Rural Road Resilient Right-of-Ways Vegetation Assessment

Town of Stowe Action Plan and Recommendations

Prepared by Joanne Garton, Vermont Urban & Community Forestry Program

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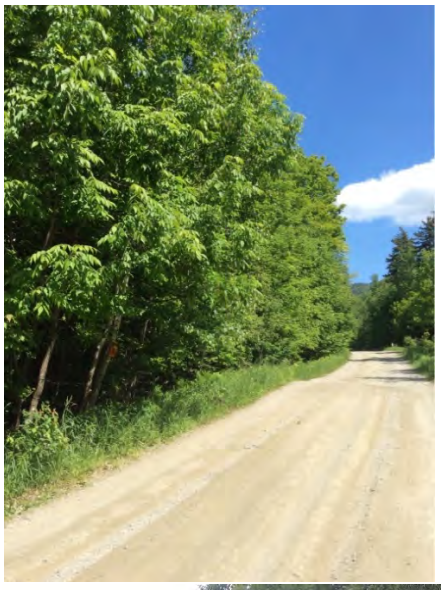



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Introduction

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 mowed or cleared areas next to the road) span almost the entire right-of-way width, others are narrow and forested, creating canopy from trees in narrow 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 maintenance often include (sometimes by regulation) ditching, stonework (stone-line ditches, check dams, or stone turn outs), grass-lining or hydroseeding, and culvert repair or replacement. This work often comes 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 choose 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.

Resilient Right-of-Ways Project Overview

In the fall of 2017, the town of Stowe was selected as a partner community to work with the Vermont Urban & Community Forestry program as a case study town in the Rural Roads Resilient Right-of-Ways (ROW) project. Funded by the USDA 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 offered statewide in 2020.

The town of Stowe was asked to form a Resilient ROW project advisory committee made up of individuals knowledgeable about, and invested in, the future of healthy and resilient roadside vegetation communities. The liaison to Stowe's municipal staff and volunteers is Tom Jackman, Director of Planning for the Town of Stowe. Members of the committee are:

Gar Anderson
Andre Blaise
Catherine Drake
Tom Jackman, Director of Planning
David Jaqua
Christine McGowan
Darsey Moon
Robert Moore, Conservation Commission Chair
Charlie Lusk, Town Tree Warden

Resilient Right-of-Ways project coordinator lead Joanne Garton and Vermont Urban & Community (VT UCF) Program Manager Danielle Fitzko described the scope of the project to the Stowe Conservation Commission and Stowe Tree Warden Charlie Lusk on September 20, 2017. Tom Jackman and Joanne Garton completed and signed the Letter of Collaboration on September 27, 2017 (See Appendix A: Letter of Collaboration). The project advisory committee met on November 1, 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 Stowe, 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**.

The roadside vegetation assessments were conducted in June and August of 2018 by Joanne Garton and VT UCF intern Beth Bannar. Field routes covered approximately 30 miles of the 55 miles of unpaved roads in Stowe. On unpaved backroads, Joanne and Beth 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 Stowe Work Plan (Appendix B). The assessed routes are drawn in red on Maps 1 through 11. 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-way corridors.

1. Establish sustainable vegetation of diverse species, age, structure, and density

Roadside forests are not your normal forest. Stressed by vehicle traffic, snowplows, mowers, road maintenance equipment, trash, pedestrians, and cyclists, vegetation in the right-of-way is in a state of perpetual disturbance. In addition, roadsides are largely unnatural – that is, they feature engineered topography, stripped topsoil, 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 be safe while also being visually interesting, ecologically integrated, and engineered to manage stormwater cleanly.

Roadside vegetation management has changed a lot in the last 30 years. What used to be a rash of herbicide treatment and a bi-annual regrading of the shoulder is now a multi-step process requiring tools including hydroseeders, straw mulch blowers, GPS, and mapping software. Towns consult licensed pesticide applicators, invasive species experts, and erosion control engineers to decide on a yearly course of action. Rural roadside right-of-ways represent over 27,000 acres of land in Vermont – management of this land is no small task. Establishing sustainable, multi-aged and diverse roadside vegetation takes thoughtful planning, appropriate expertise, and patience.

Recommendations

- Be intentional about vegetation clearing. Understand that any vegetation regrowth will be all the same age (called even-age) and, at least initially, will lack the structural diversity that keeps roadsides forests healthy. Colonizer species such as sumac, aspen, grey birch, and black locust, are very valuable to set the stage for future forests. However, they are fast-growing and therefore structurally weak and short-lived, reaching full maturity within a few decades.
- Preserve intermediate or climax plant and tree communities such as sugar maple, beech, yellow birch, red oak and basswood. Hemlock, spruce, and white pine are also long-lived species. Remember that one goal of roadside vegetation is to create soil stability with as little maintenance as possible.
- Work with a consulting forester when conducting roadside tree clearing. Foresters can represent the town's interests when contracting a logger and provide guidance on tree species composition along town roads. Your county forester[1] can help you outline the services that your town may require and provide a list of consulting (private) foresters. Learn more about Working With Foresters & Loggers[2] in the Cut With Confidence brochure series.
- Understand how vegetation affects local wildlife. Roadsides can provide strips of habitat for some species, although generally as temporary cover or food sources rather than as breeding

[1] List of Vermont County Foresters. Vermont Forests, Parks & Recreation. https://fpr.vermont.gov/forest/list-vermont-county-foresters

[2] Working With Foresters & Loggers. Part of the Landowner Guides to a Successful Timber Harvest. https://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Your_Woods/CutWithConfidence_Brochures/Forester-2.1b.pdf

or nesting sites (with the exception of some songbirds). 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, poplar, and willow) 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.

- Establish a systematic annual planting schedule. Many of Stowe's roads are forested and will revegetate themselves (called "forest regeneration") with common tree species. However, some right-of-ways that border wetlands, fields, or agricultural areas may benefit from bush and native grass planting to protect soil from erosion or from tree planting to create canopy (particularly as roadside ash trees die – see recommendation number 2 below). Start small to monitor progress and understand that planting efforts require site preparation, material purchases, monitoring, and possibly replacement of species that die. Ensure that planting efforts do not conflict with planned road construction.
- Establish a pruning[3] and maintenance schedule for existing trees. When done correctly, roadside pruning reduces the number of branches that could fall, reduce sight lines along roads, or grow into utility lines while maintaining or even improving tree health. Do not prune trees with a flail mower or boom arm mower.
- Take note of existing native plants. Utilize your town's active citizen scientists and their data recorded on iNaturalist[4].
- 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. The Vermont Agency of Transportation Technical Landscape Manual[5] (p. 2-47) recommends several seed mixtures, many of which can be applied with a hydroseeder. However, some of these mixes contain no native species. As preliminary guidance, towns may consider using the **Sand and Gravel Sites Conservation Mix** (*switchgrass, big bluestem, little bluestem, sand lovegrass, blackeyed susan*) and the **Wet Area Mix** *(Virginia wild rye grass, fox sedge, American mannagrass, giant bur-reed, common three-square, soft-stem bulrush, Canada rush*) listed in the VTrans Landscape Manual, paying close attention to the amount of fertilizer and tackifier a site may need for seeds to successfully germinate. Fertilizer is not usually necessary in roadside settings; when it is used, minimize nutrient runoff into ditches and other waterways.

  The Agency of Transportation currently uses the following seed company suppliers listed below. Contact them to learn more about their seed mixes, their native plant content, and prices.
    - Northeast Agriculture Sales[6] of Lyndonville, VT
    - Lawes AG[7] of Brandon, VT

[3] Pruning. Vermont Urban & Community Forestry Program. https://vtcommunityforestry.org/resources/tree-care/pruning.
[4] More on iNaturalist can be found at https://www.inaturalist.org/.
[5] Seed Mixes. Page 2-47. Vermont Agency of Transportation Technical Landscape Manual. https://vtrans.vermont.gov/sites/aot/files/highway/documents/environmental/VTrans%20Technical%20Landscape%20Manual.pdf.
[6] Northeast Agriculture Sales. https://www.neagsales.com/
[7] Lawes AG. http://www.lawesag.com

- Oliver Seed[8] of Milton, VT

Other seed suppliers are listed below. Contact them to learn more about their New England seed mixes, their native plant seed content, and prices.

- Vermont Wetland Plants[9] of Orwell, VT
- New England Wetland Plants[10] of Amherst, MA
- Ernst Seeds[11] of Pennsylvania, seeds can be mail ordered:
- Roundstone Seed[12] of Kentucky, seeds can be mail-ordered:
- American Meadows[13] for mail-ordered wildflower seed mixes

- Consult with neighboring towns to find out if planting or seeding initiatives can be shared. By combining missions, town may achieve an economy of scale that makes costs and logistics more palatable.

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 and near Stowe, the insect has been confirmed in Montpelier, Plainfield, Orange, Berlin and Barre Town. All Vermont towns are encouraged to prepare and manage the impacts of EAB and the upcoming loss of ash trees.

Stowe is currently within close proximity to the known infested areas[14] in Vermont but is not currently within the high risk area. However, the town of Stowe should be planning for the insect's arrival. During June of 2018, Joanne Garton (Resilient ROW project lead) contacted US Department of Agriculture Plant Health Specialist Tony Slowick to examine ash trees in poor health along Upper Hollow Road and Pinnacle Road. Although Mr. Slowick did not confirm the presence of emerald ash borer in these ash trees, he agreed to monitor them yearly and alert nearby USDA staff to their presence and declining health.

Ash trees are common in some roadside communities in Stowe and are densely congregated in some areas (for example, along Weeks Hill Road, Trapp Hill Road and Upper Hollow Road – see Map 3). EAB has not been detected in Stowe; however, the likelihood that EAB is present in Stowe remains high. Once present, EAB may kill 99% of ash trees (if not chemically treated); those along public roads can then pose a risk to safety when diseased or dying.

Out of the 228 plots assessed during the 2018 field season, 137 (or, 60% of plots) hosted at least one ash tree that would impact the right-of-way when diseased or dying. Recall that one plot was approximately 100 feet long and extended the width of the ROW, although when examining ash

[8] Oliver Seed. https://www.ldoliverseed.com/
[9] Vermont Wetland Plants. https://www.vermontwetlandplants.com/index/seed-mixes/
[10] New England Wetland Plants. https://newp.com/catalog/seed-mixes/

[11] Ernst Seeds. https://www.ernstseed.com/products/seed-mixes/page/8/
[12] Roundstone Seeds. https://roundstoneseed.com/?gclid=CjwKCAjwg-DpBRBbEiwAEV1_-AmCub3XoGAL_2Nywe7O6UeEZL9y3r1syHsYe-aUeMFPuVs-v4A0_xoC8ZAQAvD_BwE
[13] American Meadows. https://www.americanmeadows.com/wildflower-seeds/northeast
[14] Emerald Ash Borer Infested Area in Vermont, Vermont Agency of Natural Resources. http://vtanr.maps.arcgis.com/apps/PublicInformation/index.html?appid=cfda013ad1464b7b9103a3d7806f0cc5

impact, ash trees outside of the town ROW were also noted. 82 of the 137 (or, 60%) of the plots hosted 1-2 ash trees, 30 of the 137 (or, 22%) hosted 3-4 ash trees, and 25 of the 137 (or, 18%) hosted over 5 ash trees. Roughly extrapolating, Stowe can expect approximately 60% of its roads to be impacted by diseased or dying ash trees, although this field assessment may be skewed towards ash counts from forested roads more than open field. A full ash tree inventory of Stowe's roads will reveal the true impact of EAB on road operations and budgets.

Recommendations

- 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.
- Review the Urban & Community Forestry Program's other on-line resources[15] regarding EAB management.

3. Address risk trees with the tree warden

Stowe's current tree warden, Charlie Lusk, 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 for a tree to be considered a *risk* tree by the tree warden and be removed without a public 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 risk tree by the tree warden.

During the legislative session of 2018, Vermont Forests, Parks & Recreation participated in introducing new legislation that would modernize Vermont's tree warden statues[16]. However, the draft bill did not advance as an official bill and was not considered further that year. The Tree Warden Statute amendments did not go to legislative committee again this year (2019). As such, the original Vermont Tree Warden Statutes[17] (last amended in 1969) still apply. They are included in this report in Appendix C: 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.

[15] Emerald Ash Borer Management on the Vermont Urban & Community Forestry Webpage: https://vtcommunityforestry.org/community-planning/tree-pests
[16] Proposed Tree Warden Statutes Amendments. Vermont Urban & Community Forestry Program. https://vtcommunityforestry.org/resources/vermont-tree-wardens-0/proposed-tree-warden-statutes-amendments
[17] Vermont Tree Warden Statutes. Title 24, Chapter 033. http://vtcommunityforestry.org/sites/default/files/pictures/tree_warden_statutes-1.pdf

- 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[18] 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 right-of-way 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 right-of-way. 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, above.
- Learn more about tree ordinances[19] to determine if Stowe 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[20].

5. Develop a mowing policy for the mowed or cleared ROW

Stowe is already aware of its common roadside invasive plants: Japanese knotweed and honeysuckle. Wild chervil and Japanese barberry were recorded in Stowe on iNaturlist at singular roadside locations and have the capacity to spread quickly. Buckthorn and garlic mustard, common invasive plants in other central Vermont towns, have not been heavily recorded in Stowe on iNaturalist – however, the prevalence in Stowe 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.

[18] Resources for Tree Wardens. Vermont Urban & Community Forestry Program. https://vtcommunityforestry.org/resources/vermont-tree-wardens-0/resources-tree-wardens

[19] Public Policy on Vermont Urban & Community Forestry website: https://vtcommunityforestry.org/resources/public-policy

[20] Guide to Tree Ordinances and Policies for Vermont Municipalities. Vermont Urban & Community Forestry Program. https://vtcommunityforestry.org/sites/default/files/pictures/treeordinanceguide.pdf

Recommendations

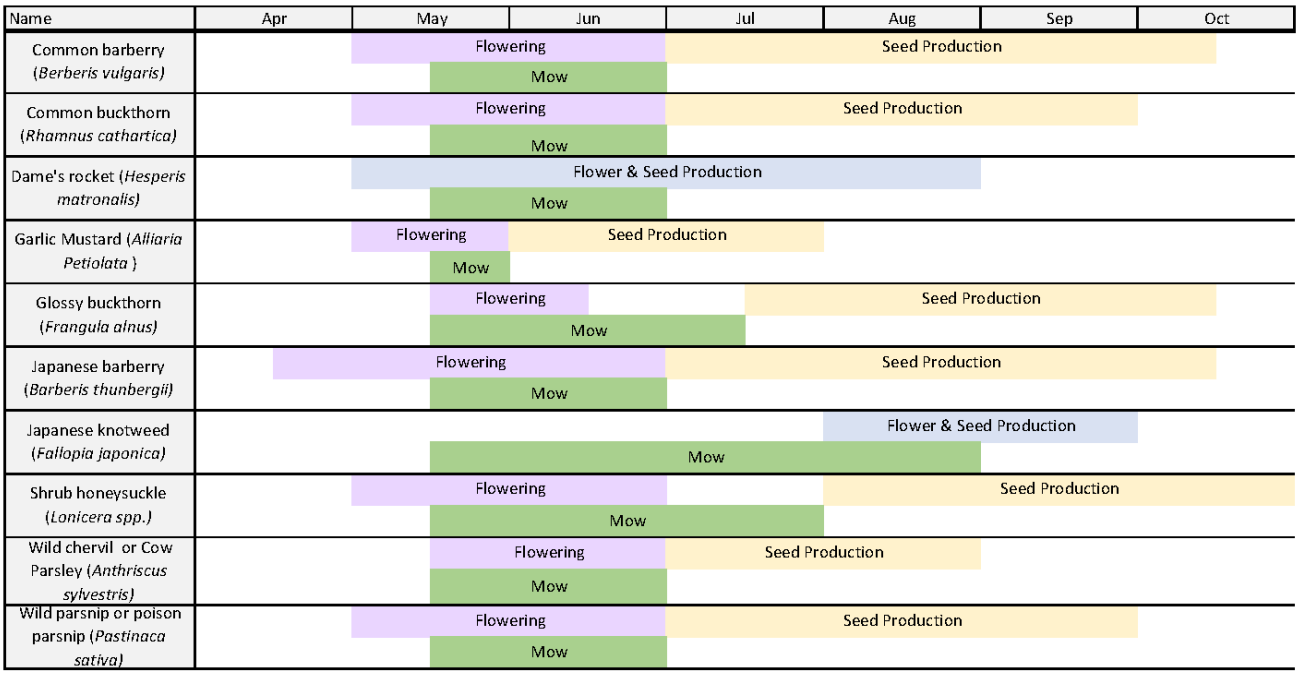
- Do not mow invasive plants after seeds have set. Knowing when invasive plants bloom will let you use mowing to your advantage to reduce the spread of invasive seeds. Follow the invasive plant phenology calendar below to learn when invasive plants bloom in Stowe.
- Areas infested with phragmites, Japanese 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. Japanese knotweed is very prevalent in Stowe – consider locations where knotweed can be kept at bay enough to establish native trees that ultimately crowd out some knotweed, or where knotweed should be eradicated to preserve sight lines along roads.
- 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 (not yet detected in Stowe) 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.
- Treatment of garlic mustard (*Alliaria petiolata*) should also occur before it goes to seed beginning in late June. However, mowing is not an effective control method. Hand pulling or use of foliar herbicide in the spring (late April, early May) or use of foliar herbicide on the basal rosettes by fall are effective control methods, as is flame weeding.
- **Beware of poison ivy.** It is technically not an invasive species but is certainly problematic for road crews, walkers, and bicyclists. And, it spreads. Poison ivy has not yet been recorded along Stowe roadsides.
- 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 (Brownsville Road, portions of Weeks Hill Road, Trapp Hill Road, West Hill Road, Maple Run Lane, and Tamarack Road).
- During construction, minimize soil disturbances to avoid future weed control and inspect and wash equipment before moving to another site.
- Within these mowing parameters, consider allowing vegetation to be 10-12" high by the end of the growing season to protect native plants from winter damage[21].
- For more information on reducing the spread of invasive plants along roadsides, see Appendix D: Best Management Practices for Roadside Invasive Plants[22], released by The Nature Conservancy.
- For more information on the management of specific invasive terrestrial plants, see the Gallery of Terrestrial Plants[23] at the VTinvasives.org website.

CALENDAR OF COMMON INVASIVE PLANT SPECIES PHENOLOGY IN VERMONT

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

[22] Best Management Practices for Roadside Invasive Plants. The Nature Conservancy. https://vtinvasives.org/sites/default/files/Best%20Management%20Practices%20for%20Roadside%20Invasive%20Plants.pdf

[23] Gallery of Terrestrial Plants on VTinvasives.org. https://vtinvasives.org/gallery-of-terrestrial-plants



6. Understand the vegetation management goals of your utility companies

The Stowe town plan does not currently address how existing utilities should or should not impact the scenic and aesthetic qualities of the town's rural roads. Understanding the vegetation management goals of each utility company operating in Stowe and opening dialog with these utilities will help residents understand how to safely manage and plant vegetation on their property and learn how utility line maintenance will affect existing vegetation over time. The Stowe road crew can also benefit from knowing the clearing rotation of vegetation in utility right-of-ways and plan accordingly to manage ash trees, hazard trees, invasive species and living snow fences that affect rural roads.

Stowe is served by three electrical utilities, Green Mountain Power (GMP), Stowe Electric Department and Vermont Electric Co-op.

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[24] and a 2013 Transmission Right-of-Way Management Plan[25]
    - According to their website[26], the Stowe Electric Department (SED) services the Town of Stowe with approximately 7.1 miles of transmission and 120 miles of overhead distribution lines, approximately 70 of which require trimming. SED aims to complete vegetation maintenance on a five-year cycle on transmission lines and seven-year cycle on distribution lines. Most easements on distribution lines are 50 feet wide, or 25 feet

[24] 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.
[25] 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.
[26] Vegetation Management. Stowe Electric Department. https://www.stoweelectric.com/about/vegetation-mgt

on either side of the line. SED retains the rights to clear trees and brush both next to and underneath the utility line if they interfere with the utility lines or the line workers' abilities to reach the utility lines or poles. SED recommends that property owners plant only low growing and non-invasive shrubs alongside or within [the utility] ROW"[27].

- Vermont Electric Coop has a Vegetation Management Plan for Vermont Electric Cooperative, Inc. Transmission and Distribution Systems[28] available online. In VEC's report, Review *Appendix D: Specifications for Vegetation Management on Transmission and Distribution Lines* to understand VEC's practices. This document outlines the basic 10-year maintenance cycle completed by outside contractors on distribution lines and describes right-of-way widths between 30 and 50 feet. Landowners cannot build structures, place obstructions, or change the grade of land within 25 feet of the pole line. The document also specifies that wood from felled trees "remain the property of the landowner and shall be left on site" at the edge of the right-of-way. The Town of Stowe may want to notify landowners about the need to keep ash wood local and note whether the utility company is performing work on their road that would result in felled ash. Lastly, the document specifies that some vegetation in the right-of-way is compatible with utility lines, namely "low growing plants and shrubs such as lilac, serviceberry, dogwood, hawthorns, and [native] honeysuckle".

7. Understand updated stormwater regulations and standards

Road-related erosion 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 consists of the municipality's implementation table and results of a road erosion inventory. More information on the Municipal Roads General Permit[29] can be found on the Municipal Roads webpage[30] of the Vermont Department of Environmental Conservation.

Trees and other vegetation play a role in controlling erosion and protecting water quality. Deciduous canopy cover can reduce rainfall intensity by 15-21%[31], coniferous canopy by 21-52%[32]. 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

[27] Official Right-of-Way Policy. Stowe Electric Department. https://www.stoweelectric.com/images/forms/Right-Of-Way_Policy_10-2014.pdf

[28] Vegetation Management Plan for Vermont Electric Cooperative, Inc., Transmission and Distribution Systems. Prepared by Sara Packer, Vermont Electric Cooperative. https://www.vermontelectric.coop/images/2014_VECVgtMgmntPlan_Rev03-20-14.pdf

[29] Municipal Roads General Permit. https://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/Permitinformation/MunicipalRoads/sw_FinalMRGP.pdf

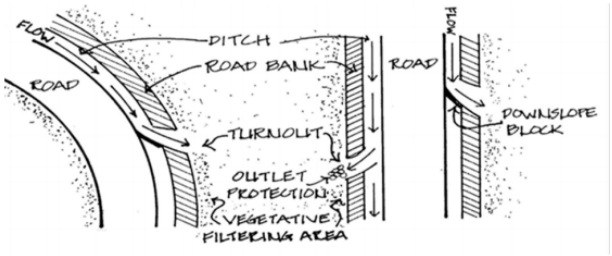
[30] Municipal Roads Program on the Vermont Department of Environmental Conservation webpage: https://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/municipal-roads-program.

[31] 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

[32] 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

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[33].



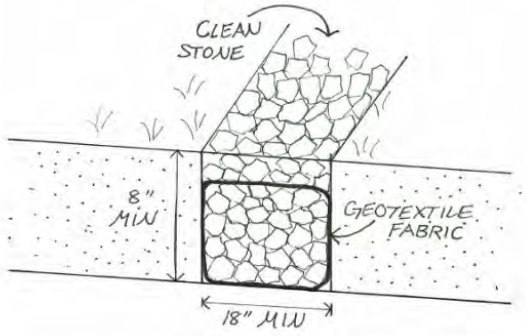


Figure 18: Infiltration Trench

***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 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[34] (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[35] offer views of classic Vermont. Grader berms

- The most common side effect of ditching is an increased line of sight along a road. Design clearing to occur on only one side of the road, leaving as many mature trees and native plants

[33] The Vermont Rain Garden Manual. Winooski NRCD, UVM Extension, Lake Champlain Sea Grant. http://winooskinrcd.org/wp-content/uploads/VTRainGardenManual.pdf
[34] Vermont Better Backroads Manual, January 2019: https://vtrans.vermont.gov/sites/aot/files/highway/documents/ltf/Better%20Roads%20Manual%20Final%202019.pdf
[35] Vermont State Design Standards 1997. Vermont Agency of Transportation, 1997. http://54.172.27.91/transportation/standards/VermontStateDesignStandards1997.pdf

as possible. Mature trees provide more stormwater reduction (20 ft^3 per tree) than newly planted trees (10 ft^3 per tree)[36].

- 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 may be necessary to maintain the ditch, but the backslope, or uphill slope next to a ditch, should not be cleared unless necessary -- plant roots in this soil keep the slope in place. Additionally, examine what height of stone in a stone-lined ditch is necessary. Revegetate any exposed slope above this minimum height.
- Consult the Vermont State Design Standards for recommended 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.

[36] Stormwater Management Benefits of Trees. Stone Environmental, 2014. https://vtcommunityforestry.org/sites/default/files/pictures/waterqualitytreebenefits.pdf

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. A public relations plan is particularly important in Stowe, whose roads include locally

(Town of Stowe Scenic Road Policy) and regionally (https://gostowe.com/green-mountain-byway/) designated scenic roads and the important role these roads play in local tourism.

10. Keep abreast of funding opportunities

Grants to support water quality improvements, vegetation planning, road maintenance that benefits water quality, and economic development may benefit Stowe as it moves forward with vegetation planning in public spaces including the road right-of-way. Numerous granting organizations with varying due dates and available funding amounts are listed in the following table. In some cases, having a vegetation plan already in place will enhance a Stowe's requests for funding.

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: None Match Requirement: 20% local	Annually, late summer
Better Roads	Municipal roadway improvements that benefit water quality: • Inventories of roadway erosion and/or stormwater management issues and capital budget planning (Category A)	Max. Award: Category A: $8,000 Category B: $20,000 Category C: $40,000 Category D: $60,000 Match Requirement: 20% local	Annually, November or December

	• 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)		
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: $22,000 for individual communities, $35,000 for group (consortium) proposals 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**.	Maximum Award: $67,500 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.	

Resilient Right-of-Ways

Field data for the Town of Stowe, Vermont
Part of the Resilient Right-of-Ways Stowe Action Plan and Recommendations
Prepared by Joanne Garton, Vermont Urban & Community Forestry Program
August 28, 2019


FORESTS, PARKS & RECREATION
VERMONT
AGENCY OF NATURAL RESOURCES


PLANT
LIVE
GROW
VERMONT URBAN & COMMUNITY
FORESTRY PROGRAM

Resilient Right-of-Ways Project Data Stowe, VT

1. Resilient Right-of-Way Community Types

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: elizabeth.bannar

Date: 1/28/2019

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

2018 Inventory Roads

Type

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

Road Surface

- Paved
- Unpaved
- Other

VERMONT AGENCY OF NATURAL RESOURCES

WHAT

Right-of-way vegetation is sometimes indistinguishable from the forests or fields on private land that neighbor rural roads. At other times, however, the transition between this publicly managed land and private property can be quite stark: young beech trees can end abruptly at a private lawn, or a cleared roadside ditch can border mature private trees. Town-managed land can be quite different from surrounding land.

HOW

Within each 100-meter plot, vegetation in the right-of-way was classified into one of four broad categories, each with distinguishing subcategories:

Tree-lined or forested

- Emerging Overstory: A shrub or sapling-lined road that exhibits stages of an early forest but does not yet exhibit canopy that shades the road.
- Immature Overstory: The tree-lined or forested roadside with overstory composed of mostly immature trees of less than 6" diameter (at breast height, also called "DBH").
- Mature Overstory: As above with overstory composed of mostly mature trees of greater than 6" diameter (at breast height, also called "DBH").
- Street Trees: Intentionally planted trees are within the ROW that are surrounded by an established herbaceous layer, mowed grass, or predominantly bare ground.

Mowed

- Frequently mowed (like a lawn).
- Seasonally mowed or harvested (like a hayfield or cornfield).

Wet

- Naturally wet due to ponds, rivers or lakes.
- Artificially made wet because of berms or ditches associated with the road.

Bare

- Due to hardscaped landscapes on the roadside, such as stone-lined ditches.
- Due to repeated disturbance such as scraping or trampling.

WHY

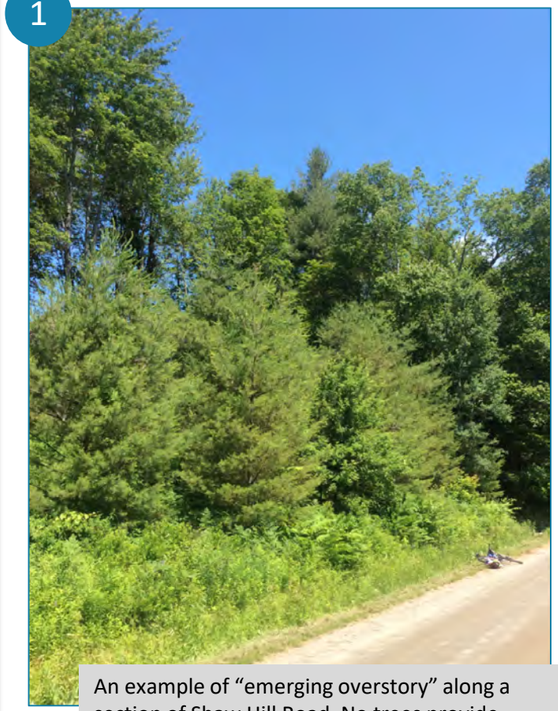
Identifying the type of vegetation in the right-of-way tell us:

The level of obligation the town currently has towards tree care, mowing, or effects of ice and roadside erosion due to stagnant or moving water.

How town residents may perceive their rural roadsides, sometimes independent of adjacent private land use.

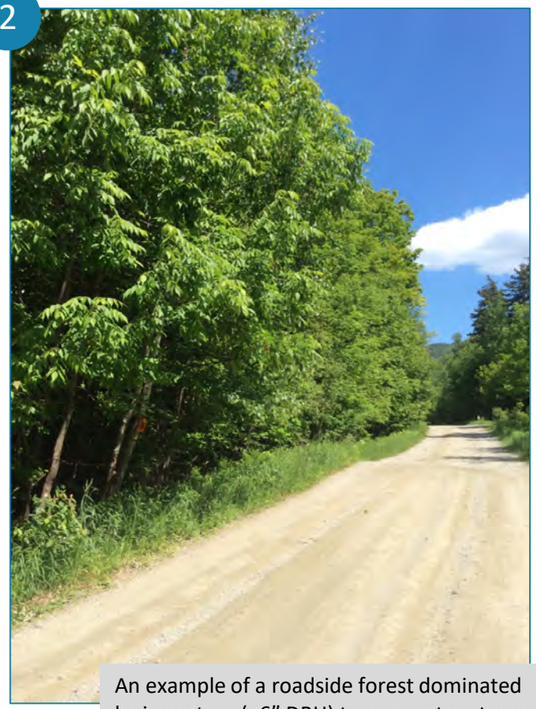
Where immature forests may become mature forests with appropriate forest management, or where mature forests may need yearly monitoring for risk trees.

1



An example of "emerging overstory" along a section of Shaw Hill Road. No trees provide canopy coverage of the road but will do so in the future if the roadside trees are left undisturbed.

2



An example of a roadside forest dominated by immature (<6" DBH) tree overstory trees in the right-of-way.

STATISTICS IN STOWE

The right-of-way vegetation types on the **approximately 30 miles** of surveyed rural routes in Stowe exhibited the following general characteristics:

84% Tree-lined, forested, or future forest: (191 / 228)
- Emerging overstory: 13% (29 / 228)
- Immature overstory: 7% (17 / 228)
- Mature overstory: **59%** (133 / 228)
- Street Trees: 5% (12 / 228)

13% Mowed:(30 / 228)
- Frequently: 4% (9 / 228)

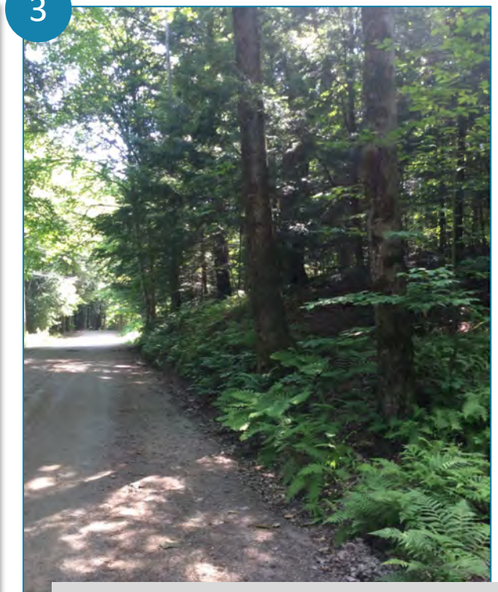
Seasonally: 9% (21 / 228)

3% Wet areas: (7 / 228)
- Riparian area, pond, lake edge, wetland: 1% (3 / 228)

Wet ditch: 2% (4 / 228)

0% Bare: 0% (0 / 228)

3



An example of a roadside forest dominated by mature (>6" DBH) overstory trees in the right-of-way. Also present is an established understory.

Resilient Right-of-Ways Project Data Stowe, VT

1. Resilient Right-of-Way Community Types

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: elizabeth.bannar

Date: 1/28/2019

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

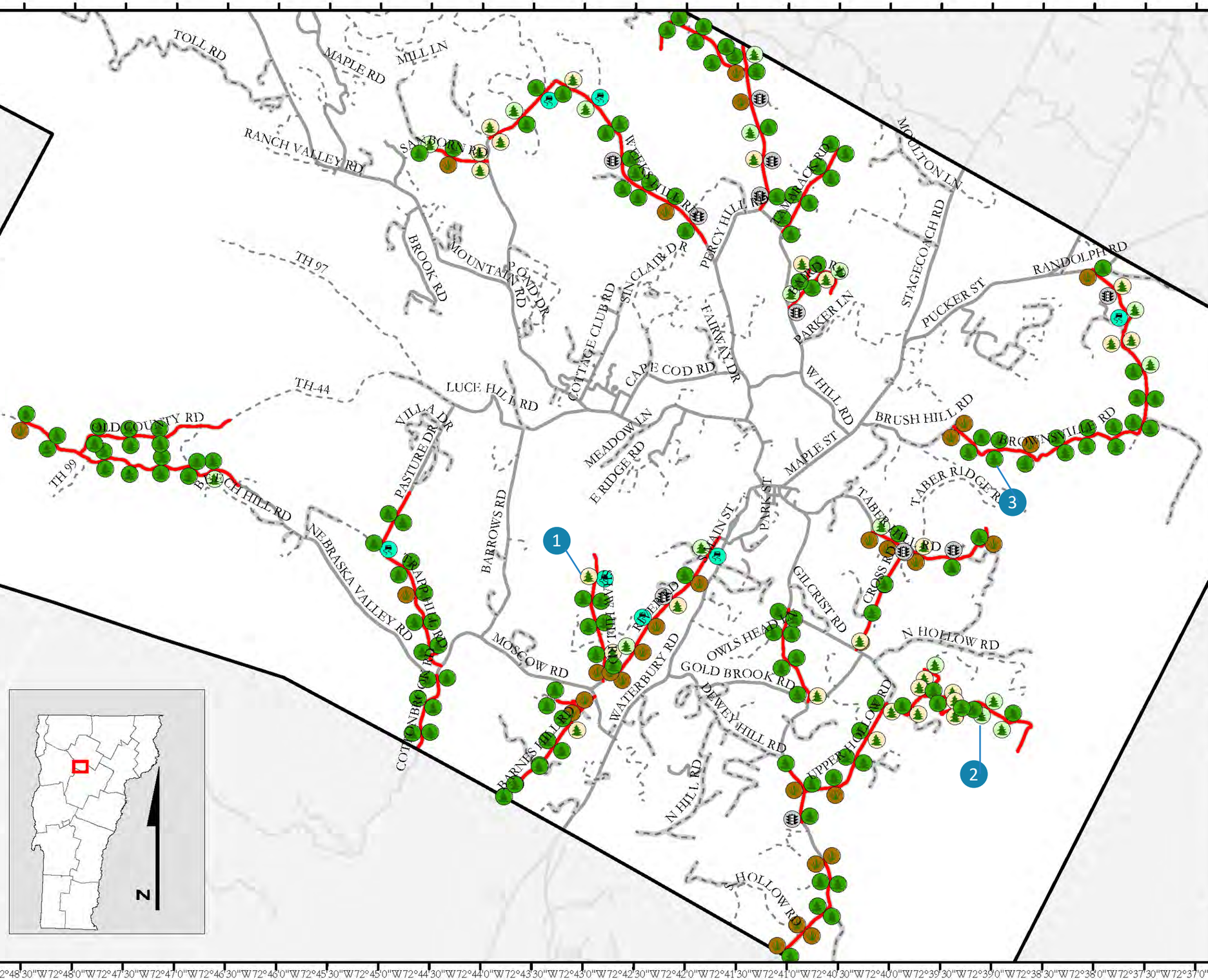
2018 Inventory Roads

Type

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

Road Surface

- Paved
- Unpaved
- Other



VERMONT AGENCY OF NATURAL RESOURCES

Resilient Right-of-Ways Project Data Stowe, VT

2. Manageable Vegetation Width

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: elizabeth.bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads

Manageable Vegetation Width (ft)

- 0
- 1-3
- 4-6
- 7-9
- 9-12
- >12

Road Surface

- Paved
- Unpaved
- Other

VERMONT AGENCY OF NATURAL RESOURCES

WHAT

In most towns, the right-of-way spans 49.5 feet, or 24.25' in each direction from the centerline of the road. The travelled width of an unpaved road and the mowed or cleared zone adjacent to the road can vary depending on topography, road erosion, road entrenchment, or neighboring land features. As such, the actual width of vegetation that the town can manage alongside its roads is often what is leftover after consideration of the width of the road and its associated infrastructure.

HOW

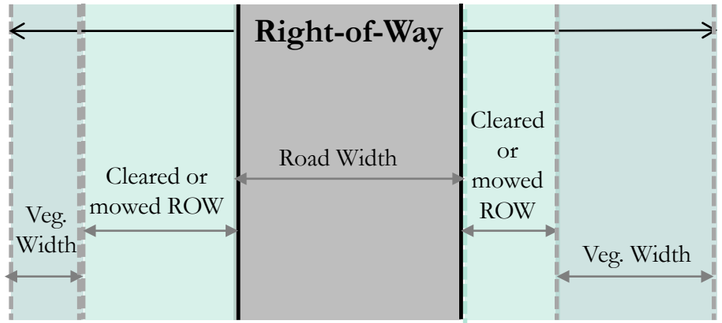
In this study, manageable vegetation width was calculated through a three-step process.

1. The road width was measured from travelled edge to travelled edge using a 25' tape measure.
2. The mowed or cleared zone was measured on each side of the road using the same tape measure.
3. The manageable vegetation width was calculated for each side of the road by subtracting half the road width and the side-specific mowed or cleared zone width from half of the right-of-way width, or;
   manageable vegetation width = (ROW width/2) - (Road width/2) – clear zone width.

WHY

Measuring the width of the road, the width of the mowed or cleared zone on each side, and calculating the manageable vegetation width on each side of a rural road tells us:

- Where opportunities exist to perform recommended silvicultural practices on significant swaths of publicly managed roadside forest.
- Where wide roads and ditches or clear zones are impacting right-of-way vegetation, allowing the town to evaluate if these road widths are necessary or desired.
- Where forest regeneration or replanting may be helpful to demarcate road edges, improve tree canopy to reduce dust, or increase a desired aesthetic (more trees, more fields, or selected trees) along designated scenic routes.



STATISTICS IN STOWE

The manageable vegetation width in the on the **approximately 30 miles** of surveyed rural routes in Stowe exhibited the following general characteristics:

Road width (ft)
- Range: 7– 31
- Average: 21.6
- Median (or, middle value): 22
- Mode (or, most frequent value): 25

Mowed or cleared ROW width (ft)
- Range: 0 – 18
- Average: 7.0
- Median (or, middle value): 6.5
- Mode (or, most frequent value): 6

Manageable vegetation width (ft)
- Range: 0 – 19
- Average: 6.9
- Median (or, middle value): 7
- Mode (or, most frequent value): 8

Resilient Right-of-Ways Project Data Stowe, VT

2. Manageable Vegetation Width

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: elizabeth.bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads

Manageable Vegetation Width (ft)

- 0
- 1-3
- 4-6
- 7-9
- 9-12
- >12

Road Surface

- Paved
- Unpaved
- Other

Resilient Right-of-Ways Project Data Stowe, VT

3. Roadside Ash Impact

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: elizabeth.bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads

Roadside Ash Count per Plot

- None
- Low (1-2)
- Medium (3-4)
- High (5+)

Road Surface

- Paved
- Unpaved
- Other

RESOURCES

Ash Tree Inventories on the Vermont Urban & Community Forestry Website: https://vtcommunityforestry.org/ash-inventory

Emerald Ash Borer Management.on the Vermont Urban & Community Forestry Website: https://vtcommunityforestry.org/community-planning/tree-pests

WHAT

Ash tree health is currently threatened by the arrival of emerald ash borer, a non-native and invasive insect that attacks all species of ash trees. Once infested, most ash trees will die within 3-5 years, posing a risk to all road users.

HOW

In this study, field staff tallied ash trees over 4" diameter at breast height (DBH) that would affect the road if portions or all of the tree weakened and fell. Tallies were counted within the right-of-way of each 100-meter plot and within adjacent areas on private land that host ash trees tall enough to fall on the road.

WHY

Identifying the presence and ash trees that may affect the road helps us:

- Understand how ash trees are distributed on the landscape surrounding survey roads.
- Estimate how many ash the town will need to manage when emerald ash borer is present.
- Identify where opportunities for replanting or forest regeneration may exist after ash die or are removed.

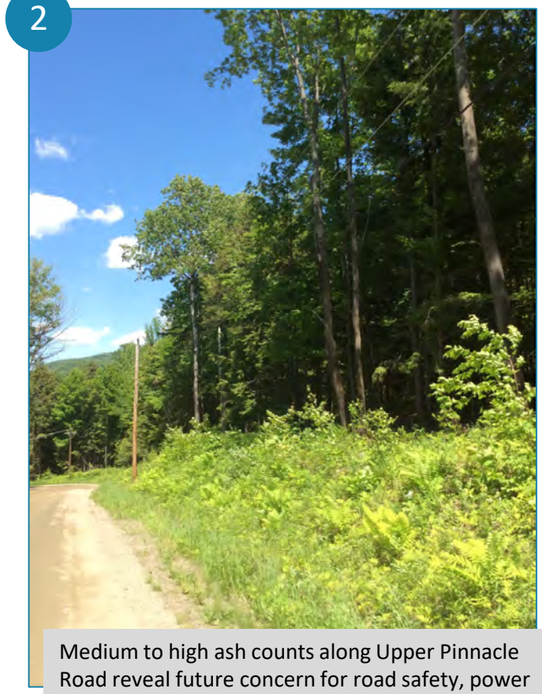
RECOMMENDATIONS

- Conduct an ash tree inventory to determine the location, distribution and size of ash trees along your rural roads. Note whether ash trees are located upslope or downslope of a road that crosses a steep slope.
- Plan to manage ash along rural roads as part of a town-wide EAB Management Plan. Consider how to remove at risk or dead trees, or select trees for treatment. Plan to use ash wood locally.
- Work with neighboring landowners to anticipate the death or removal of roadside ash trees. Consider targeted planting efforts to improve roadside canopy, reduce road erosion, protect water quality, and increase landowner privacy, particularly where right-of-way vegetation is bordered by agricultural fields or lawn. The Urban & Community Forestry Program has several examples of in-state and out-of-state partnership documents between towns and private landowners that arrange funding and care of planted trees planted where right-of-way planting alone is challenging.
- Note the timing of invasive plant flowering and seed set when planning tree removal work. Monitor ash removal sites for invasive plants that often thrive on disturbed soil and with the increased sunlight resulting the new canopy breaks.

1

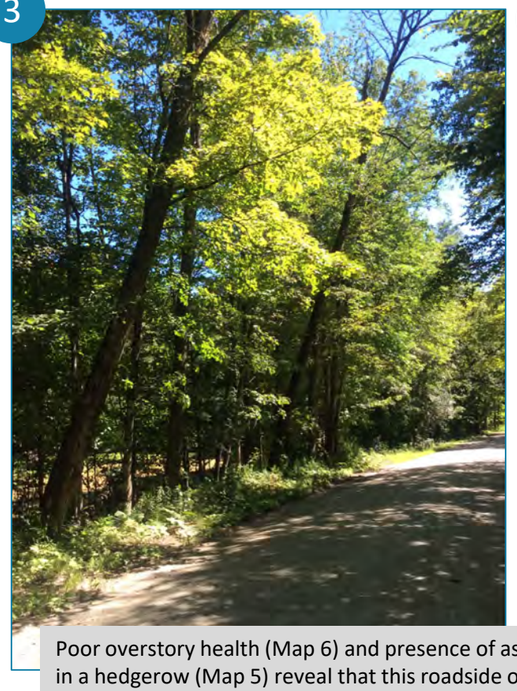
In addition to a "high" ash count, this stretch of Weeks Hill Road also exhibited fair overstory health and high mechanical damage (Map 6), Historic Trees in Fair and Poor condition (Map 7), and was recommended for removal of some mature short-lived trees and thinning of other trees to promote canopy health (Map 11).

2



Medium to high ash counts along Upper Pinnacle Road reveal future concern for road safety, power line resilience, and potential for introduction of new invasive species when road work occurs to manage or remove ash.

3



Poor overstory health (Map 6) and presence of ash in a hedgerow (Map 5) reveal that this roadside on Nebraska Valley Road may change quickly with the arrival of EAB and other tree decline.

4

Large ash line Stowe Hollow Road. These trees may be on private property. The landowner has expressed interest in understanding the impact of EAB to ask on his property and bordering roadside.

Resilient Right-of-Ways Project Data Stowe, VT

3. Roadside Ash Impact

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: elizabeth.bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

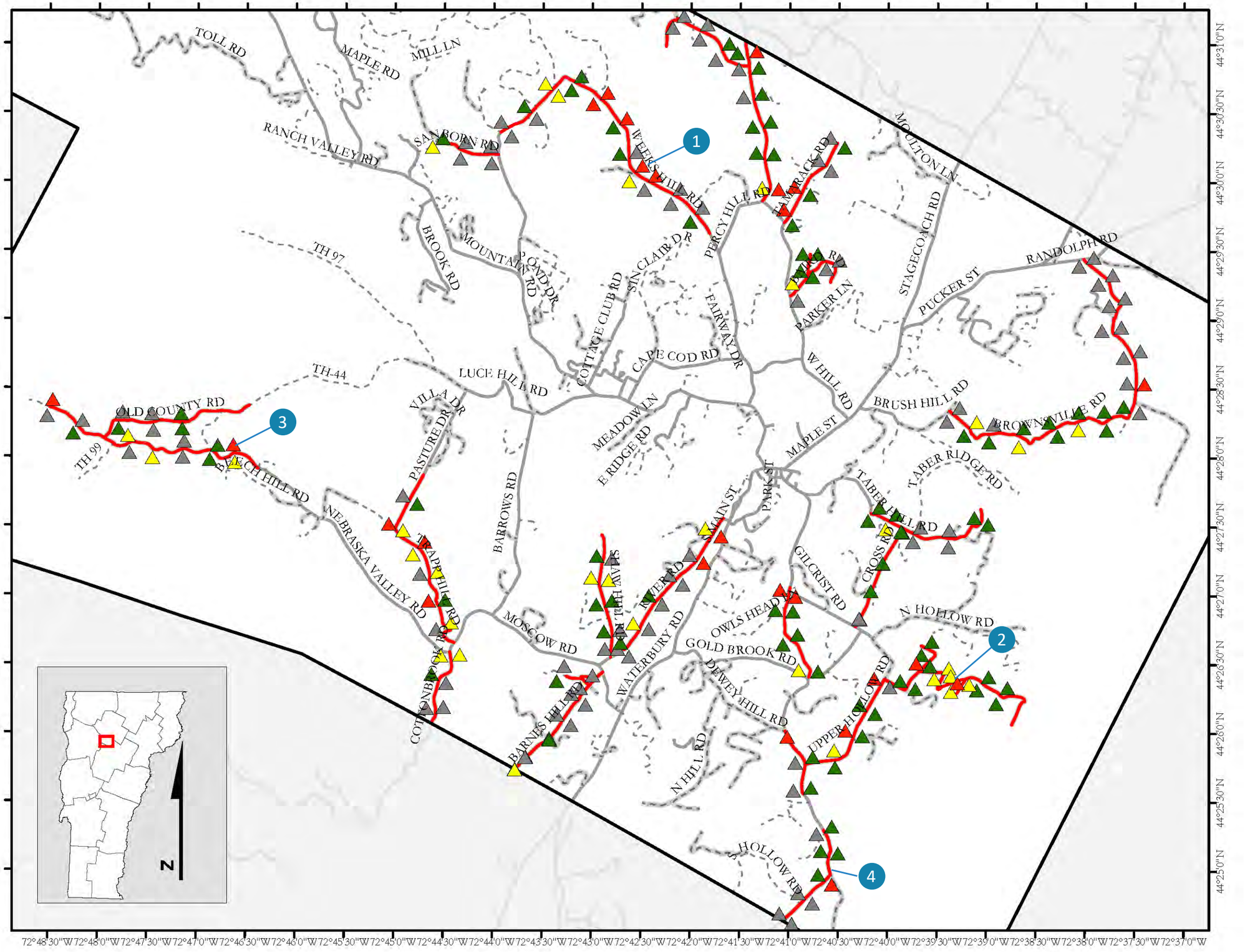
2018 Inventory Roads

Roadside Ash Count per Plot

- None
- Low (1-2)
- Medium (3-4)
- High (5+)

Road Surface

- Paved
- Unpaved
- Other



VERMONT AGENCY OF NATURAL RESOURCES

Resilient Right-of-Ways Project Data Stowe, VT

4. Overhead Utility & Vegetation Regeneration Opportunities

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads
- Utility Wire
- Promote Regen

Road Surface

- Paved
- Unpaved
- Other

RESOURCES

- Safety Guide on the Green Mountain Power website. https://greenmountainpower.com/learn/safety-guide/
- Trees & Utilities: Cooperative Management Strategies for Success. Rutgers University website: https://njaes.rutgers.edu/pubs/publication.php?pid=FS1006

WHAT

Utility companies play a large role in deciding the composition and health of roadside vegetation. Understanding where your utility companies work and how they structure their roadside pruning and clearing rotations will help town residents plan for changes in their roadside vegetation structure and not be surprised by sudden pruning, clearing, or mowing.

HOW

In this study, the impact of an overhead utility on the right-of-way was recorded after visual assessment of the 100-meter plot. Recording a "yes" for a utility impact indicated the presence of the utility within the town's 49.5-foot right-of-way or an impact on the town's right-of-way vegetation if the utility was located outside of the town's 49.5-foot right-of-way. Also noted are locations where the town can consider promoting regeneration of vegetation within the guidelines of the utility company.

WHY

Identifying the presence or impact of overhead utilities within the right-of-way tells us:

- Where towns can partner with utility companies to manage unique vegetation that is hindered by the utility company's standard procedure.
- Where landowners can be alerted to the practices implemented by the utility company servicing their road.
- Where the town should rely on the utility company for assistance removing downed trees.
- Where there are roads not impacted by overhead utilities, offering more opportunity for established forestry practices.

RECOMMENDATIONS

- Work with the local utility companies 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 vegetated buffers of grasses and ensure that disturbed areas are revegetated with native seed mixtures.
- Keep yourself and your equipment at least 10-feet away from overhead utility lines. Treat all power lines as energized. Never cut or prune trees within 10 feet of an overhead utility and never attempt to remove trees or limbs from a utility line.
- Call 888-DIG-SAFE at least 48 hours before you dig. Dig Safe a free and legally-required service that alerts you of any underground utilities in the area you may need to dig.

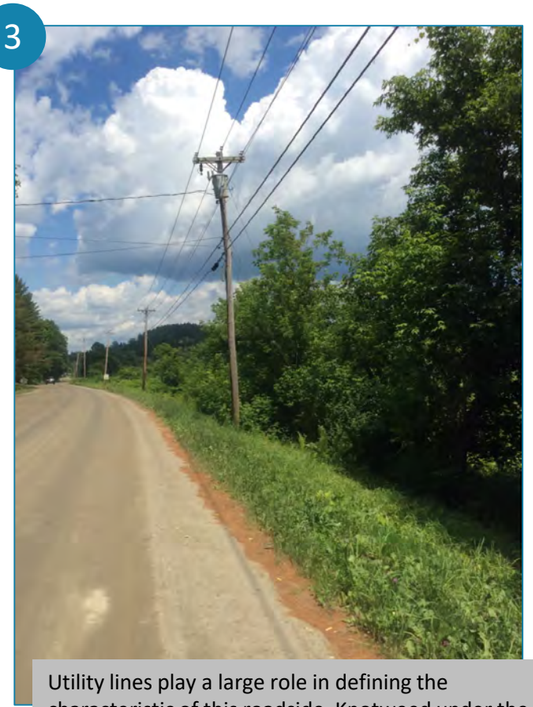
1

Utility poles lie directly within the right-of-way on Pinnacle Road. Vegetation is kept low through repeated roadside mowing. Monitor for opportunities to increase vegetation height.

2

Shrubby vegetation is allowed to grow beneath this utility line but proximal trees require repeated pruning. Utility companies and mowers should take extreme care not to bring invasive plants into this stretch of road, particularly when removing ash.

3



Utility lines play a large role in defining the characteristic of this roadside. Knotweed under the utility line will be easily spread when mowing occurs. Work with the utility company to understand their practice to reduce knotweed spread. Efforts to secure some native revegetation may be appropriate here.

4

Utility lines along agricultural fields are easily kept clear of hazards and may be well-monitored for invasive plants by farmers who do not want invasive plants in their fields.

Resilient Right-of-Ways Project Data Stowe, VT

4. Overhead Utility & Vegetation Regeneration Opportunities

FORESTS, PARKS & RECREATION VERMONT

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

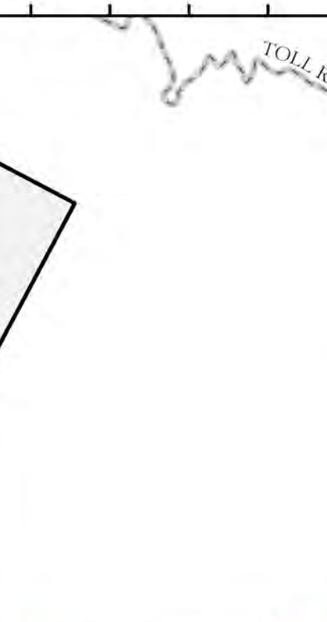
0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads
- Utility Wire
- Promote Regen

Road Surface

- Paved
- Unpaved
- Other



VERMONT AGENCY OF NATURAL RESOURCES

Resilient Right-of-Ways Project Data Stowe, VT

5. Hedgerow Locations

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads
- Hedgerow

ROW Type

- Emerging overstory (shrubs & saplings)
- Immature overstory (≤6" dbh)
- Mature overstory (>6" dbh)

Road Surface

- Paved
- Unpaved
- Other

RESOURCES

Better Roads 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

WHAT

For the purposes of this study, hedgerows are defined as narrow strips of trees and shrubs that border a road on one side and a field, lawn, or body of water on the other. For a traveler on the road, hedgerow trees create defining characteristics of the road's environment, demarcate the road edge, provide canopy cover for small mammals and birds, create a wind breaks and shade, filter stormwater, and provide beauty and enjoyment.

HOW

When a survey plot included trees, field staff evaluated whether or not the trees were part of a hedgerow located either within the right-of-way or spreading from the right-of-way onto private property. Locations on the map marked with green squares mark where trees were part of hedgerow.

WHY

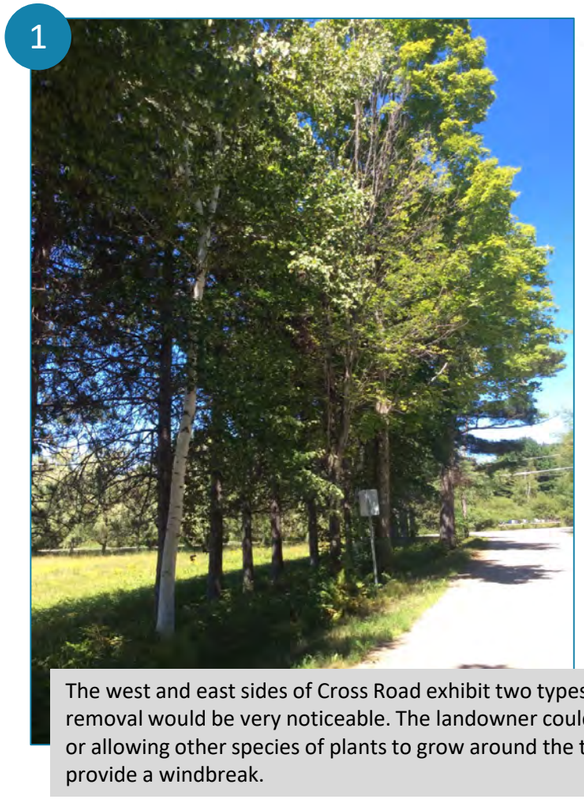
Identifying the presence of hedgerows helps us:

- Evaluate where wildlife may be traveling through otherwise unforested landscapes.
- Highlight areas where landowners may be particularly sensitive to roadside tree cutting (hedgerows create a privacy screen that many homeowners value).
- Highlight areas where hedgerows bordering agricultural fields may conflict with the goals of the farmer.
- Address whether scenic views are being impeded by hedgerows.

RECOMMENDATIONS

- Identify where ash trees make up a large portion of the trees in a hedgerow. Consider targeted replanting or interplanting in these areas to mitigate canopy loss when ash trees die.
- Identify landowners who may be willing to monitor for invasive species in hedgerows border their property.
- Identify where hedgerows may be unintentional. Some hedgerow trees and shrubs grow only when animals stop grazing fields or land use changes. Utilize the expertise of the tree warden or another forester to plan for targeted and thoughtful tree pruning and/or removal of some trees according to recommended best practices.
- To mitigate road erosion without cutting trees, utilize best management practices outlined in the recently updated Better Roads Manual to direct surface runoff off the road in either directed outlets or through ditching that extends into the existing travel lane. Recommendations about construction of turnouts is included in the Better Roads Manual on page 33.

1



2

The west and east sides of Cross Road exhibit two types of hedgerows. The trees on the left are only one deep – their removal would be very noticeable. The landowner could consider interplanting the next generation of hedgerow trees or allowing other species of plants to grow around the trees. The cedars (right) create privacy for the landowner and provide a windbreak.

3

Over time, road surfaces erode or are graded away, eventually creating a sunken road or "dugway". Utilize best management practices outlined in the recently updated Better Roads Manual to direct surface runoff off the road in either directed outlets or through ditching via directed outlets.

4

Large maple stumps are all that remains of historic roadside trees. The many thin, young trees of this hedgerow may have been left unintentionally by the landowners. This location is also recommended for thinning of young trees to promote future canopy (Map 11).

Resilient Right-of-Ways Project Data Stowe, VT

5. Hedgerow Locations

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads
- Hedgerow

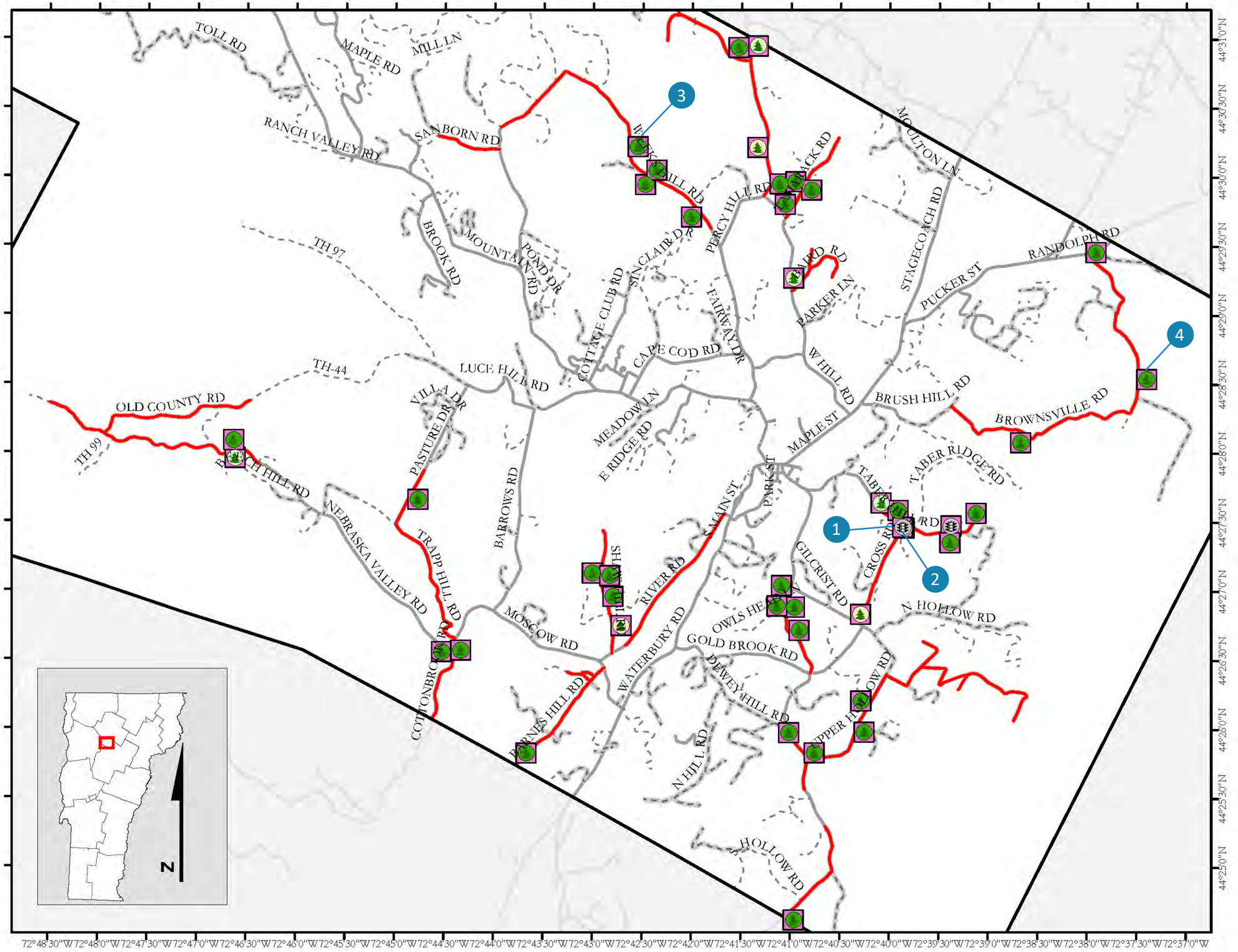
ROW Type

- Emerging overstory (shrubs & saplings)
- Immature overstory (≤6" dbh)
- Mature overstory (>6" dbh)

Road Surface

- Paved
- Unpaved
- Other

VERMONT AGENCY OF NATURAL RESOURCES



Resilient Right-of-Ways Project Data Stowe, VT

6. Overstroy Health & Mechanical Damage

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

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

- 2018 Inventory Roads

Health & Damage

- Fair health, low damage
- Poor health, low damage
- Fair health, high damage
- Poor health, high damage
- Poor health, no damage

Road Surface

- Paved

RESOURCES

Tree Characteristics: The Vermont Tree Inventory Guide (p.16-18). Created by the Vermont Urban & Community Forestry Program. http://vtcommunityforestry.org/sites/default/files/pictures/vt_inventory_guide_2014_0.pdf

Municipal Roads General Permit (MRGP): A Guide for Lakeshore Roads. Lake Wise Program, Vermont Department of Environmental Conservation. https://dec.vermont.gov/sites/dec/files/wsm/lakes/Lakewise/docs/lp_MRGP_GuidelinesForLakeRoads.pdf.

WHAT

Yearly visual examination of the health of overstory trees in the right-of-way is an efficient and low-tech field method to help towns form their roadside forest management priorities. Trees may be in decline because of their age, surrounding soil conditions, disease, or pests. However, some roadside trees decline because of repeated damage from equipment strikes by mowers and plows or from acute damage inflicted during ditching, a vehicle collision, or branch clearing with a raised flail mower. Any trees with documented fair or poor overstory health that also exhibit mechanical damage may be particularly susceptible to breaking or falling.

HOW

Overstory health of trees within the right-of-way was assessed visually in the field using reference guides such as The Vermont Tree Inventory Guide (p. 16-18). The level of mechanical damage to trees within the right-of-way was also assessed visually in the field. This map displays co-locations rated with “fair” or “poor” overstory health and “high” or “low” mechanical damage.

WHY

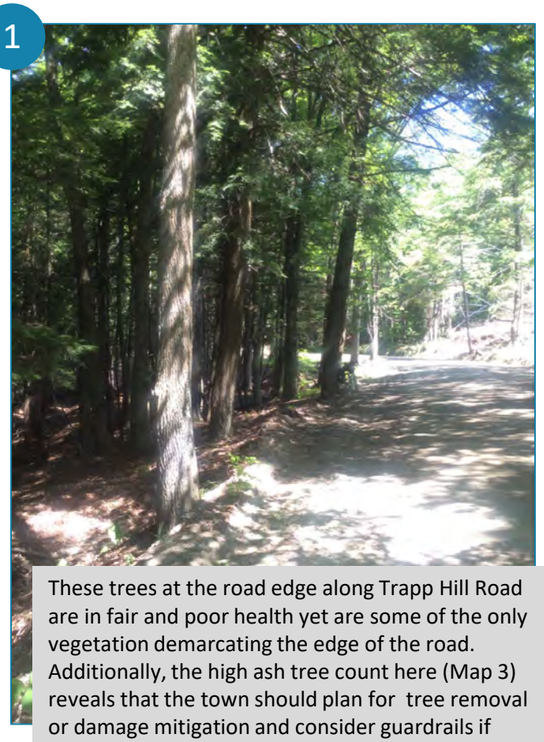
Identifying locations exhibiting declining tree health and notable mechanical damage helps us:

- Describe sample locations where roadside forest management can be proactive, promoting healthy canopy trees and reducing possible risk posed by dead or dying trees.
- Identify locations where road-tree conflicts exist, then determine if road crews should use narrower or alternate road maintenance equipment, or if a tree should be removed.
- Identify where trees may be in decline due to environmental stressors, allowing towns to prioritize replanting, interplanting, or forest regeneration.
- Determine if future road construction sites should also involve roadside forest management.

RECOMMENDATIONS

- Note roads where the road foreman expresses concerns about using the plow or grader. Work with the tree warden, conservation commission, and/or neighboring landowners to address tree preservation or removal.
- Where roadside trees border lakes and ponds, consult the Municipal Roads General Permit: A Guide for Lakeshore Roads to understand best practices for managing vegetation along lakeshores and important exemptions to the Municipal Roads General Permit.
- Where road-tree conflicts occur on steep banks, review the **Bank Stabilization Section** in the Vermont Better Roads Manual (p. 36 – 45).

1



These trees at the road edge along Trapp Hill Road are in fair and poor health yet are some of the only vegetation demarcating the edge of the road. Additionally, the high ash tree count here (Map 3) reveals that the town should plan for tree removal or damage mitigation and consider guardrails if trees are repeatedly damaged by vehicle strikes.

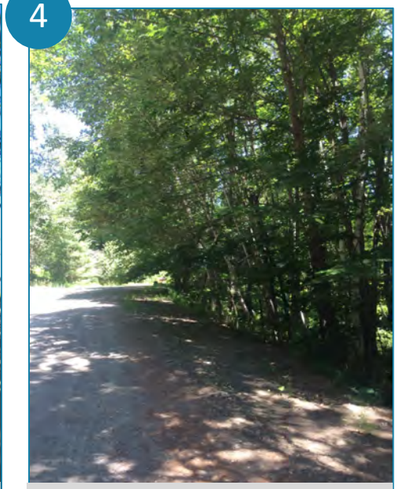
2

Despite the majority of canopy being in good health, several trees along the downhill edge of Brownsville Road are severely damaged by equipment or vehicle impacts.

3

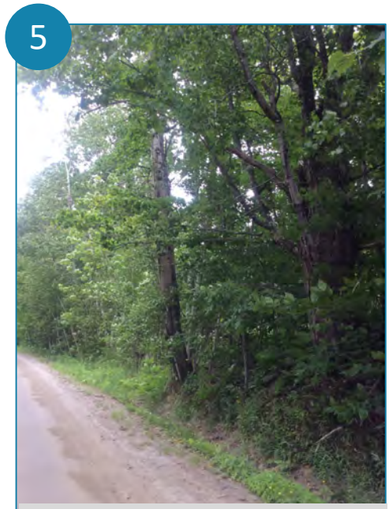
These rural road street trees are in poor health but show no outward signs of damage to the trunks. However, disease, compaction, or other recent changes to the roadside land use may have impacted the health of these trees, some of which are ash.

4



Wide right-of-way clearing has created a clear zone of bare soil and little manageable vegetation width (Map 2). Neighboring trees have been impacted by widening and possibly previous road construction.

5



Tree roots damaged by ditching can lead to undermined slopes and tree decline. These trees in fair health and with low levels of mechanical damage from previous roadwork should be monitored yearly.

Resilient Right-of-Ways Project Data Stowe, VT

6. Overstroy Health & Mechanical Damage

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

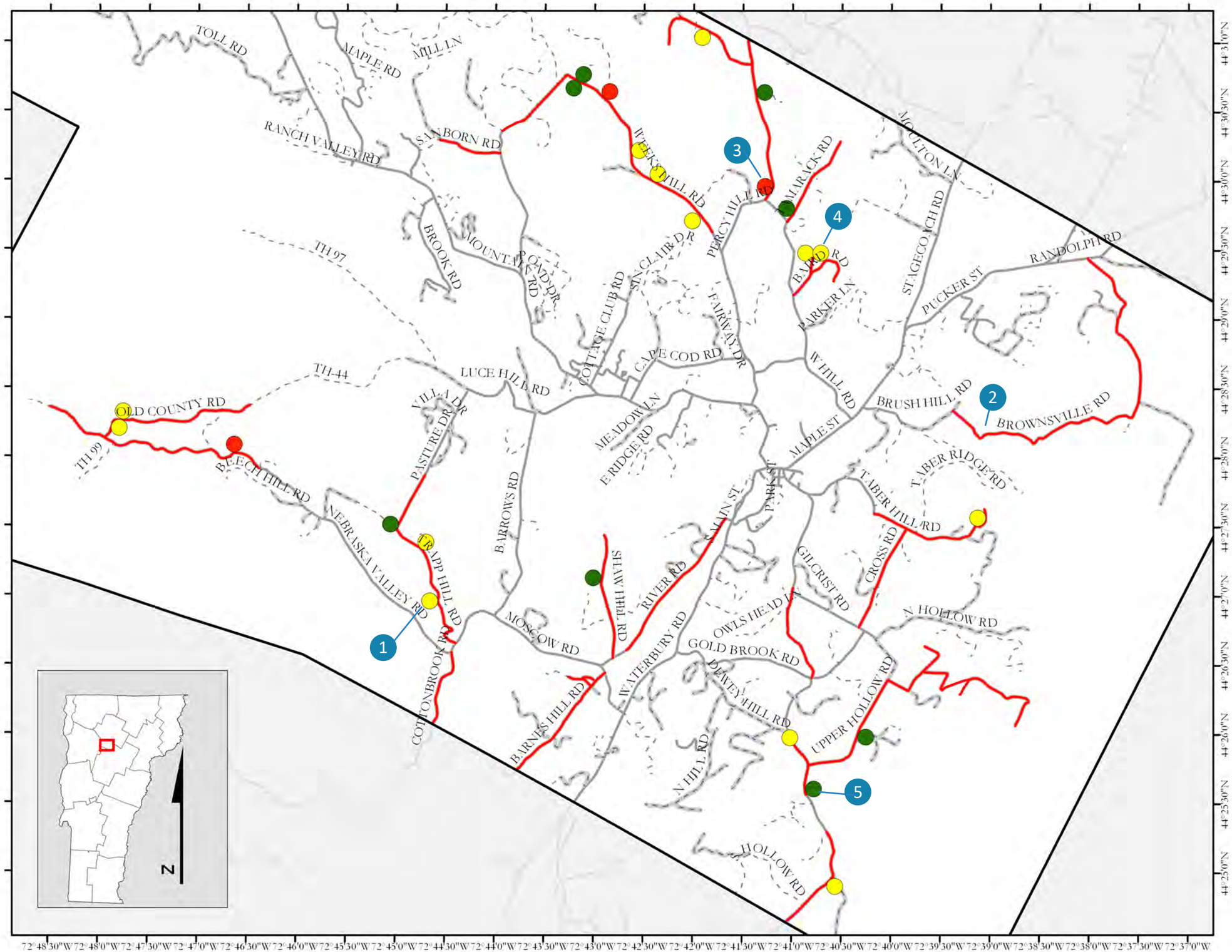
2018 Inventory Roads

Health & Damage

- Fair health, low damage
- Poor health, low damage
- Fair health, high damage
- Poor health, high damage
- Poor health, no damage

Road Surface

- Paved
- Unpaved
- Other



VERMONT AGENCY OF NATURAL RESOURCES

Resilient Right-of-Ways Project Data Stowe, VT

7. Historic Tree Locations & Health

Vermont Department of Forests, Parks & Recreation
1:50,000
Cartographer: Elizabeth Bannar
Date: 1/28/2019

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

- 2018 Inventory Roads

Historic Trees by Health

- Good
- Fair
- Poor

Road Surface

- Paved
- Unpaved
- Other

RESOURCES

Pruning on the Vermont Urban & Community Forestry website: https://vtcommunityforestry.org/resources/tree-care/pruning

Tree Planting on the Vermont Urban & Community Forestry website: https://vtcommunityforestry.org/sites/default/files/pictures/protecting_your_investment_tree_planting_maintenance.pdf

WHAT

Historic trees in the right-of-way are distinctly larger, broader, and older than surrounding trees. Often consistently spaced along a roadside, historic trees can be surrounded by mowed grass, herbaceous cover, bare soil, or a forest of young trees, shrubs, and edge species.

HOW

In this study, historic tree health was assessed by visual inspection of the trunk and canopy of any historic tree within the plot. An overall rating of “good”, “fair”, or “poor” was assigned to the of historic trees health of the plot.

WHY

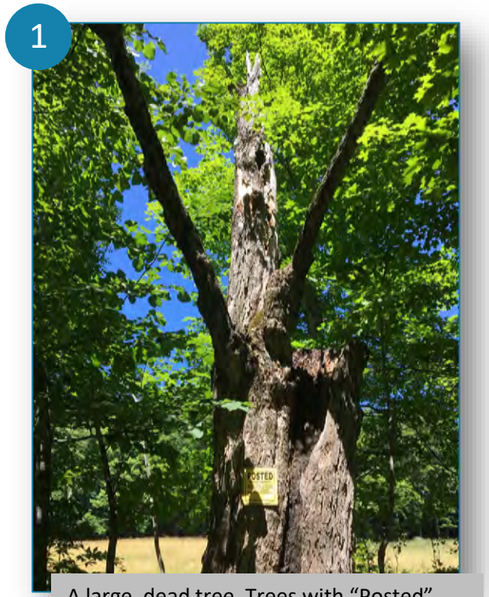
Identifying the presence and health of historic trees within survey plots tells us:

- Where roads may have a culturally important history.
- Where large trees may be in decline and pose a safety risk to road users.
- Where people may already be accustomed to seeing tree canopy over the road and value its presence.

RECOMMENDATIONS

- Evaluate the health of the historic trees during a yearly “look up” drive conducted jointly by the tree warden and road foreman. Record observations on paper, using a GPS-enabled device, or simply by flagging trees that need maintenance or require removal each year.
- Review tree care best practices including pruning. Make sure that your road crew, contracted mowers and contracted tree care specialists understand these best practices, too.
- Consider thinning trees and shrubs around healthy young trees to promote regeneration and to select for the next generation of tree canopy.
- Consider planting new trees between existing historic trees, particularly along roadsides without emerging forest. Sometimes called “interplanting”, this technique will grow a new generation of intentionally managed trees.

1

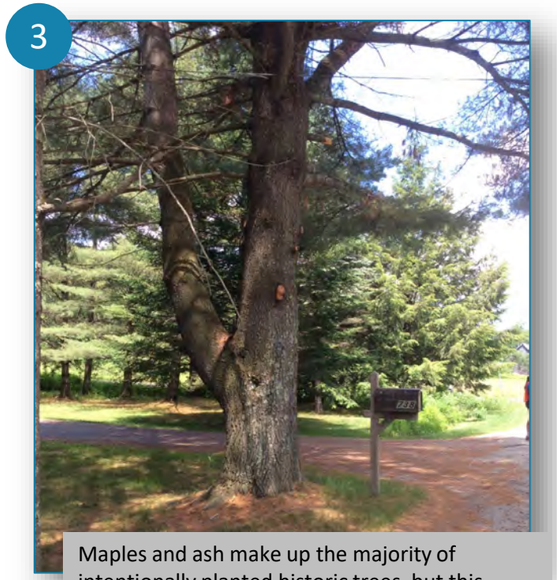


A large, dead tree. Trees with “Posted” signs are often not removed from roadsides.

2

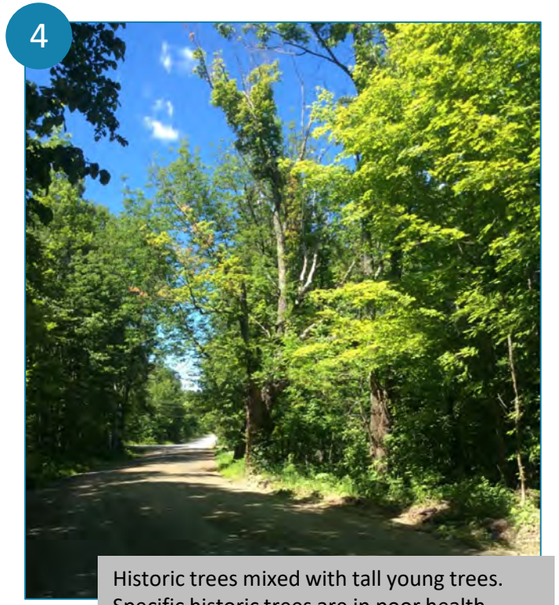
Remove historic trees as needed and consider thinning to promote the healthy maples and future tree canopy.

3



Maples and ash make up the majority of intentionally planted historic trees, but this white pine has clearly held a place along this road for a long time.

4



Historic trees mixed with tall young trees. Specific historic trees are in poor health.

5

The next generation of historic trees already planted.

Resilient Right-of-Ways Project Data Stowe, VT

7. Historic Tree Locations & Health

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

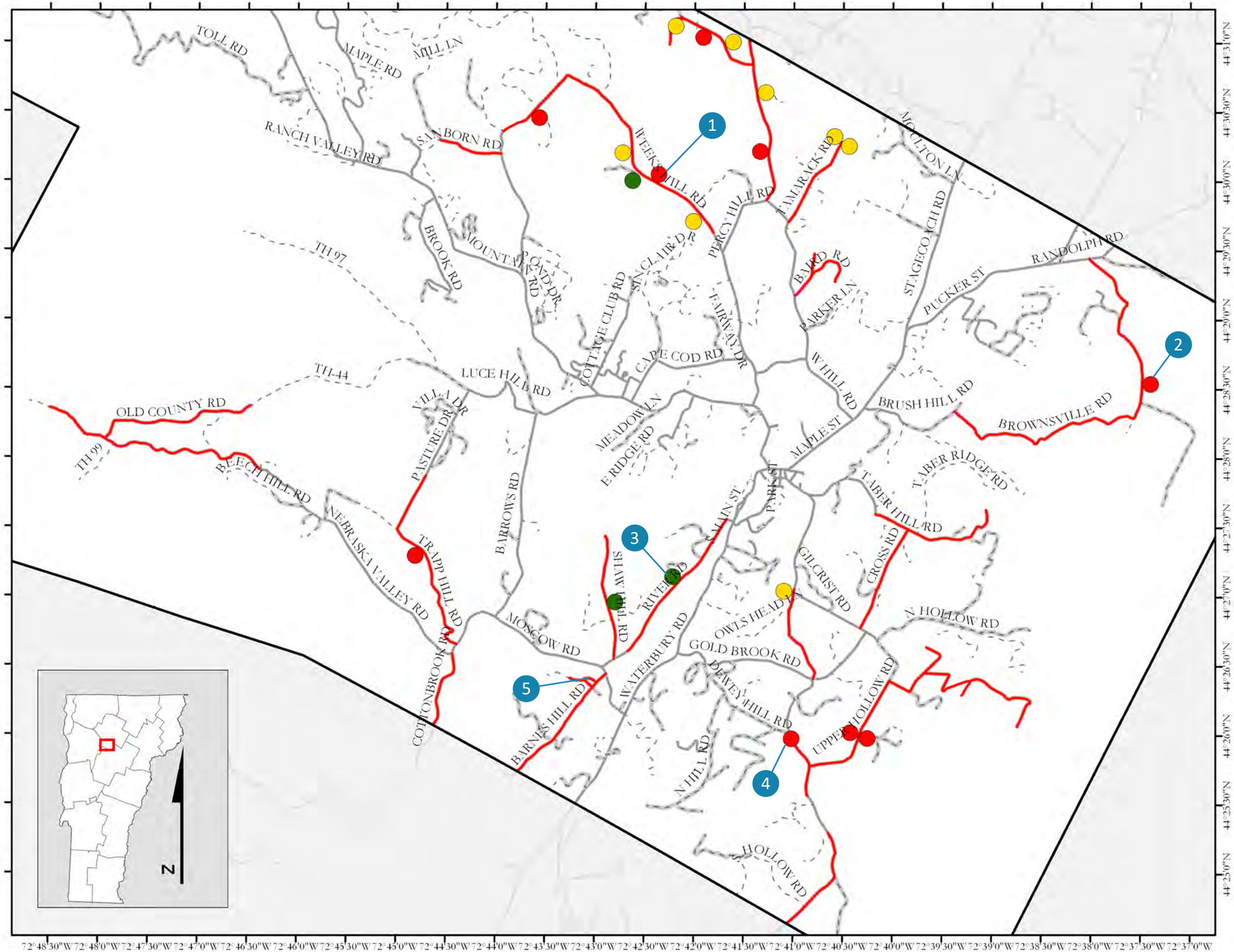
2018 Inventory Roads

Historic Trees by Health

- Good
- Fair
- Poor

Road Surface

- Paved
- Unpaved
- Other



VERMONT AGENCY OF NATURAL RESOURCES

Resilient Right-of-Ways Project Data Stowe, VT

8. Invasive Species Locations (data source: iNaturalist)

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

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

2018 Inventory Roads

Invasive Species

- Honeysuckle spp.
- Garlic mustard
- Japanese barberry
- Japanese knotweed
- Wild Chervil

Road Surface

- Paved
- Unpaved
- Other

VERMONT AGENCY OF NATURAL RESOURCES

WHAT

The consistent disturbance to the roadside edge provides ample space for invasive species to take root, flower, and spread. Additionally, road construction equipment, mowers, car tires, and even pedestrians and bicyclists can easily carry the seeds or root fragments of invasive plants down the road.

Because the roadsides are public spaces, no one person may feel entirely responsible for the management and control of these roadside plants. As such, slowing the spread of invasive roadside plants must be a persistent effort requiring consistent monitoring, management, and public outreach.

HOW

In this study, observations of invasive plant species were recorded on iNaturalist, a citizen science data collection application. The Resilient Right-of-Way map displays invasive plant species locations as noted by the Resilient ROW field staff in addition to other iNaturalist users. It is does not offer a comprehensive picture of all invasive plants. More on iNaturalist can be found at https://www.inaturalist.org/.

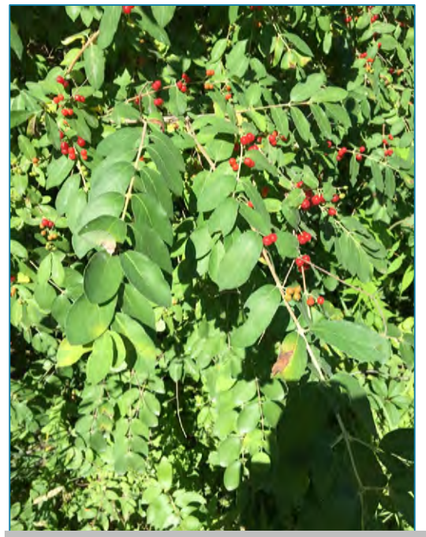
WHY

Identifying the location and species of common invasive plants along rural roads tells us:

- Where we should implement specific treatment practices found on vtinvasives.org.
- How to educate landowners about the spread of invasive species, including from and to their private property.
- How to help road crews identify new infestations of invasive plants, particularly if the small plants can be treated.
- Where to exercise extreme caution when performing roadwork or mowing so as to avoid spreading invasive plant seeds or roots on equipment or in fill.

RESOURCES

- Gallery of Terrestrial Invasive Plants on the Vermont Invasives website: https://vtinvasives.org/gallery-of-terrestrial-plants
- Best Management Practices for the Prevention and Treatment of Terrestrial Invasive Plants in Vermont Woodlands. The Vermont Chapter of the Nature Conservancy: http://www.vermontwoodlands.org/documents/FinalBMPinvasivesmanual.pdf



Morrow's Honeysuckle (*Lonicera morrowii*)

Wild Chervil (*Anthriscus sylvestris*)

Garlic Mustard (*Alliaria petiolate*)

Japanese Barberry (*Berberis thunbergii*)

Japanese Knotweed (*Fallopia japonica*)

RECOMMENDATIONS

- 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 D.
- As you are able, treat isolated existing patches of invasive species in roadside ditches by mechanical or chemical means (as appropriate).
- Preserve trees and shrubs that provide shade on roadsides. Invasive plants, like many plants, are less likely to thrive in shady areas.
- Know where your invasive species are… and where they aren't. Mow first in areas without invasive species, then mow area with known infestations (except for knotweed, phragmites, or purple loosestrife). Follow best practices to keep mowing and ditching equipment clear of invasive plant fragments and seeds.
- 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.

Resilient Right-of-Ways Project Data Stowe, VT

8. Invasive Species Locations (data source: iNaturalist)

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads

Invasive Species

- Honeysuckle spp.
- Garlic mustard
- Japanese barberry
- Japanese knotweed
- Wild Chervil

Road Surface

- Paved
- Unpaved
- Other

VERMONT AGENCY OF NATURAL RESOURCES

Resilient Right-of-Ways Project Data Stowe, VT

9. Vegeatation Preservation Opportunities

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads

Steep Slope

- Yes, down
- Yes, up

Preservation Opportunities

- Preserve Herbaceous Buffer
- No Cut (trees)

Road Surface

- Paved
- Unpaved
- Other

VERMONT AGENCY OF NATURAL RESOURCES

WHAT

Preserving trees, shrubs, or other herbaceous vegetation can reduce soil erosion, demarcate the edge of the road, create visual interest and beauty, and provide privacy for homeowners. In particular, preserved tree canopy helps intercept rainfall that would otherwise damage road surfaces, provide shade that reduces road dust on hot days, promote infiltration of rainwater into the soil, and reduce pollutants in stormwater that heads downstream.

HOW

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" recommendations where grasses, herbaceous plants, or low shrubs should not be cleared. Field teams also noted if the land in or immediately adjacent to the right-of-way exhibited a significant slope up or down and may therefore be more susceptible to erosion if vegetation is cleared.

WHY

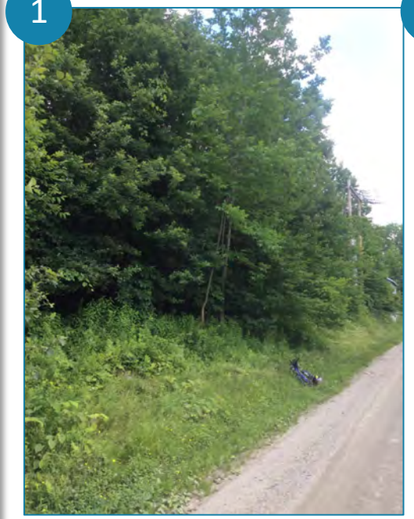
Identifying where trees and herbaceous (grassy) cover should be preserved helps us:

- Describe sample locations where trees, shrubs, or other herbaceous vegetation are helping maintain safe and passable roads.
- Plan to protect trees during future road construction events, particularly near steep slopes or water bodies.
- Balance the need to remove trees in some places with the ability to preserve trees in other places.
- Plan tree removal and preservation priorities from a town-wide perspective and avoid "knee-jerk" reactions when some trees are marked for removal.

RESOURCES

- Trees and Stormwater. Vermont Urban & Community Forestry Program. https://vtcommunityforestry.org/sites/default/files/pictures/trees_and_stormwaterv2.pdf
- Bank Stabilization: Vegetation – Shrubs and Trees (p.40), Live Stakes (p. 41), and Buffer Zone (p. 45), Vermont Better Roads Manual, 2019. https://vtrans.vermont.gov/sites/aot/files/highway/documents/ltf/Better%20Roads%20Manual%20Final%202019.pdf
- River Corridor Protection on the Vermont Department of Environmental Conservation website: https://dec.vermont.gov/watershed/rivers/river-corridor-and-floodplain-protection/protection

1



"No cut" recommendation: Trees beyond the clear zone along this portion of River Road stabilize the slope and reduce stormwater runoff travelling to the road from upslope land. Cutting trees here may reduce the resilience of neighboring trees to wind damage.

2

Logging on property border Trapp Hill Road has also impacted the right-of-way. Consider the needs of the loggers and their equipment; the topography of the roadside right-of-way, and public education around the future of the rights-of-way after logging.

3

Preserve the herbaceous buffer to filter road runoff into neighboring slopes. This location on Cross Road is not affected by an overhead utility (Map 4) and also presents an opportunity for planting (Map 10).

RECOMMENDATIONS

- In mature forests with an established understory, avoid cutting trees that do not pose a risk to travelers. In particular, note where roadside vegetation is stabilizing steep slopes. Have a forester evaluate whether a tree lean occurred recently (and may pose a risk of falling) or if it occurred many years ago and has been self-corrected. Remember that hardwood trees are "phototrophic" and can lean naturally to grow towards the light. Softwood trees, however, are "geotrophic" and grow straight up, leaning only when tilted at ground level.
- Preserve herbaceous buffer along roads in heavily forested areas. Do not increase the clear zone without specific reason. Consider hydroseeding or planting live stakes (Vermont Better Roads Manual, p. 41) on bare soil that borders ditches.
- Review the best practices of road maintenance through wet areas, particularly where bank stabilization (Vermont Better Roads Manual, p. 36) is needed between the base of a slope and a wet area. Retain buffer zones (Vermont Better Roads Manual, p. 45) between roads and sensitive areas such as streams, wetlands and lakes.
- When mowing the clear zone, consider leaving vegetation at a height of at least 6 inches. 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.
- The Vermont Rivers Program recommends a 50-foot wide buffer of native woody vegetation surrounding streams. Ensure that woody buffers extend to roadsides.

Resilient Right-of-Ways Project Data Stowe, VT

9. Vegeatation Preservation Opportunities

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads

Steep Slope

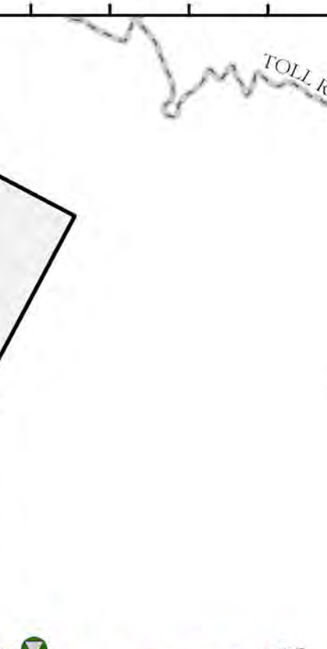
- Yes, down
- Yes, up

Preservation Opportunities

- Preserve Herbaceous Buffer
- No Cut (trees)

Road Surface

- Paved
- Unpaved
- Other



Resilient Right-of-Ways Project Data Stowe, VT

10. Planting & Regeneration Opportunities in Roadside Communities

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads
- Promote Regeneration

Planting

- Other
- Trees

Roadside Community

- Forest
- Tree Plantation
- Hedgerow to Field/Water
- Hay Field
- Agriculture Field
- Street Trees/Lawn
- Lawn
- Water Edge
- Wetland
- Riparian Zone
- Other

Road Surface

- Paved
- Unpaved
- Other

VERMONT AGENCY OF NATURAL RESOURCES

WHAT

In many towns, 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. Sometimes private landowners 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.

Acknowledging the opportunities for more vegetation in the town's right-of-ways may improve road conditions, tree health, water quality and traffic patterns for all road users. However, anyone wishing to change current land use practices in the right-of-way 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 in your town.

HOW

In this study, the land use adjacent to the right-of-way was classified into one of 11 categories. Field staff visually assessed whether there was opportunity for tree planting, shrub or grass planting, or forest regeneration. Opportunities were identified based on physical landscape characteristics only, not based on landowner or town willingness to participate.

WHY

Identifying the neighboring land use and opportunities for new vegetation in or near the right-of-way helps us:

Identify patterns in the landscape where vegetation has been eliminated.

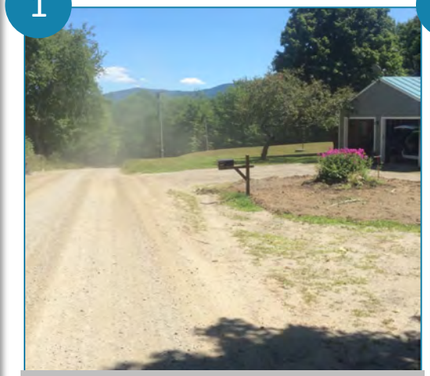
Identify common roadside scenarios that may benefit from targeted revegetation and weigh this opportunity against road safety and maintenance concerns and the preferences of town residents.

Create a statewide picture of how land uses next to the public right-of-way complement or conflict with vegetation in the right-of-way.

RESOURCES

Living Snow Fences Control Blowing and Drifting Snow. Minnesota's Best Practices Handbook for Roadside Vegetation Management. http://www.dot.state.mn.us/environment/livingsnowfence/

1



Some open expanses of unpaved road become dusty, such as this portion of Weeks Hill Road.

2

These street trees along Weeks Hill Road are in fair health but are surrounded by mowed lawn or bare soil. Planting ferns or shade-tolerant wildflowers or grasses will preserve soil. Interplanting trees among the historic street trees will ensure the next generation of tree canopy.

3

This almost even-aged stand of birch trees on Trapp Hill Road could benefit from regeneration of younger birch or selection for emerging saplings of other tree species.

4

Intentional planting in the right-of-way on this section of Brownsville Road may enhance scenic views while intercepting rainfall and reducing road erosion.

RECOMMENDATIONS

Consider what type of planting may best fit a roadside: trees to form future canopy, a mixture of low trees and bushes, native grasses, or a wildflower mix.

Identify opportunities to promote regeneration of vegetation through reduced mowing or other forestry practices that encourage resilient tree growth.

Identify places where a landowner may be open to planting or promoting more vegetation on private land adjacent to the right-of-way. Consult with the Urban & Community Forestry Program for examples of public-private collaboration for roadside planting.

To determine locations where planting or regeneration may be well-received by landowners and road users, identify if existing vegetation on private land is non-native, at risk from pests or disease, or is declining due to old age.

Consult the road foreman and neighboring landowner to understand concerns or expectations regarding mowing grass into the right-of-way. Share these expectations through the town's public relations outlets.

Where seasonal changes in the right-of-way (such as harvesting of agricultural fields) impact wind and snow drift, design or manage living snow fences.

Resilient Right-of-Ways Project Data Stowe, VT

10. Planting & Regeneration Opportunities in Roadside Communities

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads
- Promote Regeneration

Planting

- Other
- Trees

Roadside Community

- Forest
- Tree Plantation
- Hedgerow to Field/Water
- Hay Field
- Agriculture Field
- Street Trees/Lawn
- Lawn
- Water Edge
- Wetland
- Riparian Zone
- Other

Road Surface

- Paved
- Unpaved
- Other

Resilient Right-of-Ways Project Data Stowe, VT

11. Thinning Opportunities & Mature Short-lived Trees

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads
- Mature Short-lived Trees

Thinning Opportunites

- Other
- Trees

Road Surface

- Paved
- Unpaved
- Other

RESOURCES

Treescaping (p. 11-13) in The Roadside Vegetation Management Manual for Rural Road Crews. Harry Chandler, Vermont Woodlands Association. 2000. https://vtcommunityforestry.org/sites/default/files/pictures/roadside_vegetation_management_manual_for_rural_road_crews.pdf

WHAT

Many of our roadsides were pasture only a generation ago. As such, some roadside forests can be crowded with thin trees and unstable forest "pioneers" such as boxelder, pin cherry, and poplar. When done properly, tree removal may encourage growth of selected trees by reducing competition for sunlight, water, and nutrients. Selecting for windfirm and long-lived roadside canopy trees lays the groundwork for a resilient and functional roadside forest in the future.

HOW

The Resilient Right-of-Ways field staff identified plot locations during field assessments where tree removal may encourage growth of selected trees by reducing competition from less desirable species or species prone to structural problems. Also recorded was the presence of mature short-lived trees (such as paper birch or poplars) within a survey plot.

WHY

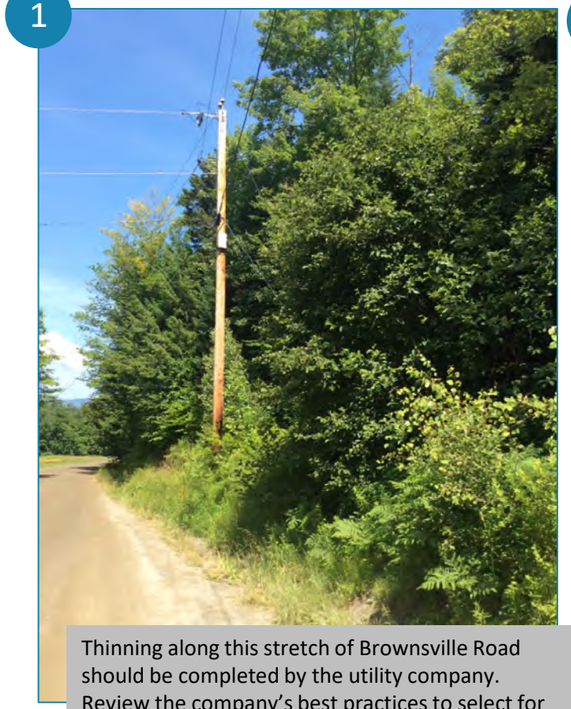
Identifying locations that may benefit from tree thinning, the removal of mature, short-lived trees, or thinning of understory brush helps us:

- Learn about how established silvicultural practices (like selective thinning, also called "treescaping") can benefit our roadside forests.
- Identify species of trees that can become weak within a short time frame (decades) and select for long-lived species for mature roadside canopy trees.

RECOMMENDATIONS

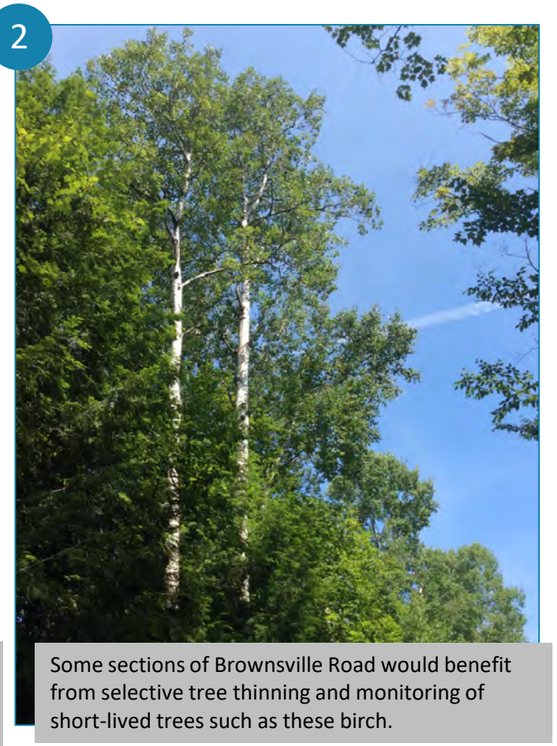
- Consult a forester to identify scenarios where the removal of some trees may benefit the growth of others. Consider performing this work while addressing road construction.
- Identify immature tree canopy dominated by small, thin beech trees (often called beech "thickets"). Work with the neighboring landowner and a forester to identify trees for thinning and trees for preservation.
- Note were mature, short-lived trees are located along steep road curves. Monitor their health and/or plan for removal. Simultaneously, consider thinning around emerging canopy trees to promote regeneration and to select for the next generation of tree canopy.
- Ensure that trees do not block a clear line of sight for drivers utilizing the road at the posted speed limit.
- Consider creating a municipal tree ordinance that specifies which trees can be removed without a hearing, particularly with regard to tree diameter, health, and placement on the road.

1



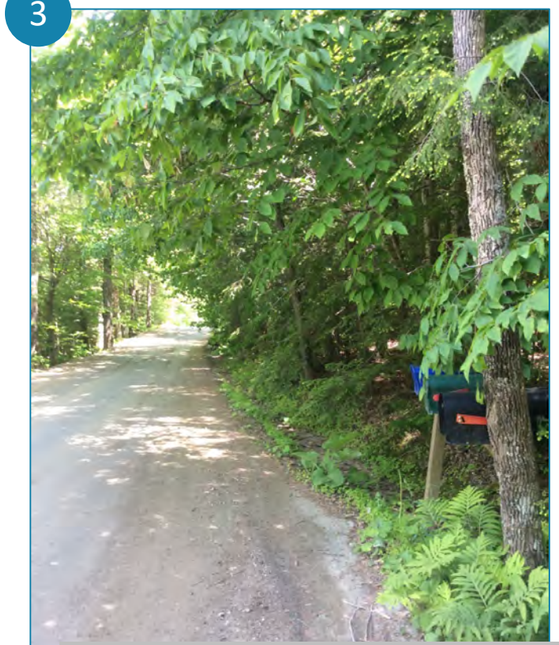
Thinning along this stretch of Brownsville Road should be completed by the utility company. Review the company's best practices to select for windfirm and long-lived trees.

2



Some sections of Brownsville Road would benefit from selective tree thinning and monitoring of short-lived trees such as these birch.

3



A high ash count (Map 3) on this section of Covered Bridge Road should be considered when thinning crowded trees and selecting for healthy, long-lived trees.

4

Crowded young trees along this section of West Hill Road is a common rural roadside scenario. Work with the neighboring landowner to selectively remove some trees and preserve others that will provide adequate privacy and create resilient roadside canopy.

Resilient Right-of-Ways Project Data Stowe, VT

11. Thinning Opportunities & Mature Short-lived Trees

Vermont Department of Forests, Parks & Recreation

1:50,000

Cartographer: Elizabeth Bannar

Date: 1/28/2019

0 0.25 0.5 1 Miles

Legend

- 2018 Inventory Roads
- Mature Short-lived Trees

Thinning Opportunites

- Other
- Trees

Road Surface

- Paved
- Unpaved
- Other

VERMONT AGENCY OF NATURAL RESOURCES

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 that are 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, and some initiatives make take more time to come to fruition. 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:

Joanne Garton, Resilient Right-of-Ways Project Coordinator
Vermont Urban & Community Forestry Program
1 National Life Drive, Davis 2
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.

Appendix A:

Rural Road Resilient Right-of-Ways Project
Town of Stowe Letter of Collaboration
July 25, 2017

Letter of Collaboration
Resilient Right-of-Ways: Rural Road Vegetation Assessments

Vermont Department of Forests, Parks and Recreation
Contact: Joanne Garton (802) 249 - 4217; joanne.garton@vermont.gov

This letter summarizes the collaborative work to be completed by the Urban & Community Forestry Program of the Vermont Department of Forests, Parks and Recreation (VT FPR) located at 1 National Life Drive, Davis 2 Montpelier, VT 05620-3801 and the Town of Stowe with offices at 67 Main Street, Stowe, VT 05672. VT FPR will work with the Town of Stowe to assess rural roadside vegetation and develop recommendations for long-term resilience of its roadside vegetation to manage stormwater runoff, maintain or improve wildlife habitat, and plan for the future of scenic and culturally important roadside hedgerows and forests, all while considering the necessary physical requirements of safe and well-maintained roads. This work will be part of the Resilient Right-of-Ways Project funded by the US Forest Service.

1. *Issue Presented*

There are multiple challenges that prevent local adoption of Green Stormwater Infrastructure (GSI), which includes trees, shrubs, and other herbaceous vegetation, in roadside environments. On rural back roads, existing trees can be improperly managed, interfering with road maintenance equipment and other infrastructure. Additionally, municipalities often lack the capacity to plan and care for roadside vegetation while still addressing public concerns regarding road safety, beauty, and future condition. To address these issues, we seek to build greater understanding and capacity within our communities to plan and maintain rural roadside vegetation to maximize their benefits. Municipalities engaged in proactive planning of roadside vegetation need technical resources to guide their planning and management efforts, as well as support to attain accurate data, develop and implement strategic plans, enhance management skills, and secure funds.

While communities statewide will benefit, this project will focus on only 10 communities within the Lake Champlain Basin. Priority communities have a high percentage of town-maintained unpaved roads, have relatively large acreages of stream headwaters (land over 1,500 feet elevation or acreage identified as source water protection area), and/or have identified impaired or stressed surface waters. These communities also have staff capacity and community willingness to consider cost-efficient and effective solutions that maximize road safety, comply with stormwater guidelines, maintain scenic sections of canopy roads, and are sensitive to the environmental concerns of landowners in each town. This work prioritizes assessments and strategies that focus on enhancing tree cover and promoting GSI practices in roadside environments to grow resilient right-of-ways.

2. *Purpose*

VT FPR will support 10 communities in Vermont to assess their roadside vegetation, including trees, and develop strategies to guide vegetation management in their towns that supports environmental, economic, and cultural values. The project will focus on two processes:

1) conducting a roadside vegetation assessment (both desk- and field-based) and writing of a report and/or map summarizing assessment results, and
2) support for towns developing action-based management plans for vegetation in their public right-of-ways, including outreach material focused on future scenarios of roadside

environments typical for each assessed town.

This is a multi-year grant project that will allow VT FPR to assist towns in implementing best management practices to maintain and enhance roadside vegetation. Areas of collaboration may be proposed by either institution and agreed to in writing. These may include, but are not limited to:

- Providing a record of roadside vegetation based on available GIS data to inform plans and budgets;
- Assessing roadside condition including identification of priority tree canopies in Stowe that support environmental or cultural goals (i.e. reduce soil erosion, protect water quality, preserve scenic character, and cultural heritage);
- Identifying best practices, management priorities, and plan of work to maximize public benefits from safe and healthy roadside vegetation;
- Providing educational outreach materials targeted at selectboard members, the town highway crew, the conservation commission, and the public regarding best practices for both clearing and maintaining roadside vegetation;
- Scheduling a public meeting with all parties involved to share results of the assessment;
- Collaborating to develop a management plan for the town's roadside vegetation; and
- Identifying priority training needs and communicating them with VT FPR to inform the development of technical training workshops in the region.

3. *Representatives*

Joanne Garton will be the primary point of contact for VT FPR. Tom Jackman, the Director of Planning for the Town of the Stowe, will be the primary point of contact for Stowe.

4. *Partner Agreement*

The Town of Stowe will:

- **Determine membership of a Project Advisory Committee; convene meetings of the Project Advisory Committee with VT FPR staff and any interested members of the public to:**
  - **outline the project scope;**
  - **review results of the right-of-way vegetation assessment;**
  - **review the draft vegetation management plan; and**
  - **receive a final presentation on the results of the collaborative effort before the end of the collaborative period and facilitate discussion how to advance resilient roadside vegetation management in Stowe.**
- Provide a point contact responsible for:
  - past and current community engagement with vegetation in the right-of-way in the town;
  - identifying key stakeholders in this effort;
  - aiding to determine the scope and scale of the roadside vegetation assessment;
  - being the recipient of project deliverables.
- Provide VT FPR with information specific to Stowe, including:
  - a current, large parcel map of the town;
  - relevant aerial maps of the town to demonstrate scope of the assessment;
  - accurate information on the extent of the public right-of-way;
  - information on past tree or vegetation inventories;
  - information on local engagement with public vegetation (including tree) management and

stewardship.

- Utilize the communication channels of the Stowe town offices/conservation commission to notify the public of key steps in the project development and invite and manage public comment.

VT FPR will:

- Meet with the Stowe conservation commission to develop a tentative schedule for the roadside vegetation assessment, management plan development, and any public meeting(s).
- Provide staff support to conduct the roadside vegetation assessment;
- Provide necessary tools for assessment, including:
  - Diameter (DBH) tapes
  - Clipboards, field sheets, iPads
  - Orange safety vests
  - Tree, shrub, and invasive plant ID guides;
- Provide an assessment summary report that includes a community profile, methodology, field observations, assessment data, charts and graphs, GIS maps, and general recommendations;
- Work with the Stowe conservation commission and/or select board and other key stakeholders to develop a management plan for Stowe's rural roadside vegetation;
- Provide opportunities for public employees and local citizens to become trained in tree care along rural roads based on needs identified by the Stowe select board and other key stakeholders.

5. *Monetary Outline*

No money will be exchanged during this project.

6. *Termination Clause*

Either party may terminate this working relationship at any time, seven days after notifying the other party in writing.

7. *Effective Date and Signatures*

This scope of work will be effective from September 26, 2017 to the end of the grant period in March 2019.

Both parties agree to the conditions as described above.

Signature 9/27/17 Date	Signature 9/27/17 Date
Joanne Garton	Tom Jackman
Name	Name
Vermont Department of Forests, Parks and Recreation	Town of Stowe

Appendix B:

Rural Road Resilient Right-of-Ways Project
Town of Stowe Work Plan
August 25, 2017

Rural Road Resilient Right-of-Ways Vegetation Assessment

Town of Stowe Work Plan

November 7, 2017 – DRAFT

Town priorities

Maintain healthy forests and roadside vegetation along Stowe's rural roads by planning for vegetation management practices appropriate to the types of right-of-way roadside communities found in the town. Through this rural roadside vegetation assessment and resulting action plan, the town will address:

- the ecological and cultural importance of the town's designated scenic roads;
- preservation of historically, culturally, or aesthetically important tree canopies;
- the footprint of best management practices (primarily ditching) along forested roads, particularly where they require the removal of vegetation along scenic roads;
- the location of invasive species along rural roads, particularly Japanese Knotweed (*Fallopia japonica*);
- preservation of historically, culturally, or aesthetically important tree canopies;
- management of roadside forests to promote healthy and long-lasting tree canopies;
- preservation of important viewsheds;
- road degradation in common mud season problem spots;
- locations where the road is too narrow or too wide;
- key roadside areas in need of planting (trees or other vegetation); and
- key roadside areas in need of thinning or cutting for increased road safety or improved canopy health.

The rural roadside vegetation assessment will also examine and evaluate town processes that:

- reduce the spread of roadside invasive species, specifically by addressing mowing practices that may facilitate movement and/or reproduction of these species;
- facilitate open dialogue between the conservation commission and road crew, particularly regarding changes in existing policy, ordinances, and future road projects; and
- promote relevant communication between the Stowe tree warden, the conservation commission, and the road foreman.

In addition, Vermont Forests, Parks and Recreation staff will facilitate exploration of a **pilot project** that outlines on-the-ground management techniques recommended for a specific road segment within the town. This may include marking of trees to be preserved or cut within the right-of-way, and/or location of potential planting locations. The pilot project will serve to highlight site-appropriate species composition for improved forest health in roadside environments. The location will be chosen at the completion of the road assessment.

Priority Roads

The road assessment will begin in the spring of 2018. The field work will cover approximately 30 of Stowe's 55 miles of unpaved roads, or approximately half of the publicly maintained backroads.

Currently, the roadside vegetation assessment focuses on 130-foot long road plots assessed approximately every quarter mile of road. Plots register data for both the left- and right-hand side of the roads as travelled S-N and W-E. Selected plots will convey a typical representation of the roadside environment at or near that quarter-mile marker. Assessment of these 130-foot long plots every quarter mile will result in coverage of approximately 10% of the covered routes.

In Stowe, priority roads for vegetation assessments were chosen from:

- designated scenic highways;
- roads highlighted during the project scoping meeting as:
    - badly affected during mud season:
        - Barnes Hill Road, Moss Glen Falls, Baird Road, West Hill Road, Sterling Valley Road, Cottonbrook Road, Covered Bridge Road
    - exhibiting historic trees
        - Weeks Hill Road, Covered Bridge Road, Randolph Road/Moss Glen Falls Road
    - hosting invasive species
        - Cape Cod Road, Birch Hill Road, Adams Mill Road,
    - roads on which wide road width encourages speeding
        - River Road, West Hill Road
- roads bordering rare natural communities;
    - Moss Glen Falls Road
- roads bordering highest priority interior forest blocks;
    - Upper Hollow Road, Taber Ridge Road, Brownsville Road, Moss Glen Falls Road, West Hill Road, Weeks Hill Road, Sanborn Road, Luce Road, Trapp Hill Road, Nebraska Valley Road, Cottonbrook Road
- roads bordering priority surface waters and riparian areas;
    - West Hill Road, Cape Cod Road, Moss Glen Falls Road, River Road, Gold Brook Road, Stowe Hollow Road
- roads ranked as "High Impact" or "Very High Impact" on the 2015 LCPC Class 3 and 4 Road Erosion Priority Ranking.
    - Nebraska Valley Road, Old County Road, Moss Glen Brook Road, Brownsville Road, Sanborn Road

Proposed Assessment Routes

Route 1 – Approx. 7 miles

Edson Hill Road – Sanborn Road – return to Edson Hill Road – Weeks Hill Road – Cape Cod Road – return to Weeks Hill to Route 100

Route 2 – Approx. 3.5 miles

West Hill Road from Rte. 100 – Baird Road – Upper Baird Road – return to West Hill Road – Tamarack Road – West Hill Road to intersection with Percy Hill Road

Route 3 – Approx. 3.25 miles

Moss Glen Falls Road – Brownsville Road

Route 4 – Approx. 5 miles
Covered Bridge Road – to Cross Road – Taber Hill Road (eastward) – return westward along Taber Hill Road to School Street

Route 5 – Approx. 4.5 miles

Stowe Hollow Road from Waterbury town border - Upper Hollow Road – Pinnacle Road – Upper Pinnacle Road – return to Upper Hollow Road to intersection with Gold Brook Road

Route 6 – Approx. 4.75 miles

Barnes Hill Road – High Pond Road – return to Barnes Hill Road - Adams Hill Road – River Road - Shaw Hill Road – return to River Road to intersection with Rte. 100

Route 7 – Approx. 3 miles (excluding road length in Morristown)

West Hill Road from intersection with Percy Hill Road – Maple Run Lane – return to West Hill Road – Sterling Valley Road

Route 8 – Approx. 2.75 miles

Cottonbrook road from Waterbury town border - Trapp Hill Road (unpaved section only) – Luce Hill Road (unpaved section only)

Route 9 – Approx. 3.5 miles

Nebraska Valley Road (unpaved section only) – Old County Road

Data Collection

Data collection includes

- the roadside community type (broad categories include forest, forest edge, street trees, wet areas, mowed, and predominantly bare)
- the width of the travelled roadway, cleared ROW, and roadside vegetation community;
- right-of-way slope;
- tree species composition;
- health of dominant trees;
- presence and health of historic trees;
- presence and severity of mechanical damage;
- influence from overhead utilities;
- presence and distribution of dominant invasive species cover;
- influence of ash affecting the ROW, and
- a categorical assessment of the broader roadside community (e.g. forest, agriculture field, water, wetland, etc.) to inform land use patterns

The assessment will also flag ROW areas that feature opportunities for planting or thinning of trees or shrubs to improve tree canopy health or the condition of the roadside community.

Appendix C:

Rural Road Resilient Right-of-Ways Project
Selected Resources for Tree Wardens

Guidelines for Public Hearings for Tree Removals

In each Vermont town, a tree warden shall be appointed by the selectboard to be responsible for the protection, care, planting, and removal of public shade and ornamental trees on town property and along the public right-of-ways. Tree wardens evaluate whether and when aging or damaged trees need to be removed, and also approve requests for removal of trees on town property by town officials. The public has the right to appeal tree warden decisions for public tree removal. According to the Vermont Tree Warden Statutes:

> ***A public shade tree within the residential part of a municipality shall not be felled without a public hearing by the tree warden, except that when it is infested with or infected by a recognized tree pest, or when it constitutes a hazard to public safety, no hearing shall be required. In all cases the decision of the tree warden shall be final except that when the tree warden is an interested party or when a party in nterest so requests in writing, such final decision shall be made by the legislative body of the municipality.*** (Amended 1969, No. 238 (Adj. Sess.), § 6.)

It is therefore the responsibility of the tree warden to hold a public hearing prior to the removal of a public ornamental or shade tree, unless the tree is diseased or dying or constitutes a hazard to public safety. Failure to hold a public hearing means that the tree warden acted outside the scope of their authority and, as seen in the example of the Holland Case below, could lead to legal action if pursued by landowners.

WHEN IS A PUBLIC HEARING NECESSARY?

Tree Warden's Decision to Remove a Public Tree.

Is the tree diseased, infected with a pest, or a hazard to public safety?

YES — A public hearing is **NOT** necessary.

No — Is the tree located in the **residental* part of town?

YES — A public hearing **is** necessary.

No — A public hearing is **not** necessary.

THE LAW IN ACTION: The Holland Case

In 2001, the Town of Holland sought to widen a Class 3 Town Highway in a residential area to accommodate large vehicles. The plan for the road expansion called for removal of approximately 30 trees and additional tree cutting, among other things.

Before the work began, an adjoining landowner brought suit in Orleans Superior Court to prevent the Town from cutting down the trees. The Town filed for summary judgment, arguing that the tree warden was not required to hold a public hearing prior to felling the trees because they contributed to the narrowness of the road, and thus created a public safety hazard.

In the end, the Court agreed with the landowner. The tree warden had no authority to remove the trees without first holding a public hearing. The public hearing must be warned by the tree warden for the discrete purposes of considering the removal of the tree.

EIGHT STEPS TO HOLDING PUBLIC HEARING FOR TREE REMOVAL*

Step 1: Determine where and when the public hearing will take place. The tree warden should provide direct notification by mail to the affected property owner(s), as well as posting a public notice in a minimum of three public places in town, at least 15 days before the hearing. The public notice should include the time, date, location, and purpose of the hearing.

Step 2: Before the hearing begins, make sure that someone is designated to take good notes and, if possible, record the proceedings of the hearing.

Step 3: At the beginning of the hearing, identify the parties that will be involved in the proceedings. Only those affected are parties: i.e., the landowner, the neighbors, town officials. Inform others in attendance that they have no official role in the hearing.

Step 4: At the public hearing, a notary, clerk, assistant clerk, of Justice of the Peace affirms everyone who will speak before the evidence is taken. An example of an affirmation used is : "Do you solemnly affirm, in the cause now under consideration before the tree warden, to tell the whole truth and nothing but the truth under the pains and penalties of perjury?"

WHAT DOES A WRITTEN DESCISION LOOK LIKE?

After the public hearing, the tree warden needs to write up a brief decision along these lines and send a copy to each of the parties who attended the hearing:

On _____, 2014, at __ p.m., I, _____, Tree Warden for the Town of _____, held a hearing at the _____ Town Office to consider removal of trees from a portion of the right-of-way for Town Highway No. __, also known as _____ Road. Present at the hearing were _____, Road Foreman for the Town of _____. Also present were _____, and _____ (list all attendees).

The parties offered the following testimony: _____

Based on the testimony provided at the hearing, authority is (or is not) granted to _____, Road Foreman for the Town of _____ to remove trees from the following portion of the right-of-way for Town Highway No. __.: _____ for the following reasons:_____
In accordance with 24 V.S.A. 2509, Persons interested in this decision may appeal the decision in writing within ___ days from the date of the decision to the _____ select board.

Signed,
_____, Tree Warden for the Town of _____

Step 5: Ask the party requesting that the tree be removed to speak first and to describe the details and their views on the removal, in as logical an order as possible. Make sure everyone who speaks gives his or her name first, every time, to make a clean transcript later on if one is needed.

Step 6: Allow the other parties to ask questions of the first speaker and those called to assist the first speaker.

Step 7: Repeat steps 5 and 6 for the other parties, one at a time, allowing them to give their reasons, and allowing them to be questioned by the other parties.

Step 8. Adjourn, and then issue a written decision (see example at left) within a reasonable period of time, starting with findings of fact, then applying the facts to the law, then a decision, and finally a notice of a right to appeal. Send copies by certified mail to each party, and have one copy for the town clerk for public record.

ADDITIONAL RESOURCES

Vermont Urban & Community Forestry Program's Tree Warden Resources: www.vtfpr.org/urban/tree_wardens.cfm
Vermont League of Cities & Towns, Municipal Assistance Center: www.vlct.org/municipal-assistance-center/overview/
The Law of Trees, compiled by Paul Gillies, Vermont Attorney: www.uvm.edu/crs/resources/citizens/trees.pdf

* Based on recommendations provided by Vermont Attorney Paul Gilles.

Vermont Tree Warden Statutes

TITLE 24: Municipal and County Government

CHAPTER 033: MUNICIPAL OFFICERS GENERALLY

§ 871. Organization of selectmen; appointments

Forthwith after their election and qualification, the selectmen shall organize and elect a chairman and, if so voted, a clerk from among their number, and file a certificate of such election for record in the office of the town clerk. Such selectmen shall thereupon appoint from among the legally qualified voters the following officers who shall serve until their successors are appointed and qualified, and shall certify such appointments to the town clerk who shall record the same:

1. Three fence viewers;
2. A poundkeeper, for each pound; voting residence in the town need not be a qualification for this office provided appointee gives his consent to the appointment;
3. One or more inspectors of lumber, shingles and wood;
4. One or more weighers of coal; and
5. A tree warden. (Amended 1963, No. 74, § 2.)

TITLE 24: Municipal and County Government

CHAPTER 067: PARKS AND SHADE TREES

§ 2502. Tree wardens and preservation of shade trees

Shade and ornamental trees within the limits of public ways and places shall be under the control of the tree warden. The tree warden may plan and implement a town or community shade tree preservation program for the purpose of shading and beautifying public ways and places by planting new trees and shrubs; by maintaining the health, appearance and safety of existing trees through feeding, pruning and protecting them from noxious insect and disease pests and by removing diseased, dying or dead trees which create a hazard to public safety or threaten the effectiveness of disease or insect control programs. (Amended 1969, No. 238 (Adj. Sess.), § 1.)

§ 2503. Appropriations

A municipality may appropriate a sum of money to be expended by the tree warden, or if one is not appointed, by the mayor, aldermen, selectmen or trustees for the purpose of carrying out this chapter. (Amended 1969, No. 238 (Adj. Sess.), § 2.)

§ 2504. Removal of trees, exception

The tree warden may remove or cause to be removed from the public ways or places all trees and other plants upon which noxious insects or tree diseases naturally breed. However, where an owner or lessee of abutting real estate shall annually, to the satisfaction of such warden, control all insect pests or tree diseases upon the trees and other plants within the limits of a highway or place abutting such real estate, such trees and plants shall not be removed. (Amended 1969, No. 238 (Adj. Sess.), § 3.)

§ 2505. Deputy tree wardens

A tree warden may appoint deputy tree wardens and dismiss them at pleasure.

§ 2506. Regulations for protection of trees

A tree warden shall enforce all laws relating to public shade trees and may prescribe such rules and regulations for the planting, protection, care or removal of public shade trees as he deems expedient. Such regulations shall become effective pursuant to the provisions of chapter 59 of this title. (Amended 1969, No. 238 (Adj. Sess.), § 4.)

§ 2507. Cooperation

The tree warden may enter into financial or other agreements with the owners of land adjoining or facing public ways and places for the purpose of encouraging and effecting a community wide shade tree planting and preservation program. He may cooperate with federal, state, county or other municipal governments, agencies or other public or private organizations or individuals and may accept such funds, equipment, supplies or services from organizations and individuals, or others, as deemed appropriate for use in carrying out the purposes of this chapter. (Amended 1969, No. 238 Adj. Sess.), § 5.)

§ 2508. Cutting shade trees; regulations

Unless otherwise provided, a public shade tree shall not be cut or removed, in whole or in part, except by a tree warden or his deputy or by a person having the written permission of a tree warden.

§ 2509. - Hearing

A public shade tree within the residential part of a municipality shall not be felled without a public hearing by the tree warden, except that when it is infested with or infected by a recognized tree pest, or when it constitutes a hazard to public safety, no hearing shall be required. In all cases the decision of the tree warden shall be final except that when the tree warden is an interested party or when a party in interest so requests in writing, such final decision shall be made by the legislative body of the municipality. (Amended 1969, No. 238 (Adj. Sess.), § 6.)

§ 2510. - Penalty

Whoever shall, willfully, mar or deface a public shade tree without the written permission of a tree warden or legislative body of the municipality shall be fined not more than $50.00 for the use of the municipality. Any person who, willfully, critically injures or cuts down a public shade tree without written permission of the tree warden, or the legislative body of the municipality shall be fined not more than $500.00 for each tree so injured or cut, for the use of the municipality. (Amended 1969, No. 238 (Adj. Sess.), § 7.)

§ 2511. Control of infestations

When an insect or disease pest infestation upon or in public or private shade trees threatens other public or private trees, is considered detrimental to a community shade tree preservation program or threatens the public safety, the tree warden may request surveys and recommendations for control action from the commissioner of agriculture, food and markets. On recommendation of the commissioner of agriculture, food and markets, the tree warden may designate areas threatened or affected in which control measures are to be applied and shall publish notice of the proposal in one or more newspapers having a general circulation in the area in which control measures are to be undertaken. On recommendation of the commissioner, the tree warden may apply measures of infestation control on public and private land to any trees, shrubs or plants thereon harboring or which may harbor the threatening insect or disease pest. He may enter into agreements with owners of such lands covering the control work on their lands, but the failure of the tree warden to negotiate with any owner shall not impair his right to enter on the lands of said owner to conduct recommended control measures, the cost of which shall be paid by the municipality. (Amended 1969, No. 238 (Adj. Sess.), § 8.)

§ 2512. Repealed. 1969, No. 238 (Adj. Sess.), § 9.

TITLE 32: Taxation and Finance

CHAPTER 017: FEES AND COSTS

§ 1680. Tree warden

When a town or incorporated village fails to fix the compensation of a tree warden or his deputies, they shall receive such compensation as the selectmen or trustees determine.

Other Statutes Related to Trees

TITLE 30: Public Service
CHAPTER 071: TELEGRAPH, TELEPHONE AND ELECTRIC WIRES

§ 2506. Trees not to be injured; exception; penalty
A tree within a street or highway shall not be cut or injured in constructing, maintaining or repairing a line of wires, without the written consent of the adjoining owner or occupant, unless the transportation board or the selectmen of the town in which the tree is situated, after due notice to the parties and upon hearing, shall decide that such cutting or injury is necessary. A person or corporation cutting or injuring such trees shall pay the damages, if any, awarded on such hearing, before cutting or injuring the trees. A person or corporation that violates a provision of this section shall be fined not more than $50.00 nor less than $5.00 for each tree so cut or injured. (Amended 1989, No. 246 (Adj. Sess.), § 31.)

TITLE 13: Crimes and Criminal Procedure
CHAPTER 077: TREES AND PLANTS

§ 3606. Treble damages for conversion of trees or defacing marks on logs
If a person cuts down, destroys or carries away any tree or trees placed or growing for any use or purpose whatsoever, or timber, wood, or underwood standing, lying or growing belonging to another person, without leave from the owner of such trees, timber, wood, or underwood, or cuts out, alters or defaces the mark of a log or other valuable timber, in a river or other place, the party injured may recover of such person treble damages in an action on this statute. However, if it appears on trial that the defendant acted through mistake, or had good reason to believe that the trees, timber, wood, or underwood belonged to him, or that he had a legal right to perform the acts complained of, the plaintiff shall recover single damages only, with costs. (Amended 1959, No. 61, eff. March 26, 1959.)

TITLE 19: Highways
CHAPTER 009: REPAIRS, MAINTENANCE AND IMPROVEMENTS

§ 901. Removal of roadside growth
A person, other than the abutting landowner, shall not cut, trim, remove or otherwise damage any grasses, shrubs, vines, or trees growing within the limits of a state or town highway, without first having obtained the consent of the agency for state highways or the board of selectmen for town highways. (Added 1985, No. 269 (Adj. Sess.), § 1.)

§ 902. Penalty for removal
A person who willfully or maliciously cuts, trims, removes or otherwise damages grasses, shrubs, vines or trees within highway limits in violation of section 901 of this title shall be fined not more than $100.00 nor less than $10.00, for each offense. (Added 1985, No. 269 (Adj. Sess.), § 1.)

§ 903. Agreements for planting

The agency or the board of selectmen may enter into agreements with individuals or organizations who wish to plant grasses, shrubs, vines, trees or flowers within highway limits. (Added 1985, No. 269 (Adj. Sess.), § 1.)

§ 904. Brush removal

The selectmen of a town, if necessary, shall cause to be cut and burned, or removed from within the limits of the highways under their care, trees and bushes which obstruct the view of the highway ahead or that cause damage to the highway or that are objectionable from a material or scenic standpoint. Shade and fruit trees that have been set out or marked by the abutting landowners shall be preserved if the usefulness or safety of the highway is not impaired. Young trees standing at a proper distance from the roadbed and from each other, and banks and hedges of bushes that serve as a protection to the highway or add beauty to the roadside, shall be preserved. On state highways, the secretary shall have the same authority as the selectmen. (Added 1985, No. 269 (Adj. Sess.), § 1.)

Appendix D:

Rural Road Resilient Right-of-Ways Project
Best Management Practices for Roadside Invasive Plants
The Nature Conservancy

Best Management Practices for Roadside Invasive Plants

SOIL DISTURBANCE & STABILIZATION

1. **Minimize soil disturbance.** Monitor recent work sites for the emergence of invasive plants for a minimum of 2 years after project completion.
2. **Stabilize disturbed soil as soon as possible.**
   - Use clean mulch, hay, rip-rap, or gravel
   - Seed with native species where possible
3. **Avoid using fill from invaded sites.** When in doubt about the quality of fill, monitor work sites for the emergence of invasive plants for a minimum of 2 years.

MOVEMENT & MAINTENANCE OF EQUIPMENT

1. **When equipment needs to be moved, plan work flow so that equipment is moved from unaffected sites to affected sites.** This is especially important during ditch cleaning and shoulder scraping.
2. **Staging areas should be free of invasive plants**
3. **All equipment and tools should be cleaned of visible dirt and plant material before leaving affected project sites.** Cleaning methods can include portable wash stations, high pressure air, brush, broom, or other hand tools.
4. **If equipment will be used in infested areas, remove above-ground invasive plant materials** such as purple loosestrife, phragmites, and Japanese knotweed prior to the start of work.

MOWING

1. **Avoid mowing areas infested with purple loosestrife, phragmites, and Japanese knotweed,** as these can sprout from stem and root fragments. Stake roadside populations with "Do Not Mow".
2. **If mowing is necessary, mow these areas BEFORE seed maturation** (approximately August 1st).
3. **Clean mowing equipment daily, and prior to transport.** This is particularly important if mowing is after seed maturation (August 1st)

HANDLING EXCAVATED MATERIAL & INVASIVE PLANT MATERIAL

1. **Destroy removed plant material.** Methods include:
   - Drying/Liquefying: *place on impervious surface and cover*
   - Brush piles: *not for plants with fruit or seed*
   - Burying: *minimum of 3 feet below grade*
   - Burning: *have a designated burn pile for invasive plants*
   - Herbicide: requires a *licensed applicator (VT Department of Agriculture)*
2. **Cover invasive plant material when transporting.**
3. **Excavated materials taken from infested areas should only be used onsite, unless all plant material has been destroyed.** Only use within exact limits of infestation.
4. **Stockpile unused excavated materials on impervious surface, or bury a minimum of 3 feet below grade** (5 feet for Japanese knotweed).
5. **Excavation should be avoided in areas containing purple loosestrife, phragmites, and Japanese knotweed.**
6. **Cover soil from infested areas when transporting.**

Adapted from New Hampshire Department of Transportation's Best Management Practices for Roadside Invasive Plants
http://www.nh.gov/dot/org/projectdevelopment/environment/units/technicalservices/documents/BMPsforRoadsideInvasivePlants.pdf

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For more information, go to www.vtinvasives.org.