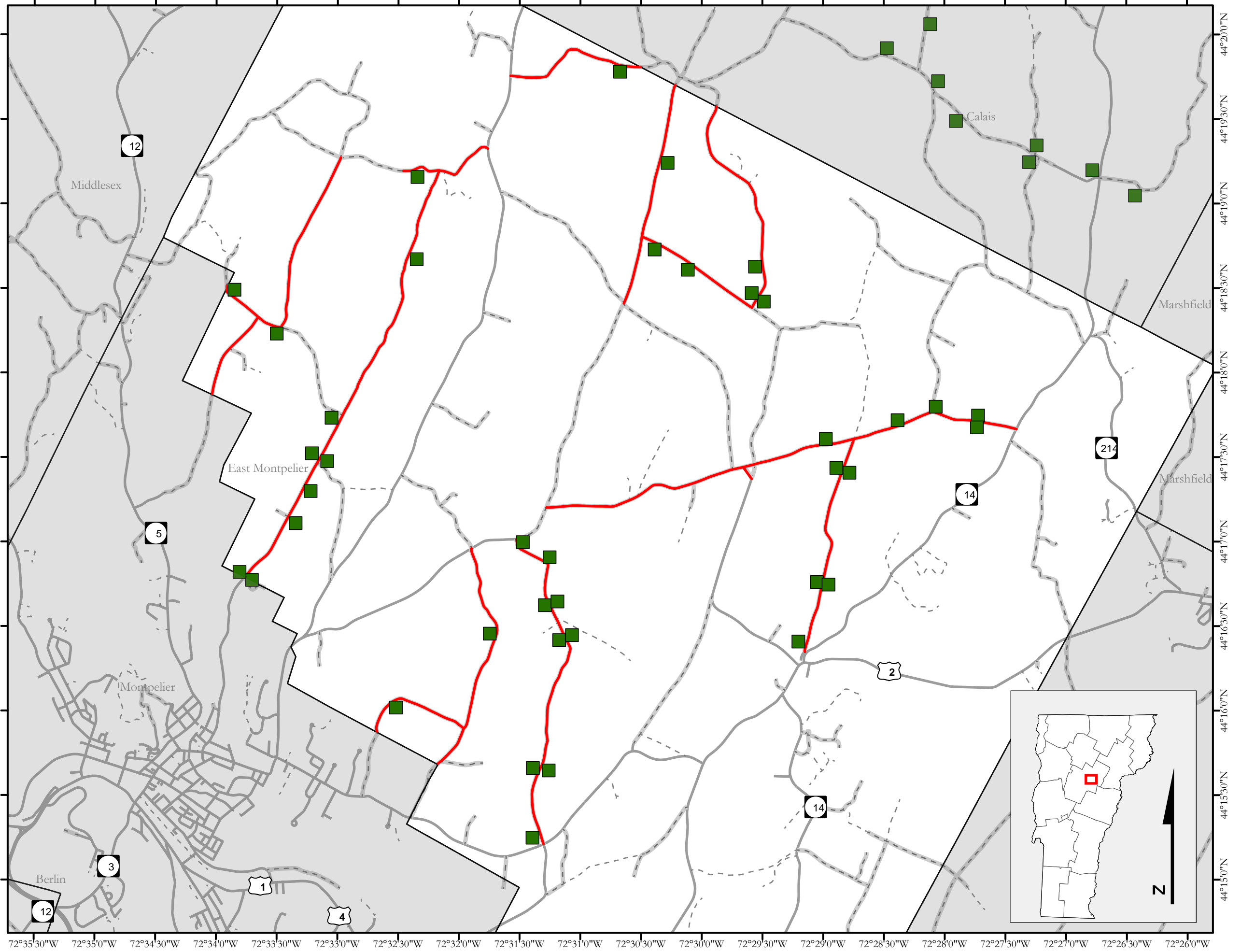
0   0.25   0.5   1 Miles
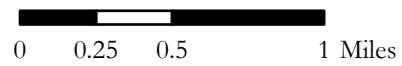
Legend

— Inventory Roads

Percent canopy

▲ High (>50%)

▲ Medium (10-50%)

▲ Low (0-10%)

Road Surface

— Paved

--- Unpaved

··· Other
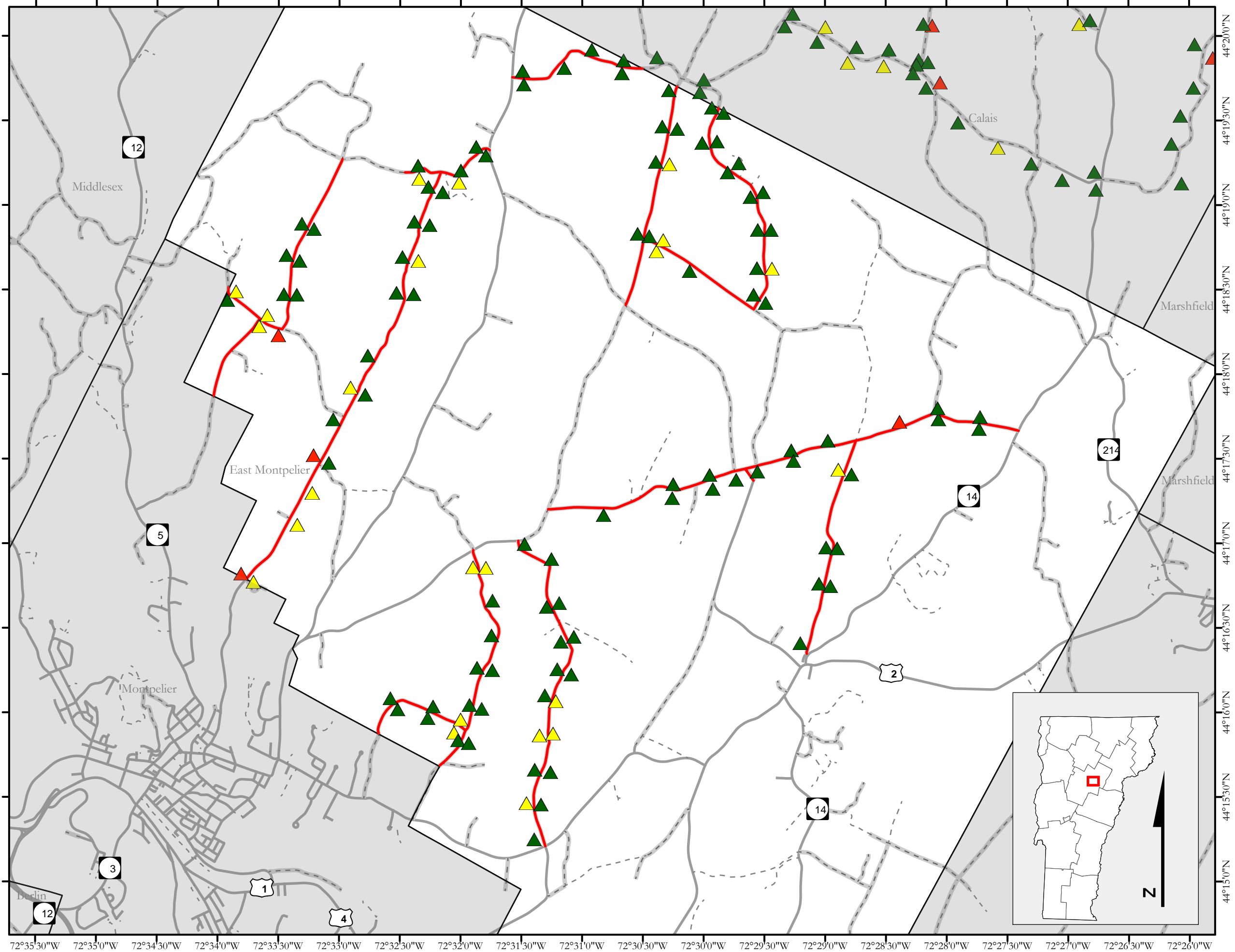
Resilient Right-of-Ways
Project Data
East Montpelier, VT

4. Agriculture in the Right-of-Way

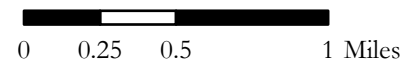### Vermont Department of Forests, Parks & Recreation
1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

This map is for illustrative purposes only. The accuracy of the data layers shown on this map are limited by the accuracy of the source materials. No warranty as to the accuracy or the usefulness of the data is expressed or implied.

0   0.25   0.5   1 Miles
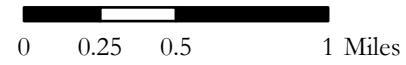
Legend

—— Inventory Roads

● Agriculture in ROW

Road Surface

—— Paved

- - - Unpaved

---- Other

Middlesex

Calais

Marshfield

East Montpelier

Montpelier

Berlin
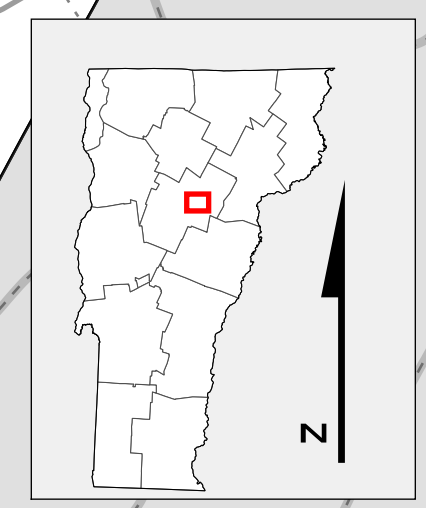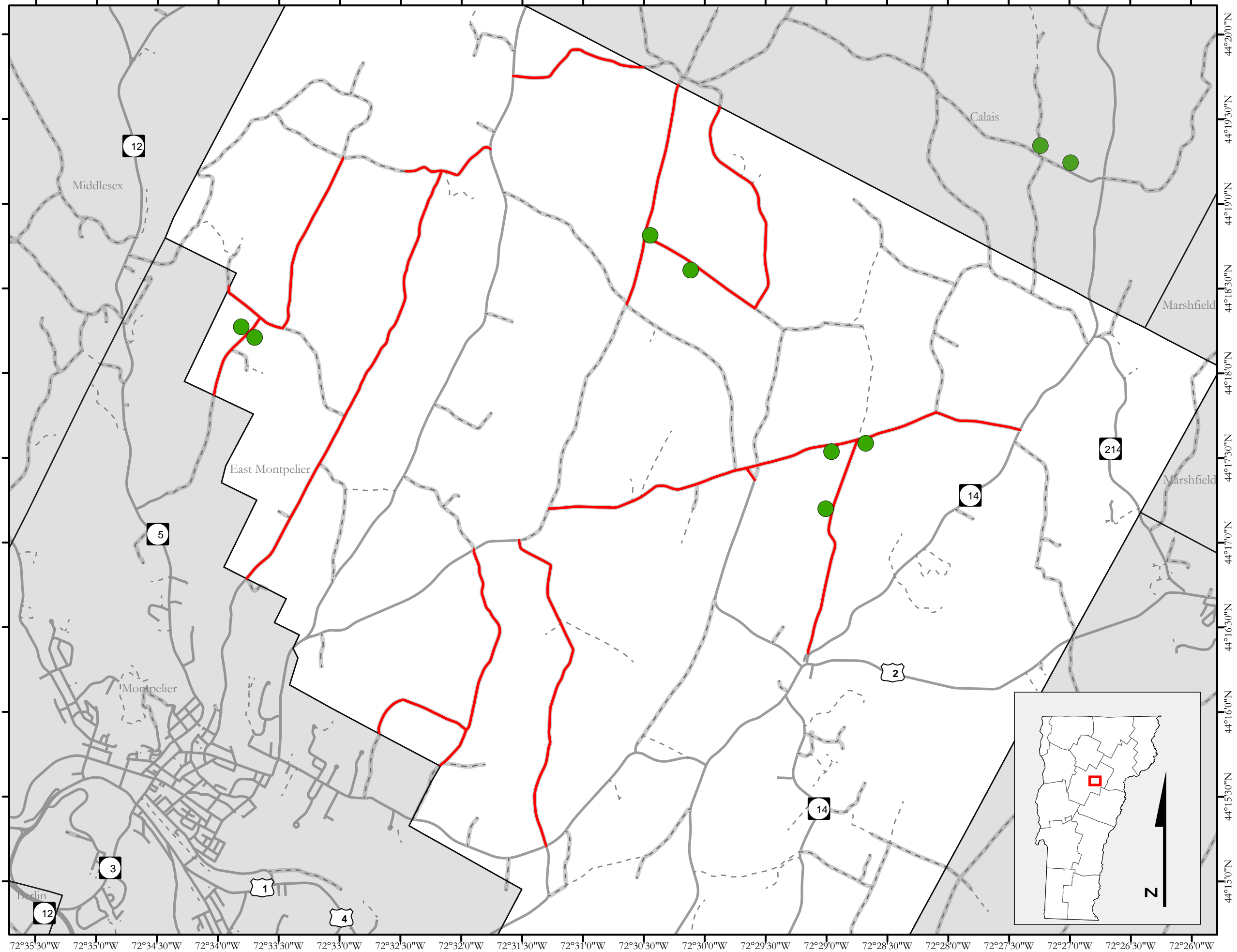
Resilient Right-of-Ways Project Data East Montpelier, VT

5. Overhead Utility & Regeneration Opportunity

Vermont Department of Forests, Parks & Recreation

1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

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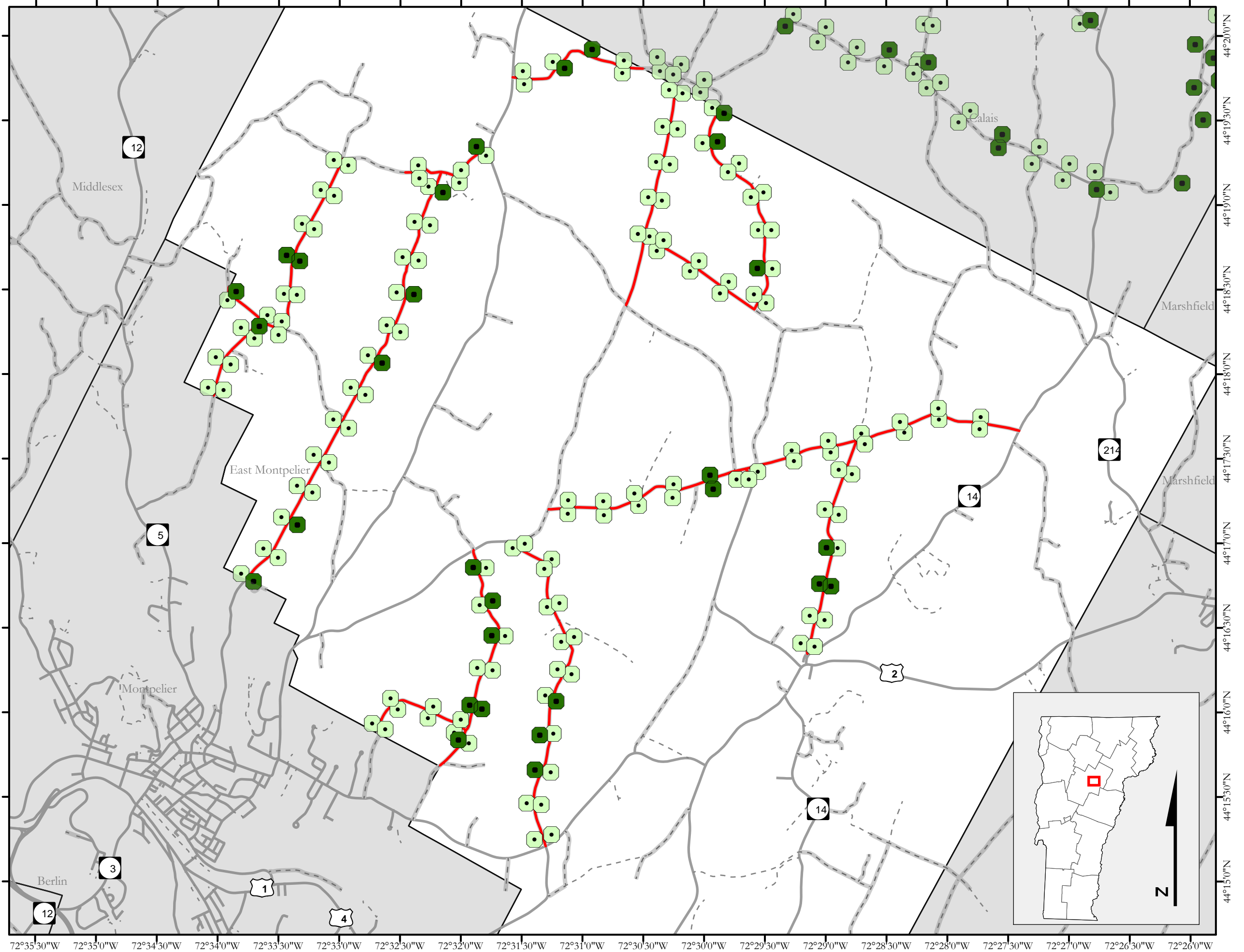
0   0.25   0.5   1 Miles
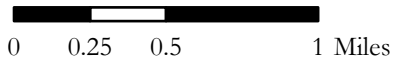
Legend

Inventory Roads

Utility Wire Present

Promote Regen Under Powerline

Road Surface

Paved

Unpaved

Other

Resilient Right-of-Ways Project Data East Montpelier, VT
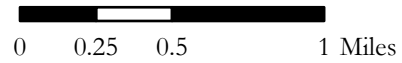
6. Hedgerow Locations

Vermont Department of
Forests, Parks & Recreation

1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

This map is for illustrative purposes only. The accuracy of the data layers shown on this map are limited by the accuracy of the source materials. No warranty as to the accuracy or the usefulness of the data is expressed or implied.

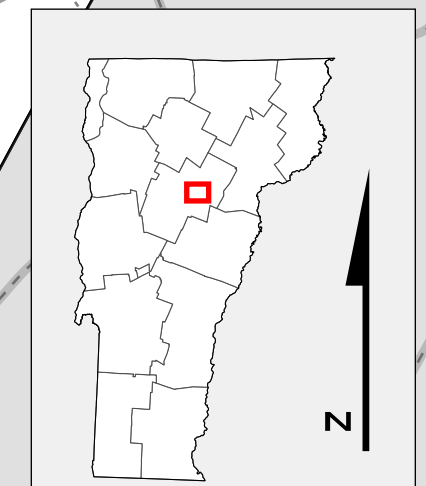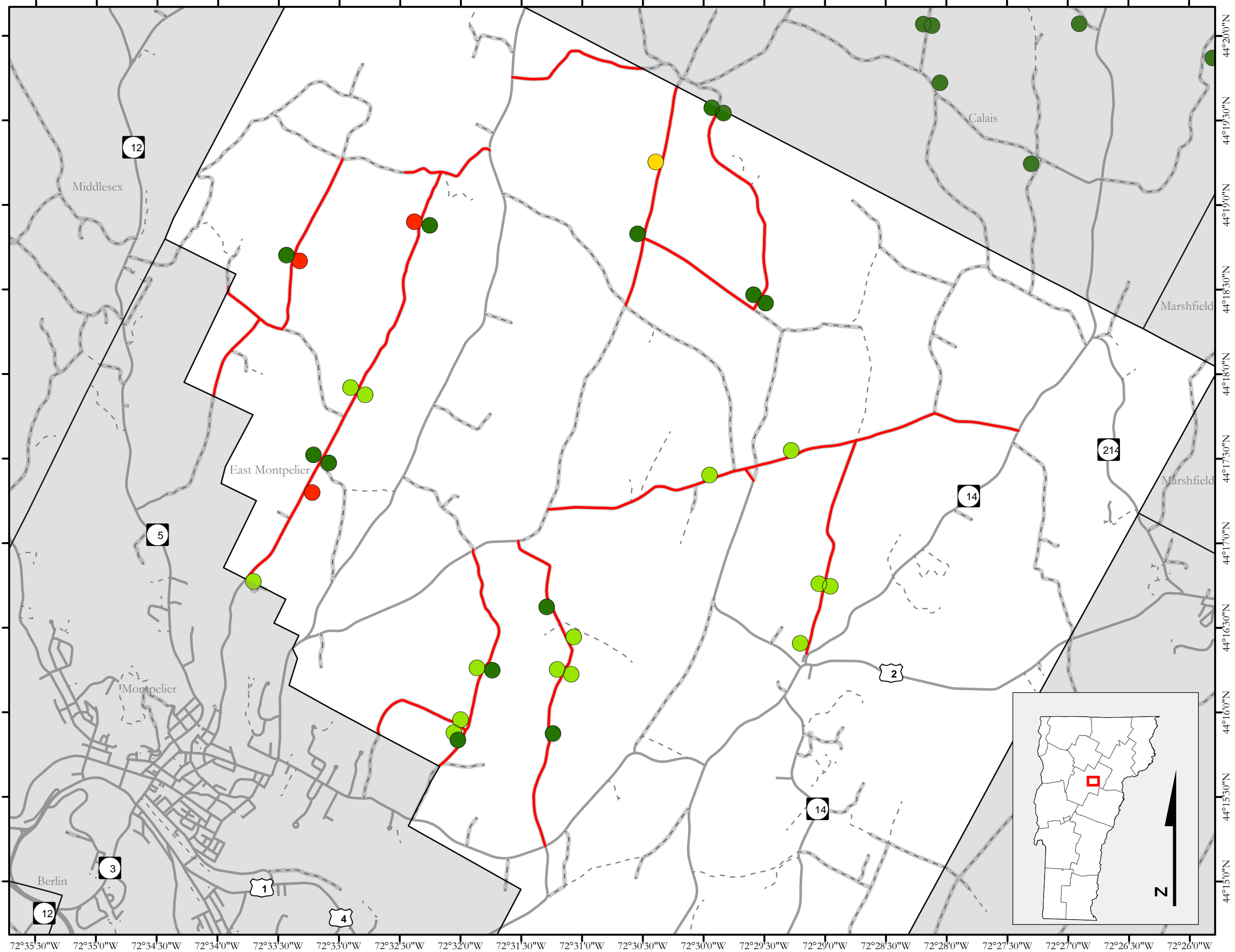0   0.25   0.5   1 Miles

Legend

— Inventory Roads

■ Hedgerow

Road Surface

— Paved

-·- Unpaved

--- Other

Resilient Right-of-Ways Project Data East Montpelier, VT

7. Softwood Cover

Vermont Department of
Forests, Parks & Recreation

1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

This map is for illustrative purposes only. The accuracy of the data layers shown on this map are limited by the accuracy of the source materials. No warranty as to the accuracy or the usefulness of the data is expressed or implied.

0   0.25   0.5   1 Miles

Legend

— Inventory Roads

% Prevalent Softwood

◻ < 25%

◼ > 25%

Road Surface

— Paved

--- Unpaved

- - - Other
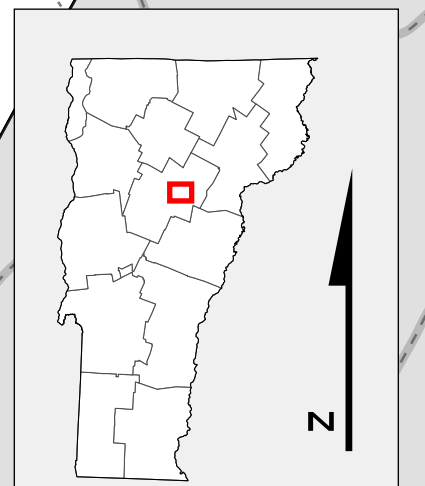
Resilient Right-of-Ways Project Data East Montpelier, VT

8. Overstory Health & Mechanical Damage
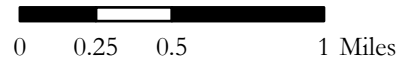

Vermont Department of
Forests, Parks & Recreation

1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

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0   0.25   0.5   1 Miles

Legend

—— Inventory Roads

Overstory Health & Damage

- ● Fair health, low damage
- ● Fair health, high damage
- ● Poor health, low damage
- ● Poor health, high damage

Road Surface

- —— Paved
- ---- Unpaved
- - - - Other

Resilient Right-of-Ways Project Data East Montpelier, VT

9. Historic Tree Location & Health

Vermont Department of Forests, Parks & Recreation

1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

This map is for illustrative purposes only. The accuracy of the data layers shown on this map are limited by the accuracy of the source materials. No warranty as to the accuracy or the usefulness of the data is expressed or implied.

0   0.25   0.5   1 Miles

Legend

— Inventory Roads

Historic Trees, Health

● Historic Trees, Good

● Historic Trees, Fair

● Historic Trees, Poor

Road Surface

— Paved

--- Unpaved

- - - Other
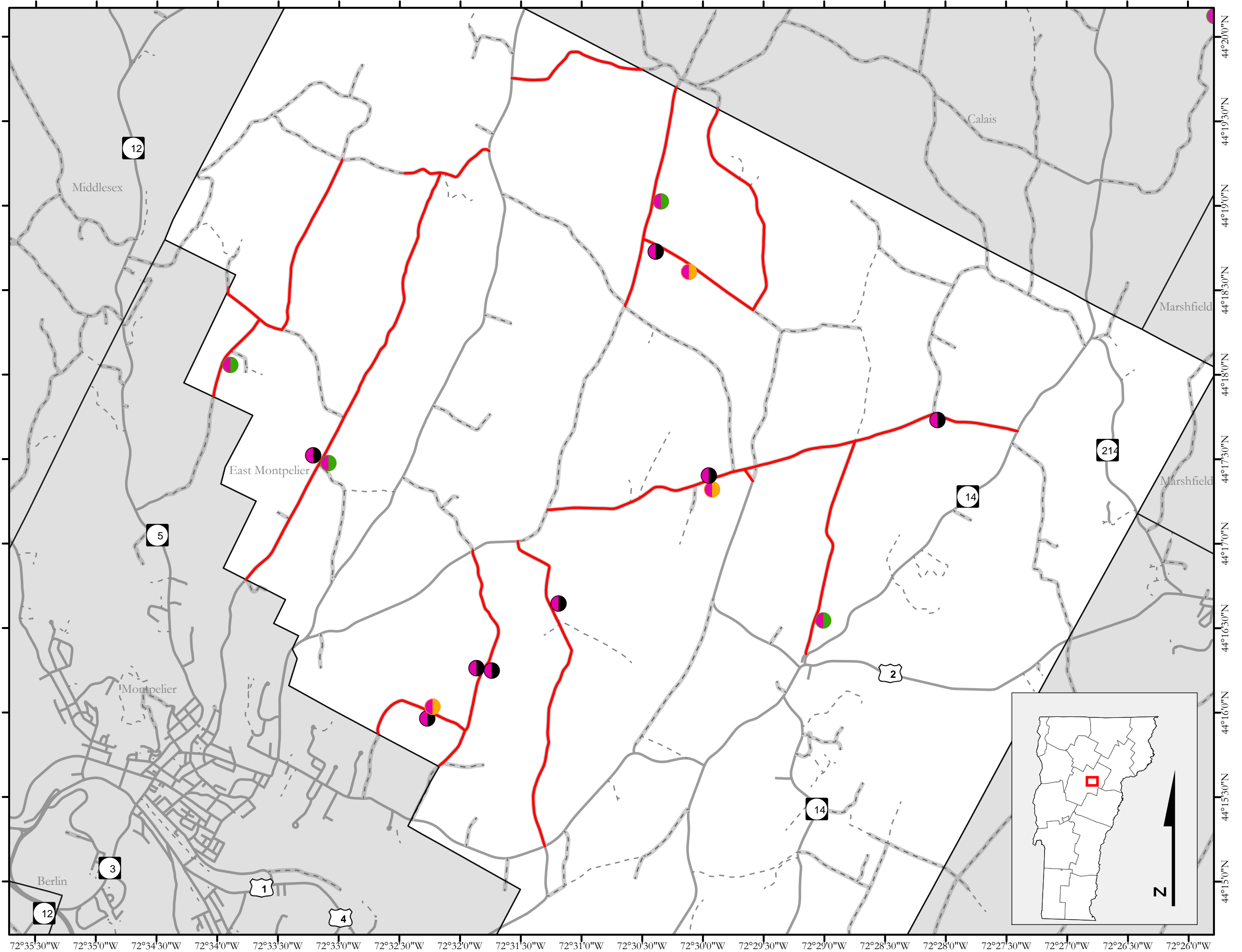
Resilient Right-of-Ways Project Data East Montpelier, VT

10. Invasive Plant Species
(data source: iNaturalist)

Vermont Department of
Forests, Parks & Recreation

1:48,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

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0   0.38   0.75   1.5 Miles

Legend

—— Inventory Roads

Invasive Plant Species

- Barberry, spp.
- Common buckthorn
- Common cowparsnip
- Cow Parsley
- Garlic mustard
- Goutweed
- Honeysuckle, spp.
- Japanese knotweed
- Loosestrife, spp.
- Multiflora rose
- Poison ivy
- Wild parsnip

Road Surface

—— Paved
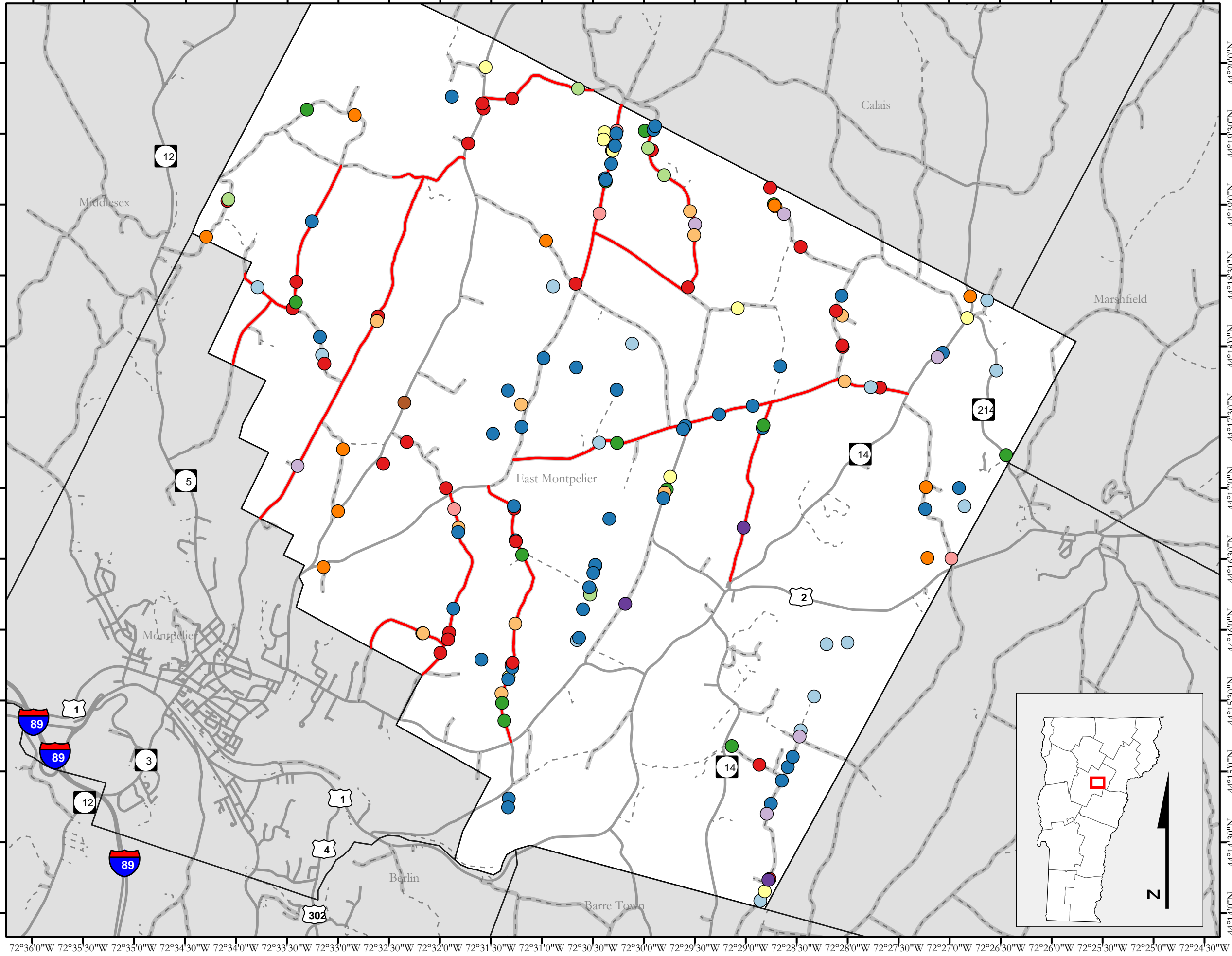
-- -- Unpaved

- - - Other

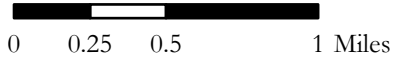# Resilient Right-of-Ways Project Data East Montpelier, VT

11. Preservation Opportunites

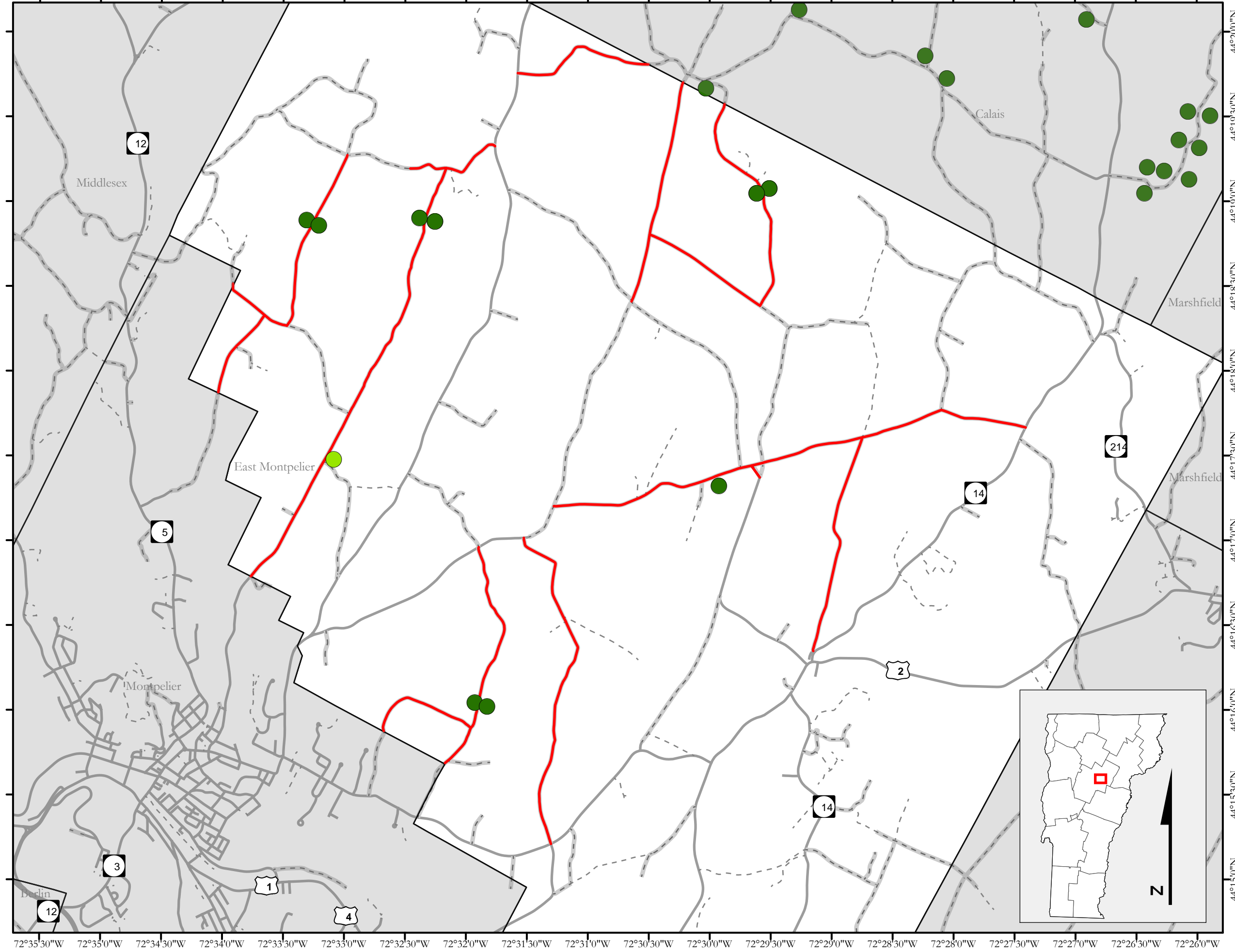### Vermont Department of Forests, Parks & Recreation

1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

This map is for illustrative purposes only. The accuracy of the data layers shown on this map are limited by the accuracy of the source materials. No warranty as to the accuracy or the usefulness of the data is expressed or implied.

| 0 | 0.25 | 0.5 | 1 Miles |

Legend

—— Inventory Roads

Preservation Opportunity

● No cut, trees

● Preserve, herbaceous buffer

Road Surface

—— Paved

- - - Unpaved

---- Other

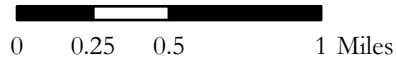# Resilient Right-of-Ways Project Data East Montpelier, VT

12. Planting & Regeneration Opportunites in Roadside Communities

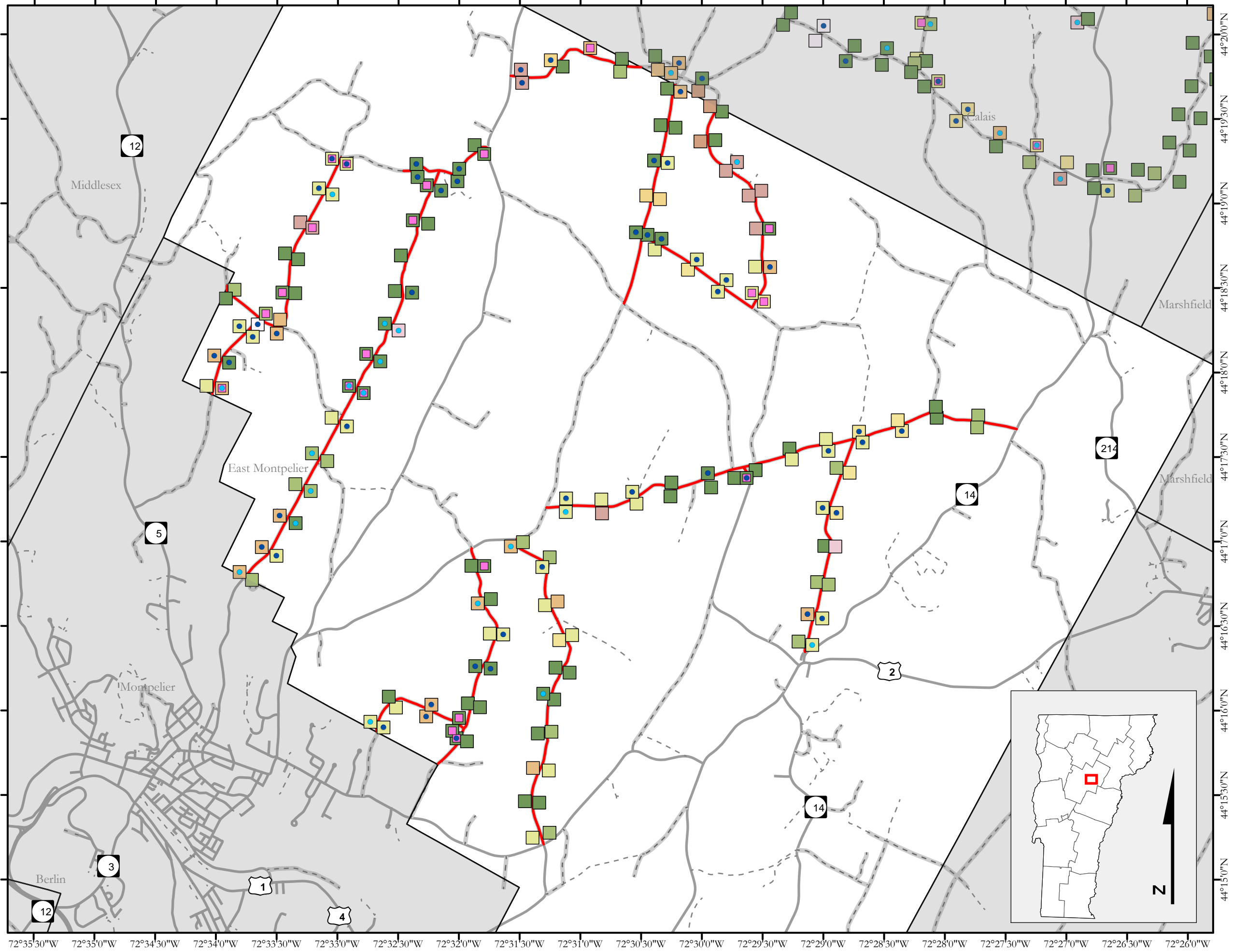Vermont Department of Forests, Parks & Recreation

1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

This map is for illustrative purposes only. The accuracy of the data layers shown on this map are limited by the accuracy of the source materials. No warranty as to the accuracy or the usefulness of the data is expressed or implied.

0   0.25   0.5   1 Miles

Legend

Inventory Roads

Planting
- Other
- Trees

Regeneration
- Promote Regeneration

Roadside Community
- Forest
- Hedgerow to Field/Water
- Field (hay)
- Field (ag)
- Street Trees/Lawn
- Lawn
- Water Edge
- Wetland
- Riparian Zone
- Tree Plantation

Road Surface
- Paved
- Unpaved
- Other

# Resilient Right-of-Ways Project Data East Montpelier, VT

13. Thinning Opportunities and Mature Short-lived Trees

Vermont Department of Forests, Parks & Recreation

1:40,000

Cartographer: Elizabeth.Bannar
Date: 12/13/2018

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0   0.25   0.5   1 Miles
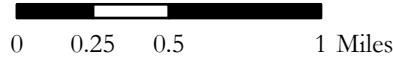
Legend

— Inventory Roads

⬤ Thinning Opportunites, trees

⬤ Mature, Short lived Trees

Road Surface

— Paved

- - - Unpaved

- - - - Other