VERMONT URBAN & COMMUNITY FORESTRY PROGRAM

Resilient Right-of-Ways

Planning for Healthy Trees, Clean Stormwater, and Reduced Erosion along Vermont's Rural Roads

March 23, 2020 - Draft

Town of Panton, VT

PLANT LIVE GROW

INTRODUCTION

The Vermont Urban & Community Forestry Program (VT UCF) initiated The Resilient Right-of-Way project in 2015 after receiving a Landscape-Scale Restoration grant from the US Forest Service aimed at reinvigorating best practices regarding construction and maintenance of green stormwater infrastructure in urban areas and backroad roadside tree and vegetation management in rural areas. UCF Technical Assistance Coordinator Joanne Garton began partnering with 10 municipalities in the Lake Champlain Basin in the summer of 2017, identifying and assessing key elements of Vermont backroads that require special management considerations and identifying the community-driven processes that guide this management.

The municipality of Panton is interested in pursuing green stormwater infrastructure opportunities in its public right-of-ways and creating a roadside vegetation management plan that identifies and mitigates existing stressors to trees and vegetation while also proposing innovative solutions to bring forestry practices to the rural roadside. VT UCF's partnership with the Town of Panton represents a new arm of the Resilient Right-of-Ways project that explores the logistics, costs, and placement of constructed green stormwater infrastructure in the rural road right-of-ways in Panton, the importance of tree species composition in the right-of-way and on private land in light of several ecological challenges, and the planning processes the town may take to mitigate stormwater runoff both into and out of the right-of-way.

In rural areas such as Panton, broader land conservation tactics may also ameliorate stormwater runoff problems. The town may consider recommendations for action on private land with landowner consent, such as tree planting, construction of rain gardens, creation of woody buffers, or conservation easements on private lands that emit or accept stormwater. Other important partners in rural roadside vegetation management and stormwater management include local agricultural landowners and the regional utility company, Green Mountain Power.

THE PANTON LANDSCAPE

The small town of Panton, Vermont sits on the shores of Lake Champlain. It covers approximately 22 square miles (14,080 acres), about 70% (9,920 acres) of which are land. The Otter Creek delineates much of the eastern border of town; approximately 3.5 miles of shoreline along Lake Champlain delineates the western border of the town. The town shares border with Ferrisburgh, Vergennes, Waltham and Addison.

Land use across Panton is primarily agricultural; much smaller portions are forested and residential. The Town of Panton Map 4: Generalized Land Cover and Land Use[1] illustrates the abundance of agricultural and open land use and the cluster of residential land use bordering roads.

Municipal road lengths in Panton

Miles of Class 2 road: 10.79
Miles of Class 3 Road: 10.69
Total miles of municipal roads: 21.47

Additional road lengths in Panton

Miles of Class 4 roads: 2.55
Miles of State highway: 2.755

Municipal right-of-way acreage in Panton

- Estimating a 3-rod (49.5 ft) right-of-way along the 21.47 miles of municipal roads, the ***municipally managed land encompassing Panton's roads and managed roadside areas equals approximately 129 acres***.
- Estimating an average travelled road width of 22-feet and an average mowed or cleared roadside width of 7-feet, ***Panton's right-of-way occupied by road width, hardscaped ditches, or regularly mowed terrain equals approximately 93.7 acres***.
- The trees and other vegetation on the remainder of this acreage is managed by the municipality; ***Panton's municipally managed right-of-way vegetation equals approximately 35.2 acres.***

ECOLOGICAL CONSIDERATIONS

Sustainable and Diverse Roadside Forests

Stressed by vehicle traffic, snowplows, mowers, road maintenance equipment, trash, pedestrians, and cyclists, roadside forests are is in a state of perpetual disturbance. The roadsides soils and structures are largely not natural features – that is, they exhibit 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.

[1] Town of Panton Maps. Created by the Addison County Regional Planning Commission, 2011. https://www.pantonvt.us/uploads/3/1/6/7/31673701/panton_maps.pdf

Recommendations to establish sustainable vegetation of diverse species, age, structure, and density include:

- 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.
- 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 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. Some roadsides are forested and will naturally 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 from emerald ash borer infestations). 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[2] 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.

Climate Change

Broad landscape planning initiatives cannot ignore the regional impacts and vulnerabilities caused by climate change. From January to March of 2020, UCF staff member Joanne Garton included the rural roadsides of Panton as the topic of study during the online session of Climate Adaptation Planning and Practices hosted by the Climate Change Response Framework, a program of the Northern Institute of Applied Climate Science. The course utilized the Adaptation Workbook, a step-by-step online resource that identified project goals,

[2] Pruning. Vermont Urban & Community Forestry Program. https://vtcommunityforestry.org/resources/tree-care/pruning.

objectives, timeframes for these objectives, climate adaptation strategies and approaches, and associated evaluation and monitoring techniques that may help the town of Panton manage all of its natural resources using a lens of healthy forest management during climate change.

The long format of the Adaptation Workbook final report required some re-writing and summarizing; the takeaways of the Adaptation Workbook are included in the remainder of this report.

Regional climate impacts include the following:

Regarding precipitation and temperature

- Temperatures in New England are projected to increase 3.5 to 8.5 °F by the end of the century, with the greatest warming expected to occur during winter.
- The growing season in New England and northern New York is generally expected to increase by 20 days or more by the end of the century, due to fewer days with minimum temperatures below 32°F.
- Precipitation patterns will be altered, with projected increases in annual precipitation and potential for reduced growing season precipitation in New England and northern New York. (1, 28, 6)
- Intense precipitation events will continue to become more frequent in New England and northern New York.
- The winter season will be shorter and milder across New England and northern New York, with less precipitation falling as snow and reduced snow cover and depth.

Regarding forest composition and condition

- Tree regeneration and recruitment will change.
- Forest composition will change across the landscape.
- Many northern and boreal tree species will face increasing stress across much of New England and northern New York.
- Habitat will become more suitable in New England and northern New York for some southern species.
- Warmer temperatures and altered precipitation in New England and northern New York will interact to change soil moisture patterns throughout the year, with the potential for both wetter and drier conditions depending on the location and season.
- Forest productivity will increase during the next several decades in the absence of significant stressors.
- However, warmer temperatures and altered precipitation in New England and northern New York will interact to change soil moisture patterns throughout the year, with the potential for both wetter and drier conditions depending on the location and season.

Regarding invasive plants and forest pests

- Certain insect pests and pathogens will increase in occurrence or become more damaging in New England and northern New York.
- Tree regeneration and recruitment will change and forest composition will change across the landscape.
- Low-diversity systems are at greater risk from climate change.

- Many invasive plants will increase in extent or abundance in New England and northern New York.

Regarding urban forestry

- The urban heat island effect can exacerbate the effects of increasing temperatures.
- Impervious cover can exacerbate the effects of increased heavy precipitation events in urban areas.
- Tree regeneration and recruitment will change.

Emerald Ash Borer

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. As of the writing of this report, the beetle has been confirmed in Bristol, a town in close proximity to Panton. The high-risk area surrounding this known infestation includes the eastern edge of Panton. See the map of the Emerald Ash Borer Infested Area in Vermont linked on vtinvasvies.org. All Vermont towns are encouraged to prepare and manage the impacts of EAB and the upcoming loss of ash trees; the town of Panton may partner with neighboring towns to understand the impact of EAB on roadside ash in Champlain Valley towns.

The Vermont Urban and Community Forestry Program is providing technical assistance and training to community members wishing to learn to identify ash trees, understand the impacts of emerald ash borer, plan for the decline of ash trees in their public places, and create EAB management plans for their towns. Municipalities are conducting roadside ash inventories to gauge the location, density, size, and condition of ash trees in municipal right-of-ways that will need management as they decline and die from emerald ash borer infestation. To prepare for EAB in Panton's landscape, the town should:

- Conduct a Rural Roadside Ash Inventory to understand the scope of impact that EAB may have in Panton
- Complete an EAB Management Plan that includes budget considerations for ash removal, treatment, risk mitigation, and hopefully, replanting of other tree species. The Vermont Urban & Community Forestry website has many examples of EAB Preparedness and Management Plans.

PARTNERSHIPS AND GENERAL TACTICS

The town of Panton has the opportunity to establish best practices in partnership with unique neighboring land uses along municipal roads and on private lands.

This section of the report examines potential right-of-way management opportunities conducted with local partners connected to both the right-of-way land itself and the processes that govern its management. Such partners include landowners with land in agricultural use, private landowners with land in residential use or as forestland, utility companies, and parties that influence municipal land management, such as planning commission members, conservation commission members, the road foreman and road crew, and the town Selectboard.

General tactics to improve regional forest health, grow resilient roadside canopy, reduce the impact of invasive plants and forest pests, and manage stormwater runoff from and into the town right-of-way include the following tactics:

Regarding road construction and right-of-way vegetation clearing

- Ensure that any road or roadside construction does not result in bare soil.
- Consider native seed mixes for roadsides; however, this will cost significantly more than seeding with a local “conservation mix”.
- Direct runoff into natural features with herbaceous and woody plant cover to reduce runoff and nonpoint source pollution, while still providing outflow for excess water.
- Connect natural features such as rain gardens and sequential stormwater treatments to other natural systems.
- Consider native trees or "novel ecosystems" for steeply sloped areas within the ROW or on neighboring private property.
- Restore or create conditions that allow tree seedlings to thrive by removing non-native species in the shrub layer and canopy trees.

Regarding urban and community forestry practices along the roadsides

- Monitor for hazard trees near the road and developed areas, remove them if there is a target present. Plan to retain healthy, low-risk trees – see an illustrated example of this process here. The town can establish a plan for risk tree management and enact it over many years.
- Treat culturally important ash trees with pesticide to ensure continued canopy cover and provide seed source for future ash trees.
- Use native plant species as ground cover or horticultural plantings in the rooting zone of urban trees.
- Reduce the impact of biological stressors. Manage herbivory to promote regeneration, growth, and form of desired species.
- Rotate planting and removal schedules so that complete canopy removal is limited in one area (e.g. along one road, in a park).
- Soften roadside edges of roadside forest stands and trees to reduce abrupt transitions and susceptibility to wind damage. See the Stormwise website at stormwise.uconn.edu.

Regarding roadside vegetation as connections between private lands

- Introduce water-loving trees to manage stormwater near and downstream of culvert outfalls or in riparian woodlands on private property.
- In forested riparian zones, carefully select any tree species that will adapt to climate change. Diversity of species will help prevent larger canopy dieback during future pest infestations.
- Identify existing tree canopy and corridors for stream connectivity, stormwater flow, and wildlife migration. Create artificial corridors between existing conserved and forested areas.

Regarding private land

- Restore or reforest riparian areas adjacent to developed areas in order to reduce erosion and nutrient loading into Lake Champlain.

- Restore native communities and ecosystem components (e.g. natural groundcover, litter layer, coarse woody debris) in riparian areas.
- Create easements on private land holdings adjacent to or close to forested riparian corridors.
- Establish and support development and management ordinances and regulations that protect and reduce impacts to high-quality remnant ecosystems.

POTENTIAL PROJECT GOALS AND OBJECTIVES

On Municipally Managed Land

Goal: Slow stormwater runoff in right-of-way and on adjacent properties.

Objectives and Timeframes: Invest in green stormwater infrastructure; direct stormwater water into a forested or planted landscape; establish woody buffers. (Within 10 years)

Action items

- Choose three locations in public ROW to construct minimal hardscaping to stabilize eroding outlets and outfalls.
- Inventory plants and trees along one site designated for roadside ditching or future road construction; identify seedlings and saplings that will be hardy and resilient in roadside climates; protect these saplings during construction. This will require long-term stewardship by the town.
- Identify a one-mile stretch of road that is slated for ditching or other changes to manage stormwater and/or address erosion according to the standards of the Municipal Roads General Permit. Identify locations for turnouts into forested areas; identify trees to be conserved.

Challenges

- Increase in storm and ice events will test the limits of hardscaped green stormwater infrastructure in the ROW.
- Emerald ash borer threatens ah trees and undermines existing forested landscape.
- Unless the ROW is wider than 3 rods (49.5 feet), this type of project will require buy-in and permission from neighboring landowners.
- Green stormwater infrastructure requires funding for concept design, engineering specs, and implementation.
- Increased severity of storm events may result in more storm damage to existing trees in or near the ROW.
- The spread of invasive plants and pests may overwhelm native species in planted buffer vegetation.

Opportunities

- Longer growing season offers more opportunity for tree, shrub or plant growth.

- Towns will have many opportunities to test out individual structures during storm events and learn from experience in their locations.

Goal: Establish healthy tree canopy along rural roads, in part to reduce future labor of road crews managing risk trees and conducting brush and invasive plant management.

Objective and Timeframe: Manage for death of ash trees due to impending emerald ash borer infestation; address large stands of dead elm; plan for climate-resilient roadside forests. (10 years)

Action items

- Inventory ash trees along priority roads in Panton.
- Identify any culturally important ash trees in the ROW and determine a treatment schedule or agreement between the town and private landowner.
- Choose two ½-mile road segments (in consultation with abutting private landowners) address risk trees, manage brush and understory, plant native trees. (Less than 10 years)
- Inventory plants and trees along one site designated for roadside ditching or future road construction; identify seedlings and saplings that will be hardy and resilient in roadside climates; protect these saplings during construction. Mitigate invasive plants. This will require long-term stewardship by the town.

Challenges: Choosing the right species for these challenging environments in concert with species range change due to climate change.

Opportunities: With the decline of ash, town residents may be emotionally invested in tree planting in the right-of-way or in public spaces. They may be excited by seeing new and ecologically unusual species along their property.

Feasibility: *Medium*
Regarding tree planting on two ½-mile sections of road: Any tree planting initiative needs to secure funding and find an invested and interested landowner. The longevity of such a project may be challenging, especially if a private landowner sells the property (particularly during the first three years of tree establishment), if the trees are not protected from herbivory browse, or the trees are not identified as public assets and protected under a shade tree plan for the town.

Monitoring: Criteria for evaluation: 75% survivorship after 3 years. Tree warden will report on survivorship once a year for three years

In Partnership with Private Landowners

Goal: Increase acreage available for planting or hardscaping needed to manage runoff coming into or out of the ROW.

Objective and Timeframe: Utilize the town right-of-way and neighboring private land to slow stormwater runoff through engineered and planted green stormwater infrastructure. (2 years)

Action items

- Site and design one rain garden downstream from public ROW.
- Analyze herbivory impacts in Panton, apply repellant or install fences at any new planting projects. Fencing in a rain garden may ensure its success.

Challenges

- Severe storm events may undermine the rain garden design, or the design required to meet estimated stormwater flow may need to be bigger than the town is willing to finance.
- Repeated freeze-thaw events may cause excessive ice on hardscaping (e.g. stone-lined ditches or pools), making it nearly impossible to manage run-off.
- Feasibility depends on participation by town and neighboring landowner. Its feasibility is not significantly affected by climate change.

Opportunities

- Longer growing season may increase stormwater mitigation effects of roadside planting.

Monitoring: *Criteria for evaluation*: 75% plant and tree survivorship after 3 years. Abutting private landowner will report on survivorship once a year for three years.

Goal: Contribute to conservation design in Panton with a focus on trees, shrubs and plants as elements of green stormwater infrastructure in riparian areas.

Objective and Timeframe: Protect or restore forested buffers along streams in Panton, many that feed directly into Dead Creek or Lake Champlain. (15 years)

Action items

- Establishes the location of riparian corridors, whether man-made or natural, and map out areas that need to retain forest cover. This may help landowners understand the ecosystem service benefits that their property provides. However, the value of these ecosystem services may not outweigh the monetary value farmers gain by cultivating land near riparian or drainage corridors.
- Identify tree species composition along one stream segment on private property, manage for death of ash trees and large stands of dead elms. Monitor canopy cover over streams. Note location and density of invasive plant species.

Challenges

- Increase in invasive pests, particularly EAB, will affect tree health in riparian buffers.
- Storm damage will affect tree health and longevity.

Opportunities

- Some water-loving tree species (like silver maple) may grow well under warming conditions.

- As long as one landowner will allow access along the riparian corridor, a pilot inventory and monitoring project seems feasible and does not require large amounts of money.

Monitoring

- *Criteria for Evaluation*: Survey composition of tree species along 1 stream segment, plan for planting or regeneration efforts. Ensure canopy cover remains at 50% or more of current canopy cover as ash die. Yearly field walk with the landowner.

In Partnership with Utility Companies

Goal: Partner with local utilities to understand and influence utility ROW vegetation management in Panton.

Objectives and Timeframes: Provide outreach and education to Panton residents adjust expectations of vegetation in the utility ROW and the effects on adjacent property. (2 years)

Action items

- Share Green Mountain Power (GMP) utility vegetation management plans and chief contact for with Panton residents.
- Visit three utility locations with GMP staff to inventory vegetation and propose suggested amendments.

Challenges

- Longer growing season may exacerbate invasive plant spread. Any amendments will need to be carefully monitored.
- Increased severity and number of storm events may result in increased erosion under utility ROW and along roads bordering utility ROW.

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Opportunities

- Change in tree species composition due to utility line clearing and/or EAB may spark more interest in roadside vegetation management outside of the utility ROW, and may spark partnerships between the utility and town in the utility ROW.
- Working with the utility company may prove financially useful for both the town and the utility in order to save costs on vegetation management in the ROW.

In Partnership with Agricultural landowners

Goal: Implement required agricultural practices (RAPs) that create vegetated buffers between roads and row crops.

***Objective and time frame*:** Utilize town right-of-way to require grass and shrub buffers, manage declining or risk trees, and promote revegetation of trees, shrubs, and grasses in the right-of-way adjacent to farmland. (30 years)

Action items

- Identify any roadsides in town where agriculture continues into the ROW.
- Identify locations where stormwater is directed into the town ROW.
- Identify one agricultural landowner maintaining a healthy buffer between row crops and the roadside. Provide outreach to the town regarding these best practices.

Challenges

- Agricultural landowners may not be able or willing to change practices.
- The town may not have resources to change stormwater drainage patterns.
- Increased severity of ice events and storms may damage vegetation in existing buffers between agricultural land and the road.
- The spread of invasive plants and pests may overwhelm native species in planted buffer vegetation.

Opportunities

- Funding to plant or manage woody buffers may be available from state-sourced grants.
- Longer growing season offers more opportunity for tree, shrub, or plant growth.

Learn more about the Resilient Right-of-Ways Project
vtcommunityforestry.org/program/technical-assistance/resilient-right-of-ways

PLANT LIVE GROW

Vermont Urban & Community Forestry Program
Vermont Department of Forests, Parks & Recreation in partnership with University of Vermont Extension